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Final
Hanford Comprehensive Land-Use Plan
Environmental Impact Statements
September 1999

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Glossary

100-year flood. A flood event of a magnitude that occurs, on average, once every 100 years, and equates to a 1-percent probability of occurring in any given year.

Adequate public facilities. Facilities which have the capacity to serve development without decreasing levels of service below locally established minimums.

Affected environment. In an environmental impact statement, a description of the existing environment covering information that directly relates to the scope of the proposed action and alternatives that are analyzed in the impact analysis. The affected environment provides a baseline and must include sufficient detail to support the impact analysis, including cumulative impacts. Environmentally sensitive resources, such as floodplains and wetlands, threatened and endangered species, prime and unique agricultural lands, and historic and cultural resources, must be identified.

Agriculture. Improvements or activities associated with the growing, cultivating, and/or harvesting of crops and livestock, including those activities necessary to prepare the agricultural commodity for shipment.

Agricultural land-use designation. As presented in this environmental impact statement, an area designated for the tilling of soil, raising of crops and livestock, and horticulture for commercial purposes along with all those activities normally and routinely involved in horticulture, and the production of crops and livestock. Includes related activities consistent with Agricultural uses.

Atmospheric stability. A measure of the amount of mixing and turbulence in the atmosphere.

Attainment area. Any area that is designated, pursuant to 42 U.S.C. 7407(d) of the *Clean Air Act of 1970*, as having ambient conditions equal to or less than national primary or secondary ambient air quality standards for a particular air pollutant or a group of air pollutants.

Animal-unit-month (AUM). An AUM is defined as the amount of forage required by an animal-unit (i.e., a mature cow weighing 453.6 kg [1,000 lbs] with unweaned calf) for one month assuming average daily consumption to be 11.8 kg (26 lbs) of dry matter. Therefore, by convention, an AUM equals 353.8kg (780 lbs) of dry forage. The amount of area that is required for each AUM determines the stocking rate or the actual number of animals on a specific area at a specific time. The area of land allowed per animal unit for the entire grazing period of the year is expressed as animal units/unit area (AU/Ha) or unit area/AUM (Ha/AUM).

Background radiation. Radiation from cosmic sources; naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material); consumer products containing nominal amounts of radioactive material or producing nominal amounts of radiation; and global fallout that exists in the environment (e.g., from the testing of nuclear explosive devices).

Barrier. Man-made components of a waste management system designed to prevent or impede the release of radionuclides or other contaminants to the biosphere. Barriers can include the waste form, waste container, and materials placed over, under, or around these containers or wastes. For example, an engineered cap constructed over a waste site is a barrier.

1 **Basalt.** A dark grey to black, fine grained igneous rock composed primarily of calcium feldspar
2 and pyroxene, with or without olivine. This material underlies the Hanford Site, and may be
3 quarried for use as riprap in the construction of caps to prevent the migration of contaminants in
4 surface soils and burial grounds by preventing infiltration of precipitation.
5

6 **Benthic.** Living on or at the bottom of a body of water.
7

8 **Biodiversity.** The diversity of ecosystems, species, and genes, and the variety and variability of
9 life. Biodiversity also is a qualitative measure of the richness and abundance of ecosystems and
10 species in a given area.
11

12 **Bounding.** Represents the maximum reasonably foreseeable event or impact. All other
13 reasonably foreseeable events or impacts would have fewer and/or less severe environmental
14 impacts.
15

16 **Candidate species.** A plant or animal species that is under consideration by the U.S. Fish and
17 Wildlife Service or Washington Department of Fish and Wildlife for listing as either threatened or
18 endangered.
19

20 **Cap.** Construction of an engineered barrier over the top of a waste site in order to prevent or
21 impede the release of radionuclides or other waste material into the environment.
22

23 **Carcinogen.** Any substance or agent that is capable of producing cancer.
24

25 **Chronic exposure.** The absorption or intake of hazardous material over a long period of time
26 (e.g., over a lifetime).
27

28 **Class I area.** Under the *Clean Air Act of 1970*, the designation applies to pristine areas, such as
29 national parks and wilderness areas, where substantial growth is effectively precluded in order to
30 avoid degradation of air quality. Goat Rocks Wilderness Area is the closest Class I area to the
31 Hanford Site, located approximately 90 miles northwest.
32

33 **Class II area.** A designation for areas under the *Clean Air Act of 1970* where moderate
34 degradation of air quality is permissible. The Hanford Site and its immediate vicinity are in a
35 Class II Area.
36

37 **Cold War.** Intense economic, political, military, and ideological rivalry between nations just short
38 of military conflict. Major expansions in the production of nuclear materials for military
39 applications were undertaken at the Hanford Site so that the Nation could maintain an
40 overwhelming arsenal of nuclear weapons. In the context of this environmental impact
41 statement, the Cold War refers to the period from the end of World War II to 1989 (when the
42 Berlin Wall was dismantled).
43

44 **Confined aquifer.** An aquifer bounded above and below by less permeable layers.
45 Groundwater in the confined aquifer is under a pressure greater than atmospheric pressure.
46

47 **Conservation.** Areas of ecological, geological, archaeological, and cultural significance and
48 sensitivity that are to be protected and managed so as to maintain the essential qualities derived
49 from the landscape, but contain supplemental values of scientific, education, historical, scenic,
50 and mineral importance that may be suited to human uses insofar as the essential qualities
51 remain intact over the landscape.
52

53 **Conservation (Mining) land-use designation.** As presented in this environmental impact
54 statement, an area reserved for the management and protection of archeological, cultural,

1 ecological, and natural resources. Limited and managed mining could occur as a special use
2 (e.g., a permit would be required) within appropriate areas. Limited public access would be
3 consistent with resource conservation. Includes activities related to Conservation (Mining),
4 consistent with the protection of archeological, cultural, ecological, and natural resources.
5

6 **Conservation (Mining and Grazing) land-use designation.** An area reserved for the
7 management and protection of archeological, cultural, ecological, and natural resources. Limited
8 and managed mining and commercial grazing could occur as a special use (e.g., a permit would
9 be required) within appropriate areas. Limited public access would be consistent with resource
10 conservation. Includes activities related to Conservation (Mining and Grazing), consistent with
11 the protection of archeological, cultural, ecological and natural resources.
12

13 **Controlled area.** An area to which access is controlled to protect individuals from exposure to
14 radiation or radioactive and/or hazardous materials.
15

16 **Contamination.** The presence of unwanted radioactive and/or hazardous materials above
17 background concentrations in environmental media (e.g., air, soil, water) or on the surfaces of
18 structures, objects, or personnel.
19

20 **Criteria pollutants.** Substances for which national ambient air quality standards have been
21 established by the U.S. Environmental Protection Agency.
22

23 **Critical areas.** Critical areas are required by Chapter 36.70A of the *State of Washington's*
24 *Growth Management Act*. Guidelines for defining critical areas are given in WAC 365-190-080.
25 Items to be considered by the local planning agency are as follows: (1) wetlands, (2) aquifer
26 recharge areas, (3) frequently flooded areas, (4) geologically hazardous areas, and (5) fish and
27 wildlife habitat conservation areas. Counties and cities may use information prepared by the
28 Washington Department of Fish and Wildlife (WDFW) to classify and designate locally important
29 habitats and species. Priority habitats and priority species are being identified by the WDFW for
30 all lands in Washington State. While these priorities are those of the Department, they and the
31 data on which they are based may be considered by counties and cities.
32

33 **Critical habitat.** Any air, land, or water area determined (through a regulatory action under the
34 *Endangered Species Act of 1973*) to be essential to the survival of a population of an endangered
35 or threatened species or habitat deemed to be necessary for the recovery of a threatened or
36 endangered species. Critical habitat has not been designated on the Hanford Site.
37

38 **Cumulative impact.** The impact on the environment that results from the incremental impact of
39 the action when added to other past, present, and reasonably foreseeable, future actions.
40 Cumulative impacts can result from individually minor, but collectively significant actions taking
41 place over a period of time.
42

43 **Cultural resources.** Areas or objects that are of cultural significance to human history at the
44 national, state, or local level. Generally includes paleontological, pre-contact, and post-contact
45 resources, as well as resources of traditional use or religious value to Native Americans.
46

47 **Decommissioning.** The process of removing a facility from operation, followed by
48 decontamination, entombment, dismantlement, or conversion to another use.
49

50 **Decontamination.** The actions taken to reduce or remove substances that pose a substantial
51 present or potential hazard to human health or the environment, (e.g., removing radioactive
52 contamination from facilities, soil, or equipment by washing, chemical action, mechanical
53 cleaning, or other techniques).
54

1 **Development.** Any change in use, or extension of the use of the land, including, but not limited to, the construction, reconstruction, conversion, structural alteration, relocation, or enlargement of
2 any improvements.
3
4
5 **DOE orders.** Requirements internal to the U.S. Department of Energy that establish agency
6 policy and procedures, including procedures for compliance with applicable laws.
7
8 **Derived concentration guides.** Concentrations of radionuclides in air and water that an
9 individual could continuously consume, inhale, or be immersed in at average annual rates without
10 receiving an effective dose equivalent greater than 100 mrem/yr.
11
12 **Dose (or radiation dose).** A generic term that means absorbed dose, dose equivalent, effective
13 dose equivalent, committed dose equivalent, committed effective dose equivalent, or total
14 effective dose equivalent. Relates to a chemical to which an organism is exposed; generally
15 denotes the quality of radiation or energy that is absorbed by the organism.
16
17 **Dose conversion factor.** Any factor used to change an environmental measurement to dose in
18 units of concern.
19
20 **Ecosystem.** The interacting system of a biological community and its physical environment,
21 considered as a unit in nature.
22
23 **Emission standards.** Legally enforceable limits on the quantities and/or kinds of air pollutants
24 that can be emitted into the atmosphere.
25
26 **Endangered species.** Animals, birds, fish, plants, or other living organisms threatened with
27 extinction by man-made or natural changes in their environment. Requirements for declaring a
28 species endangered are contained in the *Endangered Species Act of 1973*.
29
30 **Emergency planning zone (EPZ).** The EPZ is an area surrounding a facility for which
31 emergency planning and preparedness efforts are carried out to ensure that prompt and effective
32 actions can be taken to minimize the impact to onsite personnel, public health and safety, and the
33 environment in the event of an operational emergency. The EPZ begins at the boundary of the
34 facility and ends at a distance for which special planning and preparedness efforts are no longer
35 required. Access restrictions are not required within an EPZ; however, DOE would be
36 responsible for ensuring adequate planning and preparedness efforts. A plan that evaluates
37 hazard assessments and determines the size of EPZs is a requirement of DOE Order 151.1,
38 *Comprehensive Emergency Management System Order*.
39
40 **Environmental justice.** The fair treatment of people of all races, cultures, and income with
41 respect to the development, implementation, and enforcement of environmental laws, regulations,
42 and policies. Executive Order 12898 required Federal agencies to identify and address any
43 potentially disproportionately high and adverse human health and environmental effects of agency
44 policies, programs, and activities on minority and low-income populations.
45
46 **Evapotranspiration.** The combined processes by which water is transferred from the surface
47 of the Earth to the atmosphere, including evaporation of liquid or solid water, and transpiration
48 from plants.
49
50 **Exclusive use zone (EUZ).** The EUZ is an area designated for DOE operations activities
51 associated with a waste site or facility. Each DOE nuclear facility is encouraged by DOE Order
52 420.1, *Facility Safety*, to maintain siting distance for a public buffer zone as part of the defense in
53 depth approach to prevent public health effects in the event of an unmitigated accident. The EUZ
54 is reserved for DOE or other hazardous operations with severely restricted public access. This

1 zone extends from the facility fence line to a distance at which threats to the public from routine
2 and accidental releases diminish to the point where public access can be routinely allowed. It is
3 inside the emergency planning zone (EPZ).
4

5 **Exposure scenario.** A set of facts, assumptions, and inferences about how exposure takes
6 place that aids the exposure assessor in evaluating, estimating, or quantifying exposures.
7

8 **Facility area.** An area within the Hanford Site Boundary immediately surrounding a facility or
9 group of facilities that functions under process safety management and a common emergency
10 response plan.
11

12 **Floodplain.** The portion of a river valley that becomes covered with water when the river
13 overflows its banks at flood stage.
14

15 **Food chain.** The pathways by which any material entering the environment passes from the first
16 absorbing organism through plants and animals, including humans.
17

18 **Fugitive dust.** The particulate matter that is stirred up and released into the atmosphere during
19 excavation or construction activities.
20

21 **Grazing.** To feed on growing herbage, attached algae, or phytoplankton
22

23 **Groundwater.** The supply of water below the land surface in the zone of saturation.
24

25 **Groundwater mounds.** A hydrologic condition, often caused by artificial recharge of an aquifer,
26 in which "mounds" of groundwater are created. These mounds have been known to alter the
27 natural hydraulic gradients and drainage patterns of an aquifer. The pressure and weight of the
28 groundwater mounds can increase the hydrostatic head so all nearby groundwater, and any
29 associated contaminant plume, could move more rapidly toward a receptor.
30

31 **Grouting.** The process of immobilizing or fixing solid or liquid forms of waste to enable safe
32 storage or disposal. Generally, grout is a fluid mixture of cementitious materials and waste that
33 sets up as a solid mass.
34

35 **Half-life.** The time in which half the atoms of a particular radioactive substance disintegrate to a
36 different nuclear form. Used as a measure of the persistence of radioactive materials; each
37 radionuclide has a characteristic, constant half-life. Measured half-lives vary from millionths of a
38 second to billions of years.
39

40 ***Hanford Federal Facility Agreement and Consent Order.*** The *Hanford Federal Facility*
41 *Agreement and Consent Order* (also referred to as the Tri-Party Agreement), is a binding
42 agreement, negotiated pursuant to Section 120 of the *Comprehensive Environmental Response,*
43 *Compensation, and Liability Act of 1980*, and other regulations signed by the U.S. Department of
44 Energy, the U.S. Environmental Protection Agency (Region 10), and the Washington State
45 Department of Ecology, to organize responsibilities for remediation of the Hanford Site and to
46 establish milestones by which the remediation will be accomplished. This agreement commits
47 the three agencies to a long-term cooperative program to remediate the contaminated sites at
48 Hanford. The Tri-Party Agreement contains a blueprint for remediation and uses enforceable
49 milestones to keep the program on schedule.
50

51 **Hazard classification.** A safety classification based on potential onsite consequences. Criteria
52 for this classification are discussed in DOE Order 5480.23, *Nuclear Safety Analysis Reports*.
53

54 **Hazardous air pollutant.** Any air pollutant subject to a standard promulgated under 42 U.S.C.

1 Section 7412 or other requirements established under 42 U.S.C. Section 7412 of the *Clean Air*
2 *Act of 1970*, including 42 U.S.C. Section 7412 (g), (j), and (r) to the *Clean Air Act of 1970*. The
3 State of Washington regulates similar pollutants as "toxic air pollutants." However, State
4 regulations apply only to new sources; Federal regulations apply to new and existing sources.
5 The list of chemicals regulated by the state overlaps with the Federal list, but is considerably
6 longer.

7
8 **Hazardous material.** A substance or material, including a hazardous substance, that has been
9 determined by the U.S. Secretary of Transportation to be capable of posing an unreasonable risk
10 to health, safety, and property when transported in commerce.

11
12 **Hazardous substance.** Any substance that, when released to the environment in an
13 uncontrolled or unpermitted fashion, becomes subject to the reporting and possible response
14 provisions of the *Clean Water Act of 1977* and the *Comprehensive Environmental Response,*
15 *Compensation, and Liability Act of 1980*.

16
17 **Hazardous waste.** Those wastes that are identified as hazardous pursuant to RCRA
18 (40 CFR 261).

19
20 **High-efficiency particulate air (HEPA) filter.** A filter with an efficiency of at least 99.95% that is
21 used to separate particles from exhaust streams prior to release into the atmosphere.

22
23 **Highest and best use (of property).** Section 101-47.4909 of the Federal Property Management |
24 Regulations defines the "highest and best use" as that use to which a property can be put that |
25 produces the highest monetary return from the property, promotes its maximum value, or serves |
26 a public or institutional purpose. The "highest and best use" determination must be based upon |
27 the property's economic potential, qualitative values inherent in the property, and utilization factors |
28 affecting land use such as zoning, physical characteristics, other private and public uses in the |
29 vicinity, neighboring improvements, utility services, access, roads, location, and environmental |
30 and historical considerations. |

31
32 **High-Intensity Recreation land-use designation.** As presented in this environmental impact
33 statement, an area allocated for high-intensity, visitor-serving activities and facilities (commercial
34 and governmental) such as golf courses, recreational vehicle parks, boat launching facilities,
35 Tribal fishing facilities, destination resorts, cultural centers, and museums. Includes related
36 activities consistent with High-Intensity Recreation.

37
38 **High-level waste.** The highly radioactive waste material that results from processing or
39 reprocessing spent nuclear fuel, including liquid waste produced directly from reprocessing and
40 any solid waste derived from the liquid that contains a combination of transuranic and fission
41 product nuclides in quantities that require permanent isolation. High-level waste may include
42 other highly radioactive material that the U.S. Nuclear Regulatory Commission, consistent with
43 existing law, determines by rule to require permanent isolation.

44
45 **Historic resources.** The sites, districts, structures, and objects that are considered limited and
46 nonrenewable because of an association with historic events, persons, or social or historic
47 movements.

48
49 **Horticulture.** The science and art of growing fruits, vegetables, flowers, or ornamental plants.

50
51 **Hydraulic conductivity.** The capacity of a porous medium to transport water. The parameter
52 relating the volumetric flux to the driving force in flow through a porous medium (particularly water
53 through soil); a function of both the porous medium and the properties of the fluid.

1 **Hydraulic gradient.** The slope of the water table.

2
3 **Impact.** The effect, influence, alteration, or imprint of an action. Impacts may be beneficial or
4 detrimental.

5
6 **Industrial land-use designation.** As presented in this environmental impact statement, an area
7 suitable and desirable for activities, such as reactor operations, rail, barge transport facilities,
8 mining, manufacturing, food processing, assembly, warehouse, and distribution operations.
9 Includes related activities consistent with Industrial uses.

10
11 **Industrial-Exclusive land-use designation.** As presented in this environmental impact
12 statement, an area suitable and desirable for treatment, storage, and disposal of hazardous,
13 dangerous, radioactive, and nonradioactive wastes. Includes related activities consistent with
14 Industrial-Exclusive uses.

15
16 **Infrastructure.** The basic services, facilities, and equipment needed for the operation and
17 growth of an area.

18
19 **Institutional controls.** The term “institutional controls” is intended to be a broad term. It
20 generally includes all non-engineered restrictions on activities, access, or exposure to land,
21 groundwater, surface water, waste and waste disposal areas, and other areas or media. Some
22 common examples of tools to implement institutional controls include restrictions on use or
23 access, zoning, governmental permitting, public advisories, installation master plans, and legal
24 restrictions such as deed notices or other environmental easements. Institutional controls may
25 be temporary or permanent restrictions or requirements.

26
27 **Interim action (NEPA).** An action that may be undertaken while work on a required program
28 environmental impact statement is in progress, and the action is not covered by an existing
29 program statement. An interim action may not be undertaken unless such action: (1) is justified
30 independently of the program; (2) is itself accompanied by an adequate environmental impact
31 statement or has undergone other *National Environmental Policy Act of 1969* review; and (3) will
32 not prejudice the ultimate decision on the program (i.e., interim action prejudices the ultimate
33 decision on the program when the action tends to determine subsequent development or limits
34 alternatives).

35
36 **Ion exchange.** The reversible interchange of ions of like charge within a medium.

37
38 **Land use.** A term used to indicate the utilization of any piece of land. The way in which land is
39 being used is the land use.

40
41 **Land-use planning.** A decision-making process to determine the future or end use of a parcel
42 of land, considering such factors as current land use, public expectations, cultural
43 considerations, local ecological factors, legal rights and obligations, technical capabilities, and
44 cost.

45
46 **Life-cycle costs.** All costs, except the cost of personnel occupying a facility, from the time that
47 the space requirement is defined until the facility passes out of government hands.

48
49 **Low-Intensity Recreation land-use designation.** As presented in this environmental impact
50 statement, an area allocated for low-intensity, visitor-serving activities and facilities, such as
51 improved recreational trails, primitive boat launching facilities, and permitted campgrounds.
52 Includes related activities consistent with Low-Intensity Recreation.

53
54 **Low-level waste.** Radioactive waste that is not classified as high-level waste, transuranic

1 waste, or spent nuclear fuel. Test specimens of fissionable material irradiated for research and
2 development, and not for the production of power or plutonium, may be classified as low-level
3 waste if the concentration of transuranic elements is less than 100 nanocuries per gram of
4 waste. The U.S. Department of Energy, U.S. Environmental Protection Agency, and U.S. Nuclear
5 Regulatory Commission share the responsibility for managing low-level waste.
6

7 **Manhattan Project.** The code name for the large-scale national project that developed the first
8 atomic bomb.
9

10 **Maximally exposed individual (MEI).** An hypothetical person who lives near the Hanford Site
11 who, by virtue of location and living habits, could receive the highest possible radiation dose.
12

13 **Maximum contaminant level (MCL).** Under the *Safe Drinking Water Act of 1974*, the maximum
14 permissible concentrations of specific constituents in drinking water that is delivered to any user
15 of a public water system that serves 15 or more connections and 25 or more people. The
16 standards take into account the feasibility and cost of attaining the standard. In this
17 environmental impact statement, MCLs are referred to as *Drinking Water Standards*.
18

19 **Milestone.** An important or critical event that must occur in order to achieve the objectives of the
20 Tri-Party Agreement.
21

22 **millirem (mrem).** One thousandth (10^{-3}) of a rem (see also, rem).
23

24 **Mitigation.** Those actions that avoid impacts altogether, minimize impacts, rectify impacts,
25 reduce or eliminate impacts, or compensate for impacts.
26

27 **Mitigation bank.** Wetland enhancement, restoration, or creation undertaken to provide
28 mitigation (compensation) for wetlands losses from future development activities undertaken in
29 advance of development as part of a credit program.
30

31 **Mixed waste.** Waste containing both radioactive and hazardous components as defined by the
32 *Atomic Energy Act of 1954* and the *Resource Conservation and Recovery Act of 1976*,
33 respectively.
34

35 **Modified Mercalli intensity (MMI).** The MMI scale (designated by Roman numerals I through
36 XII) is used to measure the intensity of an earthquake in a particular area. It differs from the
37 Richter Scale (which measures the energy released by an earthquake). Briefly, the scale is:
38 I --Barely Felt; II -- Just Felt; III -- Noticeable; IV -- Rattling; V -- Felt Strong; VI -- Frightening; VII --
39 Disturbing; VIII -- Panicking; IX -- Some Damage; X -- Much Damage; and XI -- Complete
40 Destruction.
41

42 **Multiple use management.** Management of the various surface and subsurface resources so
43 that they are utilized in the combination of ways that will best meet the present and future needs
44 of the public, without permanent impairment of the productivity of the land or the quality of the
45 environment.
46

47 **National Ambient Air Quality Standards (NAAQS).** Air quality standards established by the
48 *Clean Air Act of 1970*. Primary NAAQS are intended to protect public health with an adequate
49 margin of safety. Secondary NAAQS are intended to protect the public welfare from any known
50 or anticipated adverse effects of a pollutant.
51

1 **National Environmental Research Parks.** Outdoor laboratories set aside for ecological
2 research to study the environmental impacts of energy developments and for informing the public
3 of environmental and land use options. The parks were established under the U.S. Department
4 of Energy to provide protected land areas for research and education in the environmental
5 sciences and to demonstrate the environmental compatibility of energy technology development
6 and use.

7
8 **National Priorities List (NPL).** A formal listing of the most hazardous waste sites in the nation,
9 as established under the *Comprehensive Environmental Response, Compensation, and Liability*
10 *Act of 1980*, that have been identified for remediation.

11
12 **National Register of Historic Places.** A list of architectural, historical, archaeological, and
13 cultural sites of local, state, or national significance, established by the *Historic Preservation Act*
14 *of 1966*, and maintained by the National Park Service. Sites are nominated to the Register by
15 state or Federal agencies.

16
17 **Nearest public access location.** For facility accident analysis, the location of the nearest point
18 where members of the public could be present, such as on an uncontrolled public highway that
19 crosses the Hanford Site.

20
21 **Nitrogen oxides (NO_x).** Gases formed from atmospheric nitrogen and oxygen when
22 combustion takes place under high temperature and high pressure. Nitrogen oxides include nitric
23 oxide (NO) and nitrogen dioxide (NO₂). Nitrogen oxides are considered to be a major air pollutant
24 and are regulated under the *Clean Air Act*. In the presence of sunlight, nitric oxide combines with
25 atmospheric oxygen to form nitrogen dioxide, which can cause lung damage at high
26 concentrations.

27
28 **Nonattainment area.** An area which is shown by monitoring data to exceed any national primary
29 or secondary ambient air quality standard for a pollutant.

30
31 **NO_x.** A generic term used to describe oxides of nitrogen (see nitrogen oxides).

32
33 **Nuclear fuel.** Materials that are fissionable and can be used in nuclear reactors for the
34 production of energy.

35
36 **Nuclide.** A generic term referring to all known isotopes, both stable and unstable, of the
37 chemical elements.

38
39 **Offsite.** Any place located outside of the Hanford Site boundary.

40
41 **Onsite.** A place located within the Hanford Site boundary.

42
43 **Operable unit.** A discrete set of one or more release sites that are considered together for
44 assessment and remedial activities. Criteria for placement of release sites into an operable unit
45 include geographic proximity, similarity of waste characteristics and site types, and the
46 possibilities for economy of scale.

47
48 **Outfall.** The end of a drain or pipe that carries waste water or other effluents into a ditch, pond,
49 or river.

50
51 **Overlay wildlife refuge.** An overlay wildlife refuge is one which is owned by one or more
52 Federal agencies and managed by the USFWS.

53
54 **Permeability.** The degree of ease with which water can pass through a rock or soil.

1 **Physiographic province.** An extensive portion of the landscape, normally encompassing many
2 hundred square miles, which portrays similar qualities of soil, rock, shape, and vegetation of the
3 same geomorphic origin.
4

5 **Planning criteria.** The factors used to guide development of the land use plan, or revision, to
6 ensure that it is tailored to the issues previously identified and to ensure that unnecessary data
7 collection and analyses are avoided.
8

9 **Plume.** The cloud of a pollutant in air, surface water, or groundwater formed after the pollutant is
10 released from a source.
11

12 **Plutonium-Uranium Extraction (PUREX) Facility.** The PUREX Facility on the Hanford Site
13 used a chemical process to reprocess spent nuclear fuel and irradiated targets.
14

15 **PM₁₀.** All particulate matter in the ambient air with an aerodynamic diameter less than or equal to
16 ten (10) micrometers.
17

18 **Polychlorinated biphenyls (PCBs).** A class of chemical substances formerly manufactured for
19 use as an insulating fluid in electrical equipment. These chemical substances are highly toxic to
20 aquatic life, persist in the environment, and accumulate in animal tissues.
21

22 **Porosity.** The ratio of the volume of pores of a material to the volume of its mass.
23

24 **Post-contact resources.** Sites, districts, structures, and objects considered limited and
25 nonrenewable because of their association with renowned events, persons, or social
26 movements.
27

28 **Pre-contact resources.** All evidences of human activity that predate recorded history and can
29 be used to reconstruct lifeways and culture history of past peoples. These include sites,
30 artifacts, and the contexts in which they occur.
31

32 **Pre-contact.** Of, relating to, or existing in times antedating written history. Pre-contact cultural
33 resources are those that antedate written records of the human cultures that produced them.
34

35 **Prehistoric resources.** All evidence of human activity that predates recorded history and can
36 be used to reconstruct lifestyles and cultural history of past peoples, including artifacts and the
37 contexts in which the artifacts occur.
38

39 **Preservation land-use designation.** As presented in this environmental impact statement, an
40 area managed for the preservation of archeological, cultural, ecological, and natural resources.
41 No new consumptive uses (e.g., mining or extraction of non-renewable resources) would be |
42 allowed within this area. Limited public access would be consistent with resource preservation. |
43 Includes activities related to Preservation uses.
44

45 **Probable maximum flood.** The largest flood for which there is any reasonable expectancy in a
46 specific area. The probable maximum flood is normally several times larger than the largest
47 flood of record.
48

49 **Process knowledge.** The set of information used by trained and qualified individuals who are
50 cognizant of the origin, use, and location of waste-generating materials and processes in
51 sufficient detail to certify the identity of the waste.
52

53 **Processing (of irradiated nuclear fuel).** Applying a chemical or physical process designed to
54 alter the characteristics of the nuclear fuel matrix or to recover a particular material.

1 **Production reactor.** A nuclear reactor that is used to irradiate target material to produce special
2 nuclear material or by-product material.

3
4 **rad.** The unit of absorbed dose of ionizing radiation. One rad is equal to an absorbed dose of
5 100 ergs/gram.

6
7 **Radiation (ionizing radiation).** Alpha particles, beta particles, gamma rays, x-rays, neutrons,
8 high-speed electrons, high-speed protons, and other particles capable of producing ions. In the
9 context of this EIS, radiation does not include non-ionizing radiation such as radiowaves,
10 microwaves, or visible, infrared, or ultraviolet light.

11
12 **Radioisotope.** An unstable isotope of an element that decays or disintegrates spontaneously,
13 emitting radiation in the process. Approximately 5,000 natural and artificial radioisotopes have
14 been identified. Usually synonymous with *radionuclide*.

15
16 **Raptor.** A bird of prey (e.g., hawk, eagle, etc.).

17
18 **Red Zone.** The Bureau of Reclamation's (BoR's) Red Zone is an administrative area on the
19 Wahluke Slope set aside by the BoR from irrigated agricultural development while the BoR
20 studies the connection between irrigation in this area and mass wasting events at the White
21 Bluffs.

22
23 **Recharge.** Replenishment of water to an aquifer.

24
25 **Record of Decision (ROD).** A public document that records the final decision(s) concerning a
26 proposed action. The ROD is based in whole or in part on information and technical analysis
27 generated during either the *Comprehensive Environmental Response, Compensation, and*
28 *Liability Act of 1980* process, or the *National Environmental Policy Act of 1969* process, both of
29 which consider public comments and community concerns during the decision-making process.

30
31 **Redd.** The spawning ground or nest of various fish species; the term usually refers to salmon
32 nests.

33
34 **Region of influence.** The region in which the direct and indirect principal socioeconomic and
35 environmental justice effects of actions are likely to occur and are expected to be of
36 consequence.

37
38 **rem.** The dosage of ionizing radiation that will cause the same biological effect as 1 roentgen of
39 x-ray or gamma ray exposure. Acronym for roentgen-equivalent man.

40
41 **Remediation.** The process of cleaning up a site where a release of a hazardous substance has
42 occurred.

43
44 **Reprocessing (of nuclear fuel).** Processing of reactor irradiated nuclear material (primarily
45 spent nuclear fuel) to recover fissile and fertile material, in order to recycle the materials, primarily
46 for defense purposes. Historically, reprocessing has involved aqueous chemical separations of
47 desired elements (typically uranium or plutonium) from undesired elements in the fuel.

48
49 **Research and Development land-use designation.** As presented in this environmental
50 impact statement, an area designated for conducting basic or applied research that requires the
51 use of a large-scale or isolated facility. Includes scientific, engineering, technology development,
52 technology transfer, and technology deployment activities to meet regional and national needs.
53 Includes related activities consistent with Research and Development.

1 **Reverse-well injection.** Process in which solutes are injected in an underlying geologic
2 formation through wells. During the early years of Hanford, waste solutions were pumped into
3 reverse wells as a method of waste disposal.

4
5 **Riparian habitat.** A specialized form of wetland restricted to areas along, adjacent to, or
6 contiguous with perennially flooded and intermittently flowing rivers and streams. Also,
7 periodically flooded lake and reservoir shore areas.

8
9 **Riprap.** A loose assemblage of stones that may be used in cap construction. In caps, riprap is
10 used as a capillary break to retard downward migration of water and to limit bioinvasion.

11
12 **Risk.** Quantitative expression of possible loss that considers both the probability that a hazard
13 causes harm and the consequences of that event.

14
15 **Safety analysis report.** A report, prepared in accordance with DOE Orders 5481.1B and
16 5480.23, that summarizes the hazards associated with the operation of a particular facility and
17 defines minimum safety requirements.

18
19 **Sanitary waste.** Liquid or solid wastes that are not considered hazardous or radioactive,
20 generated as a result of routine operations of a facility.

21
22 **Saturated zone.** A subsurface area in which all pores are filled with water under pressure equal
23 to or greater than atmospheric pressure.

24
25 **Scope.** In an environmental impact statement, the range of actions, alternatives, and impacts to
26 be considered.

27
28 **Scoping process.** An early and open public participation process for determining the scope of
29 issues to be addressed and for identifying the significant issues related to a proposed action.

30
31 **Sedimentary interbeds.** Rock layers composed of materials, such as sand or gravel, which
32 are derived from the breakdown of various rocks and are layered between other rock types.

33
34 **Seismicity.** The phenomenon of earth movements; seismic activity. Seismicity is related to the
35 location, size, and rate of occurrence of earthquakes.

36
37 **Sensitive species.** A Washington State category for plant species considered vulnerable or
38 declining, that could become endangered or threatened without active management or removal of
39 threats. Also sometimes used as a generic term for any plant and wildlife species that are
40 threatened or endangered, rare, vulnerable or declining, or monitored by state or Federal
41 agencies.

42
43 **Seral shrub-steppe.** The developmental phase of a climax community with characteristic
44 structure and plant species composition. The shrub-steppe community is typically a disclimax
45 community of sagebrush and grasses caused by heavy grazing and wildland fire control policy.

46
47 **Shrub-steppe.** Typically a treeless area covered by grasses and shrubs and having a semiarid
48 climate. Precipitation is typically very slight, but sufficient to support the growth of sparse grass
49 and other plants adapted to living in conditions where water is scarce. Washington State
50 Department of Fish and Wildlife considers shrub-steppe a priority habitat.

51
52 **Solid waste.** Any garbage, refuse, or sludge from a waste treatment plant, water supply
53 treatment plant, or air pollution control facility and other discarded material, including, solid liquid,
54 semisolid, or contained gaseous material resulting from industrial, commercial, mining, and

1 agricultural operations and from community activities. Solid waste does not include solid and
2 dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows, or
3 industrial discharges which are point sources subject to permits under Section 402 of the *Federal*
4 *Water Pollution Control Act, as amended*, or source, special nuclear, or by-product material as
5 defined by the *Atomic Energy Act of 1954*, as amended.
6

7 **SO_x**. A generic term used to describe oxides of sulfur. The combination of sulfur oxides with
8 water vapor produces acid rain (see also, sulfur oxides).
9

10 **Stabilization (of waste sites)**. Actions taken to reduce the environmental hazards associated
11 with an area used for disposal of hazardous and/or radioactive materials.
12

13 **Stakeholder**. Any person or organization with an interest in or affected by U.S. Department of
14 Energy activities. Stakeholders may include representatives from Tribal governments, Federal
15 agencies, state agencies, Congress, unions, educational groups, industry, environmental groups,
16 other groups, and members of the general public.
17

18 **Sulfur oxides**. Pungent, colorless gases formed primarily by the combustion of fossil fuels.
19 Sulfur oxides are considered to be major air pollutants and may damage the respiratory tract and
20 vegetation (see also, SO_x).
21

22 **Superfund**. The common name used for the *Comprehensive Environmental Response,*
23 *Compensation, and Liability Act of 1980* and its amendments.
24

25 **Surface water**. All waters that are open to the atmosphere and subject to surface runoff (rivers,
26 lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other
27 collectors that are directly influenced by surface water.
28

29 **Surplus facility**. Any facility or site (including equipment) that has no identified programmatic
30 use and may or may not be contaminated with radioactive or hazardous materials to levels that
31 require controlled access.
32

33 **Syncline**. A fold in the rock structure inclining upward on both sides of a median axis as in a
34 downward fold of rock strata; opposite of anticline.
35

36 **Threatened species**. Any species that is likely to become an endangered species within the
37 foreseeable future throughout all or a significant part of its range.
38

39 **Transuranic waste**. Waste containing more than 100 nanocuries of alpha-emitting transuranic
40 isotopes, which have half-lives greater than 20 years, per gram of waste, except for (1) high-level
41 radioactive waste; (2) waste that the U.S. Department of Energy has determined, with
42 concurrence of the Administrator of the U.S. Environmental Protection Agency, does not need the
43 degree of isolation required by 40 CFR 191; or (3) waste that the U.S. Nuclear Regulatory
44 Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR 61.
45

46 **Transmissivity**. A measure of the capacity of a water-bearing unit to transmit fluid. The product
47 of the thickness and the average hydraulic conductivity of a unit. Also, the rate at which water is
48 transmitted through an aquifer under a specific hydraulic gradient at a prevailing temperature and
49 pressure.
50

51 **Tritium**. A radioactive isotope of the element hydrogen, with two neutrons and one proton (H-3).
52

53 **Unconfined aquifer**. An aquifer that has a water table or surface at atmospheric pressure. At
54 Hanford, the unconfined aquifer is the uppermost aquifer and is the most susceptible to

1 contamination from Hanford Site operations.

2
3 **Vadose zone.** The area between the land surface and the top of the water table. Saturated
4 bodies, such as perched groundwater, may exist in the vadose zone. The vadose zone is also
5 known as the zone of aeration and the unsaturated zone.

6
7 **Vegetation type.** A classification of the plant community on a site based on the dominant plant
8 species in the community.

9
10 **Volatile organic compound (VOC).** Chemical containing mainly carbon, hydrogen, and oxygen
11 that readily evaporates at ambient temperature. Exposure to some organic compounds can
12 produce toxic effects on biological tissues and processes.

13
14 **Vulnerable aggregations.** Vulnerable aggregations are animal species that must aggregate at
15 some specific location and at a specific time to complete some action in their life cycle. These
16 aggregations include sage grouse, a bat colony, great blue heron at a nesting rookery, snakes in
17 a hibernaculum, migrating salmon at a river falls, elk herds during rut, etc. When these animals
18 aggregate, the species becomes vulnerable aggregations that can be severely impacted by
19 predators or disease.

20
21 **Waste management.** The planning, coordination, and direction of functions related to the
22 generation, handling, treatment, storage, transport, and disposal of waste, as well as associated
23 surveillance and maintenance activities.

24
25 **Waste minimization.** An action that economically avoids or reduces the generation of waste by
26 source reduction, reducing the toxicity of hazardous waste, improving energy usage, or recycling.
27 These actions are consistent with the general goal of minimizing present and future threats to
28 human health, safety, and the environment.

29
30 **Water level (water table).** The top elevation of the groundwater.

31
32 **Wetland.** Those areas that are inundated or saturated by surface water or groundwater at a
33 frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in
34 a saturated soil environment. These areas are frequently transitional between terrestrial and
35 aquatic systems.

36
37 **Wilderness area.** An area formally designated by Act of Congress as part of the National
38 Wilderness Preservation System.

39
40 **Wild and Scenic River.** A portion of a river that has been designated by Congress as part of the
41 *National Wild and Scenic Rivers Act of 1968*.

42
43 **Withdrawn lands.** Withdrawn lands are lands DOE has “borrowed” from other Federal agencies
44 for DOE’s mission. These lands could be either Public Domain lands (as in the case of the BLM
45 and some of the BoR lands) or lands that left the Public Domain and were subsequently acquired
46 by another Federal agency for their mission (i.e., BoR lands for the Columbia Basin Irrigation
47 Project) that were in turn borrowed by DOE for its mission.

48
49 **Worker.** Any person whose day-to-day activities are controlled by process safety management
50 programs and a common emergency response plan. When evaluating the potential
51 consequences of an accident, the worker is defined as an individual located within 100 m (328 ft)
52 downwind of the facility location where the accident occurs.

53
54 **Zoning.** A police power measure, enacted by general purpose unit of local government, in which

1 the community is divided into districts or zones within which permitted and special uses are
2 established as are regulations governing lot size, building bulk, placement, and other
3 development standards.
4

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2
3
4
5

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1.0 Introduction²

Coordinated land-use planning is one of the many trustee responsibilities the U.S. Department of Energy (DOE) has, as a Federal agency holding Federal assets. This *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS) considers several land uses for the Hanford Site planned for at least the next 50 years. As Hanford cleanup progresses through the next 40 years, cleanup Records of Decision (RODs) issued under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) and decisions made through the *Resource Conservation and Recovery Act of 1976* (RCRA) permitting process will impact some areas within the proposed land uses. Likewise, other DOE missions, such as research and development (R&D), might be collocated at Hanford because of DOE's continued Federal presence as the long-term caretaker of CERCLA/RCRA or low-level waste (LLW) disposal sites. Other DOE missions, such as economic development or even other Federal mandates such as natural resource protection, could also impact Hanford land uses.

As with all Federal activities, where, when, and how quickly Hanford waste sites are remediated and proposed land uses are achieved depends on Congressional funding. It is DOE's responsibility to include in its annual budget request sufficient funds for applicable environmental requirements. The Tri-Party Agreement, which defines the schedule for clean-up activities at the Hanford Site is one source of such requirements, and is itself dependent on Congressional funding. These cleanup activities are an important factor in determining when, or even if, proposed land uses might be fulfilled.

The DOE has prepared this HCP EIS to evaluate the potential environmental impacts associated with implementing a comprehensive land-use plan (CLUP) for the Hanford Site for at least the next 50 years. The DOE is expected to use this land-use plan in its decision-making process to establish what is the "highest and best use" of the land (41 *Code of Federal Regulations* [CFR] 101-47, "Federal Property Management Regulations"). The final selection of a land-use map, land-use policies, and implementing procedures would create the working CLUP when they are adopted through the ROD for this EIS.

Creating this land-use plan benefits DOE in several ways:

- C As a Natural Resource Trustee, DOE is encouraged by the Council on Environmental Quality (CEQ) to further the goals of biodiversity and actively manage the land's intrinsic resources.
- C Federal law and Executive Orders require that executive agencies hold only that land necessary to economically and efficiently support agency missions.³

² Vertical lines in the margins like these to the right indicate where changes have been made since the publication of the Revised Draft HRA-EIS in April, 1999.

³ Specifically, Executive Order 12512, *Federal Real Property Management*, requires executive agencies to ensure the effective use of real property in support of mission-related activities. Also, to stimulate the identification and reporting of excess real property and to achieve maximum utilization, the *Federal Property and Administrative Services Act of 1949*, as amended, requires all executive agencies to periodically review their real property holdings. These reviews identify property which is "not needed," "underutilized," or "not being put to optimum use." Property determined to be excess should be promptly reported to the Federal General Services Administration (DOE 1997b).

- 1 C DOE is required to develop a future use plan for the Hanford Site by 42 U.S.C. 7274k
2 (Public Law 104-201, Section 3153, *National Defense Authorization Act for Fiscal*
3 *Year 1997*).
4
5 C DOE's *Land- and Facility-Use Policy* is to develop a comprehensive plan to support
6 the Department's critical missions, stimulate the economy, and protect the
7 environment.
8
9 C A land-use plan provides a means for coordinating planning and plan implementation
10 with Tribal governments and local jurisdictions, as well as facilitating site and
11 infrastructure transition and privatization activities.
12
13 C A land-use plan formed with cooperating agencies and consulting Tribal governments
14 establishes a planning baseline for the Hanford Site in a regional context, from which
15 DOE and stakeholders can deliberate from, and depart on new future directions.
16
17 C Completing this HCP EIS and subsequent publication of the ROD finalizes the
18 Hanford Future Site Uses Working Group (Working Group) process begun in 1992 as
19 scoping for this EIS.
20
21 C This land-use plan can be used by the regulators to establish goals for the
22 CERCLA/RCRA cleanup (i.e., remediation) processes (see Table 1-3). Remediation
23 will be conducted under CERCLA/RCRA authority. If the remediation process cannot
24 support the proposed land use within the National Contingency Plan's (NCP's) 10^{-4} to
25 10^{-6} risk range, then this EIS contains a proposed process for changing the "highest
26 and best use" of the land while maintaining institutional controls (see Chapter 6).
27

28 In this EIS, DOE is working with Tribal governments and Federal, state, and local
29 agencies to develop several land-use alternatives – specifically, the potential environmental
30 consequences associated with each alternative – for at least the next 50-year time frame.
31 These individual land-use plans, together with a common set of policy statements, represent the
32 distinct alternatives developed by the cooperating agencies and consulting Tribal governments
33 on this document. The cooperating agencies are the U.S. Department of the Interior (DOI),
34 which includes the Bureau of Land Management (BLM), Bureau of Reclamation (BoR), and U.S.
35 Fish and Wildlife Service (USFWS); Benton, Franklin, and Grant counties; and the
36 City of Richland. The consulting Tribal governments are the Nez Perce Tribe Department of
37 Environmental Restoration and Waste Management (Nez Perce Tribe) and the Confederated
38 Tribes of the Umatilla Indian Reservation (CTUIR).
39

40 With the exception of the required No-Action Alternative, each alternative presented
41 represents a Tribal, Federal, state, or local agency's Preferred Alternative. Each alternative is
42 presented independently. Effort was taken to present each alternative with equal measure to
43 encourage public comment.
44

45 This CLUP's authority is limited to as long as DOE retains legal control of some portion
46 of the real estate. This EIS does not contain any new mechanisms or preferences regarding the
47 transfer of land, but with input from the cooperating agencies and consulting Tribal governments,
48 this EIS would continue to be useful for considering proposals regarding Hanford lands that
49 might be transferred beyond the control of DOE. This EIS is not focused on land transfer, but
50 rather speaks to the integrated use and management of land and resources independent of who
51 owns the land. Land transfer is a complicated and separate process from the CLUP and once
52 property leaves DOE control, DOE has no more authority over the use of that land unless the

1 property was conveyed with deed or other legal restrictions. For more information about the
2 process for transferring property, see Section 1.4.3.

3
4 The HCP EIS provides environmental review for the following DOE actions:

- 5
6 C Designation of existing and future land uses, and land-use policies and implementing
7 procedures, through the adoption of a CLUP for the Hanford Site.
- 8
9 C Incorporation of site-specific CERCLA RODs into a regional land-use planning
10 process.

11 12 13 **1.1 Historic Background**

14
15 The Hanford Site is a geographically diverse land area in southeastern Washington
16 State. A large area of pristine shrub-steppe habitat, the Hanford Site is bisected by the last free-
17 flowing stretch of the Northwest's Columbia River. In contrast, the Hanford Site is also included
18 on the CERCLA National Priorities List (NPL) of contaminated sites. About 4 percent of the Site
19 is surface contaminated, and 30 percent of the Site overlays contaminated groundwater from the
20 past production of defense nuclear materials.

21
22 The Hanford Site occupies 1,517 square kilometers (km²) (586 square miles [mi²]) in the
23 southeastern portion of the State of Washington (see text box, "How Big is Hanford?" and
24 Figure 1-1, Location of the Hanford Site). Figure 1-2 shows the names and locations of local
25 landmarks that are referenced throughout this EIS. Within the geographic boundary of the Site,
26 there are 36.42 km² (14.1 mi²) of Columbia River surface water and one section (1 mi²) of land
27 owned by the State of Washington. Established by the Federal government in 1943, the Hanford
28 Site is owned by the Federal government and is managed by the U.S. Department of Energy,
29 Richland Operations Office (RL).

30 31 **1.1.1 Early Land Use of the Region**

32
33 The Hanford Site is located within the
34 Pasco Basin, a unique feature of the Columbia
35 Plateau. The basin is the only area along the mid-
36 Columbia River where the river is not confined
37 within a gorge. Instead, the river is bounded by
38 wide expanses of uplands. During the pre-contact
39 era, these uplands contained abundant natural
40 resources, including native plants, wildlife, and
41 geologic resources. In addition, the Pasco Basin
42 is where the Snake River and the Yakima River
43 join the Columbia River, providing a wealth of
44 riparian areas as well as an excellent means of
45 transportation throughout the semiarid inland
46 northwest. These rivers once contained
47 enormous fisheries of salmon, steelhead,
48 sturgeon, eels, freshwater clams, and other
49 aquatic resources.

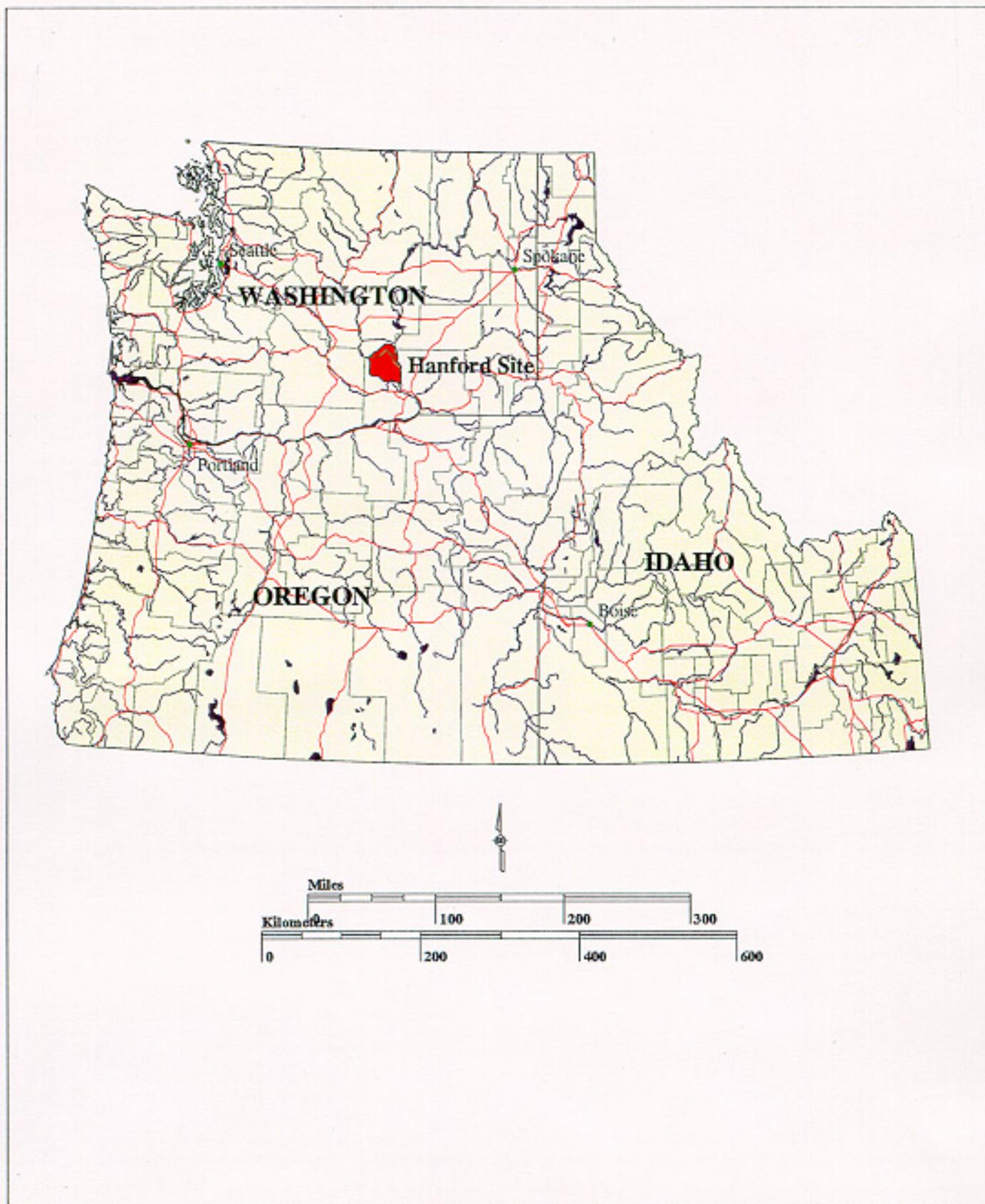
How Big is Hanford?

The Hanford Site boundary encloses 1,517 square kilometers (km²) (586 square miles [mi²]) based on the newest GIS interpolation of the legal site boundary. Historically the site area of 1,450 km² (560 mi²) was calculated by addition of sections and their subunits based on surveys from the 1800's. Included within the Site is 36.42 km² (14.1 mi²) of Columbia River surface water and one square mile of Washington State land. A square mile is 1,609 meters (5,280 feet) to a side. A square mile is also known as a section, equal to 259.2 hectares (ha) (640 acres [ac]). Typically, in eastern Washington agriculture, four 65-ha (160-ac), center-pivot circle irrigation systems would occupy each section.

In this document, all measurements are in metric units, followed by the British equivalents. The DOE's documents use metric units as required by Executive Order 12770, Metric Usage in Federal Government Programs"; the *Metric Conversion Act of 1975* (Public Law 94-168, as amended by Public Law 100-418); and various Title 15, *Code of Federal Regulations*.

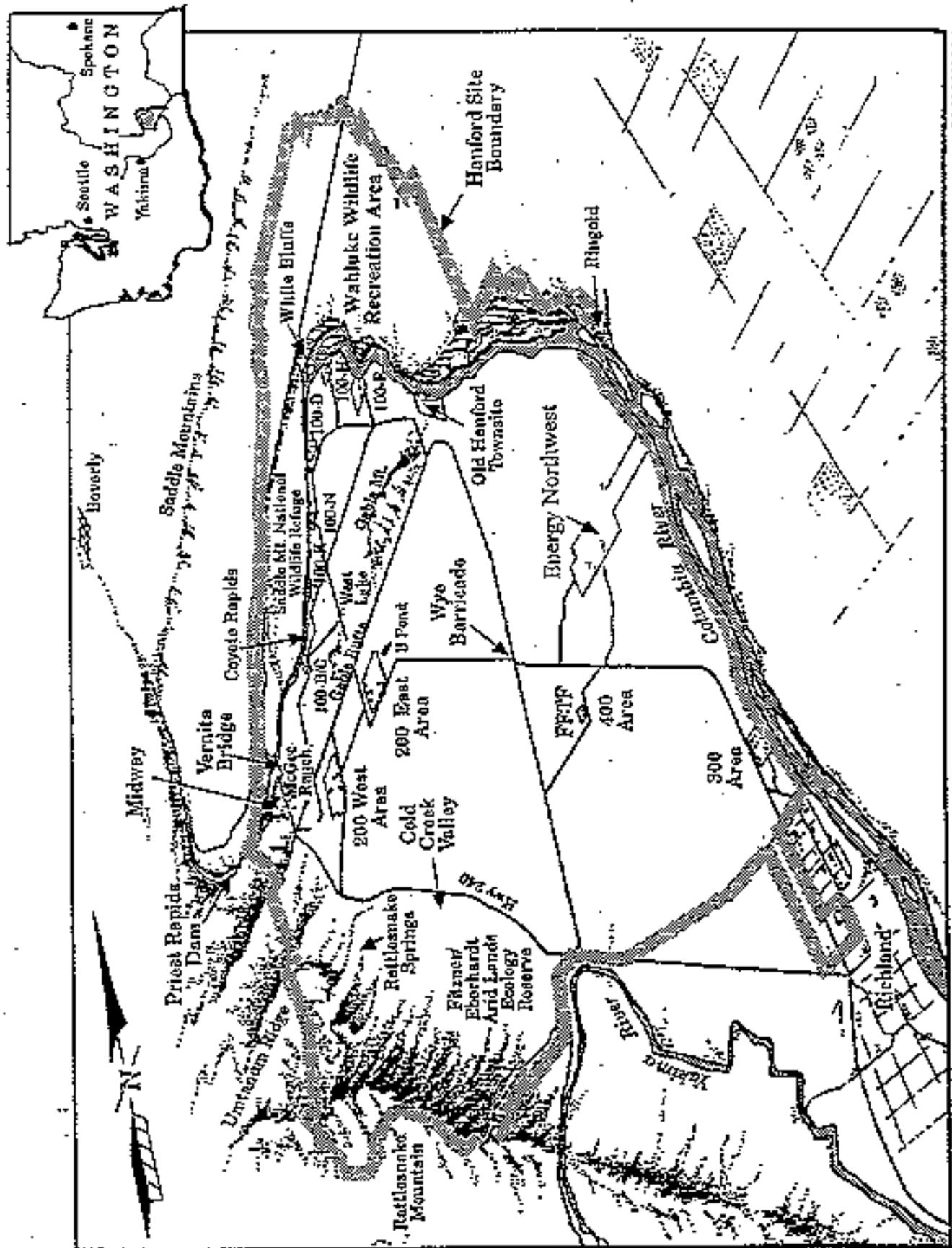
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5

Figure 1-1. Location of the Hanford Site.



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Figure 1-2. Hanford Site Local Names and Landmarks.



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1 These physical features of the Pasco Basin made the basin highly attractive to American
2 Indian Tribes. Archeologic evidence has demonstrated their presence in the area for more than
3 10,000 years. Tribal oral histories confirm that Tribes have been in the region for a very great
4 period of time. The near-shore areas of these rivers contain many village sites, fishing and fish
5 processing sites, hunting areas, plant gathering areas, and religious sites, while upland areas
6 were used for hunting, plant gathering, religious practices, and overland transportation.
7

8 For at least the past several thousand years, the Pasco Basin was a major economic
9 hub in the larger Columbia River Basin trading region. The Pasco Basin's location along the
10 main travel corridor between Puget Sound and the Great Plains meant American Indian Tribes in
11 the area were extensively involved in inter-regional economic activity. As a result, the Pasco
12 Basin was relatively densely populated and contained a diversity of Tribes and bands
13 (Figure 1-3).
14

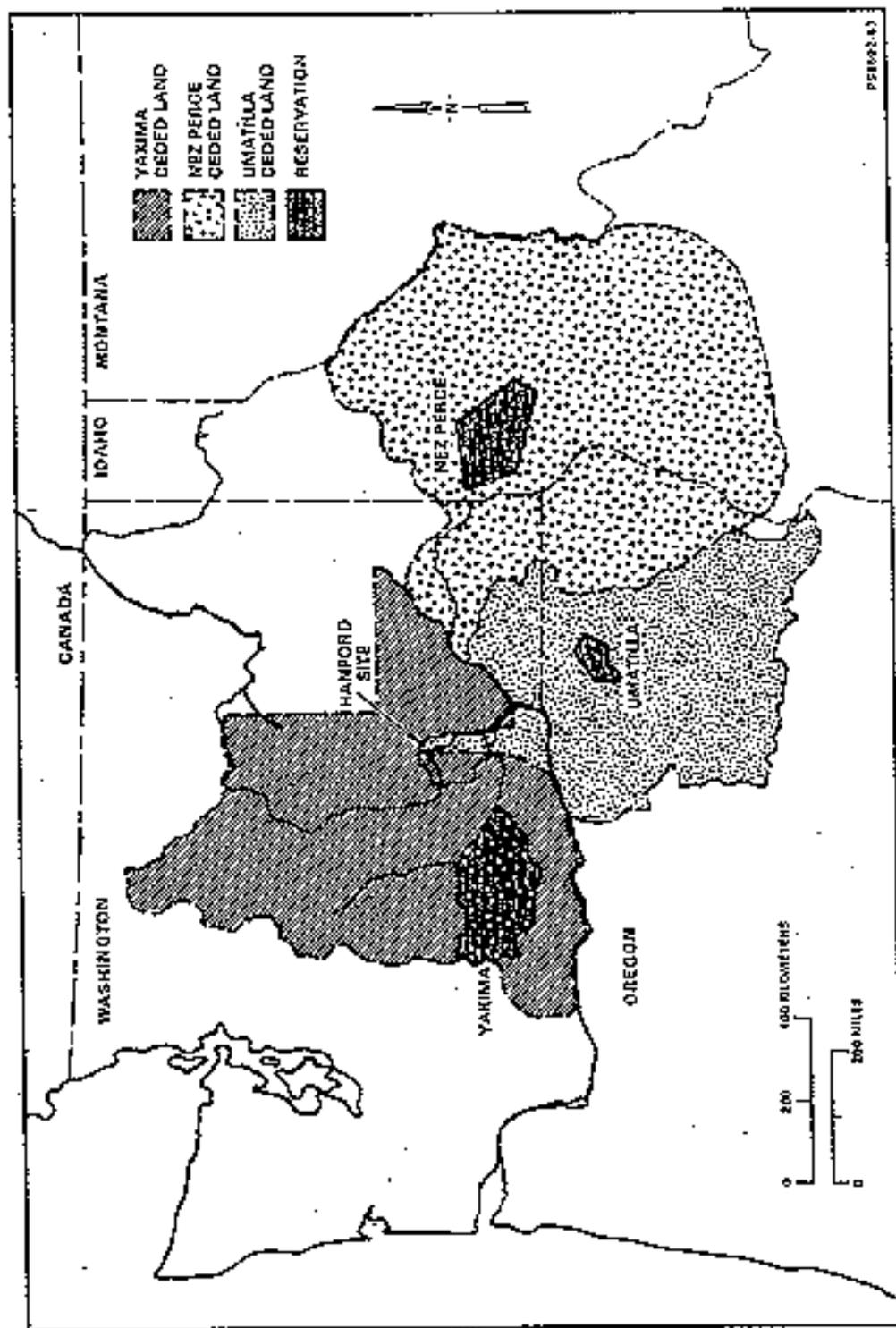
15 The arrival of the horse in the region around the year 1700 greatly increased the
16 distances that could be traveled by individuals and by Tribes and bands, further increasing the
17 intensity of trade, warfare, and other interaction between groups. The arrival of the horse also
18 initiated a period during which American Indians of the region began keeping large herds of
19 domesticated horses.
20

21 The first European-American trappers and traders began arriving in the region around
22 1800. Their goals were to acquire furs to sell in Asia and Europe. Lewis and Clark arrived in the
23 fall of 1805 to establish the United States' territorial claim to the region. Trapping organizations
24 such as the Hudson's Bay Company and the Northwest Bay Company became increasingly
25 active in the years after the Lewis and Clark expedition. These arrivals were followed by
26 Catholic and Protestant missionaries. Catholic missionaries briefly established a mission at
27 Columbia Point (the confluence of the Yakima and Columbia Rivers). Although the Oregon Trail
28 was established in 1843, and large numbers of non-Indians came to the Northwest via that trail,
29 very few settled in the Pasco Basin, preferring instead to continue on to the Willamette Valley of
30 Oregon.
31

32 In 1855, Governor Isaac Stevens, representing the United States government, and Joel
33 Palmer, U.S. Superintendent of Indian Affairs, negotiated treaties with many of the American
34 Indian Tribes in the region (see Appendix A). These treaties called for the relocation of those
35 Tribes to permanent reservations located away from the Pasco Basin. The Tribes retained in
36 their treaties, however, the right of taking fish at all "usual and accustomed" places; erecting
37 buildings for curing; and to hunt, gather plants, and pasture livestock on "open and unclaimed
38 lands" where they traditionally had conducted these activities. To this day, American Indians
39 travel to the Pasco Basin to use its resources.
40

41 There were other exceptions to the relocation of American Indians. Peopeomoxmox, a
42 Walla Walla negotiator of the treaty between the United States and the Cayuse, Walla Walla,
43 and Umatilla Tribes, retained in that document the right to operate a trading post where the
44 Columbia River and Yakima River join at Columbia Point. In addition, the Wanapum Band,
45 which did not negotiate a treaty with the United States, remained resident in the Pasco Basin.
46 Nevertheless, over the following 88 years, the Wanapum came under ever-increasing pressure
47 as non-Indian homesteaders seized much of their lands.
48
49

Figure 1-3. American Indian Ceded Land and Retained Reservations.



1 Significant non-Indian settlement of the region began relatively late. In 1888, small
2 irrigation companies and farmer cooperatives began to develop irrigation systems in the
3 Columbia Basin. The agricultural economy of the region saw upswings and downswings, from
4 agricultural price increases during World Wars I and II, drought during the 1920s, and the Great
5 Depression during the 1930s. While, principally, non-Indian farmers lived on the adjacent private
6 lands, members of the Wanapum Band continued to reside on portions of the future Hanford
7 Site that remained in Federal ownership. In 1942, approximately 19,000 people lived in Benton
8 and Franklin counties. Pasco was the largest population center, with approximately 3,900
9 people (Gerber 1992). The City of Richland had a population of approximately 200 people
10 (Relander 1956).

11
12 In the 1940s, almost all of the land that would at some time be considered part of the
13 Hanford Site was being used for crops or grazing. More than 88 percent (about 152,971 ha
14 [378,000 ac]) was sagebrush range land interspersed with volcanic outcroppings, where some
15 18,000 to 20,000 sheep grazed during winter and spring. Some 11 percent (almost 19,830 ha
16 [49,000 ac]) was farmland, much of it irrigable but not all under cultivation. Less than 1 percent
17 (less than 809 ha [2,000 ac]) consisted of town plots, right of ways, school sites, cemeteries,
18 and similarly used land, most of it in or near the three small communities of Richland, Hanford,
19 and White Bluffs (Jones 1985).

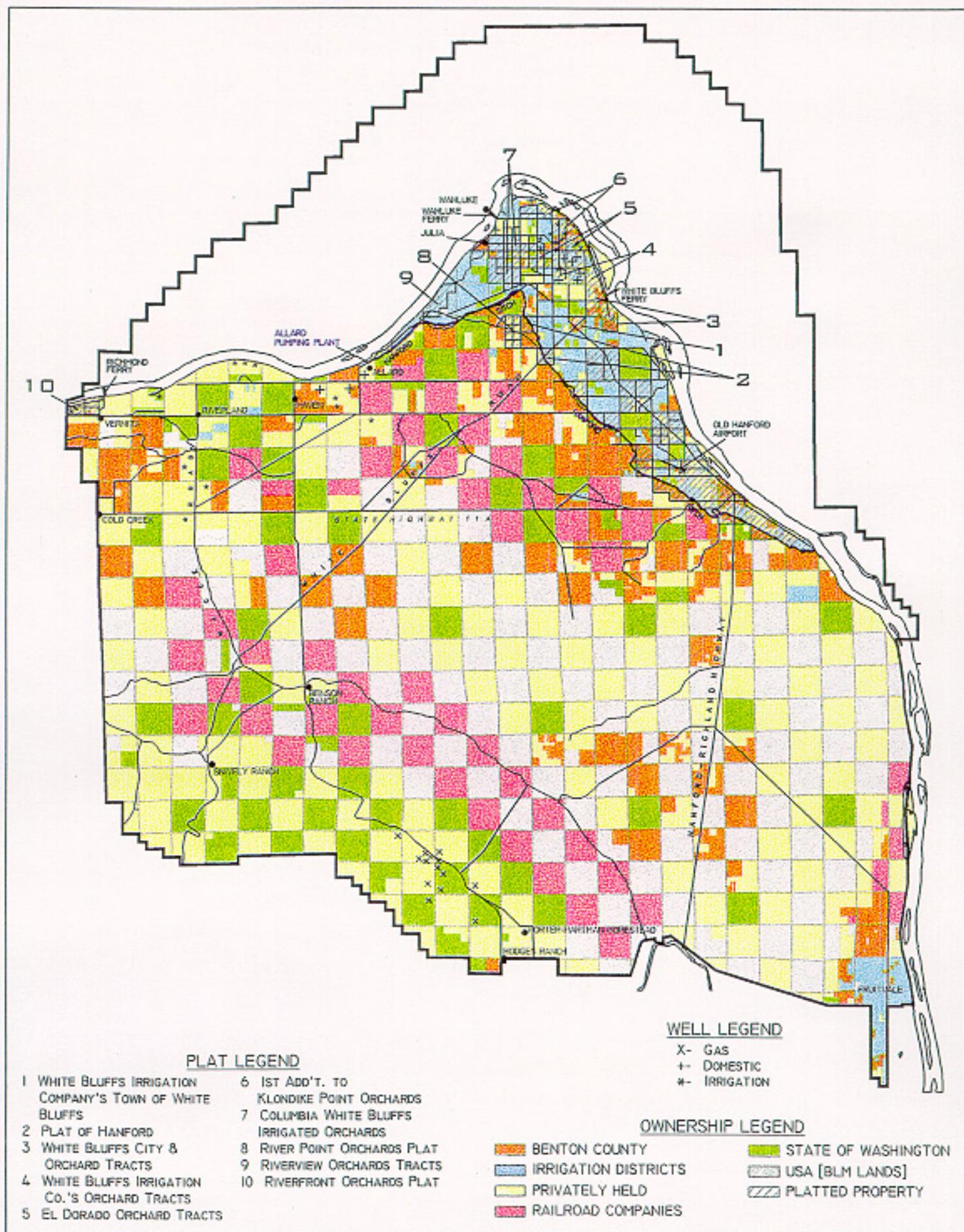
20
21 More than one-third of the Hanford area at the time was government-owned. The Federal
22 government owned nearly 28,733 ha (71,000 ac); the State of Washington more than 18,211 ha
23 (45,000 ac); and the five local counties (i.e., Benton, Yakima, Grant, Franklin, and Adams) about
24 16,592 ha (41,000 ac). More than 91,054 ha (225,000 ac) belonged to private individuals or to
25 corporate organizations, including more than 2,428 ha (6,000 ac) owned by several irrigation
26 districts (Jones 1985). Figure 1-4 provides an example of pre-Hanford Benton County lands in
27 1943.

28 29 **1.1.2 Establishment of the Hanford Site**

30
31 The entry of the U.S. into World War II and the race to develop an atomic bomb led to a
32 search for a suitable place to locate plutonium production and purification facilities. The U.S.
33 Army Corps of Engineers (USACE) selected the site near the towns of White Bluffs and Hanford
34 because of the remote location, good climate, and, most importantly, the abundant supply of
35 hydroelectric power and clean water from the Columbia River. The selection was made in early
36 1943 and land acquisition proceedings began. The War Department began with condemnation
37 of private lands, followed by appraisals, negotiations, and payments to landowners. Some
38 property owners protested the offered purchase prices and won larger settlements through the
39 courts. Originally, 1,605 km² (620 mi²) were acquired through a combination of withdrawal of
40 lands from the Public Domain and the acquisition of state and privately owned lands. The towns
41 of Hanford and White Bluffs were vacated, the Wanapum were relocated to above the Priest
42 Rapids area, and Richland was transformed into a government town. The U.S. Atomic Energy
43 Commission (AEC) leased an additional 70,000 ha (173,000 ac) as secondary control zones.
44 These secondary zones were released in 1953 and 1958.

45
46 For more than 40 years, the primary mission at Hanford was associated with the
47 production of nuclear materials for national defense. Land management and development
48 practices at the Hanford Site were driven by resource needs for nuclear production, chemical
49 processing, Waste Management, and R&D activities. The DOE developed infrastructure and
50 facility complexes to accomplish this work, but large tracts of land used as protective buffer
51 zones for safety and security purposes remained undisturbed. These buffer zones preserved a
52 biological and cultural resource setting unique in the Columbia Basin region.
53

Figure 1-4. Pre-Hanford Benton County Lands - 1943.



1.1.3 Change in Mission from Defense Production to Environmental Restoration

In the late 1980s, the primary DOE mission changed from defense materials production to environmental restoration. In 1989, DOE entered into the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) with the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) (Ecology et al. 1989). This agreement is intended to accomplish the following:

- C Define EPA's CERCLA cleanup provisions for remediation of hazardous substances.
- C Define the RCRA waste treatment, storage, and disposal requirements and corrective actions for hazardous waste management as administered by Ecology.
- C Establish the responsibilities for each agency (DOE, EPA, and Ecology).
- C Establish milestones for achieving remediation and regulatory compliance.

The DOE expects that CERCLA/RCRA authority will be used to remediate areas of the Hanford Site consistent with applicable requirements to support "highest and best use" land use. If the remediation process cannot support the proposed land use within the NCP's 10^{-4} to 10^{-6} risk range, then this EIS contains a proposed process for changing the "highest and best use" of the land (see Chapter 6).

Today, the Hanford Site has a diverse set of missions associated with environmental restoration, Waste Management, and Science and Technology. These missions have resulted in the growing need for a comprehensive, long-term approach to planning and development for the Site. Additionally, DOE's *Land- and Facility-Use Policy* (DOE 1994b); DOE Order 430.1, *Life-Cycle Asset Management* (DOE 1995c); and the *National Defense Authorization Act for Fiscal Year 1997* each require the development of a CLUP for the Hanford Site.

To comply with these requirements, DOE has developed a process for implementing a Hanford CLUP, and has integrated this process into this Final HCP EIS (see Chapter 6). The NEPA ROD issued for this EIS would create the CLUP by documenting a final land-use map and adopting final Hanford land-use policies and implementing procedures. Together, these pieces would form the CLUP. The CLUP would consider the role of the Hanford Site in a regional context, and would integrate mission requirements and other factors as directed by the Secretary of Energy (see text box, "*Land- and Facility-Use Policy*" [DOE 1994b]).

DOE's Land- and Facility-Use Policy

On December 21, 1994, the Secretary of Energy issued a *Land- and Facility-Use Policy* for DOE, which contains the following statement:

"It is Department of Energy policy to manage all of its land and facilities as valuable national resources. Our stewardship will be based on the principles of ecosystem management and sustainable development. We will integrate mission, economic, ecological, social, and cultural factors in a comprehensive plan for each site that will guide land and facility use decisions. Each comprehensive plan will consider the site's larger regional context and be developed with stakeholder participation. This policy will result in land and facility uses which support the Department's critical missions, stimulate the economy, and protect the environment."

1.2 The National Environmental Policy Act Process

The *National Environmental Policy Act of 1969* (NEPA) requires consideration of potential environmental impacts associated with Federal agency actions and provides opportunities for public involvement in the decision-making process. In accordance with NEPA requirements, DOE has prepared this Final HCP EIS to help decision makers and the public understand the potential environmental impacts associated with establishing future (for at least

1 the next 50 years) land uses at the Hanford Site through the adoption of a CLUP and its integral
2 land-use maps, policies, and implementing procedures.

3
4 **1.2.1 Scope of the Hanford Comprehensive Land-Use Plan Environmental Impact**
5 **Statement and Comprehensive Land-Use Plan**
6

7 The DOE received more than 2,000 comments from approximately 233 commenters on
8 the August 1996 Draft HRA-EIS. Response was mixed. Many commenters felt land-use
9 planning was poorly integrated into the public scoping process and the Draft HRA-EIS.
10 Ecology's and EPA's comments centered around disagreements with the CERCLA/RCRA
11 assumptions that were used for the waste volume, cost, and risk assessments. Several key
12 stakeholders (i.e.; the DOI, City of Richland, Benton County, and Nez Perce Tribe) felt that with
13 the magnitude of the land-use decision, they needed to be invited into the process as
14 cooperating agencies.

15
16 The DOE realized that, without stakeholder support, the regulators (EPA and Ecology)
17 would not be able to use the Draft HRA-EIS land-use plan, as presented, in terms of factoring in
18 potential future land use into the cleanup decision-making process. The DOE then formally
19 invited local land-use planning authorities and Tribes to be cooperating agencies and consulting
20 Tribal governments. From January through March 1997, DOE worked with the cooperating
21 agencies and consulting Tribal governments to clarify and resolve the issues, still with the intent
22 of incorporating comments on the August 1996 Draft HRA-EIS to produce a final EIS. However,
23 through this consultation process, DOE determined that stakeholders wanted an EIS
24 emphasizing land-use maps as alternatives (as opposed to alternatives representing levels of
25 access independent of the land use[s], as presented in the August 1996 Draft HRA-EIS). The
26 DOE then decided to produce a Revised Draft HRA-EIS in cooperation with, and response to
27 EPA, Ecology, Tribal governments, local governments, and other stakeholder comments.
28

29 On April 23, 1999, DOE published the Revised Draft HRA-EIS. A public comment period
30 was held from April 23, 1999, to June 7, 1999. Comments on the Revised Draft HRA-EIS have
31 been incorporated into this Final HCP EIS as appropriate. The DOE's responses to comments
32 are presented in the Comment Response Document of this Final EIS.
33

34 The Final HCP EIS evaluates the potential environmental impacts from establishing land
35 uses at the Hanford Site for at least the next 50 years, defers the evaluation of impacts
36 associated with remedial actions to Tri-Party Agreement documents, and includes the entire
37 Hanford Site within the scope of the document. In general, the differences between the Final
38 HCP EIS and the August 1996 Draft HRA-EIS can be summarized as follows:
39

- 40 C This Final HCP EIS focuses on land-use impacts and decisions rather than potential
41 remediation impacts.
- 42
- 43 C Each alternative in the Final HCP EIS features a Site-wide map designating land
44 uses, whereas alternatives in the August 1996 Draft HRA-EIS focused on individual
45 geographic areas.
- 46
- 47 C In response to public comment, the Final HCP EIS includes a new DOE Preferred
48 Alternative as well as land-use alternatives developed by the cooperating agencies
49 and consulting Tribal governments.
- 50
- 51 C The Final HCP EIS contains land-use policies and implementing procedures for
52 integration into the Hanford CLUP (see Chapter 6).
53

1 Preparation of the Final HCP EIS is consistent with the *National Defense Authorization* |
2 *Act of 1994*, which requires the development of a future-use plan for the Hanford Site; and is |
3 responsive to public comments received during scoping and during public comment periods on |
4 the 1996 original draft and the 1999 Revised Draft HRA-EIS. The Final HCP EIS also provides a |
5 basis for considering potential future proposals regarding transferring ownership and control of |
6 some or all of the Hanford Site such as the Wahluke Slope. As the original 1996 Draft EIS |
7 provided for consideration of land use, no additional scoping meetings were required. |
8

9 **1.2.1.1 Public Review of the Revised Draft Hanford Remedial Action Environmental** |
10 **Impact Statement and Comprehensive Land-Use Plan.** Once DOE made the decision to |
11 reduce the scope of the August 1996 Draft HRA-EIS and issue a Revised Draft, the agency |
12 announced it would conduct a 45-day public review and comment period following issuance of |
13 the Revised Draft EIS to the public. This public review and comment period, held from April 23, |
14 1999, to June 7, 1999, included four formal public hearings in Portland, Oregon; Richland, |
15 Washington; Mattawa, Washington; and Spokane, Washington. The DOE accepted public |
16 comments on the Revised Draft HRA-EIS at these hearings and throughout the comment |
17 period, and has responded in writing to those comments in this Final HCP EIS. |
18

19 **1.2.2 External Coordination/Involvement in the Preparation of the Revised Draft** |
20 **Hanford Remedial Action Environmental Impact Statement and Comprehensive** |
21 **Land-Use Plan** |
22

23 During the public comment period on the August 1996 Draft HRA-EIS, several agencies |
24 and American Indian Tribes expressed an interest in working with DOE to establish alternative |
25 visions for land use. To encourage a variety of viewpoints and strengthen the EIS, DOE involved |
26 representatives of other Federal agencies, American Indian Tribes, and state and local |
27 governments in ongoing planning efforts. Eventually, these groups received formal invitations |
28 from DOE to become cooperating agencies and consulting Tribal governments in the |
29 preparation of the Revised Draft HRA-EIS. |
30

31 Since March 1997, DOE has worked with the cooperating agencies and consulting Tribal |
32 governments to establish a framework for the environmental analyses presented in this Final |
33 HCP EIS. Substantial agreement was reached among the cooperating agencies and consulting |
34 Tribal governments on the development of land-use designations and on the format for |
35 determining the potential environmental impacts associated with the land uses carried forward in |
36 this Final HCP EIS (see Chapters 3 and 5). The cooperating agencies and consulting Tribal |
37 governments also worked together to develop the policies and implementing procedures for the |
38 CLUP (see Chapter 6). Alternatives that reflect the land-use values and preferences of different |
39 organizations were developed because the cooperating agencies and consulting Tribal |
40 governments have different resource usage requirements and goals. |
41

42 **1.2.3 Identification of Public Land-Use Values** |
43

44 Through cooperative activities during the past seven years, diverse stakeholder groups |
45 have developed statements of values related to the future of the Hanford Site to provide guidance |
46 to Congress, the states of Oregon and Washington, DOE, Ecology, and EPA. It is from this |
47 guidance that the proposed policies and implementing procedures for the CLUP have been |
48 developed. The first set of values was formulated in 1992 by the Hanford Future Site Uses |
49 Working Group (FSUWG 1992) and includes the following statements: |
50

- 51 C Protect the Columbia River.
- 52
- 53 C Deal realistically and forcefully with groundwater contamination.
- 54

- 1 C Use the Central Plateau wisely for Waste Management.
- 2
- 3 C Do no harm during cleanup or with new development.
- 4
- 5 C Cleanup of areas of high future use value is important.
- 6
- 7 C Clean up to the level necessary to enable the future use option to occur.
- 8
- 9 C Transport waste safely and be prepared.
- 10
- 11 C Capture economic development opportunities locally.
- 12
- 13 C Involve the public in future decisions about the Hanford Site.
- 14

15 After the success of the Hanford Future Site Uses Working Group, other similar
16 stakeholder groups were formed, including the Hanford Tank Waste Task Force and the Hanford
17 Advisory Board (HAB). In 1993, the Hanford Tank Waste Task Force reinforced the first set of
18 values by adding the following statements (Hanford Waste Tank Task Force 1993):

- 19
- 20 C Protect the environment.
- 21
- 22 C Protect public/worker health and safety.
- 23
- 24 C “Get on with the cleanup” to achieve substantive progress in a timely manner.
- 25
- 26 C Use a systems design approach that keeps endpoints in mind as intermediate
27 decisions are made.
- 28
- 29 C Establish management practices that ensure accountability, efficiency, and allocation
30 of funds to high priority items.
- 31

32 The first major action taken by the HAB in early 1994 was to endorse and adopt both
33 previously issued sets of values. In September 1994, acting on a recommendation from the
34 Cultural and Socioeconomic Committee, the HAB adopted the following additional values
35 (Takaro 1995):

- 36 C Historic and cultural resources have value and should not be degraded or destroyed.
37 Appropriate access to those resources is a part of that value.
- 38
- 39 C Workforce stability and reasonable stability in the demand for public services are
40 important for the affected communities. In decisions on projects and contractors,
41 consideration should be given to affected workforce and population shifts.
- 42
- 43 C Cleanup and Waste Management decisions should be coordinated with the efforts of
44 the affected communities, to shift toward more private business activity and away
45 from dependence on Federal projects that have adverse environmental or economic
46 impact.
- 47
- 48 C The importance of ecological diversity and recreational opportunities should be
49 recognized; those resources should be enhanced as a result of cleanup and Waste
50 Management decisions.

- c These concerns should be considered while promoting the most effective and efficient means that will protect environmental quality, and public health and safety, now and for future generations.
- c Cleanup activities should protect, to the maximum degree possible, the integrity of all biological resources, with specific attention to rare, threatened, and endangered species and their related habitats.

1.2.4 Development of the August 1996 Draft Hanford Remedial Action Environmental Impact Statement and Comprehensive Land-Use Plan

The Notice of Intent (NOI) to prepare the HRA-EIS was published in the *Federal Register* (57 FR 37959) on August 21, 1992. The NOI stated that the EIS would evaluate a range of reasonable alternatives to accomplish the scope of the Tri-Party Agreement within the framework of potential future Hanford Site use/cleanup strategies.

Public scoping meetings were held at four locations in the Northwest: Spokane, Washington, on September 29, 1992; Pasco, Washington, on October 1, 1992; Seattle, Washington, on October 5, 1992; and Portland, Oregon, on October 8, 1992. The public scoping period for the HRA-EIS ended on January 15, 1993.

As discussed in Section 1.2.3, in 1992 the EPA, Ecology, and DOE, in cooperation with other interested parties, organized a process to involve stakeholders in the development of a vision for the future of the Hanford Site. A committee consisting of representatives of labor, environmental, governmental, agricultural, economic development, citizen-interest groups, and Tribal governments was established and became known as the Hanford Future Site Uses Working Group (Working Group). The Working Group was charged with three related tasks (see text box, “Working Group’s Objectives”). The result of the Working Group’s efforts, a report entitled, *The Future for Hanford: Uses and Cleanup -- The Final Report of the Hanford Future Site Uses Working Group*, was issued in December 1992 (FSUWG 1992), and was submitted to DOE as a formal scoping comment for the HRA-EIS.

Working Group’s Objectives	
c	Identify a range of potential future uses for the Hanford Site.
c	Select cleanup scenarios enabling the future uses in light of potential exposure to contaminants, if any, after cleanup.
c	Probe for convergence among the cleanup scenarios to identify priorities or criteria that could prove useful in focusing or conducting the cleanup.

The August 1996 Draft HRA-EIS was developed to assess the potential environmental impacts, primarily from remediation activities, associated with establishing land-use objectives for the Hanford Site. The land-use objectives were developed by DOE using concepts developed by the Working Group. In 1996, DOE decided to expand the land-use planning initiative into a formal CLUP in the August 1996 Draft HRA-EIS to conform to the Secretary of Energy’s new *Land- and Facility-Use Policy* (DOE 1994b) and DOE Order 430.1, *Life-Cycle Asset Management*.

1.2.5 Public Review of the August 1996 Draft Hanford Remedial Action Environmental Impact Statement and Comprehensive Land-Use Plan

The August 1996 Draft HRA-EIS, which addressed impacts associated with remedial actions and land-use planning, was released to the public during the week of August 26, 1996. A public hearing was held in Richland, Washington, on October 17, 1996, and additional public meetings were held throughout the Northwest during the public comment period, which ended December 10, 1996.

1 **1.2.5.1 Major Issues.** Numerous public agencies, American Indian Tribes, interest groups, and
2 members of the public provided comments that indicated a diverse range of values and
3 objectives. Several major issues and concerns were identified by commenters during the
4 August 1996 Draft HRA-EIS formal public comment period. The primary issues identified by the
5 commenters included the following:
6

- 7 C Remedial action cost and volume of contaminated material estimates in the August
8 1996 Draft HRA-EIS were not considered to be consistent with similar estimates
9 made in support of CERCLA documentation.
- 10 C Analyses of potential impacts associated with remediation were considered
11 duplicative of the CERCLA process.
- 12 C The combination of a land-use plan with remedial action evaluations was confusing.
13 Suggestions were made to reduce or eliminate emphasis on remedial actions and
14 focus instead on those elements of the HRA-EIS pertaining to land-use planning.
15 Widespread support for the development of a comprehensive land-use plan was
16 evident, though not necessarily for the “Hanford Site Comprehensive Land-Use Plan,”
17 presented in Volume 4 of the August 1996 Draft HRA-EIS.
- 18 C The August 1996 Draft HRA-EIS did not identify DOE’s Preferred Alternative for level-
19 of-access controls (i.e., unrestricted, restricted, or exclusive use) for the Hanford Site
20 although there was only one land-use map presented.
- 21 C The Comprehensive Land-Use Plan was considered by commenters to be a major
22 Federal action that was not only inadequately integrated in the August 1996 Draft
23 HRA-EIS, but also was out of the scope of the EIS.
- 24 C Land-use alternatives, other than the one plan presented in Volume 4 of the August
25 1996 Draft HRA-EIS, were not evaluated.
- 26 C Tribal members’ treaty rights and authority were inadequately addressed in the
27 August 1996 Draft HRA-EIS.
- 28 C Cumulative impact analyses were considered inadequate.
- 29 C The August 1996 Draft HRA-EIS did not adequately address the need of the local
30 community to diversify and strengthen the economy to offset the decline of Hanford
31 Site employment and did not sufficiently emphasize the role that agriculture and
32 related industries play in the region.
- 33 C Many commenters requested that the entire Hanford Site be cleaned up to a level that
34 would allow for unrestricted level-of-access use.
- 35 C DOE should coordinate with Benton County and the City of Richland to develop an
36 integrated land-use planning process.
- 37 C The level-of-access alternatives (unrestricted, restricted, and exclusive) were
38 confusing without an actual land-use designation.

39 The comments received on the August 1996 Draft HRA-EIS, as well as transcripts from
40 the public hearing are contained in a Revised Draft HRA-EIS Comment and Response
41 Document, which is available for review in the public reading rooms. In addition, a comment
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1 summary is provided in Appendix F of the Revised Draft document. A summary of comments
2 received on the Revised Draft HRA-EIS is included as part of this Final HCP EIS.

3 4 **1.2.6 Public Review of the Revised Draft HRA-EIS and Summary of Major Issues**

5
6 On April 23, 1999, DOE published the Revised Draft HRA-EIS. A public comment period
7 was held from April 23, 1999 to June 7, 1999. Public hearings on the Revised Draft HRA-EIS
8 were held on May 18, 1999, in Portland, OR; on May 20, 1999, in Richland, WA; on June 2, 1999
9 in Mattawa, WA; and on June 3, 1999 in Spokane, WA. Comments on the Revised Draft HRA-
10 EIS have been incorporated into this *Final Hanford Comprehensive Land-Use Plan* EIS (HCP
11 EIS), as appropriate. The DOE's responses to comments are presented in the Comment
12 Response Document of this Final EIS.

13
14 More than 400 comment documents were received by DOE, including letters, postcards,
15 questionnaires, and surveys as well as electronic mail. In addition, more than 200 pages of
16 transcripts were generated during the four public hearings.

17
18 The DOE considered all comments received on the Revised Draft HRA-EIS. Many of the
19 comments supported particular alternatives, or a combination of alternatives. A significant
20 number of the comments addressed environmental issues, such as the plight of wildlife habitat
21 and the continued preservation of habitat for plants and animals, including the diminishing
22 population of salmon, and the Hanford Reach designation as a Wild and Scenic River. The
23 comments and comment responses are given in the Final HCP-EIS Comment Response
24 Document, and summarized comments and responses are found in Appendix F.

25
26 Twenty-eight major topics were identified and given general responses from the
27 hundreds of comments received. More than 200 detailed comments were given individual
28 responses in the Comment Response Document. The major topics are summarized below.

29
30 **No-Action Alternative.** A few commenters gave input regarding this alternative, with two
31 supporting it and two opposing the lack of planning in this alternative.

32
33 **DOE's Preferred Alternative.** Most commenters citing this alternative offered support, albeit
34 with many favoring some modification to further protect the environment. Those opposed cited
35 the lack of economic development for Grant County and keeping the Wahluke Slope under
36 Federal control as the basis for their opposition.

37
38 **Alternative One.** Almost all letters received regarding this alternative were in favor of this
39 alternative, citing the emphasis on preservation and the additional protection that it provides for
40 high value or sensitive ecological areas on the Hanford Site, and the prohibition against
41 agriculture, mining, grazing, and intensive recreational uses that would compromise the
42 ecological and wildlife values presented. The opposing letter expressed the need for economic
43 development.

44
45 **Alternative Two.** Almost all commenters citing this alternative were in favor of it. The primary
46 issue expressed in the supporting comments was the additional protection given to the
47 environment, particularly that afforded to the high value ecological areas and natural and
48 sensitive lands on the Hanford Site. Some commenters expressed the desire for even more
49 protection of the environment, citing this alternative as the one closest to total preservation. The
50 two opposing commenters cited lack of economic development.

51
52 **Alternative Three.** A significant majority of the commenters citing this alternative supported it,
53 particularly the economic development provided to Grant County. These commenters wanted

1 the land returned to farming. Opposing commenters cited the lack of adequate protection of the
2 shrub-steppe habitat, and the concern that irrigation would undermine the White Bluffs.

3
4 **Alternative Four.** Commenters expressing an opinion on this alternative generally supported it,
5 citing the large amount of preservation. Those opposed expressed concern that there was no
6 economic development.

7
8 **National Wildlife Refuge/DOE's Preferred Alternative.** More than 300 commenters wrote
9 concerning the DOE's Preferred Alternative, with the modification that a National Wildlife Refuge
10 be created/expanded for additional protection of the environment. Six commenters were against
11 this combination, citing as their reasons the USFWS's lack of adequate resources to properly
12 manage the land, and the lack of consideration of the previous use in farming and future
13 economic development.

14
15 **Other Combinations.** More than 100 comments expressed concern or support for parts of
16 alternatives or an additional alternative. A few submitted their own alternative maps. Some
17 commenters addressed the issue of Federal versus local control. A few supported an extension
18 to the public comment period. The comment was made that additional mapping be done to
19 better represent the wildlife population picture. Others suggested that cleanup, not planning, be
20 the focus of the mission at the Hanford Site.

21
22 **Preservation.** Several commenters expressed their support for preservation of the Hanford
23 Site, varying from preservation of the entire Hanford Site, to the addition of the 200 West Area
24 sagebrush to preservation. Many cited the Hanford Reach, the creation of a National Wildlife
25 Refuge, McGee Ranch, May Junction, the islands, the LIGO land, Gable Mountain, Gable Butte,
26 and the sand dunes. Reasons cited were historical, ecological, cultural, biological, and
27 economic.

28
29 **Conservation (Mining).** A large majority of the commenters expressing a view on this topic
30 said mining could be allowed but only for the necessary materials to support cleanup of the
31 Hanford Site. Some letters described specific areas that should not be mined (primarily the ALE
32 Reserve), while one commenter cited the need for McGee Ranch silt specifically for the cleanup
33 program.

34
35 **Conservation (Mining and Grazing).** More than 200 commenters were against allowing any
36 commercial grazing on the Hanford Site. Many commenters cited grazing as being incompatible
37 with wildlife protection. The spreading of noxious weeds was attributed to livestock grazing,
38 because hooves tear up the delicate ground cover habitat. There was a concern raised
39 regarding possible plutonium contamination of the livestock.

40
41 **Low-Intensity Recreation.** Commenters gave a variety of views regarding recreation. Boat
42 launches were generally supported, although a boat launch at White Bluffs drew comments for
43 and against. Two commenters opposed any recreation at the Hanford Site. Several expressed
44 the view that only non-motorized vehicles or recreation be allowed on constructed trails, while
45 others supported access for limited recreation such as campsites for paddlers and access for
46 kayakers and rafters.

47
48 **High-Intensity Recreation.** Most of the commenters who expressed views on High-Intensity
49 Recreation were in support of the B Reactor Museum. Some commenters were opposed to any
50 High-Intensity Recreation on the Hanford Site.

51
52 **Research and Development.** Letters received on this land-use designation cited the need for
53 restricting or prohibiting research and development, using only the 300 Area, LIGO, and FFTF,
54 for example.

1 **Industrial.** Some commenters addressing this topic recommended limiting industrial
2 development to the 300 Area and 1100 Area, or areas near the Tri-Cities, which would support
3 the industry with infrastructure. A few commenters were against any industrial development at
4 Hanford, while some expressed that timing was important, with cleanup of the site first, then
5 development.
6

7 **Industrial-Exclusive.** Several commenters stated that the area designated for Industrial-
8 Exclusive land use should be reconfigured to represent what was shown in Alternatives One and
9 Two.
10

11 **Agriculture.** Ninety percent of the more than 200 commenters addressing Agriculture were
12 opposed to any agriculture on the Hanford Site, citing the possible endangering of the health of
13 the Columbia River from irrigation runoff, the potential damage to the White Bluffs from irrigation,
14 the need for preservation of the shrub-steppe habitat for wildlife, and the possibility that
15 agriculture on the Hanford Site would be bad, perceptually, for all Washington State agriculture.
16 The commenters in support cited the need to support world food production, schools, and the
17 rural area in Grant County.
18

19 **Policy.** Several letters were received addressing payment in lieu of taxes (PILT), expressing
20 support for DOE to give Grant County PILT; others would like the PILT based on lost opportunity
21 instead of current land use. Commenters also reiterated the need for continuation of the
22 cleanup mission, the need to consider human health and safety, and the need to better address
23 environmental justice by expanding farming opportunities on the Wahluke Slope.
24

25 **Procedure.** Several letters addressed the membership of the Site Planning Advisory Board,
26 wanting to add regulators and Tribes as sovereign nations, and to limit counties involvement.
27 Several commenters expressed the opinion that the Secretary's announcement in April 1999 of
28 the DOE's Preferred Alternative prejudiced the outcome. Commenters also wanted a document
29 name change, a change in timing, and cultural reviews and natural resources for land-use
30 planning.
31

32 **Plan.** Some commenters addressed the comprehensive land-use plan, citing a variety of items.
33 These included the concern that "management by committee" is too risky, thanking the DOE for
34 keeping an open process, lack of impacts from industrial development, the recommendation that
35 planning should be seven generations out, and concerns regarding the sensitivity of LIGO to
36 noise and vibration.
37

38 **Public Involvement.** Several letters cited the commenter's appreciation for the opportunity to
39 comment, positive feedback on multiple public hearings, and complimented DOE and the
40 Cooperating Agencies on the quality of the document and the work that went into preparing the
41 document.
42

43 **Salmon and Steelhead.** All letters addressing salmon were in support of protection of salmon
44 and salmon habitat and salmon recovery efforts, and this extended to other anadromous fish,
45 such as steelhead, as well.
46

47 **Hanford Reach.** More than 100 letters were received supporting protection of the Hanford
48 Reach, citing the importance of the salmon spawning habitat and the welfare of the eagles and
49 other wildlife that eat the salmon. Concern was expressed for the erosion of the White Bluffs,
50 and the effects of regional agricultural growth on spawning habitat.
51

52 **Tribal Rights.** Several commenters expressed their concern that Tribal rights be honored by
53 the DOE. Many expressed an opinion that no grazing of any type should be allowed on the

1 Hanford Site. Also supported was the protection of cultural and religious sites, working with the
2 Yakama Indian Nation, and consideration of an option to deed stewardship back to the Tribes.

3
4 **Wild and Scenic River.** Several commenters supported a Wild and Scenic River designation
5 for the Columbia River flowing through the Hanford Reach, citing protection of the river and the
6 riverbanks. A few of those opposed the designation were concerned for future local needs, such
7 as water rights.

8
9 **Habitat.** Many commenters were in favor of setting aside land for conservation and preservation
10 of habitat, noting that the wildlife needs protection. Many of the commenters mentioned the
11 valuable shrub-steppe habitat, which is home to many species, including the sage sparrow,
12 desert butterflies, and species of snakes, other reptiles, and amphibians. A few commenters did
13 not support wildlife habitat, noting that shrub-steppe is only weeds, or that wildlife can coexist
14 with farming.

15
16 **Wahluke Slope.** Many commenters addressed the Wahluke Slope, with more than half against
17 any farming there. Other commenters supported farming, or an impartial study of all the
18 potential uses of the land.

19
20 **Split Record of Decision.** Over 180 commenters supported a split ROD in the interest of
21 moving the designation of a wildlife refuge forward, without waiting for cleanup of the site to be
22 completed.

23 24 **1.2.7 Summary of Changes Made in Response to Public Comment**

25
26 Based on the public comment received, the following changes have been made to the
27 DOE's Preferred Alternative:

- 28
- 29 • All Conservation (Mining and Grazing) has been changed to Conservation (Mining).
- 30 • The National Wildlife Refuge designation (from Alternative One) has been extended to
31 include the ALE Reserve, the Riverlands, and McGee Ranch; and all river islands not in
32 Benton County. The Preferred Alternative clarifies that the refuge would be an overlay
33 wildlife refuge (without a transfer of title from DOE), and that DOE retains the right to
34 mine the ALE insert for cover materials.
- 35 • A railroad right-of-way through the Riverlands portion of the proposed Refuge would be
36 given status as a preexisting condition and included in the proposed USFWS permit to
37 manage the Refuge.
- 38 • The White Bluffs town-site (from Alternatives One and Three) has been added to the
39 Preferred Alternative map as Low-Intensity Recreation to serve as the White Bluffs
40 Memorial.
- 41 • The Low-Intensity Recreation dots (comfort stations) along the river which could
42 eventually serve as anchor points for a river trail from Richland to Vernita Bridge have
43 been moved to ensure that they have both river and road access.
- 44 • A High-Intensity Recreation triangle (from Alternative Three) has been added to the
45 Preferred Alternative map near Horn Rapids Park on the Yakima River.
- 46

47 In addition to changes made to the Preferred Alternative, and the identifying of Alternative
48 One as the environmentally preferable alternative, many other changes were made to the
49 document updating items, refining analyses, and correcting errors.

1 **1.2.8 Biodiversity in the National Environmental Policy Act Process**

2
3 In January 1993, the CEQ issued a report titled, *Incorporating Biodiversity*
4 *Considerations Into Environmental Impact Analysis Under the National Environmental Policy*
5 *Act* (CEQ 1993). This report was designed with the following objectives:
6

- 7 c Provide an overview of major issues related to biodiversity
- 8
- 9 c Outline general concepts regarding biodiversity analysis and management
- 10
- 11 c Describe how biodiversity is addressed in NEPA analyses
- 12
- 13 c Provide options for agencies undertaking NEPA analyses that consider biodiversity.
- 14

15 The CEQ report indicated that physical alteration, as a result of changing land use, is the
16 most profound cause of biodiversity loss. When natural, undisturbed lands (resembling much of
17 the land at the Hanford Site) are converted to industrial, residential, agricultural, or recreational
18 uses, ecosystems are disrupted and biodiversity is diminished. The CEQ report further states
19 that, "Beyond the direct removal of vegetation and natural landforms in local areas, development
20 of sites for human use fragments larger ecosystems and produces isolated patches of natural
21 areas. Activities such as timber harvesting and grazing also may fragment natural areas, but
22 more important, they result in simplification of ecosystems."
23

24 On February 11, 1999, the President issued Executive Order 13112, *Invasive Species*,
25 intended to prevent the introduction of invasive species and provide for their control and to
26 minimize the economic, ecological, and human health impacts caused by invasive species. The
27 Order, which is applicable to each Federal agency whose actions may affect the status of
28 invasive species, establishes an Invasive Species Council made up of the Secretaries of various
29 Federal agencies, and also calls for the formation of a stakeholders' Invasive Species Advisory
30 Committee to provide information and advice to the Council.
31

32 Each disturbance factor on a given tract of land weakens the native plant community,
33 causing potentially catastrophic and accelerated change in landscape components. Therefore,
34 any activity proposed for a site that disturbs the vegetation and soil surfaces of that site should
35 be examined for its effect on invasive weeds and consequences to site biodiversity. If such
36 disturbance activities do occur, it is important to consider how the effects of the disturbance
37 would be managed, before the action takes place. Specific actions can be taken to help prevent
38 the introduction and/or spread of invasive weeds onto the Wildlife Refuge areas of the Hanford
39 Site. For example, equipment being moved onto the Refuge could be steam-cleaned and
40 washed free of vegetation and soil debris at an offsite location before being placed onsite to
41 remove invasive plant seeds and reproductive parts. Additionally, Hanford road activity should
42 be monitored and immediate management action should be taken, when necessary, to prevent
43 invasive species from becoming established along roadsides.
44

45 It is the goal of DOE to ensure that the Hanford Site lands are managed in a way that
46 allows biodiversity to be considered prior to finalizing any land-use or land-management
47 decision. To further the biodiversity goal, DOE contacted the Interior Columbia Basin

1 Ecosystem Management Project (ICBEMP)¹, and provided the Geographic Information System
2 (GIS) database developed for this EIS as a contribution to that project.

3 4 **1.2.9 Environmental Justice in the National Environmental Policy Act Process**

5
6 On February 11, 1994, the President of the U.S. issued Executive Order 12898, *Federal*
7 *Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*.
8 This Executive Order mandates each Federal agency to make environmental justice part of the
9 agency mission. To the greatest extent practicable and permitted by law, Federal agencies
10 must identify and address disproportionately high and adverse human health or environmental
11 effects of their programs, policies, and activities on minority populations and low-income
12 populations.

13
14 As stated in the President's February 11, 1994, memorandum to Heads of Agencies that |
15 accompanied the Executive Order, "Each Federal agency shall analyze the environmental
16 effects, including human health, economic, and social effects, of Federal actions, including
17 effects on minority communities and low-income communities, when such analysis is required
18 by NEPA. Mitigation measures outlined or analyzed in an environmental assessment, EIS, or
19 ROD, whenever feasible, should address significant and adverse environmental effects of
20 proposed Federal actions on minority communities and low-income communities." The
21 memorandum and Executive Order ensure that minority and low-income communities will have
22 a voice in the development and implementation of any Federal action that might adversely affect
23 those communities.

24
25 In addition, the memorandum and Executive Order indicated that all Federal agencies
26 were to be proactive in identifying and, to the extent practicable, mitigating any potential
27 disproportionately high and adverse impacts on minority and low-income communities that could
28 result from proposed Federal actions. In order to implement the provisions of
29 Executive Order 12898, the *U.S. Department of Energy Environmental Justice Strategy*
30 (DOE 1995a), was prepared. Guidance provided in this publication, as well as CEQ's
31 *Environmental Justice Guidance under NEPA* (March 1998) and EPA's *Guidance for*
32 *Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (April
33 1998), were used to the extent practicable in the HRA-EIS.

34 35 36 **1.3 National Environmental Policy Act and Other Environmental** 37 **Reviews**

38
39 Past land-use commitments, based on other NEPA documents, as well as CERCLA
40 RODs addressing remediation, have had a direct impact on the development of the land-use
41 alternatives presented in this Final HCP EIS. Table 1-1 summarizes the Hanford-related EISs |

1 The Interior Columbia Basin Ecosystem Management Project is a Federal land- and ecosystem-
management plan commissioned in 1993. The plan affects 100 counties in seven states (including all
of eastern Washington and eastern Oregon), and includes more than nearly 22 million ha (54 million ac)
of private property. Federal agencies involved are the BLM, National Marine Fisheries Service, Forest
Service, and the EPA. Much of the plan deals with water. The plan also proposes aggressive ecosystem
restoration practices in order to better control fire, insect outbreaks, and noxious disease spread. Over
75,000 comments (mostly form letters) have been received on the project. In June 1998, the U.S. House
Appropriations Subcommittee on the Interior said that ICBEMP should be stopped, its field offices closed,
and its studies turned over to the appropriate Federal agencies (TCH 1998a). If the project is stopped,
either by Congressional action or lack of funding, the thousands of pages of studies and ideas that have
been produced by the project will be given to Federal land management agencies such as the Forest
Service.

1 and RODs and shows the relationships these documents have to land-use planning. Table 1-2
2 summarizes the regional *State Environmental Policy Act of 1971* (SEPA) EISs. Table 1-3
3 summarizes CERCLA RODs.
4

5 The restrictions posed by approved CERCLA RODs were taken into consideration in the
6 development of the land-use alternatives in this Final HCP EIS. Conversely, the land-use
7 alternative selected for implementation in the ROD for this EIS would be useful for remediation
8 decisions yet to be made in other areas of the Hanford Site. The EPA, Ecology, and DOE
9 consider land-use designations in a given area when determining cleanup levels. If the desired
10 “highest and best use” land use cannot be attained because of remediation-linked technical or
11 economic constraints, or if the remedial action required to achieve that land use would cause
12 unacceptable-unavoidable impacts, then the land use designation of this EIS would be amended
13 using the policies and implementing procedures in Chapter 6 to the next “highest and best use”
14 land use. If required by the CERCLA ROD/RCRA Permit, a deed restriction would be filed with
15 the local land-use jurisdictional agency to conditionally implement the land use.
16

17 **1.3.1 Interim Actions**

18

19 During the preparation of this EIS, several outside parties have made proposals to DOE
20 regarding future uses of portions of the Hanford Site. Such proposals undergo NEPA review to
21 determine whether they are major Federal actions, or if they have significant environmental
22 impacts that would require preparation of EISs. This is consistent with the CEQ’s regulation in
23 40 CFR 1506.1(b), “Limitations on Actions During the NEPA Process.”
24

25 The Hanford 1100 Area and the Hanford railroad southern connection (from Horn Rapids
26 Road to Columbia Center) have been transferred from DOE ownership to Port of Benton
27 ownership in order to support future economic development. Land use of the 1100 Area and the
28 railroad southern connection would remain Industrial, as proposed in all alternatives of this EIS.
29 The DOE prepared an environmental assessment that resulted in a finding of no significant
30 impact (FONSI) on August 27, 1998, transferring the 1100 Area and the Southern rail connection
31 to the Port of Benton (DOE/RL EA-1260). The Port officially took ownership and control of the
32 “1100 Area” (consisting of 318 ha [786 ac], 26 buildings, and 26 km [16 mi] of rail tract) on
33 October 1, 1998, and is currently studying the feasibility of reconnecting the Hanford main rail
34 line to Ellensburg, Washington, as it was in the 1970s, as an alternative route for Yakima Valley
35 rail traffic flowing between the Puget Sound and the Tri-Cities. Although the 1100 Area is no
36 longer under DOE control, it is included in this EIS to support the local governments with their
37 SEPA EIS analyses of the Hanford sub-area of Benton County under the State of Washington’s
38 Growth Management Act.
39

40 Energy Northwest (formerly known as the Washington Public Power Supply System, or
41 WPPSS) has requested DOE approval of a sublease of a portion of the land they lease from
42 DOE north of the 300 Area. This sublease would be for siting, construction, and operation of an
43 aluminum smelter. Land use of the Energy Northwest-leased land would remain Industrial, as
44 proposed in all alternatives of this EIS. The environmental effects of the proposed sublease and
45 aluminum smelter were being considered in DOE/EA-1259, which was suspended due to lack of
46 response from the proponents.
47
48

Table 1-1. NEPA Reviews Affecting the Hanford Site. (5 pages)

NEPA EISs	Purpose	Status	Potential Mission Impacts on Hanford	Relationship to Land-Use Planning
<p>3 4 5 6 7</p> <p><i>Double-Shell Tanks for Defense High-Level Radioactive Waste Storage, Hanford Site, Richland, Washington</i> (DOE/EIS-0062, April 1980)</p>	<p>To complete construction and operation of 13, 1-million gallon double-shell waste tanks. These tanks would be used to manage defense high-level radioactive wastes resulting from the chemical processing of spent nuclear fuel in the 200 East Area.</p>	<p>The ROD was published in the <i>Federal Register</i> on July 9, 1980.</p>	<p>The double-shell tanks were constructed and are currently in operation.</p>	<p>Committed the 200 Areas to continued Waste Management (Industrial-Exclusive use).</p>
<p>8 9 10 11</p> <p><i>Decommissioning of the Shippingport Atomic Power Station, Hanford Site, Richland, Washington</i> (DOE/EIS - 0080, May 1982)</p>	<p>Dismantle and remove all fluids, piping, equipment, components, structures, and waste to a waste disposal facility.</p>	<p>The ROD was published in the <i>Federal Register</i> on August 19, 1982.</p>	<p>The Shippingport Atomic Power Station Waste was disposed at the Hanford Site.</p>	<p>Committed the 200 Areas to continued Waste Management (Industrial-Exclusive use).</p>
<p>12 13 14 15</p> <p><i>Operation of PUREX and Uranium Oxide Plant Facilities, Hanford Site, Richland, Washington</i> (DOE/EIS - 0089, February 1983)</p>	<p>This EIS analyzed the environmental effects of DOE's proposal to resume operations of the PUREX and Uranium Trioxide chemical processing plants.</p>	<p>The ROD was published in the <i>Federal Register</i> on May 16, 1983.</p>	<p>In 1990, DOE determined that the PUREX Facility would no longer operate. The plant has been shutdown, deactivated, and readied for decontamination and decommissioning (D&D). Operation up until 1990 resulted in discharge of liquid effluents to the ground in the 200 East Area.</p>	<p>Committed the 200 Areas to continued Waste Management (Industrial-Exclusive use).</p>
<p>16 17 18 19</p> <p><i>Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes, Hanford Site, Richland, Washington</i> (DOE/EIS-0113, December 1987)</p>	<p>Examined the potential impacts for final disposal of existing high-level, transuranic, and tank waste stored at the Hanford Site.</p>	<p>The ROD was published in the <i>Federal Register</i> on April 14, 1988.</p>	<p>Committed to dispose of double-shell tank waste, cesium and strontium capsules, retrievably stored and newly generated transuranic waste in the 200 Areas. Also committed to construct and operate facilities associated with high-level waste vitrification; construct and operate the WRAP facility for transuranic soil waste, and a grout facility for LLW.</p>	<p>Committed to Waste Management (Industrial-Exclusive use) in the 200 Area. Many of the tank waste issues were superseded by the <i>Tank Waste Remediation System EIS</i> (DOE/EIS-189).</p>
<p>20 21 22 23</p> <p><i>Decommissioning of Eight Surplus Production Reactors at the Hanford Site, Richland, Washington</i> (DOE/EIS-0119, December 1991)</p>	<p>Evaluated decommissioning alternatives for the eight surplus plutonium production reactors at the Hanford Site.</p>	<p>The ROD was published in the <i>Federal Register</i> in September 1993.</p>	<p>The DOE determined that the reactor blocks for the eight plutonium reactors will be kept at their present sites for up to 75 years until their radiation level lowers through natural decay. The reactor blocks would then be moved to the 200 Areas for burial.</p>	<p>Commits to restrictive land use of the 100 Areas surrounding the reactors until 2068. Constitutes a future committed land use, Waste Management (Industrial-Exclusive use), for the 200 Areas.</p>

Table 1-1. NEPA Reviews Affecting the Hanford Site. (5 pages)

NEPA EISs	Purpose	Status	Potential Mission Impacts on Hanford	Relationship to Land-Use Planning
1 2 3 4 <i>Columbia River System Operation Review Environmental Impact Statement</i> (DOE/EIS-0170, November 1995)	To develop Bureau of Reclamation (BoR), U.S. Army Corps of Engineers (USACE), DOE, and Bonneville Power Administration (BPA) management strategy for multiple uses of the Columbia River System.	The ROD was approved on March 10, 1997. This was prepared by the BPA, USACE, and the BoR.	May control Columbia River flows.	May limit land use along the Columbia River (Low-Intensity Recreation use).
5 6 7 <i>Tank Waste Remediation System, Hanford Site, Richland, Washington</i> (DOE/EIS-0189, August 1996)	This EIS addressed management and disposal of the contents of 177 high-level radioactive waste tanks and cesium and strontium capsules.	The ROD was published in the <i>Federal Register</i> on February 27, 1997.	The DOE would implement the preferred alternative to retrieve, separate, vitrify, and dispose of the tank waste. The low-level fraction of the separation process would be disposed of onsite in subsurface vaults. The high-level fraction would be disposed of offsite at the potential geologic repository. A decision on the cesium and strontium capsules was deferred.	Commits the 200 Areas to Waste Management (Industrial-Exclusive use) during the retrieval, separation, and vitrification process. It also constitutes a long-term commitment of the 200 Areas for onsite disposal of LLW.
8 9 10 <i>Waste Management Programmatic Environmental Impact Statement</i> (DOE/EIS-0200, May 1997)	This EIS is a nationwide study that examines the management of five types of radioactive and hazardous waste: transuranic, hazardous waste, high-level waste, and low-level and low-level mixed waste.	<i>Federal Register</i> notice announcing change in scope of PEIS (narrowing to Waste Management alternatives) 1/24/95. Eleven regional public hearings held on DEIS (10/17-11/14/95). Public comment period extended through 2/19/96. ROD for treatment and storage of transuranic waste (63 FR 3629, 1/23/98). ROD for treatment of non-waste water hazardous waste (63 FR 41810, 8/5/98). ROD for storage of High-level Radioactive Waste (64 FR 46661, 8/26/99. Planning additional RODs.	Alternatives considered include centralizing or regionalizing the waste at one or two sites. Those sites that have the largest volumes of a given waste type generally were considered as sites for treatment, storage, or disposal.	A decision to centralize the waste could commit the 200 Areas to Waste Management (Industrial-Exclusive use).

Table 1-1. NEPA Reviews Affecting the Hanford Site. (5 pages)

NEPA EISs	Purpose	Status	Potential Mission Impacts on Hanford	Relationship to Land-Use Planning
1 2 3 <i>Idaho High Level Waste and Facility Disposition Environmental Impact Statement (DOE/EIS-0287)</i>	This EIS is a site specific EIS tiering from the <i>Waste Management Programmatic Environmental Impact Statement (DOE/EIS-0200, May 1997 and the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement (DOE/EIS-203-F).</i>	In preparation.	Calcined wastes would be shipped to Hanford for vitrification under an alternative in the EIS.	Area in the Central Plateau would be required to stage the wastes before and after treatment.
4 5 6 7 8 9 <i>Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs (DOE/EIS-0203, April 1995)</i>	EIS evaluated programmatic alternatives to managing spent nuclear fuel until 2035. This EIS did not evaluate the final disposition of the spent nuclear fuel.	The ROD was published in the <i>Federal Register</i> on June 2, 1995. An amended ROD was published in the <i>Federal Register</i> on February 28, 1996.	According to this ROD, Hanford production reactor fuel would remain at the Hanford Site pending ultimate disposition. Fast Flux Test Facility (FFTF) fuel will be sent to the Idaho National Engineering and Environmental Laboratory (INEEL). The amended ROD reduced the number of shipments of sodium-bonded fuel from Hanford to the INEEL from 524 to 12.	This decision commits to onsite storage of spent fuel in the 200 Areas until as late as 2035.
10 11 12 13 <i>Safe Retrieval, Transfer and Interim Storage of Hanford Tank Wastes, Hanford Site, Richland, Washington (DOE/EIS-0212, October 1995)</i>	EIS evaluated alternatives for addressing near-term safety issues in the Hanford Site priority watch list tanks. Accumulation of flammable gas in three tanks had been identified as a safety issue.	The ROD was published in the <i>Federal Register</i> on November 21, 1995.	Construction of a replacement Cross-Site Transfer System (pipeline) for moving waste from the 200 West Area to the 200 East Area. Construction of a waste retrieval system in one tank and continuation of mitigation actions to control flammable gas.	This decision creates infrastructure support to tank waste management in the 200 East Area, and commits the new cross-site transfer system pipeline (Industrial-Exclusive use).
14 15 16 17 18 19 20 21 22 23 <i>Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement (DOE/EIS-0229, November 1996)</i> <i>Surplus Plutonium Disposition Environmental Impact Statement (DOE/EIS-0283)</i>	DOE/EIS-0229 evaluated alternatives of facilities for plutonium disposition. Included conversion of bomb components into plutonium oxide, immobilization of surplus plutonium in glass, and mixed oxide fuel fabrication. Site-specific decisions would be made in DOE/EIS-0283.	The ROD for DOE/EIS-0229 was published in the <i>Federal Register</i> on January 14, 1997. The Notice of Intent for DOE/EIS-0283 was published in the <i>Federal Register</i> on May 18, 1997. The Draft EIS was released in July 1998, and a supplement to the Draft EIS was released in May, 1999.	May result in plutonium or highly enriched uranium storage in the 200 West or 400 Areas. Under EIS-0283, the SRS is the site chosen for siting the facility for weapons-useable plutonium disposition.	The 400 Area would remain as Industrial use, with the exception of one to two buildings being used for nuclear materials storage (Industrial use).
24 25 26 <i>Plutonium Finishing Plant Stabilization Environmental Impact Statement (DOE/EIS-0244, May 1996)</i>	To reduce potential health risks and environmental risks associated with 3,800 kg (8,400 lbs) of plutonium within the Plutonium Finishing Plant.	The ROD was published in the <i>Federal Register</i> on July 10, 1996.	Stabilized forms of plutonium would be stored within vaults at the Plutonium Finishing Plant pending ultimate disposition.	Commits the 200 West Area to long-term storage of plutonium and other transuranic materials (Industrial-Exclusive use).

Table 1-1. NEPA Reviews Affecting the Hanford Site. (5 pages)

	NEPA EISs	Purpose	Status	Potential Mission Impacts on Hanford	Relationship to Land-Use Planning
1 2 3 4	<i>Management of Spent Nuclear Fuel from the K Basins Hanford Site, Richland, Washington</i> (DOE/EIS-0245, January 1996)	Evaluated alternatives for spent nuclear fuel stored in the 100-K Area Basins to reduce risk to public health and the environment.	The ROD was published in the <i>Federal Register</i> on March 15, 1996.	Irradiated fuel will be removed from 100 K-Basins, treated, and sealed in canisters and stored in the 200 Area. Sludge from the K Basins will be disposed of in existing double-shelled tanks or grouted and packaged for disposal in the 200 Areas.	Commits the 200 Area to the storage of the K Basin fuels and conversion of sludge. Future uses must accommodate restoration after 105-K fuel storage basins are remediated (Industrial-Exclusive use).
5 6 7 8 9 10	<i>Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High Level Radioactive Waste at Yucca Mountain, Nye County, Nevada</i> (DOE/EIS-0250) In preparation.	Would evaluate the suitability of a geologic repository (e.g., Yucca Mountain at the Nevada Test Site) for the disposal of commercial and defense high-level radioactive waste.	The Notice of Intent (NOI) was published in the <i>Federal Register</i> in August 1995. The Draft EIS was published in July 1999.	The Yucca Mountain site would accept up to 7000 metric tonnes (7,700 tons) of vitrified defense waste from Hanford and other DOE sites.	Until the Yucca Mountain facility is licensed by the Nuclear Regulatory Commission, high-level radioactive waste and spent nuclear fuel would be stored in the 200 Areas (Industrial-Exclusive use).
11 12 13 14 15 16	<i>Disposal of Decommissioned, Defueled Cruiser, Ohio Class, and Los Angeles Class Naval Reactor Plants Environmental Impact Statement</i> (Adopted by DOE as DOE/EIS-0259, April 1996)	Evaluated alternatives for the disposal of defueled reactor compartments from cruisers and submarines.	The ROD was published in the <i>Federal Register</i> on August 9, 1996.	Approximately 100 cruiser and submarine reactor compartments would be disposed of in a 70-ha (173-ac) waste disposal unit in the 200 East Area.	Commits the 200 East Area to Waste Management activities (Industrial-Exclusive use).
17 18 19 20 21	<i>Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement</i> (DOE/EIS-0286) In preparation.	To review ongoing and proposed waste management activities, to implement programmatic RODs that result from the <i>Final Waste Management Programmatic EIS</i> (DOE/EIS-0200), and to facilitate decisions on the future operation of Hanford waste treatment, storage, and disposal facilities.	The NOI was published in the <i>Federal Register</i> on October 27, 1997. The scoping period closed January 30, 1998. In April 1998, DOE accepted the request of the Yakama Nation that they be co-preparers of the EIS. The Draft EIS is expected sometime in late 1999.	May result in unchanged, minimized, or maximized levels of waste storage, treatment, and disposal of low-level, low-level mixed, transuranic, and hazardous waste and contaminated equipment at Hanford.	Is expected to require continued use of the 200 Areas for Waste Management purposes (Industrial-Exclusive use).
22 23 24 25	<i>Waste Management Operations, Hanford Reservation, Richland, Washington</i> (ERDA-1538, December 1975)	To provide information for use in planning and decision making to ensure that future waste management practices would be conducted to minimize adverse environmental consequences.	Final EIS issued December 1975. Predates final Council on Environmental Quality (CEQ) NEPA regulations; therefore, ROD not required.	Reassessed the environmental impacts associated with continuing the Hanford Site Waste Management Operations Program to provide information for use in planning and decision making. Addressed waste generated by nuclear defense production, research and development, and other programs and activities at the Hanford Site. The high-level waste preferred alternative was to continue solidifying liquid tank waste to a salt cake form and construct additional double-shell tanks.	Committed portions of the 100, 200, and 300 Areas to continued Waste Management (Industrial-Exclusive use).

Table 1-1. NEPA Reviews Affecting the Hanford Site. (5 pages)

NEPA EISs	Purpose	Status	Potential Mission Impacts on Hanford	Relationship to Land-Use Planning	
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	<i>Bonneville Power Administration Transmission System Vegetation Management Program Draft Environmental Impact Statement</i> (DOE/EIS-0285)	This DEIS establishes Planning Steps for managing vegetation across 24,000 km (15,000mi) of power lines and 350 substations in the northwest.	The Draft EIS was issued August, 1999 and public comment is open until October 9,1999.	Establishes BPA's vegetation management preferences across several areas of the Hanford Site. Noxious weeds and weed corridors are associated with access roads.	Would determine the available vegetation control techniques, herbicides used, and acceptable biological impacts.
6 7 8 9 10 11	<i>Disposal of Decommissioned, Defueled Naval Submarine Reactor Plants</i> (Lead Agency - Department of the Navy; DOE was a Cooperating Agency) (May 1984)	Evaluated disposition of defueled reactor compartments from decommissioned nuclear submarines. (See also DOE/EIS-0259.)	The ROD was published in the <i>Federal Register</i> in December 1984.	Land disposal of reactor compartments in the 200 East Areas	Committed the 200 East Area to Waste Management (Industrial-Exclusive use).
12 13 14 15 16 17 18 19	<i>Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the United States, Including the Role of the Fast Flux Test Facility</i> (DOE/EIS-0310)	Would evaluate expansion of FFTF missions.	The Secretary decided on August 18, 1999, that the DOE would conduct a programmatic National Environmental Policy Act (NEPA) review, including an Environmental Impact Statement.	Potential environmental impacts associated with proposed expansion of infrastructure, including the possible role of the FFTF, for civilian nuclear energy research and development activities; production of isotopes for medical, research, and industrial uses; and production of plutonium-238 for use in advanced radioisotope power systems for future NASA space missions.	Proposed FFTF uses are compatible with Industrial or Research and Development land uses.
20 21 22 23 24	<i>Hanford Reach of the Columbia River, Comprehensive River Conservation Study and Final Environmental Impact Statement</i> (National Park Service, June 1994)	The Department of the Interior (DOI) and DOE evaluated alternatives for protecting and managing the Hanford Reach and environs of the Columbia River.	The ROD was approved in July 1996. Congressional action is required for the recommended Wild and Scenic River. The proposed National Wildlife Refuge could be established administratively.	Wild and Scenic designation (recreational) would eliminate certain land uses (residential, agricultural, and waste management) within the study area. Establishes wildlife and habitat management access for other areas.	Compatible land uses with the recommendation include: recreation, wildlife, and habitat management for the river corridor and areas north of the river (Low-Intensity Recreation use). Incompatible land uses include: industrial, waste management, agricultural, and grazing.

1 **Table 1-2. SEPA Reviews Affecting the Hanford Site. (2 pages)**

2	SEPA EISs	Purpose	Status	Potential Mission Impact on Hanford	Relationship to Land-Use Planning
3 4 5 6 7 8 9 10	<i>Commercial Low-Level Radioactive Waste Disposal Site (U.S. Ecology) on the Hanford Site Environmental Impact Statement</i> - In preparation.	To provide sufficient information to allow state agencies to make the following key decisions: approval of a site closure plan, renewal of the operating license, and an amendment to the regulations limiting the receipt of naturally occurring and accelerator-produced radioactive materials (NARM).	<p>The lead agencies are the Washington Department of Ecology (Ecology) and the Washington Department of Health (DOH).</p> <p>Public scoping - February 1997 through March 27, 1997. A public meeting was held March 5, 1997 at Ecology's office in Kennewick, Washington.</p> <p>Ecology and Health have invited DOE Richland Operations Office (RL) to consult with them on issues, concerns, and potential impacts that should be considered in the EIS. The three agencies met on March 25, 1997, and on April 8, 1997, RL sent a response letter to DOH and Ecology outlining DOE's issues and concerns, and RL's role.</p>	May allow additional amounts of low-level radioactive wastes and NARM to be disposed in the Central Plateau at the privately owned US Ecology site, which was leased by the State from the Federal government.	Expected to continue to require waste management in the 200 Areas (Industrial-Exclusive use).
11 12 13 14	<i>City of Richland Comprehensive Plan/EIS</i> (August, 1997)	When adopted, the Comprehensive Plan will include the mandated elements on land use, housing, transportation, capital facilities, and utilities, with an optional element on economic development.	The lead agency is the City of Richland. The Final EIS was issued on August 27, 1997.	The City of Richland's Comprehensive Plan is consistent with current and proposed land uses at Hanford and DOE missions.	The City of Richland's Comprehensive Plan addresses land use within the City boundary, and zones land within the City of Richland's urban growth area that extends into the 300 Area of the Hanford Site (Industrial use).
15 16 17 18 19 20 21	<i>SEPA EIS on Treatment of Low-Level Mixed Wastes (ATG) City of Richland EIS</i> (EA6-97, March 1998)	ATG proposes to build a gasification and vitrification treatment, storage and disposal (TSD) facility in Richland, Washington.	The Final SEPA EIS was issued on March 9, 1998.	Effect of construction and overall operation of the building was evaluated under SEPA. The action would be undertaken as a private action in anticipation of future work for a variety of contracts, including DOE. ATG may proceed with the facility whether or not the Hanford Site low-level mixed waste is included.	A mixed waste TSD facility would be built in an area which is outside of, but in close proximity to the Hanford Site boundary. A TSD facility is a compatible land use under the Heavy Industrial land-use designation in the City of Richland's Comprehensive Plan. The Hanford CLUP does not have a Heavy Industrial land-use designation.

Table 1-2. SEPA Reviews Affecting the Hanford Site. (2 pages)

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SEPA EISs	Purpose	Status	Potential Mission Impact on Hanford	Relationship to Land-Use Planning
<p><i>Draft Benton County Comprehensive Plan (SEPA EIS Addendum) (September 1997)</i></p>	<p>To revise the Benton County Comprehensive Plan in accordance with the <i>State Growth Management Act</i> and SEPA. The Comprehensive Plan is being updated to address land-use planning for all of Benton County, including the portion of the Hanford Site that lies within Benton County. The Comprehensive Plan includes an addendum to the Final SEPA EIS, dated March 1981, prepared for the 1985 Benton County Comprehensive Plan. Detailed planning for the Hanford sub-area was not included in the 1985 plan.</p>	<p>The Final HCP EIS would provide the basis for the Benton County SEPA review for the Hanford sub-area plan of the Benton County Comprehensive Plan.</p> <p>The lead agency is Benton County.</p>	<p>The Benton County Comprehensive Plan will not affect DOE missions at Hanford while DOE retains management of the Site. If, however, land is turned over to state or local governments, such as the Port of Benton, then the stipulations identified in the Benton County Comprehensive Plan would apply. Such transfers might help to fulfill DOE's mission of economic transition and diversification of the local economy.</p>	<p>The Benton County Comprehensive Plan addresses land uses for the County, including the portion of the Hanford Site that lies within Benton County (Industrial, Industrial-Exclusive, Research and Development, High-Intensity Recreation, and Low-Intensity Recreation use). The 1100 Area and 300 Area would remain in an Industrial use designation. The HCP EIS could fulfill the SEPA requirements for the Counties and, as cooperating agencies, they could identify another alternative as their Preferred Alternative.</p>

8 SEPA = *State Environmental Policy Act of 1971*
9

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Table 1-3. CERCLA Reviews Affecting the Hanford Site.

2

CERCLA RODs	Purpose	Status	Potential Mission Impact on Hanford	Relationship to Land-Use Planning
1100 Area	Remediation of the 1100 Area and scattered other waste sites still within the southern portion of the Hanford Site.	1100-EM-1, 1100-EM-2, 1100-EM-3, and 1100-IU-1 - Final Record of Decision (ROD) issued September 24, 1993. Certified remedial action - July 1996 Delisted from National Priorities List	1100 Area remediated and available for other compatible uses.	Institutional controls required to prevent disturbance of the asbestos landfill barrier and groundwater. A deed restriction for the Horn Rapids asbestos landfill has been filed with the Benton County Auditor's Office. Industrial-Exclusive equivalent land-use designation.
300 Area	Remediation of the 300 Area	300-FF-1, 300-FF-5 - Final ROD issued July 17, 1996. Remedial Investigation/Feasibility Study (RI/FS) for NPL Site - to be completed after all operable units are addressed.	Remediation would allow industrial use.	Institutional controls required to prevent disturbance of soil below 15 ft and groundwater. Restricted subsurface and groundwater use. Industrial-Exclusive equivalent land-use designation.
100 Area	Remediation of the 100 Areas	100-BC-1, 100-HR-1, and 100-DR-1 - Interim ROD for 37 high-priority waste sites issued September 1995. The ROD was amended May 14, 1997, to include additional waste sites. 100-HR-3/100-KR-4 (Groundwater OUs) - Interim ROD April 1, 1996 100-IU-1, 100-IU-3, 100-IU-4, 100-IU-5 - Interim ROD issued February 12, 1996. RI/FS for NPL Site - to be completed after all operable units are addressed.	100 Areas to be remediated to allow unrestricted residential use: - Unrestricted surface use - Restricted subsurface and groundwater use - Support facilities for groundwater pump-and-treat remediation systems must be maintained.	Institutional controls required to prevent disturbance of soil below 15 feet and groundwater. A deed restriction has been filed for the 183-H Solar Basin RCRA closure with the Benton County Auditor's Office. Industrial-Exclusive equivalent land-use designation. Restricted subsurface and groundwater use.
200 Areas	Remediation of the 200 Areas	Environmental Restoration Disposal Facility - Final ROD issued January 1995. 200-ZP-1 (Groundwater OU) - Interim ROD issued June 5, 1995. 200-UP-1 (Groundwater OU) - Interim ROD issued February 24, 1997. RI/FS for NPL Site - to be completed after all operable units are addressed.	200 Areas to be remediated to industrial-exclusive use. Support facilities for groundwater pump-and-treat remediation systems must be maintained.	Institutional controls required to prevent disturbance of barriers and groundwater. Restricted surface, subsurface, and groundwater use. A deed restriction has been filed for an asbestos trench in the Central Waste Landfill with the Benton County Auditor's Office. Industrial-Exclusive equivalent land-use designation.

7

1.4 Hanford Site Planning Efforts

1.4.1 Hanford Site Planning Documents

Several Hanford Site planning documents have been developed to address the various information needs of DOE managers. These planning documents are periodically updated to reflect new information and DOE decision making, such as the decision(s) DOE will make based on this Final HCP EIS. Summarized below these planning documents are:

- Draft *Hanford Cultural Resources Management Plan* (CRMP) (DOE-RL 1999)
- Draft *Hanford Biological Resources Management Plan* (BRMaP) (DOE-RL 1996c)
- *Hanford Strategic Plan* (DOE-RL 1996b)
- *Accelerating Cleanup: Paths to Closure at the Hanford Site* (DOE 1998)
- *Hanford Site Ground-Water Protection Management Plan* (DOE-RL 1995c)
- *Management and Integration of Hanford Site Groundwater and Vadose Zone Activities* (DOE-RL 1998).

The CRMP establishes guidance for the identification, evaluation, recordation, curation, and management of archaeological, historic, and traditional cultural resources. The plan specifies methods of consultation with affected Tribes, government agencies, and interested parties; and includes strategies for the preservation and/or curation of representative properties, archives, and objects. This plan is currently being revised with the active participation of affected Tribes and government agencies.

The BRMaP provides DOE and DOE contractors with a consistent approach for protecting biological resources and for monitoring, assessing, and mitigating impacts to biological resources from site development and environmental restoration activities. Primarily, the BRMaP supports DOE's Hanford missions; provides a mechanism for ensuring compliance with laws protecting biological resources; provides a framework for ensuring that appropriate biological resource goals, objectives, and tools are in place to make DOE an effective steward of the Hanford biological resources; and implements an ecosystem management approach for biological resources on the Site. The BRMaP provides a comprehensive direction that specifies DOE biological resource policies, goals, and objectives.

The *Hanford Strategic Plan* is a planning document that articulates DOE's current vision

Hanford Strategic Plan

The 1996 *Hanford Strategic Plan* identifies six critical success factors to achieve the Hanford vision and missions. It will be periodically updated.

Protect worker safety and health

- reduce accidents and radiological exposure
- achieve voluntary protection program "star" status

Protect public health and the environment

- reduce or eliminate emissions and effluents
- regulatory and Tri-Party Agreement compliance

Manage Hanford to achieve progress

- projectize Hanford for clear management accountability, responsibility, and authority
- establish and control project baselines
- link key performance measures to results
- maintain a well-trained and qualified workforce

Optimize the Hanford Site infrastructure

- develop cost-competitive infrastructure commensurate with mission needs
- involve staff and community in the outsourcing process

Contribute to economic diversification

- blend economic diversification strategies with all Hanford activities and contractors
- involve local community and leaders in projects

Build and strengthen partnerships for progress

- include American Indian Tribes, regulators, and stakeholders in planning processes
- champion the public's right to know with prompt, accurate information

1 and commitments to a long-range strategic direction for the Hanford Site missions (see text box,
2 “*Hanford Strategic Plan*” on previous page). Decisions and actions are made using NEPA,
3 CERCLA, RCRA, and recognized processes as appropriate.
4

5 A revision of the *2006 Plan*, the *Accelerating Cleanup: Paths to Closure at the Hanford*
6 *Site* builds on an already accelerated pace of activities and numerous efficiencies implemented
7 at the Hanford Site during the last few years. It commits to significant cleanup progress on the
8 Site by 2006, while recognizing that much cleanup effort will remain beyond 2006.
9

10 The *Hanford Site Ground-Water Protection Management Plan*, and the *Management and*
11 *Integration of Hanford Site Groundwater and Vadose Zone Activities* documents both provide
12 management and protection guidelines to protect groundwater from radioactive and
13 nonradioactive hazardous substances.
14

15 This Final HCP EIS builds on these past planning efforts to address land-use planning at
16 the Hanford Site and presents a range of alternative land uses that represents different visions.
17

18 **1.4.2 Integrating Planning Efforts by Other Governments and Agencies**

19
20 This section includes information supplied to DOE by representatives of other
21 governments and agencies about their respective planning efforts. The concept of “agreeing to
22 disagree” on issues such as Tribal members’ treaty rights allowed the agencies to set aside
23 differences and work together on the land-use planning process.
24

25 **1.4.2.1 Tribal Rights.** Tribal governments and DOE agree that the Tribal members’ treaty-
26 reserved right of taking fish at all “usual and accustomed” places applies to the Hanford Reach
27 of the Columbia River where it passes through Hanford.
28

29 Tribal governments and DOE, however, disagree over the applicability of Tribal
30 member’s treaty-reserved rights to hunt, gather plants, and pasture livestock on the Hanford
31 Site. The Tribal governments and DOE have decided not to delay completion and
32 implementation of a comprehensive land-use plan for the Hanford Site. Instead, the Tribes and
33 DOE have gone ahead with the land-use planning process while reserving all rights to assert
34 their respective positions regarding treaty rights. Neither the existence of this EIS nor any
35 portion of its contents is intended to have any influence over the resolution of the treaty rights
36 dispute.
37

38 **1.4.2.2 Other Federal Agencies.** In 1943, the USACE began the acquisition of the Hanford
39 Site. Public land managed by the BLM was withdrawn from BLM and placed under DOE control
40 by a land withdrawal order. The BoR land was placed under DOE control by a memorandum of
41 agreement and, finally, land was purchased (sometimes via condemnation) from private owners.
42 Today, DOE continues to manage these acquired lands, which form a checkerboard pattern of
43 underlying ownership over large portions of the Hanford Site (for additional information, see
44 Section 4.1.3).
45

46 The BLM and BoR continue to retain an interest in their original property holdings prior to
47 the establishment of the Hanford Site. The DOE must use the land consistent with the purposes
48 for which they were originally acquired from BLM and BoR. Any other use of these lands by
49 DOE requires BLM and BoR involvement. The BLM is responsible for administering Public
50 Domain land. The BoR is responsible for the ultimate development of the irrigable lands within
51 the Wahluke Slope as part of the Columbia Basin Reclamation Project. Both the BLM and BoR
52 have an interest in the Hanford resources and in management of those resources over the long
53 term. When DOE relinquishes its withdrawals on these lands, the BLM and/or BoR would have
54 the right of first refusal to the land. The BLM would examine the lands for current uses and

1 suitability for return to the Public Domain. Depending upon condition, and after public
2 involvement, suitable lands could be retained and designated for a special protective
3 classification, recreational use, multiple use management, exchange, etc. If unsuitable, then
4 DOE or the Federal General Services Administration (GSA) would have the responsibility to
5 dispose of the land.
6

7 In addition to BoR's irrigation system maintenance activities, DOE lands on the
8 Wahluke Slope, have been managed in part by the Washington Department of Fish and Wildlife
9 (WDFW) as the Wahluke State Wildlife Recreation Area and, in part, by the USFWS as the
10 Saddle Mountain National Wildlife Refuge. In April 1999, the WDFW and the USFWS notified the
11 DOE of their intent to modify their management responsibilities on the Wahluke Slope under the
12 1971 agreement. The USFWS informed the DOE that it intends to allow essentially the same
13 uses permitted by the State of Washington under the WDFW's management of the Wahluke
14 Slope. Therefore, transfer of management of the Wahluke Slope from the WDFW to the
15 USFWS involves only a change in the agency managing the property and does not involve any
16 change in the management activities for the Wahluke Slope. Management of the entire Wahluke
17 Slope by the USFWS as an overlay wildlife refuge is consistent with the 1996 DOI Hanford
18 Reach EIS ROD. The ROD recommended the Wahluke Slope be designated a wildlife refuge
19 and the Hanford Reach a Wild and Scenic River, and that the wildlife refuge be managed by the
20 USFWS.
21

22 The USFWS is managing the Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE
23 Reserve) under a cooperative agreement with DOE that was signed on August 27, 1997. The
24 USFWS is currently preparing a Comprehensive Conservation Plan (CCP) (equivalent to an
25 area management plan [AMP]; see Chapter 6) for the ALE Reserve.
26

27 Aside from BoR, BLM, and the USFWS current management responsibilities, the
28 U.S. National Park Service (NPS) has, with DOE as a co-preparer, completed an EIS for the
29 Hanford Reach of the Columbia River in 1994. The *Hanford Reach of the Columbia River,
30 Comprehensive River Conservation Study and Final Environmental Impact Statement* (Hanford
31 Reach EIS) (NPS 1994) examines alternatives for preservation of the resources and features of
32 the Hanford Reach (including addition of the Hanford Reach to the National Wild and Scenic
33 Rivers System), and evaluates impacts that could result from various uses of the river. The
34 DOI's ROD (NPS 1996) recommends that the Congress designate federally owned and privately
35 owned lands within 0.4 km (0.25 mi) of the Columbia River, on both banks from river mile 396
36 to 346.5 as a Recreational River under the Wild and Scenic Rivers System; and that the portion
37 of the Hanford Site that lies north of the river be designated as a National Wildlife Refuge
38 managed by the USFWS. Congress is still contemplating actions that are necessary to
39 implement the DOI's ROD.
40

41 In addition to the proposed wild and scenic discussions, other discussions have
42 occurred to transfer administrative jurisdiction over certain parcels of land in the State of
43 Washington from the Secretary of Energy to the Secretary of the Interior, affecting ownership of
44 about 19,943 ha (49,280 ac, 197 km², 75 mi²) of the Hanford Site. This swap would consolidate
45 the scattered Benton County portion of Hanford's BLM Public Domain lands, into an area
46 beginning near 100-D, running south and east along the Columbia River shore, to just north of
47 Energy Northwest (formerly known as WPPSS) and then west to Gable Mountain.
48

49 As long as these lands are needed by DOE (i.e., still withdrawn from the BLM by DOE),
50 this legislative action would not affect DOE's administration of the areas involved (see
51 Figure 4-3). The DOE's use of withdrawn BLM Public Domain lands is consistent with most
52 land-use designations with the exceptions of Industrial Exclusive, Research and Development,
53 High-Intensity Recreation, or Industrial designations where BLM's multiple-use mandate would
54 be limited by an extensive infrastructure.

1 **1.4.2.3 Local Governments.** Portions of the Hanford Site lie within Benton, Franklin, Adams,
2 and Grant counties. The primary contaminated portion of the Site falls within Benton County,
3 and parts of the Wahluke Slope fall within Franklin, Grant, and Adams counties. The City of
4 Richland abuts the southern boundary of the Hanford Site in Benton County. The City of
5 Richland's urban growth area (UGA) extends into the Hanford Site's 300 Area and considerable
6 development within the city limits and adjacent to the Site has already occurred.
7

8 Most planning by local governments falls under the *State of Washington Growth*
9 *Management Act of 1990* (GMA), which established a statewide planning framework and created
10 roles and responsibilities for planning at the local, regional, and state level. The GMA requires
11 the largest and fastest growing counties (counties with more than 50,000 people or population
12 growth of more than 20 percent in the past 10 years), and cities within those counties to develop
13 new comprehensive plans. Counties not required to plan under the GMA may elect to do so.
14 Benton, Franklin, and Grant counties, along with the City of Richland, have elected to plan under
15 the GMA requirements.
16

17 Under the GMA, any county or city that implements the GMA is required to: (1) have the
18 county legislative authority adopt a county-wide planning policy under the *Revised Code of*
19 *Washington* (RCW) 36.70A.210; (2) have the county and each city located within that county
20 adopt development regulations conserving agricultural lands, forest lands, mineral resource
21 lands, and critical areas which must be designated by the local government within one year of
22 the date the county legislative authority adopts its resolution of intention; (3) have the county
23 designate the UGAs in cooperation with each city under RCW 36.70A.110; and (4) have the
24 county and each city located within the county produce a comprehensive plan and development
25 regulations within four years of the county announcing its intention to plan.
26

27 **1.4.2.3.1 Benton County.** The relationship between DOE and Benton County differs
28 from DOE's relationship to other counties with an interest in Hanford because most of the
29 Hanford Site is located within Benton County. As a cooperating agency, Benton County does not
30 agree with the Tribal view that Hanford lands are "open and unclaimed." Benton County is
31 preparing a comprehensive land-use plan that covers the entire county, which includes a portion
32 of the Hanford Site. The DOE is committed to cooperating with the Benton County's planning
33 effort, per a signed agreement by the Secretary of Energy in March 1996 with local governments,
34 titled *Statement of Principles Outlining the Relationship Between the U.S. Department of Energy*
35 *and Local Governments* (RL No. 98-089, dated June 1998).
36

37 As part of its planning effort, Benton County has developed a proposed critical areas
38 map, which depicts lands identified as critical areas under the GMA (see Figure 1-5). The
39 county has completed its SEPA review of the critical areas map and draft implementing
40 ordinance provisions, which would be amended to the county's adopted Critical Resources
41 Protection Ordinance. The Benton County Planning Commission has reviewed and approved
42 the map and ordinance amendments at public hearings, and has forwarded them to the Board of
43 County Commissioners for action, which is pending. Critical areas include wetlands areas with
44 a critical recharging effect on aquifers used for potable water, fish and wildlife habitat
45 conservation areas, frequently flooded areas, and geologically hazardous areas.
46

47 The Port of Benton, which must comply with county land-use plans, has already received
48 the 1100 and 3000 Areas, and has expressed interest in the industrial development of portions of
49 the 300 Area and in the area south of Energy Northwest (formerly known as WPPSS) Plant
50 Number 2.
51

52 **1.4.2.3.2 City of Richland.** The City of Richland plans in coordination with Benton
53 County under the GMA. Richland is greatly influenced by activities at the Hanford Site and has
54 gone through several boom-and-bust cycles in response to employment levels at Hanford. Land

1 use at Hanford has the potential to affect the economic development of Richland. The city
2 currently provides services such as water, electricity, and sanitary sewers to the southern portion
3 of the Hanford Site. The City of Richland has identified portions of the southern Hanford Site
4 (Figure 1-6) suitable for industrial development and possible annexation.
5

6 **1.4.2.3.3 Counties of the Wahluke Slope.** Franklin, Grant, and Adams counties also |
7 contain portions of the Hanford Site. The planning efforts of these local county governments vary
8 by each planning jurisdiction. For example, land-use planning for Grant County reflects the
9 Wahluke 2000 Plan prepared by farming interests in 1992 and supported by Grant County (Figure
10 1-7). Land-use planning for Franklin County reflects the results from a land-use analysis
11 conducted by the Franklin County Planning Department.
12

13 **1.4.3 Federal Land-Transfer Procedures**

14

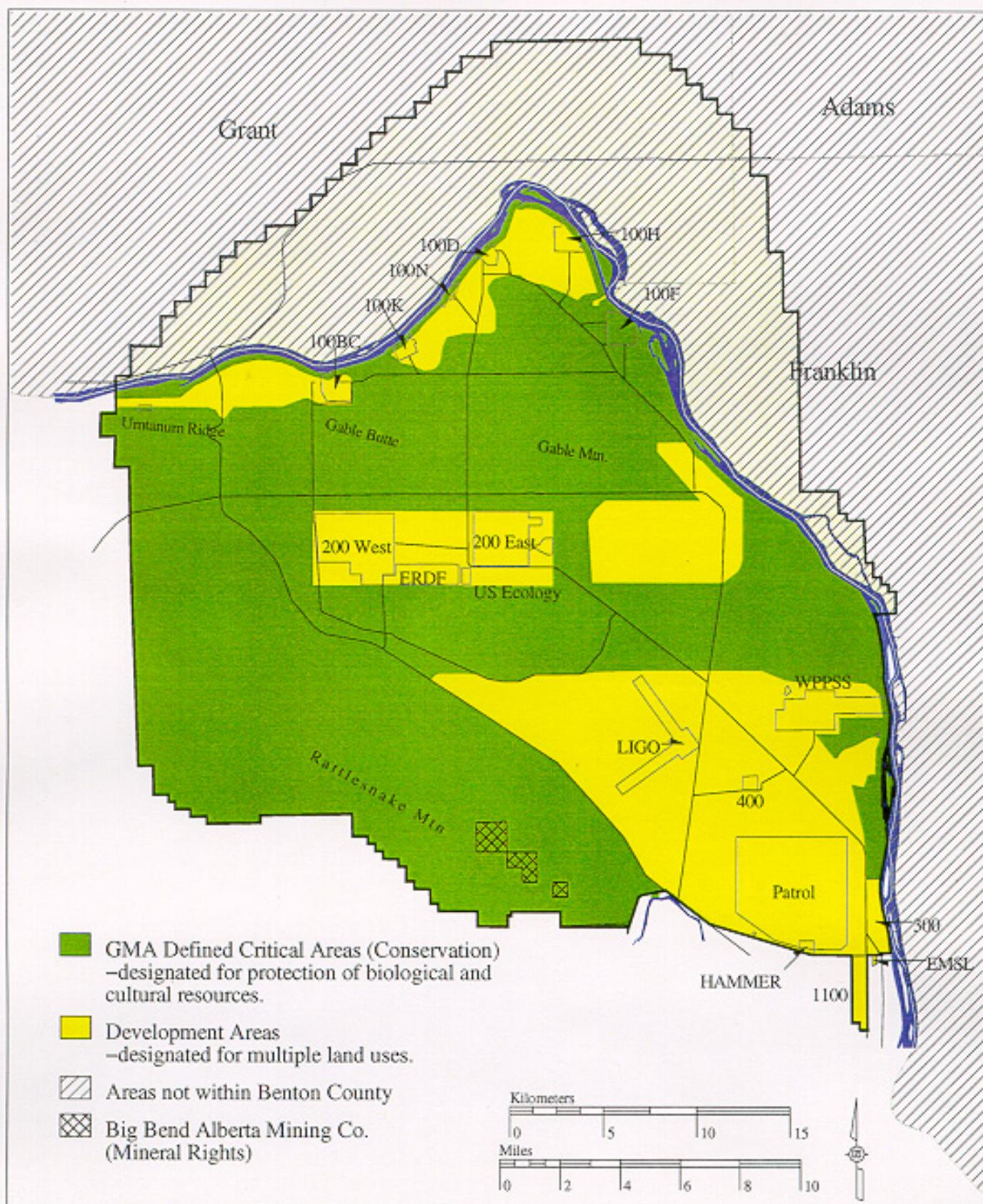
15 The DOE annually examines its real estate holdings to identify any excess properties. |
16 The GSA has developed the following questions for executive agencies such as DOE to consider
17 in identifying valid real property needs (DOE 1997c):
18

- 19 C Is all of the property essential for program requirements?
- 20
- 21 C Are buffer zones kept to a minimum?
- 22
- 23 C Can the land be disposed of and program requirements satisfied through reserving
24 rights and interests in the property?
- 25
- 26 C Is the land being retained merely because it is landlocked?
- 27
- 28 C Is the land being retained merely because it is considered undesirable due to
29 topographical features or believed to be not disposable?
- 30
- 31 C Is any portion of the property being retained primarily because the present boundaries
32 are marked by existing fences, roads, and utility systems?
33

34 These questions are specifically applicable to purchased land. However, in the absence
35 of other guidance, it is reasonable to apply these same factors when assessing the need for land
36 withdrawn from the Public Domain.
37

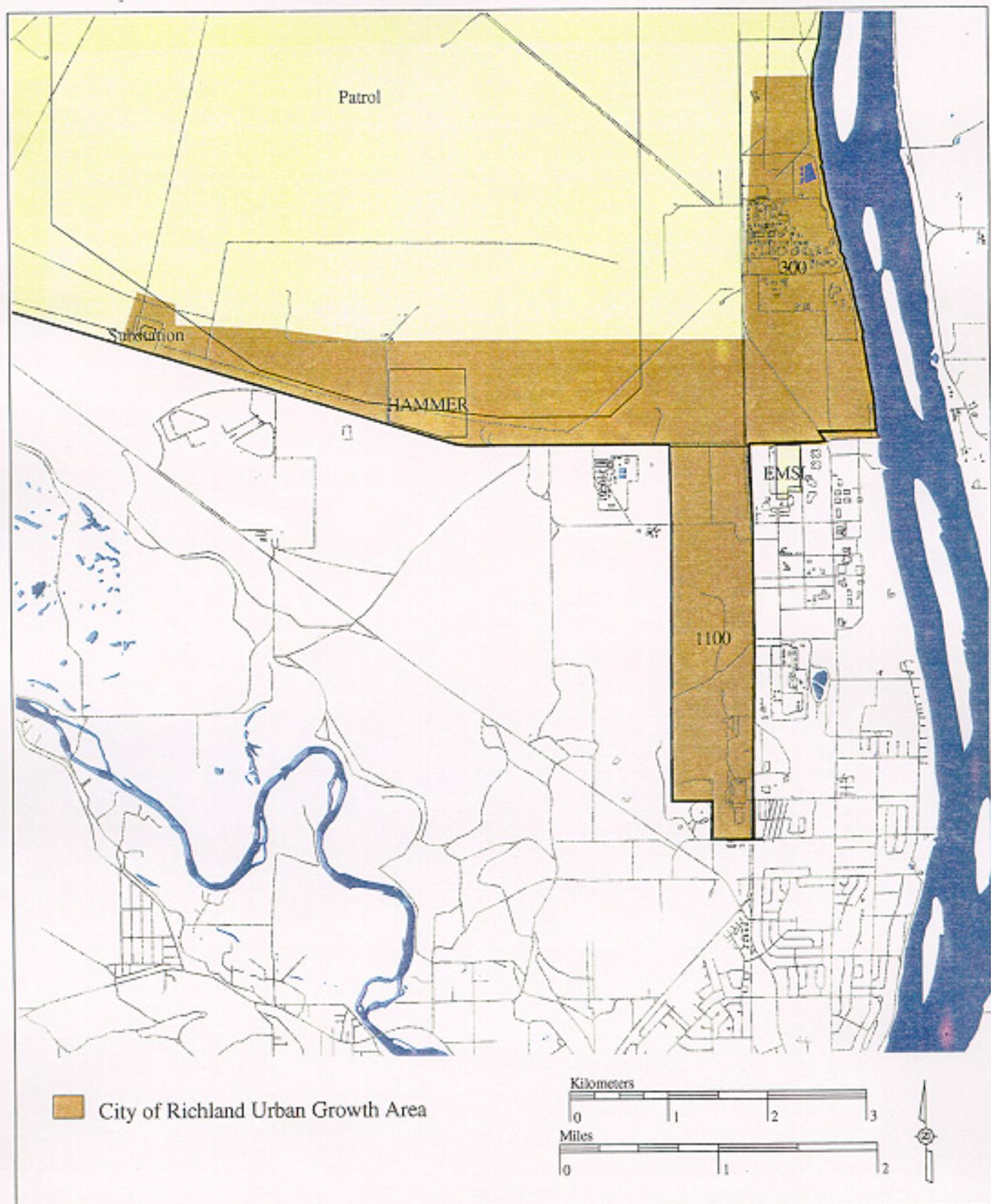
38 Within the context of Hanford, the CLUP's authority exists only as long as DOE retains
39 legal control of some portion of the real estate. For example, in the Columbia River Corridor,
40 DOE might decide to retain control of the subsurface or groundwater and release only the first 4.6
41 m (15 ft) of the surface. However, because of the cooperating agencies' involvement in the
42 CLUP process, the CLUP can provide reasonable assurance as to what the land use would be if
43 the land is transferred to the control of one of the cooperating agencies. Further, the creation of a
44 land-use plan through the NEPA process would provide a basis for considering future land
45 transfer proposals. The DOE would conduct appropriate further NEPA review (i.e., EIS,
46 environmental assessment, or categorical exclusion), tiered from this EIS, before making
47 decisions on any specific future land-transfer proposals.
48
49

Figure 1-5. Benton County Proposed Critical Areas Map.



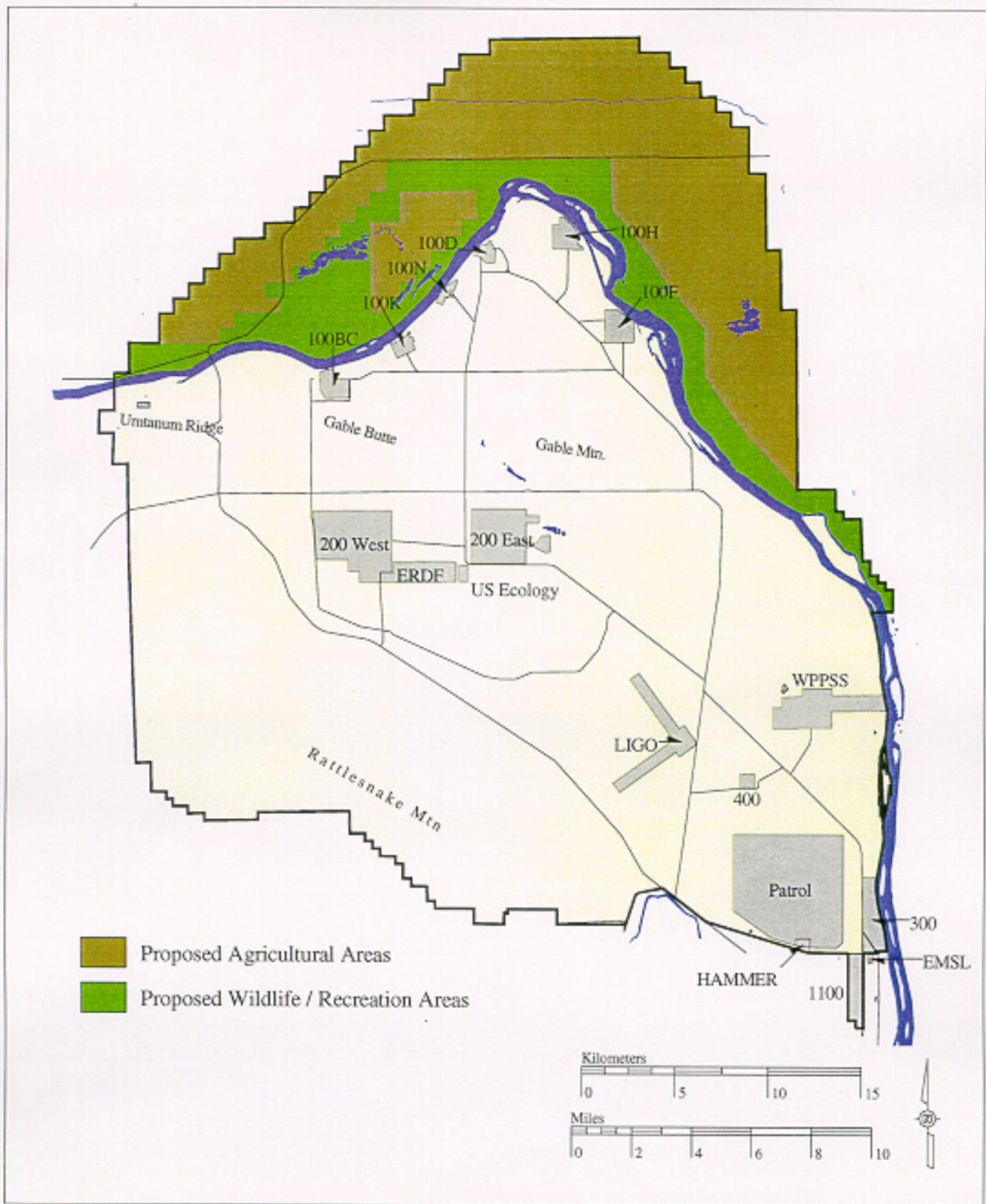
BHI:pp 04/23/96 clup/bentonco1.aml Database: 03-AUG-1998

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Figure 1-6. City of Richland Urban Growth Area.



BH: rpp 01/13/98 draft_2/urban1 amf Database: 03-AUG-1998

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Figure 1-7. Wahluke 2000 Plan Map.



BHLrpp 01/13/98 draft_2/urban4.aml Database: 03-AUG-1998

1 In its NEPA regulations (10 CFR 1021),
2 DOE has identified several categorical exclusions
3 of typical classes of action relevant to land
4 transfers that normally do not require an EIS or an
5 environmental assessment. As described in 10
6 CFR 1021.410, to find that a proposal may be
7 categorically excluded, DOE must determine that
8 the proposal fits within the class of action (see text
9 box, “DOE’s Land Transfer CXs”) that there are no
10 extraordinary circumstances that may affect the
11 significance of the proposal (e.g., “... unresolved
12 conflicts regarding alternate uses of available
13 resources...”), and that the proposal is not
14 connected to other actions with potentially
15 significant impacts. Departmental policy requires
16 field activities to identify long-term mission needs
17 and rationally plan for future site development.
18 More specifically, policy requires that
19 comprehensive land-use plans be developed
20 based on mission needs, site and regional
21 conditions, strategic goals, and other technical
22 information such as the need for buffer zones.
23 Also, disposals are made through the
24 Department’s certified realty specialists at field
25 sites in accordance with statutory and regulatory
26 requirements. This CLUP’s authority is limited to
27 as long as DOE retains legal control of some
28 portion of the real estate.
29

30 This EIS does not contain any new mechanisms or preferences regarding the transfer of
31 land, but with the input from the cooperating agencies and consulting Tribal governments, this
32 EIS would continue to be useful for considering proposals regarding Hanford lands that might be
33 transferred beyond the control of DOE. This EIS is not focused on land transfer, but instead
34 focuses on the integrated use and management of land and resources independent of who owns
35 the land. Land transfer is a complicated and separate process from the CLUP and, once
36 property leaves DOE control, DOE has no control over the use of that land unless the property
37 was conveyed with deed or other legal restrictions. For more information about regulations
38 pertaining to land transfer or facility leasing, see Table 1-4. For more information about the
39 process for transferring property, refer to the guidebook, *Cross-Cut Guidance on Environmental*
40 *Requirements for DOE Real Property Transfers* (DOE 1997b), or Ecology’s guidebook, *Hanford*
41 *Land Transfer* (Ecology 1993).

DOE’s Land Transfer CXs

A.7 Transfer, lease, disposition, or acquisition of interests in personal property (e.g., equipment and materials) or real property (e.g., permanent structures and land), if property use is to remain unchanged; i.e., the type and magnitude of impacts would remain essentially the same.

B1.24 Transfer, lease, disposition or acquisition of interests in uncontaminated permanent or temporary structures, equipment therein, and only land that is necessary for use of the transferred structures and equipment, for residential, commercial, or industrial uses (including, but not limited to, office space, warehouses, equipment storage facilities) where, under reasonably foreseeable uses, there would not be any lessening in quality, or increases in volumes, concentrations, or discharge rates, of wastes, air emissions, or water effluents, and environmental impacts would generally be similar to those before the transfer, lease, disposition, or acquisition of interests. Uncontaminated means that there would be no potential for release of substances at a level, or in a form, that would pose a threat to public health or the environment.

B1.25 Transfer, lease, disposition or acquisition of interests in uncontaminated land for habitat preservation or wildlife management, and only associated buildings that support these purposes. Uncontaminated means that there would be no potential for release of substances at a level, or in a form, that would pose a threat to public health or the environment.

1

Table 1-4. Regulations Affecting Land Transfer. (3 pages)

2	Year	Law	Name	Mechanism	Term	Approvals	Major Elements
3	1954	PL 83-703, Sec. 161(g)	<i>Atomic Energy Act (AEA)</i>	<ul style="list-style-type: none"> S Lease Real Property S Lease Personal Property S Sell Real Property S Sell Personal Property 	Not specified	Sec. of Energy approval delegated to field offices	<ul style="list-style-type: none"> S General authority to sell, lease, grant, and dispose of real and personal property. (There must be a direct correlation between the purpose of the lease and the mission of DOE derived from the AEA.) S Limited to R&D efforts or efforts to support atomic energy, or efforts to support international agreements
4	1955	PL 221-Chapter 543: 69 STAT 471, as amended 1964 (PL 88-394); (US Code 42 U.S.C. 2349)	<i>Atomic Energy Community Act</i>	<ul style="list-style-type: none"> S Lease Land S Lease Equipment S Sell Equipment 	Not specified	Sec. of Energy approval Congressional Review	<ul style="list-style-type: none"> S Applies to Hanford Site only S Must obtain fair market value S Congress has 45 day review S Must reduce adverse economic impact in local area
5	1977	PL 95-91, 91 STAT 565, as amended, 42 U.S.C. 701 et. seq., August 4, 1977	<i>Energy Organization Act</i>	Lease Real Property	5 years	Local DOE field office authority for approval established under DOE Order 4300.1C	<ul style="list-style-type: none"> S Not currently needed, but not yet exceeded S Does not require fair market value, but implementing DOE Order 4300.1C does require fair market value
6	1948	PL 80-537	Authorizing the transfer of certain property for wildlife, or other purposes	Transfer of excess	Not specified	General Services Administration	Upon application to GSA, the Secretary of the Interior is authorized to accept transfer of federally excessed land that has value for migratory birds without compensating the excessing agency.
7	1954	43 U.S.C. Section 931c, Chapter 22	<i>Public Lands Authorization for Certain Uses</i>	Lease Land	30 years	Secretary or designee	<ul style="list-style-type: none"> S DOE must have authority over land S Fair market value must be received S Can only lease to states, counties, cities, towns, townships, municipal corporations, or other public agencies for the purpose of construction and maintaining on such lands, public buildings or other public works

Table 1-4. Regulations Affecting Land Transfer. (3 pages)

Year	Law	Name	Mechanism	Term	Approvals	Major Elements
1	1980	PL 96-480 <i>Stephen-Wydler Technology Innovation Act</i>	S Technology Transfer S Cooperative Research Agreements S Licensing	N/A	Local DOE field office authority	S Established technology transfer as a mission of the Federal government
2 3	1949	Chapter 288, 63 STAT 377 40 U.S.C. 471 et. seq. <i>Federal Property and Administrative Services Act of 1949, as amended</i>				
4 5	1994	PL 103-251, 15 USCA 3710a <i>Cooperative Research & Development Agreements (CRADA)</i>	S Land Use S Facility Use S Equipment Transfer	5 years	Local DOE field office authority	S Must be joint effort between one or more government laboratories and one or more non-Federal parties S Work scope must be research and development S Special consideration to small businesses S Both parties can provide people, services, facilities, equipment, intellectual property, and other resources, except government cannot provide cash

Table 1-4. Regulations Affecting Land Transfer. (3 pages)

Year	Law	Name	Mechanism	Term	Approvals	Major Elements
1 1994	PL 103-160, Sec 3154, 3155	<i>Defense Authorization Act</i> (Hall Amendment)	<p>Section 3154:</p> <ul style="list-style-type: none"> S Lease Real Property and related personal property <p>Section 3155:</p> <ul style="list-style-type: none"> S Transfer Personal Property 	<p>Section 3154:</p> <p>10 years - option for additional term (unspecified)</p>	<p>Section 3154:</p> <ul style="list-style-type: none"> S Requires Secretary approval or designee plus administrator of EPA for NPL Site or appropriate state official. State official has 60 days to reject request for concurrence <p>Section 3155:</p> <ul style="list-style-type: none"> S Secretary or designee approval required 	<p>Section 3154:</p> <ul style="list-style-type: none"> S Located at DOE facility to be closed or reconfigured S Not needed by DOE S Under DOE's control S Must be acquired land, not Public Domain land S Can be leased for less than fair market value S Lease revenues can be used at the Site generating the revenues. <p>Section 3155:</p> <ul style="list-style-type: none"> S Can be used if transfer mitigates adverse economic consequences that might otherwise arise from the closure of the facility S Equipment must be located at the facility to be closed S Must be excess to DOE needs S Must cost more than 110% of new cost to relocate if needed elsewhere in DOE S Consideration received may be less than fair market value S Additional terms may be required that Secretary deems necessary to protect U.S. interests

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2.0 Purpose and Need

The U.S. Department of Energy (DOE) has several missions to fulfill at the Hanford Site that include, but are not limited to, being a natural resource trustee, developing economic diversification, managing energy research, and remediating legacy wastes. These missions have competing natural resource consumption needs and management values. Governments and stakeholders within the region have an interest in Hanford resources and in management of those resources over the long-term. The DOE needs to assess the relative qualities of Hanford's resources, compare the priorities and needs of Hanford's missions, and reach decisions such as the identification and disposal of any excess lands. DOE Order 430.1 and Federal Law 42 U.S.C. 7274k require a land-use plan for the Hanford Site. This Final HCP EIS provides the analysis needed to adopt a land-use plan.

The DOE needs to determine (1) if DOE wants to plan with the cooperating agencies and Tribal governments, and (2) how the land-use planning process should be integrated into the current Hanford Site management systems. The decision to cooperatively plan involves the adoption of a comprehensive land-use plan that contains three parts, as outlined in Chapter 6: a land-use map, planning policies, and implementing procedures. The default would be no comprehensive land-use plan as referenced in the No-Action Alternative.

The role of the Final HCP EIS is to document, in a public forum, the process of determining the best combination of land uses required to meet DOE mission needs for minimally the next 50 years. Through this EIS, DOE is responding to the following needs:

- C Meet the mandate set forth in 42 U.S.C. 7274k, requiring the development of a final future-use plan
- C Support the U.S. Environmental Protection Agency, Washington State Department of Ecology, and DOE remediation decision-making processes
- C Develop a comprehensive land-use plan for the Hanford Site in accordance with DOE Order 430.1 (DOE 1995c).

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3.0 Description of the Proposed Action and Alternatives

This chapter describes the proposed action and the alternative methods by which the proposed action could be accomplished. Also included is a discussion of the No-Action Alternative. A No-Action Alternative is required by the *National Environmental Policy Act of 1969* (NEPA) and provides a baseline against which the impacts of the other alternatives can be compared.

3.1 Proposed Action

The proposed action for the *Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS) is to develop and implement a comprehensive land-use plan (CLUP) for the Hanford Site. As mandated by 42 U.S.C. 7274k, the land-use plan must address at least a 50-year planning period, although some specific DOE activities such as decommissioning of reactors are expected to take longer. The CLUP would include the following sections which are the minimum parts of a “comprehensive” land-use plan.

- C A land-use map with land-use designations. The Record of Decision (ROD) for this HCP EIS would select one of the alternative land-use maps presented in Chapter 3 or would select a land-use map such as the revised Preferred Alternative that combines features of several alternatives.
- C A set of definitions for each land-use map designation that apply to all of the alternative land-use maps (not applicable to the No-Action Alternative).
- C A set of land-use plan policies (see Chapter 6) that apply to all of the alternative land-use maps (not applicable to the No-Action Alternative).
- C A set of procedures for plan implementation (see Chapter 6) that would promote DOE’s responsibility for coordination of land-use decisions with cooperating agencies and consulting Tribal governments (not applicable to the No-Action Alternative).

Once established, this land-use plan would provide a framework for making Hanford Site land-use and facility-use decisions.

3.2 Development of the Alternatives

Alternative land-use plans for the Hanford Site were developed through a cooperative effort with DOE; the Confederated Tribes of the Umatilla Indian Reservation (CTUIR); the Nez Perce Tribe Department of Environmental Restoration and Waste Management (Nez Perce Tribe); the U.S. Department of the Interior (DOI) via the Bureau of Land Management (BLM), Bureau of Reclamation (BoR), and the U.S. Fish and Wildlife Service (USFWS); the Washington Department of Fish and Wildlife (WDFW); the City of Richland; and Benton, Franklin, and Grant counties. Following development of the alternatives, an analysis of potential environmental impacts resulting from proposed land uses associated with each alternative was conducted. With the exception of DOE’s Preferred Alternative and the No-Action Alternative (both of which were written by DOE), the narratives of each alternative do not contain parallel information because each alternative was written by a separate cooperating agency or consulting Tribal government with differing management goals. The results of these impact analyses are presented in Chapter 5.

1 **3.2.1 Involvement of the Cooperating Agencies**

2
3 During the public comment period on the
4 August 1996 Draft HRA-EIS, several entities
5 formally requested cooperating agency status in
6 developing the Final HCP EIS. These agencies
7 included the DOI, the City of Richland, and Benton
8 and Franklin counties (with whom the State of
9 Washington has placed land-use planning
10 authority under the *Washington Growth*
11 *Management Act of 1990* [GMA]). Each of these
12 agencies has a legal interest in land-use planning
13 at the Hanford Site because each has some
14 responsibility or interest in managing Hanford
15 lands or dependent resources. From a
16 management perspective, it is also important to
17 understand who orchestrates Columbia River
18 activities (see text box, “*The Managed River*”).
19

20 Discussions with the interested agencies
21 were initiated in January 1997 to provide a forum
22 to participate in Hanford Site land-use planning
23 and alternatives development. On March 4, 1997,
24 DOE issued letters formally requesting the
25 participation of these agencies, as well as Grant
26 County and affected Tribal governments, in the
27 development of a Revised Draft HRA-EIS. Later,
28 upon request, a letter was also issued to the
29 USFWS (see Appendix B).
30

31 For the convenience of DOE, there are two
32 permits with the USFWS for managing land on the
33 Hanford Site. On the Wahluke Slope, the USFWS
34 manages the Saddle Mountain National Wildlife
35 Refuge (NWR) under a permit signed in 1971.
36 Unless this agreement is dissolved, the Saddle
37 Mountain National Wildlife Refuge would continue
38 to be managed as part of the NWR System under
39 all alternatives described in this chapter. On the
40 Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve), the USFWS and DOE have a 25-
41 year agreement, signed in 1997, that the USFWS will manage the ALE Reserve consistent with
42 the existing ALE Reserve Management Plan until the new plan is developed. This new
43 Comprehensive Conservation Plan (CCP) is being developed by the USFWS under DOE
44 funding. Through the CCP, the USFWS will identify USFWS proposed management actions.
45 The finished CCP will, in turn, give the USFWS the authority to manage the ALE Reserve as a
46 part of the NWR System. The CCP would be the equivalent of an area management plan (AMP)
47 developed under the guidelines in Chapter 6. Unless the DOE permit is revoked, the USFWS
48 would manage the ALE Reserve and proceed with CCP preparation to identify refuge
49 management actions to bring the ALE Reserve into the NWR System.
50

51 The land-use planning sessions with the participating agencies resulted in development of
52 the nine land-use designations, six alternatives (including the No-Action Alternative), land-use

The Managed River

Because ownership is integral to land-use planning, it is important to understand who owns the Columbia River. Within the Hanford Comprehensive Land-Use Plan, DOE, Bureau of Land Management (BLM), Bureau of Reclamation (BoR), U.S. Army Corps of Engineers (USACE), and Washington State Department of Natural Resources all own portions of the Columbia River’s islands, riverbed, shoreline, water, or adjoining riverbanks. The Columbia River is central to both commerce and environmental quality for the Northwest.

In addition to ownership, it also helps to know what activities are regulated and who the managers are in the Columbia River Corridor. The Columbia River is a highly managed river. At the top of the Federal responsibilities are Congressional Treaties. There are treaties with Tribal Nations concerning fishing rights, international treaties concerning migratory birds, and specific treaties with Canada that concern river flows, hydropower marketing, and migratory fish stocks. Next is the authority of the Federal agencies. Section 404 of the *Clean Water Act* involves two lead agencies — the U.S. Environmental Protection Agency (EPA), whose regulations implement the Dredged and Fill Material Discharge Permit Program of Section 404, and the USACE, whose regulations also implement the permit program and who control river flows via their dams.

The DOI has several agencies with regulatory authority on the river, including the USFWS for the migratory and listed *Endangered Species Act* plants or animals, the National Park Service while the river is being considered for Wild and Scenic Recreational status, and the BoR which controls river flows via their dams. The U.S. Department of Commerce’s National Oceanic and Atmospheric Administration, National Marine Fisheries Service (or “NOAA Fisheries”) administers NOAA’s programs that support the migratory salmon and steelhead stocks. The DOE regulates the Columbia River flow through its agency, the Bonneville Power Administration, marketing the

1 planning policies and implementing procedures, the potential environmental impacts analysis,
2 and the structure of the Revised Draft HRA-EIS. The cooperating agency land-use planning
3 sessions are expected to continue through publication of the HCP EIS ROD and implementation
4 of the CLUP (see Chapter 6).

6 **3.2.2 Development of the Nine Hanford Site Land-Use Designations**

8 The following land-use designations and their definitions were co-written by the
9 cooperating agencies and consulting Tribal governments so alternative land-use plans could be
10 commonly developed and compared. These land-use groupings determined to be suitable for the
11 Hanford Site lands include the following designations:

- 13 c Industrial-Exclusive
- 14 c Industrial
- 15 c Agricultural
- 16 c Research and Development
- 17 c High-Intensity Recreation
- 18 c Low-Intensity Recreation
- 19 c Conservation (Mining and Grazing)
- 20 c Conservation (Mining)
- 21 c Preservation.

22
23 These Hanford Site land-use designations and their definitions are presented in Table 3-1.
24 In developing these land-use designation definitions, the cooperating agencies and consulting
25 Tribal governments drew from the Final Report of the Future Site Uses Working Group (Working
26 Group), the August 1996 Draft HRA-EIS, Benton County's GMA planning effort, and the City of
27 Richland's GMA planning effort.

29 **3.2.3 Identification of Land-Use Suitability**

31 Developing alternatives was preceded by a land-use suitability analysis for a given area of
32 the Hanford Site. A roundtable opportunity-and-constraint discussion on existing Site conditions
33 was shared by the cooperating agencies and consulting Tribal governments. During these
34 discussions, the land-use designations in Table 3-1 were developed. While land-use decisions
35 are fundamentally value-driven decisions, they also should be decisions formed by opportunities
36 and constraints (see text box, "What is an Opportunity or Constraint?"). Existing Site conditions
37 and resources analyzed in the Final HCP EIS include the following:

- 39 c Biological
- 40 c Surface water
- 41 c Groundwater
- 42 c Waste sites including vadose zone
- 43 c Geological
- 44 c Cultural
- 45 c Economic (e.g., infrastructure).

47 These land-use designations, while based on land-use suitability, also provide insight into
48 a myriad of potential land-use opportunities and reflect the many and varied interests of the
49 cooperating agencies and consulting Tribal governments. Examples of potential land-use
50 activities taking place under each land-use designation are defined in Table 3-1.

Table 3-1. Hanford Site Land-Use Designations.

Land-Use Designation	Definition
Industrial-Exclusive	An area suitable and desirable for treatment, storage, and disposal of hazardous, dangerous, radioactive, and nonradioactive wastes. Includes related activities consistent with Industrial-Exclusive uses.
Industrial	An area suitable and desirable for activities, such as reactor operations, rail, barge transport facilities, mining, manufacturing, food processing, assembly, warehouse, and distribution operations. Includes related activities consistent with Industrial uses.
Agricultural	An area designated for the tilling of soil, raising of crops and livestock, and horticulture for commercial purposes along with all those activities normally and routinely involved in horticulture and the production of crops and livestock. Includes related activities consistent with Agricultural uses.
Research and Development	An area designated for conducting basic or applied research that requires the use of a large-scale or isolated facility, or smaller scale time-limited research conducted in the field or within facilities that consume limited resources. Includes scientific, engineering, technology development, technology transfer, and technology deployment activities to meet regional and national needs. Includes related activities consistent with Research and Development.
High-Intensity Recreation	An area allocated for high-intensity, visitor-serving activities and facilities (commercial and governmental), such as golf courses, recreational vehicle parks, boat launching facilities, Tribal fishing facilities, destination resorts, cultural centers, and museums. Includes related activities consistent with High-Intensity Recreation.
Low-Intensity Recreation	An area allocated for low-intensity, visitor-serving activities and facilities, such as improved recreational trails, primitive boat launching facilities, and permitted campgrounds. Includes related activities consistent with Low-Intensity Recreation.
Conservation (Mining and Grazing)	An area reserved for the management and protection of archeological, cultural, ecological, and natural resources. Limited and managed mining (e.g., quarrying for sand, gravel, basalt, and topsoil for governmental purposes) and grazing could occur as a special use (i.e., a permit would be required) within appropriate areas. Limited public access would be consistent with resource conservation. Includes activities related to Conservation (Mining and Grazing), consistent with the protection of archeological, cultural, ecological, and natural resources.
Conservation (Mining)	An area reserved for the management and protection of archeological, cultural, ecological, and natural resources. Limited and managed mining (e.g., quarrying for sand, gravel, basalt, and topsoil for governmental purposes) could occur as a special use (i.e., a permit would be required) within appropriate areas. Limited public access would be consistent with resource conservation. Includes activities related to Conservation (Mining), consistent with the protection of archeological, cultural, ecological, and natural resources.
Preservation	An area managed for the preservation of archeological, cultural, ecological, and natural resources. No new consumptive uses (i.e., mining or extraction of non-renewable resources) would be allowed within this area. Limited public access would be consistent with resource preservation. Includes activities related to Preservation uses.

What is an Opportunity or Constraint?

In land-use planning, existing conditions offer a mix of “opportunities and constraints.” Not all opportunities are equally viable at a specific point in time. And, few constraints are insurmountable given today’s engineering and construction capabilities.

For example, shorelines of navigable water bodies typically have *constraints* to development because of potential flooding, geologic instability, bank erosion, wildlife habitat, and cultural resources. However, shorelines also offer excellent *opportunities* for enhancing recreation, cultural resources, fishery habitat, and water quality. These shorelines also are unique in that siting of needed water “dependent” and water “related” developments that cannot be an opportunity (physically located) in upland landscapes.

Landscapes with few or no constraints present the greatest challenges because they represent boundless opportunities with no hint as to their inherent suitability for one land use or another. Consequently, unless a site’s suitability for a particular land use is narrowly prescribed by law (e.g., wetlands are protected for biological and water quality needs), the land-use decision is fundamentally value driven. Therefore, when the opportunities and constraints of a particular landscape are analyzed together, the “suitability” for different land uses can be compared and contrasted for an informed and value-driven decision.

1 *Industrial-Exclusive* – Would use existing
2 waste management areas, such as the 200 Area.
3 This land-use designation would preserve DOE
4 control of the continuing remediation activities and
5 use the existing compatible infrastructure required
6 to support activities such as dangerous waste,
7 radioactive waste, and mixed waste treatment,
8 storage, and disposal facilities. The DOE and its
9 contractors, and the Department of Defense and
10 its contractors, could continue their federal waste
11 disposal missions; and the Northwest Low-Level
12 Radioactive Waste Compact could continue using
13 the U.S. Ecology site for commercial radioactive
14 waste. Research supporting the dangerous
15 waste, radioactive waste, and mixed waste
16 treatment, storage, and disposal facilities would be
17 also encouraged within this land-use designation.
18 New uses of radioactive materials such as food
19 irradiation could be developed and packaged for
20 commercial distribution here under this land-use
21 designation. This land-use designation supports
22 the Environmental Protection Agency (EPA)
23 Brownfields Initiative for contaminated areas (EPA
24 1997).

25
26 *Industrial* – Would allow the opportunity for
27 expanded economic growth as a result of an
28 increased and diversified regional marketplace.

29 This land-use designation would use existing compatible infrastructure, including transportation
30 corridors, utilities and availability of energy, and suitable buildings or building space to encourage
31 redevelopment and current DOE missions of research into energy resources development and
32 other research opportunities. Redevelopment could include leasing or selling of idle industrial
33 equipment currently held by DOE such as has been done for the aluminum extrusion presses in
34 the 300 Area or the locomotive machine shop in the 1100 Area, to laboratory facilities and other
35 infrastructure. Leases for industrial facilities such as the Energy Northwest’s (formerly the
36 Washington Public Power Supply System, or WPPSS) reactor or a proposed metal smelter
37 cluster would be encouraged. This land-use designation supports the EPA Brownfields Initiative
38 for contaminated areas (EPA 1997).

39
40 *Agricultural* – Would use the economic potential of the Columbia River Basin in eastern
41 Washington (see text box, “*Hanford’s Agricultural Opportunity Cost*,” Section 3.3.5.3.1). Under
42 the Agricultural land-use designation, the land would be grazed, irrigated, plowed, planted with
43 monocultures (e.g., wheat, grapes, apples, cherries, alfalfa, potatoes, etc.), fallowed, chemically
44 managed (e.g., fertilizers, and pesticides would be applied), burned to control weeds and
45 disease, and otherwise utilized consistent with common regional agricultural practices.

46
47 *Research and Development* – Would allow economic growth potential from research
48 activities associated with the Hanford Science and Technology Mission, the Hanford Site
49 remediation mission, and non-DOE-related research activities including large-scale, multi-
50 decade research and development (R&D) facilities such as the Environmental Molecular
51 Sciences Laboratory (EMSL) and the Laser Interferometer Gravitational Wave Observatory
52 (LIGO), as well as smaller scale and/or time-limited research conducted in the field or within
53 facilities that consume limited resources. Examples include environmental characterization or
54 monitoring studies, site-specific testing of waste management or cleanup technologies, or

1 environmental research in unique areas such as the Columbia River or the ALE Reserve. This
2 land-use designation would take advantage of existing compatible infrastructure, including
3 transportation corridors, utilities, and availability of energy, suitable buildings or building space,
4 security (i.e., controlled access), and the isolation of the Hanford Site from large population
5 centers.

6
7 *High-Intensity Recreation* – Would use the economic potential of planned multi-activity
8 recreational uses, including destination resorts, golf courses, and recreational vehicle service
9 areas. High-Intensity Recreation is also used to accommodate recreational activities that would
10 require a permanent commitment for infrastructure such as a septic drain field for flush toilets or
11 waste water from fish cleaning stations associated with Tribal-reserved use sites or other public
12 use sites.

13
14 *Low-Intensity Recreation* – Would allow use of the Hanford Site’s natural features and the
15 opportunity for human recreational activities (e.g., birding, fishing, hunting, rafting, kayaking,
16 hiking, and biking), which would result in minimal disturbance and require minimal development.
17 Low-Intensity Recreation would require active management practices to enhance or maintain the
18 existing resources, and to minimize or eliminate undesirable or non-native species.

19
20 *Conservation (Mining and Grazing)* – Would enable the extraction of valuable near-
21 surface geologic resources at some locations on the Hanford Site after obtaining NEPA, RCRA,
22 CERCLA, or, where applicable, *State Environmental Policy Act* (SEPA) approval to protect
23 NEPA-sensitive (e.g., biologic, geologic, historic, or cultural) resources. This land-use
24 designation would allow permitted (i.e., conditional) livestock grazing and mining (quarrying)
25 activities for governmental purposes in specific, limited areas. The Hanford Site has no proven
26 reserve of any metallic ore bodies; therefore, heap/leach or open-pit mining methods would not
27 be applicable. Should DOE determine that some or all of the Public Domain lands are surplus to
28 DOE’s needs and release the Public Domain lands back to the DOI, the DOI could then
29 determine if the Tribal treaty language “the privilege of hunting, gathering roots and berries, and
30 pasturing their horses and cattle upon open and unclaimed land” is applicable. Conservation
31 (Mining and Grazing) would afford protection of natural resources; however, other compatible
32 uses, such as recreation, or non-intrusive environmental research activities would also be
33 allowed provided those activities are consistent with the purposes of the Conservation land-use
34 designation. Conservation would require active management practices to enhance or maintain
35 the existing resources, and to minimize or eliminate undesirable or non-native species.

36
37 *Conservation (Mining)* – Would allow the same permitted uses as Conservation (Mining
38 and Grazing), except grazing would be prohibited. This land-use designation reflects the
39 anticipated need for onsite geologic resources to construct surface barriers as required by
40 Hanford Site remediation activities. Conservation would require active management practices to
41 enhance or maintain the existing resources, and to minimize or eliminate undesirable or non-
42 native species.

43
44 *Preservation* – Would protect the unique Hanford Site natural resources and would
45 enhance the benefits resulting from the protection of these resources. Preservation would
46 require active management practices which could include grazing for fire and weed control to
47 preserve the existing resources, and to minimize or eliminate undesirable or non-native species.
48 Commercial grazing of domesticated livestock would not be allowed. An approved wildfire
49 management plan that manages biological resources and protects cultural resources in addition
50 to infrastructure also would be required. Preservation would not preclude all access, but would
51 allow only uses such as nonintrusive environmental research or game-management activities,
52 provided that those activities are consistent with the purposes of the preservation of natural
53 resources.

1 A discussion of the affected environment and the existing constraints due to legacy waste
2 contamination and other features is presented in Chapter 4. Chapter 4 also contains Hanford
3 Site maps that illustrate the relevant Site characteristics of the natural environment and individual
4 constraints.

6 **3.2.4 Developing the Environmental Impact Statement Alternatives**

8 Following identification of the opportunities and constraints on the Hanford Site (see
9 Chapter 4), and development of the nine land-use designations, individual alternatives were
10 developed. Based on visions, goals, and objectives of the cooperating agencies and consulting
11 Tribal governments, the land-use designations were applied to specific tracts of land on the
12 Hanford Site. This process resulted in the development of the five (six, including the No-Action)
13 alternatives that are presented and analyzed in this Final HCP EIS.

15 **3.2.5 Incorporation of the Future Site Uses Working Group's Geographic Study Areas 16 into the Alternatives**

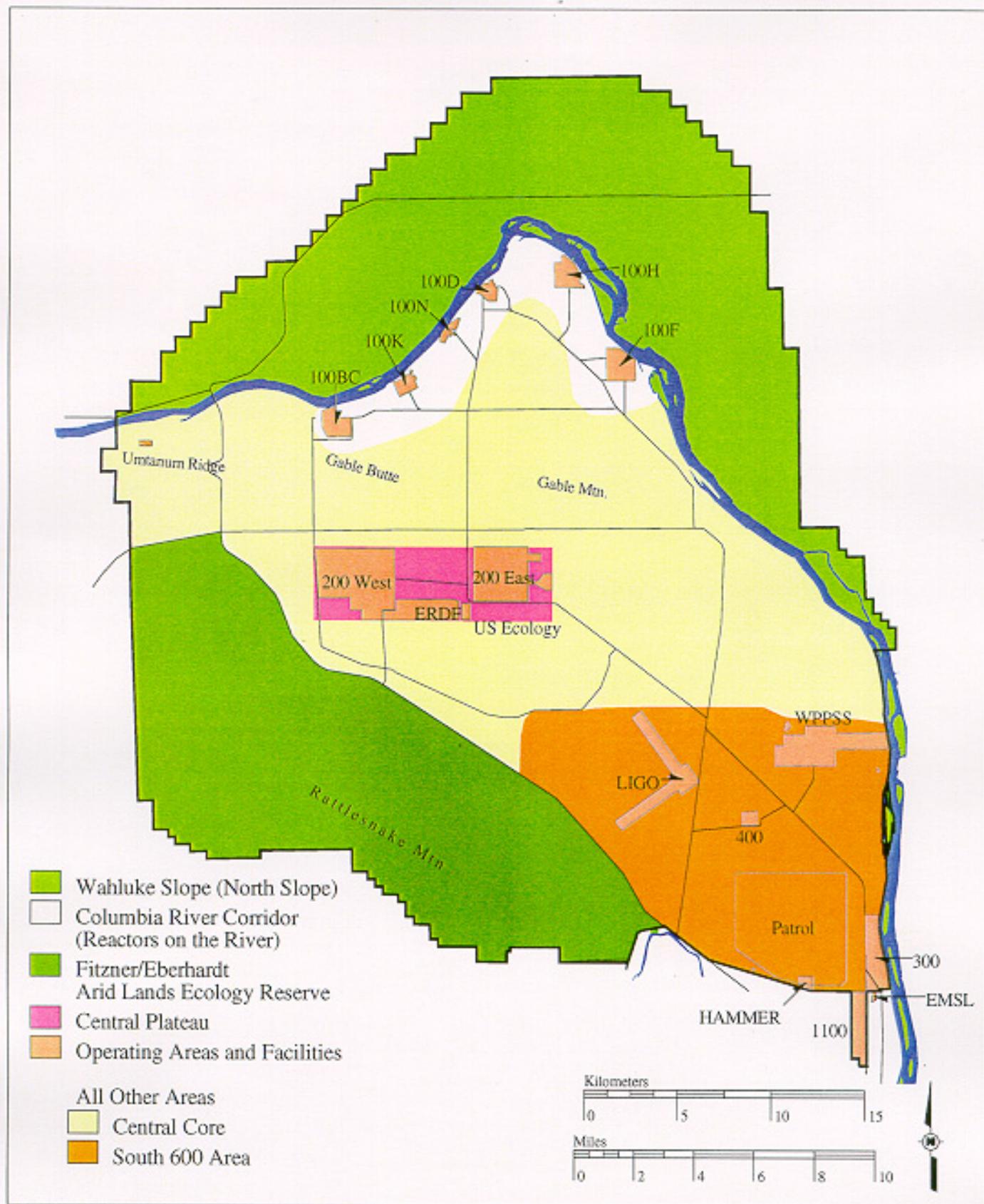
18 On December 22, 1992, the Hanford Future Site Uses Working Group (Working Group)
19 which submitted its report into the official scoping record for the HRA-EIS, provided one of the
20 first coordinated outside looks into the future of the Hanford Site. One of the important
21 contributions of the Working Group was the establishment of six geographic study areas for the
22 Hanford Site for planning purposes (see Figure 3-1). These geographic areas were North of the
23 River, the Columbia River, Reactors on the River, the Central Plateau, All Other Areas, and the
24 ALE Reserve. These original geographic areas are used in this EIS with the following slight
25 modifications:

- 27 C The North of the River geographic area has adopted the local name, the Wahluke
28 Slope.
- 30 C Two geographic areas – the Reactors on the River and the Columbia River – have
31 been combined into a single geographic area, the Columbia River Corridor, consistent
32 with Hanford Advisory Board (HAB) advice.
- 34 C The buffer area associated with the Central Plateau geographic area is not shown;
35 instead, the Central Plateau geographic area represents only the central waste
36 management area and defers the point of compliance for groundwater to the Tri-Party
37 Agreement's processes.
- 39 C The All Other Areas geographic area was divided into the South 600 Area to reflect the
40 clusters of infrastructure located there, and the Central Core that surrounds the
41 Central Plateau but contains less developed infrastructure.

43 **3.2.6 Screening for Reasonable Alternatives**

45 As discussed in the "Memorandum to Agencies: Forty Most Asked Questions Concerning
46 the Council on Environmental Quality's (CEQ) *National Environmental Policy Act* Regulations"
47 (40 FR 18026), reasonable alternatives include the alternatives that are feasible from a common
48 sense, technical, and economic standpoint. Further, the CEQ guidance states that the number
49 of reasonable alternatives considered in detail should represent the full spectrum of alternatives
50 for meeting the purpose and need of the agency, but should not discuss every unique alternative
51 when an unmanageably large number of alternatives would be involved.

Figure 3-1. Geographic Study Areas on the Hanford Site.



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1 An infinite number of land-use alternatives could be developed for the Hanford Site.
2 Consequently, DOE and the cooperating agencies and consulting Tribal governments developed
3 a process for generating a series of alternatives representative of the many stakeholder desires
4 for the future of the Hanford Site lands. This involved considering the relevant factors that
5 influence land use at the Hanford Site. These factors include the following:
6

- 7 C Consider public values from scoping and comments on the August 1996 Draft
8 HRA-EIS
9
- 10 C Consider land commitments that have been previously made by major Federal actions
11 (NEPA and CERCLA RODs)
12
- 13 C Consider current DOE missions, including economic diversification
14
- 15 C Consider site characteristics
16
- 17 C Consider regional development and ecosystem characteristics
18
- 19 C Consider the Working Group's possible future-use options and HAB advice
20
- 21 C Consider existing land uses, permits, easements, and current ownerships (i.e., the
22 BLM, BoR, DOE, State of Washington, and Big Bend Alberta Mining Company) in
23 developing proposed land uses
24
- 25 C Consider projected changes to the natural and built environment for at least the next
26 50 years
27
- 28 C Consider projected land uses for at least 50 years (in the year 2046)
29
- 30 C Evaluate projected land uses against the values, goals, and objectives of the
31 expressed public interests and the cooperating agencies and consulting Tribal
32 governments
33
- 34 C Consider contamination institutional controls
35
- 36 C Honor treaties.
37
38

39 **3.3 Description of the Alternatives**

41 The individual alternative land-use plans developed for this Final HCP EIS, as well as the |
42 No-Action Alternative, are discussed in the following sections. The No-Action and DOE's
43 Preferred Alternatives were written by DOE, Alternative One was written by DOE with input from
44 the USFWS, Alternative Two was written by a representative of the Nez Perce Tribe Department
45 for Environmental Restoration and Waste Management, Alternative Three was written by local
46 government land-use planners (Benton, Franklin and Grant counties, and the City of Richland),
47 and Alternative Four was written by a representative from the Confederated Tribes of the Umatilla
48 Indian Reservation. Differences between alternatives are the result of each respective agency
49 having unique values, goals, and objectives (vision) that the agency applies to the common set of
50 resources and, from which, each agency develops a vision for the Hanford Site. Each alternative
51 discussion begins with the values used to develop that alternative. Agency goals were used to
52 develop the nine land-use designations listed in Table 3-1. These land-use designations and the
53 agencies' values were, in turn, used to generate the six alternatives.

3.3.1 No-Action Alternative

As required by CEQ regulations for implementing NEPA (40 CFR 1502.14[d]), the No-Action Alternative have been included. Question 3 of CEQ's *NEPA's Forty Most Asked Questions* guidance, "Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the *National Environmental Policy Act*" (40 CFR 1500-1508), 46 FR 18026-18038, explains how DOE is to develop the No-Action Alternative:

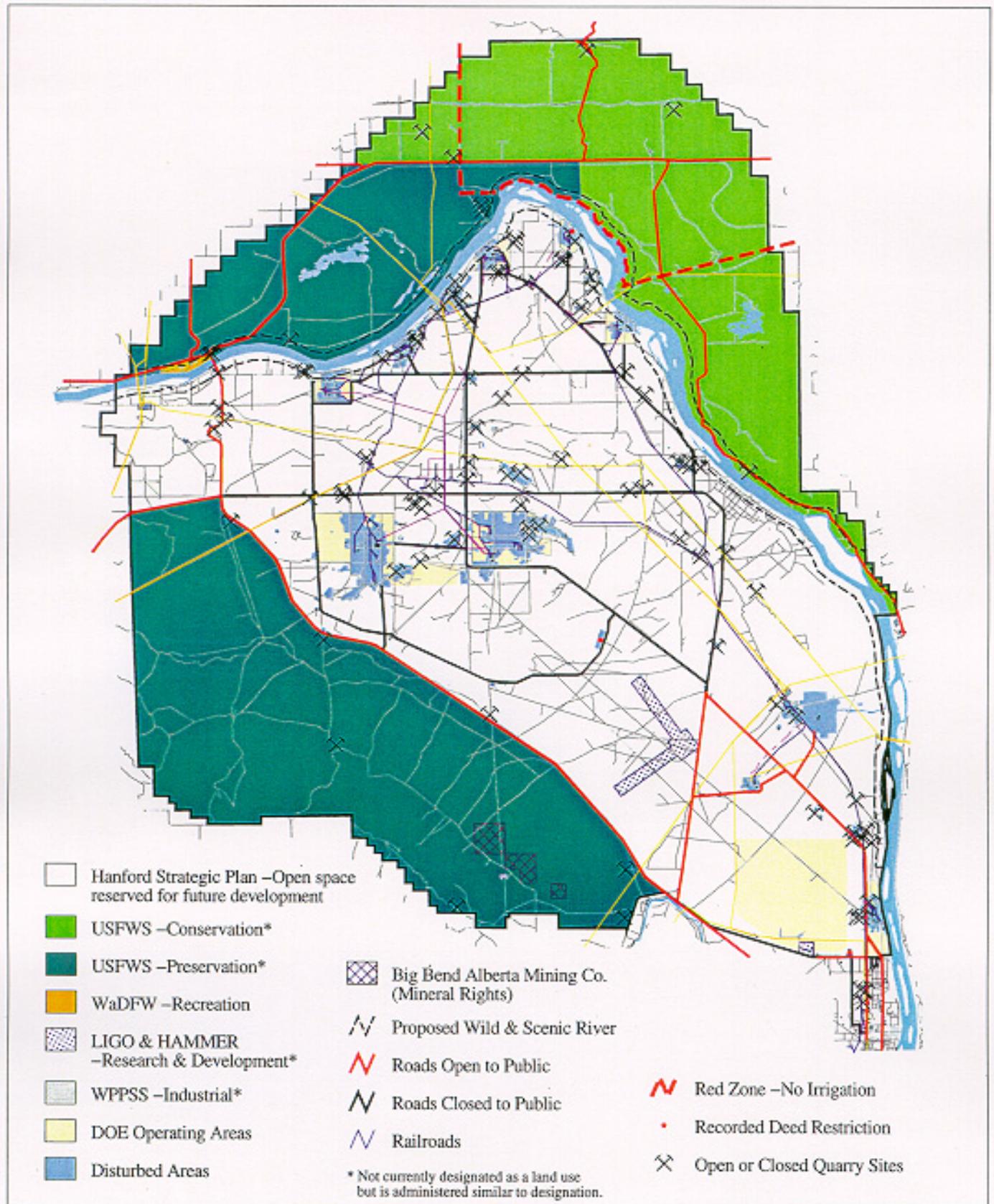
There are two distinct interpretations of "no action" that must be considered, depending on the nature of the proposal being evaluated. The first situation might involve an action such as updating a land management plan where ongoing programs initiated under existing legislation and regulations will continue, even as new plans are developed. In these cases "no action" is "no change" from current management direction or level of management intensity. To construct an alternative that is based on no management at all would be a useless academic exercise. Therefore, the "no action" alternative may be thought of in terms of continuing with the present course of action until the action is changed. Consequently, projected impacts of alternative management schemes would be compared in the EIS to those impacts projected for the existing plan. In this case, alternatives would include management plans of both greater and lesser intensity, especially greater and lesser levels of resource development.

Therefore, in keeping with CEQ guidance, the No-Action Alternative is presented as "no change" from current management direction or level of management intensity. Specifically "no change" means that DOE would not employ the land uses shown in Table 3-1, any of the alternative maps (or combination of alternative maps), and the CLUP policies and implementing procedures in Chapter 6 for managing Hanford Site lands into the future. The No-Action Alternative is DOE's mission-related operation provisions and managerial values of the 1996 *Hanford Strategic Plan* (DOE-RL 1996b) without a framework and implementation procedures to assure the planned use and sustainability of the Site's land and resources. If an alternative is adopted in the ROD, it would simply add more structure to the implementation of the current *Hanford Strategic Plan*.

The No-Action Alternative serves two purposes. First, it serves as a true baseline common to all of the alternatives that presents the current status of land use and land management on the Hanford Site. For this purpose, a baseline no-action map was developed that contains available information defining existing buildings and infrastructure at the Hanford Site. Second, the No-Action Alternative provides a basis for comparing the alternatives against a "no change" in land-use management policy baseline.

To analyze the impacts associated with implementing the no change in land-use management policy/No-Action Alternative, assumptions regarding land-management options were applied. In the No-Action Alternative, specific land-use decisions and designations would be made through the NEPA process on a project-by-project basis as needed. Still there would not be a true land-use designation, land-use policies, or implementing procedures. There would only be areas of the Hanford Site that are currently used or managed for specific purposes guided by administrative agreements (e.g., the ALE Reserve and the Wahluke Slope) and areas of the Hanford Site that are committed to a general land-use because of historical uses and existing NEPA or CERCLA/RCRA ROD commitments but are subject to change by future projects or missions that are unknown at this time. Consequently, potential uses for the Hanford Site lands under the No-Action Alternative are mapped using the policies presented in *Hanford Strategic Plan* (DOE-RL 1996b) (Figure 3-2). Impacts associated with these potential future uses are analyzed and presented in Chapter 5.

Figure 3-2. No-Action Alternative.



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1 **3.3.1.1 Planning Goals, Objectives, and**
 2 **Values (Vision).** No publicly reviewed land-
 3 management plan has been developed for the
 4 Hanford Site since 1975 (ERDA 1975) (see text
 5 box, "Permanent Commitments"). In the
 6 incorporated by reference *Waste Management*
 7 *Operations, Hanford Reservation, Richland,*
 8 *Washington: Final Environmental Statement*
 9 (ERDA 1975), the Section IX.2.3, "Land Use,"
 10 states:

11
 12 *Continuation of the Hanford Waste*
 13 *Management Operations Program will*
 14 *result in (1) occupancy of land by*
 15 *structures containing radionuclides, and*
 16 *(2) restricted use of land containing*
 17 *radionuclides. The quantity of land*
 18 *committed will remain essentially constant*
 19 *for about 300 years because of the*
 20 *presence of ¹³⁷Cs, ⁹⁰Sr, and transuranium*
 21 *materials in the burial grounds and crib*
 22 *sites unless major recovery and cleanup*
 23 *programs are initiated. After 300 years,*
 24 *the quantity of land required for such*
 25 *purposes will decrease to the lands which*
 26 *contain plutonium or other long-lived*
 27 *transuranics. Recovery of plutonium from*
 28 *stored waste would eliminate the need for*
 29 *long-term control and surveillance.*

30
 31 *A summary description of the committed*
 32 *lands is presented in Table IX-2. The*
 33 *areas in that table include appropriate*
 34 *buffer zones for surveillance and*
 35 *prevention of disturbance of the*
 36 *radionuclides by nearby activities such as*
 37 *irrigation agriculture.*

38
 39 *Commitment of some of the Hanford lands to waste management makes that land*
 40 *unavailable for other uses. Because there are tens of thousands of acres of similar*
 41 *desert land available throughout the western United States, the dedicated land cannot be*
 42 *considered to have rare characteristics that result in a premium value, such as for*
 43 *residential or industrial use. Ample similar land is available nearby for any such uses*
 44 *foreseen.*

<i>Permanent Commitments</i>
<p>The resources that are considered to be committed in an irretrievable and irreversible manner by the Hanford Waste Management Operations are (1) land and materials containing or used for storing radionuclides with a half-life longer than 10 years; (2) labor expended by construction and operating personnel; and (3) materials, such as fuels and chemicals, that are burned, diluted, or consumed during use.</p>
<p>Most land containing fission product radionuclides with long half-lives can be considered unusable for agricultural purposes for centuries. Although most of these radionuclides probably could be separated from the land, reduction of the concentration to a level which would permit unrestricted use undoubtedly would cost more than the value associated with normally expected uses. This land will require a commitment of both people and surveillance equipment until the radioactivity is essentially removed by processing or decay.</p>
<p>Land containing transuranic materials, particularly plutonium, can be considered unusable for any purpose for hundreds of thousands of years. Until any recovery program for the transuranic materials would be completed, this land will require a commitment of both people and surveillance equipment.</p>
<p>About half a million tons of fossil fuels and 50,000 tons of chemicals are expected to be irreversibly consumed by the Hanford Waste Management Operations. Some components of the concrete structures and equipment, as well as about 2,428 ha (6,000 ac) of desert land, are essentially irretrievable due to the practical aspects of reclamation and/or radioactive decontamination. Present operating practices will not require additional land usage for cribs (ERDA 1975).</p>

Table IX-2. Dedicated Waste Management Lands.

General Location	Content^a	Approximate Area (Acres)
100 Areas	Burial Grounds	70
200 Areas	Burial Grounds, Process Buildings, Tank Farms, Cribs, and Ponds	5,100
300 Area	Burial Grounds and Process Ponds	50
600 Area	Burial Grounds	10
Total		5,230^b

Table is a quote from the **Waste Management Operations, Hanford Reservation, Richland, Washington: Final Environmental Statement (ERDA 1538, 1975)**. Other EIS's and CERCLA RODs have committed even more areas such as ERDF, the 200 West expansion and the 200 East trenches to DOE waste disposal activities.

^a Excludes standby facilities.

^b This is 1.4% of the total Hanford Reservation land area.

In place of any formalized plan, land management at the Hanford Site would be administered using the visions outlined in the *Hanford Strategic Plan* (DOE-RL 1996b), which is not a land-use plan but is instead a DOE mission plan that is periodically updated. The 1996 *Hanford Strategic Plan* details the management direction for the Site. As outlined in the Strategic Plan, Hanford's environmental management, or cleanup mission is to protect the health and safety of the public, workers, and the environment; control hazardous materials; and utilize the assets (i.e., people, infrastructure, site) for other missions. Hanford's Science and Technology mission is to develop and deploy Science and Technology in the service of the nation, including stewardship of the Hanford Site.

Hanford Site managerial values, which are further explained in the 1996 Strategic Plan, are identified below:

- C **Safety** -- The safety and health of our workers and the public will not be compromised. We place a high priority on managing and reducing the risks in our workplace, as well as risks to the public and the environment.
- C **Results** -- We are committed to environmental and scientific excellence. We will meet or exceed the needs and expectations of our customers. Our employees are encouraged to seek creative and innovative solutions and to continuously find ways to improve what we do.
- C **Teamwork** -- We work as a team to accomplish our missions. We regard all concerned parties as essential members of the team and value and plan for their participation. "Win-win" solutions are essential elements of the way we do business. We value the diversity of our employees and all other members of the team.
- C **Integrity** -- We conduct ourselves with the highest standards of professionalism and ethical behavior. We honor our commitments and comply with applicable laws and regulations. We are proper stewards of the taxpayers' interest.

1 The 1996 *Hanford Strategic Plan* divided the Hanford Site into five distinct geographic
2 study areas, including the Columbia River, Reactors on the River (100 Areas), Central Core,
3 Central Plateau (200 Areas), and the South 600 Area (DOE-RL 1996b). These areas were
4 modified to be consistent with the geographic areas used in this Final HCP EIS. Specifically, the
5 Columbia River and Reactors on the River geographic areas were combined to create the
6 Columbia River Corridor geographic area. The Wahluke Slope and ALE Reserve were not
7 included in the 1996 *Hanford Strategic Plan* but have been included in this alternative, since these
8 areas would remain under DOE authority.

9
10 **3.3.1.2 Assumptions Regarding Future Use.** Specific land-use decisions under the No-Action
11 Alternative would continue to be made through the NEPA or the *Hanford Federal Facility*
12 *Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989) process on a project-
13 by-project, as-needed basis and without consideration of conformance to a CLUP.

14 **3.3.1.3 Application of the Land-Use Designations.**

15
16
17 **3.3.1.3.1 The Wahluke Slope.** The entire Wahluke Slope is managed for DOE by other
18 agencies by permit. The western portion of the Wahluke Slope is managed by the USFWS as
19 the Saddle Mountain NWR. Current permit conditions require this area to be closed to the public
20 as part of a security zone for the N Reactor (now shut down), and the area would continue to be
21 managed similar to the Preservation designation. This permit also provides protection for the
22 K Basin spent nuclear fuel (SNF) removal project. The USFWS permit provides additional
23 protection to sensitive areas and species of concern. The remainder of this geographic area has
24 been managed by the WDFW and is now designated the Wahluke Wildlife Recreation Area.

25
26 In April 1999, the WDFW and the USFWS notified the DOE of their intent to modify their
27 management responsibilities on the Wahluke Slope under the 1971 agreement leaving only a
28 small portion (about 324 ha (800 ac)) northwest of the Vernita bridge under WDFW permit. The
29 USFWS informed the DOE that it intends to allow essentially the same uses permitted by the
30 State of Washington under the WDFW's management of the Wahluke Slope. Therefore, transfer
31 of management of the Wahluke Slope from the WDFW to the USFWS involves only a change in
32 the agency managing the property and does not involve any change in the management activities
33 for the Wahluke Slope. Management of the entire Wahluke Slope by the USFWS as an overlay
34 wildlife refuge is consistent with the 1996 DOI Hanford Reach EIS ROD. The ROD
35 recommended the Wahluke Slope be designated a wildlife refuge and the Hanford Reach a Wild
36 and Scenic River, and that the wildlife refuge be managed by the USFWS.

37
38 Consistent with the permit, this land is managed similar to the Conservation (Mining and
39 Grazing) designation. These designations are also consistent with the BoR's Red Zone, in which
40 irrigation is prohibited to minimize slumping of the bluffs into the Columbia River. Under this
41 alternative, limited public access for hunting, fishing, or recreation; permitted mining and grazing
42 activities; and agricultural leases would continue. Existing permits with the USFWS can be
43 revoked by DOE at any time.

44
45 **3.3.1.3.2 The Columbia River Corridor.** The surface water in this geographic area
46 would continue to be managed to allow limited public access and use as a Low-Intensity
47 Recreation area. Access to the Columbia River's islands would remain restricted to provide
48 protection for cultural, aesthetic, biological, and geologic resources. Restrictions that are
49 intended to preserve the unique character of the Hanford Reach portion of the Columbia River
50 (Public Law 100-605) would also remain in effect. Public access to the Reactors on the River
51 area (i.e., the 100 Areas) would remain restricted, which is consistent with current management.

1 Hazardous and/or dangerous waste has been disposed of at the 183-H Solar Evaporation
 2 Basins under the terms of EPA and Ecology regulations. Future use restrictions associated with
 3 this parcel of land are to be consistent with the terms of 40 CFR 264.117(c) and *Washington*
 4 *Administrative Code* (WAC) 173-303-610(7)(d). The WAC 173-303-610(7)(d) and 40 CFR
 5 264.117(c) are identical in intent and similar in text and state the following:
 6

7 *Post-closure use of property on or in which [hazardous and/or] dangerous wastes*
 8 *remain after partial or final closure must never be allowed to disturb the integrity of*
 9 *the final cover, liner(s), or any other components of any containment system, or*
 10 *the function of the facility's monitoring system, unless the department finds that*
 11 *the disturbance: (i) Is necessary to the proposed use of the property, and will not*
 12 *increase the potential hazard to human health or the environment; or (ii) Is*
 13 *necessary to reduce a threat to human health or the environment.*
 14

15 A deed restriction has been filed with Benton County for the 183-H Solar Basin RCRA
 16 corrective action (BHI 1997) because of residual contamination. Other deed restrictions or
 17 covenants for activities that potentially may extend beyond 4.6 m (15 ft) below ground surface are
 18 expected for the CERCLA remediation areas (see Figure 4-34).
 19

20 **3.3.1.3.3 The Central Plateau.** Lands within the Central Plateau geographic area would
 21 continue to be used for the management of radioactive and hazardous waste materials. These
 22 management activities would include collection and disposal of radioactive and/or hazardous
 23 waste materials that remain onsite, contaminated groundwater management, current offsite
 24 commitments, and other related and compatible uses. After incorporating by reference the
 25 previous 1975 ERDA 1538 irreversible and irretrievable (I&I) commitments and other documented
 26 commitments into this EIS (see Section 1.3), future individual project land-use requirements
 27 would be I&I committed through the appropriate NEPA and CERCLA/RCRA/NEPA integrated
 28 processes. Deed restrictions or covenants also would be applied to this area through the
 29 CERCLA and RCRA processes.
 30

31 **3.3.1.3.4 The All Other Areas.** These areas would be available for other Federal
 32 programs or leased for non-Federal uses, provided that such uses are consistent with the safety
 33 requirements and address the cultural and biological resource issues through DOE's NEPA
 34 process. After incorporating by reference the previous 1975 ERDA 1538 irreversible and
 35 irretrievable (I&I) commitments and other documented commitments into this EIS (see Section
 36 1.3), future individual project land-use requirements would be I&I committed through the
 37 appropriate NEPA and CERCLA/RCRA/NEPA integrated processes. The All Other Areas
 38 geographic area would remain under Federal ownership to protect the public from routine or
 39 accidental releases of radiological contaminants and/or hazardous materials. The use of
 40 protective buffer zones surrounding the waste remediation, processing, and disposal areas is
 41 required by DOE Order 151.1, *Comprehensive Emergency Management System* (DOE 1996f),
 42 and Occupational Safety and Health Administration (OSHA) regulations 29 CFR 1910.120,
 43 "Hazardous Waste Operations and Emergency Response" (Site Safety and Control Plan), and
 44 OSHA 29 CFR 1910.119, "Process Safety Management (PSM) Rule." These buffer zones limit
 45 public exposure to radiological and hazardous chemicals from routine operations and accidents.
 46

47 A portion of this geographic area (just north of the City of Richland) would be used for
 48 industrial purposes. An Industrial use would allow R&D facilities similar to the EMSL. The lands
 49 in and adjacent to the 300 and 400 Areas would remain under Federal ownership, but DOE would
 50 be able to lease lands for private and public uses (including withdrawn public lands with the
 51 owning agency's permission) to support regional industrial and economic development (e.g.,
 52 Energy Northwest [formerly known as WPPSS]). Other Federal uses would be allowed by permit
 53 (e.g., LIGO). This area includes a section south of the 200 Areas that was sold to the State of

1 Washington for a dangerous waste, non-nuclear disposal site but remains undeveloped. If the
2 state were to develop that property per its Quit Claim Deed (State of Washington 1980), the state
3 would have to obtain appropriate county, state, and Federal permits.
4

5 The Horn Rapids Landfill (HRL), operated by the U.S. Department of Energy Richland
6 Operations Office (RL), encompasses approximately 20 ha (50 ac) of the 600 Area. Originally,
7 the landfill was a quarry for sand and gravel. Subsequently, the HRL was used as a landfill for
8 office and construction waste, asbestos, sewage sludge, fly ash, and reportedly numerous
9 drums of unidentified organic liquids. Consistent with EPA recommendations for operators of
10 landfills that handle asbestos, fencing and warning signs have been erected around the perimeter
11 of the HRL to control public access. The HRL has been remediated under the terms of the 1100
12 Area CERCLA ROD. Future-use restrictions associated with this parcel of land as an asbestos-
13 containing landfill are to be consistent with the terms of 40 CFR 61.151. In general, for the
14 purposes of restrictions on land uses, 40 CFR 61.151 indicates that a notation must be made on
15 the deed or covenant notifying a potential purchaser that the land has been used for asbestos-
16 containing waste material. A deed restriction for asbestos has been filed with Benton County for
17 the HRL. Other deed restrictions or covenants would likely be applied to this area through the
18 CERCLA and RCRA processes.
19

20 The DOE's transfer of the 1100 Area to the Port of Benton for economic development was
21 approved through an interim action environmental assessment. The DOE prepared an
22 environmental assessment that resulted in a finding of no significant impact (FONSI) on
23 August 27, 1998, transferring the 1100 Area and the Southern rail connection to the Port of
24 Benton (DOE/RL EA-1260). Although the 1100 Area is no longer under DOE control, it is
25 included in this EIS to support the local governments with their SEPA EIS analyses of the Hanford
26 sub-area of Benton County under the State of Washington's Growth Management Act.
27

28 The Port of Benton officially took ownership and control of the "1100 Area" (consisting of
29 318 ha [786 ac], 26 buildings, and 26 km [16 mi] of rail tract) on October 1, 1998. Together with
30 the Washington State Department of Transportation and Legislature Transportation Committee,
31 the Port of Benton is funding a major study (\$600,000) to determine the feasibility of reconnecting
32 the Hanford main rail line to Ellensburg, Washington, as it was in the 1970s, as an alternative
33 route for Yakima Valley rail traffic flowing between the Puget Sound and the Tri-Cities. The
34 current Yakima Valley route passes directly through all the cities in the Valley, including the cities
35 of Yakima and Kennewick, which have plans to develop their downtown areas to be more people
36 friendly.
37

38 Specifically, the Port of Benton has expressed a desire to use the Hanford rail system and
39 extend the current system upriver where there is currently only an abandoned railroad grade.
40 Provisions for the reconnection would be made in DOE's permit to the USFWS for management
41 of the Riverlands. The DOE Preferred Alternative would not hinder the rail option because it
42 would be considered a pre-existing, nonconforming use (see Chapter 6). At this time, DOE has
43 no plans to maintain the northern portions of the existing rail line.
44

45 **3.3.1.3.5 The Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve).** The
46 ALE Reserve geographic area would continue to be managed similar to the Preservation
47 designation in accordance with the Rattlesnake Hills Research Natural Area designation and the
48 USFWS permit. Big Bend Alberta Mining Company holds mineral rights on about 5 km² (2 mi²)
49 under the southern portion of the ALE Reserve (see Section 4.2.3.1). The USFWS and DOE
50 have a 25-year agreement signed in 1997 that the USFWS will manage the ALE Reserve
51 consistent with the existing ALE Management Plan until the new plan is developed. This new
52 Comprehensive Conservation Plan (CCP) is being developed by the USFWS under DOE
53 funding. Through the CCP, the USFWS will identify USFWS proposed management actions.

1 The CCP will give the USFWS the authority to manage the ALE Reserve as a part of the NWR
2 System. The CCP would be the equivalent of an area management plan (AMP) developed under
3 the guidelines in Chapter 6. Unless the DOE permit is revoked, the USFWS would manage the
4 ALE Reserve and proceed with CCP preparation to identify refuge management actions that
5 could bring the ALE Reserve into the NWR System.
6

7 Currently, persons wishing to visit the ALE Reserve must first contact an appropriate staff
8 member of either DOE or the USFWS.
9

10 **3.3.2 The Agency's (DOE's) Preferred Alternative**

11
12 The CEQ requires an agency to “. . . identify the agency's Preferred Alternative if one or
13 more exists, in the draft statement, and identify such alternative in the final statement . . .
14 (40 CFR 1502.14[e]).” In the development of the Preferred Alternative, DOE took into account its
15 role as the long-term caretaker for the Site for at least the next 50 years. The DOE used
16 information from the Hanford Geographic Information System (HGIS) and Waste Information Data
17 System (WIDS) databases. Information considered by DOE includes:
18

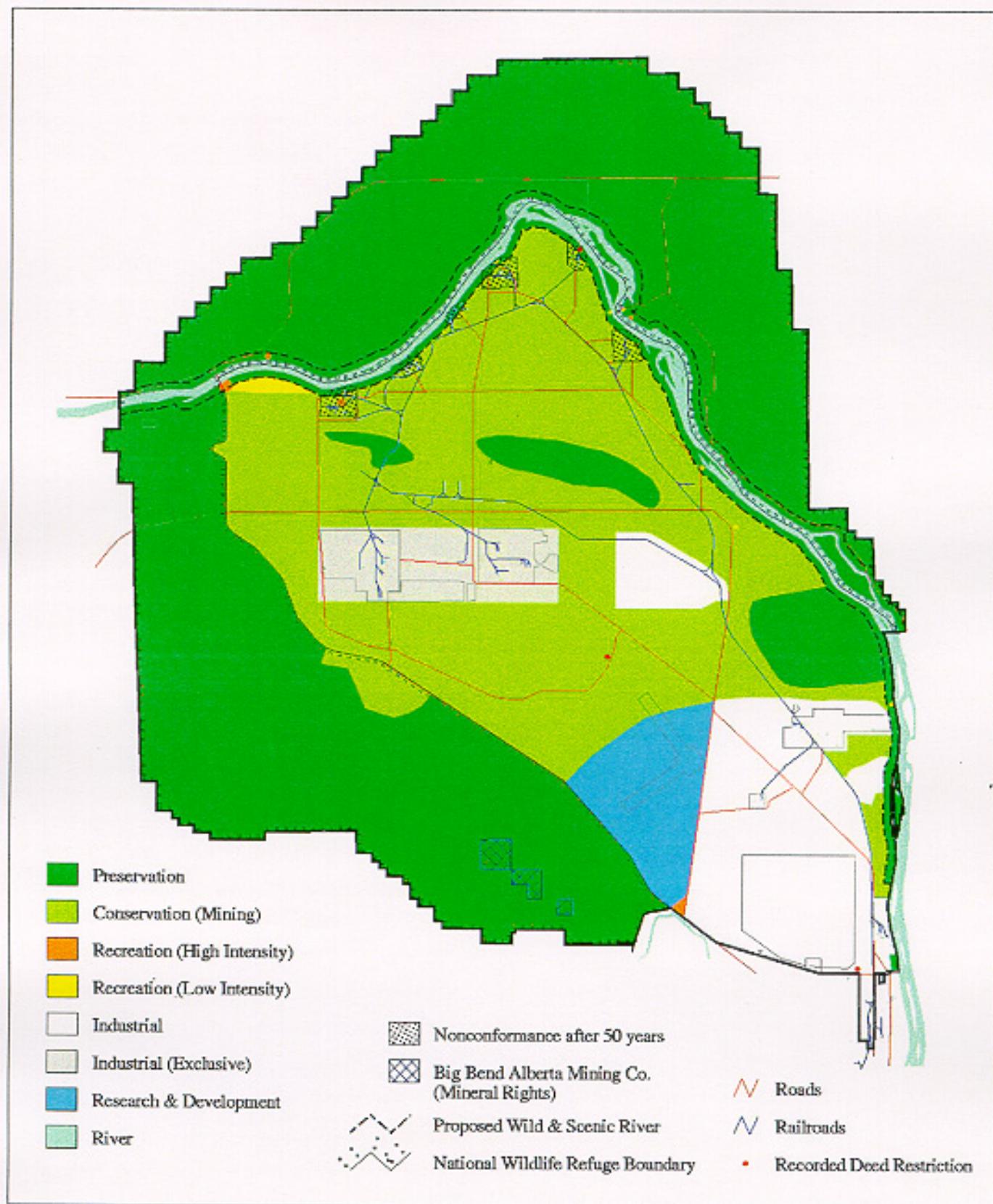
- 19 C All surface waste sites, including those remediated (Figure 4-34)
- 20
- 21 C Groundwater contaminants and flow direction (Figures 4-15, 4-35, and 4-36)
- 22
- 23 C Cultural and biological resources (Figure 4-27)
- 24
- 25 C Exclusive-use zones (EUZs) and emergency planning zones (EPZs) associated with
26 DOE and other Hanford activities (e.g., Energy Northwest's nuclear power reactor,
27 U.S. Ecology's low-level waste [LLW] disposal site, LIGO, etc.) (Figure 4-37).
28

29 The DOE believes that the Preferred Alternative would fulfill the statutory mission and
30 responsibilities of the agency and give adequate consideration to economic, environmental,
31 technical, and other factors.
32

33 **3.3.2.1 Planning Goals, Objectives, and Values (Vision).** Much like the No-Action Alternative,
34 DOE's Preferred Alternative was developed based on policies that are consistent with the 1996
35 *Hanford Strategic Plan* (DOE-RL 1996b). However, unlike the No-Action Alternative, DOE's
36 Preferred Alternative would establish policies and implementing procedures that would place
37 Hanford's land-use planning decisions in a regional context.
38

39 The DOE has identified the map alternative presented in Figure 3-3 and the land-use
40 policies and implementing procedures of Chapter 6 as the Agency's (DOE's) Preferred
41 Alternative. The DOE's Preferred Alternative represents land-management values, goals, and
42 objectives of DOE for at least the next 50 years. It also represents a multiple-use theme of
43 Industrial-Exclusive, Industrial, Research and Development, High-Intensity Recreation,
44 Low-Intensity Recreation, Conservation (Mining), and Preservation land uses that have been
45 identified by the public, cooperating agencies, and consulting Tribal governments as being
46 important to the region.
47
48

1
2
3
Figure 3-3. DOE's Preferred Alternative.



B:\H:\m0 04/23/98 clup\prefalt.aml Database: 25-AUG-1999

3.3.2.2 Assumptions Regarding Future Use. The assumptions used to develop DOE's Preferred Alternative are as follows:

- C DOE, as a Federal agency, has a Trust responsibility to protect Tribal interests.
- C DOE has a responsibility to consult with and recognize the interests of the cooperating agencies. The DOE continues to support DOL's proposal to expand the Saddle Mountain NWR to include all of the Wahluke Slope, consistent with the 1994 Hanford Reach EIS and 1996 Hanford Reach ROD.
- C DOE will support economic transition and potential industrial development by the City of Richland or the Port of Benton by encouraging the use of existing utility infrastructure on the Hanford Site.
- C Other entities will ask for Hanford's resources and lands.
- C The public will continue to support protection of cultural and natural resources on the Site, especially on the Wahluke Slope, the Columbia River Corridor, the McGee Ranch, and the ALE Reserve.
- C Mining of onsite geologic materials will be needed to construct surface barriers as required by Hanford Site remediation activities.
- C Remediation of the Site will continue and, where necessary, the institutional controls currently in place will continue to be required at some level for at least the next 50 years. Institutional controls are transferrable and can be shared with other governmental agencies.
- C Plutonium production reactor blocks will remain in the 100 Areas throughout the planning period and will be considered a pre-existing, nonconforming use.
- C Vadose zone contamination will persist in the All Other Areas, Central Plateau, and 100 Area. Contaminated groundwater will remain unremediated in the All Other Areas, Central Plateau, and 100 Area.
- C The public will support preservation of the Manhattan Project's historical legacy and development of a High-Intensity Recreation area, consistent with the B Reactor Museum proposal.
- C The public will support access to the Columbia River for recreational activities and public restrictions consistent with the protection of cultural and biological resources.
- C Areas will be set aside specifically for R&D projects.
- C Sufficient area will be retained to support current and expected DOE facility safety authorization basis.

Planning for Possible Future Missions

The Preferred Alternative identifies lands required to support DOE's current Environmental Management and Science and Technology missions at the Hanford Site, as well as lands for future industrial development by the City of Richland and the Port of Benton. The DOE is proposing that additional lands be maintained under the Industrial land-use designation in areas where existing infrastructure is available and other compatible uses exist. The DOE believes it is prudent to retain land under the Industrial land-use designation to support possible future missions, rather than convert the land to the Conservation or Preservation land-use designation at this time. This would avoid possible conflicts with future missions. The DOE anticipates that the need for land under the Industrial land-use designation would continue to be evaluated during future planning efforts, which may result in conversion of some lands to the Conservation, Preservation, or other land-use designations.

- 1
2 C An adequate land base and utility infrastructure will be maintained to support possible
3 industrial development associated with future DOE missions.
4

5 **3.3.2.3 Application of the Land-Use Designations.** Land-use designations identified for
6 DOE's Preferred Alternative are Industrial-Exclusive, Industrial, Research and Development,
7 High-Intensity Recreation, Low-Intensity Recreation, Conservation (Mining), and Preservation
8 (see text box, "Planning for Possible Future Missions," and Figure 3-3).
9

10 **3.3.2.3.1 The Wahluke Slope.** Recently the Wahluke Slope was administered for wildlife |
11 and recreation as the Saddle Mountain NWR and the Wahluke Wildlife State Recreation Area |
12 under permits granted by DOE to the USFWS and WDFW, respectively. In April 1999, the |
13 WDFW and the USFWS notified the DOE of their intent to modify their management |
14 responsibilities on the Wahluke Slope under the 1971 agreement leaving only a small portion |
15 (about 324 ha (800 ac)) northwest of the Vernita bridge under WDFW permit. The USFWS |
16 informed the DOE that it intends to allow essentially the same uses permitted by the State of |
17 Washington under the WDFW's management of the Wahluke Slope. Therefore, transfer of |
18 management of the Wahluke Slope from the WDFW to the USFWS involves only a change in the |
19 agency managing the property and does not involve any change in the management activities for |
20 the Wahluke Slope. Management of the entire Wahluke Slope by the USFWS as an overlay |
21 wildlife refuge is consistent with the 1996 DOI Hanford Reach EIS ROD. The ROD |
22 recommended the Wahluke Slope be designated a wildlife refuge and the Hanford Reach a Wild |
23 and Scenic River, and that the wildlife refuge be managed by the USFWS.
24

25 The DOE's Preferred Alternative would expand the existing Saddle Mountain National
26 Wildlife as an overlay wildlife refuge to include all of the Wahluke Slope consolidating
27 management of the Wahluke Slope under the USFWS, consistent with the Hanford Reach EIS's
28 ROD (DOI 1996). An overlay refuge is one where the land belongs to one or more Federal
29 agency, but it is managed by the USFWS.
30

31 The entire Wahluke Slope would be designated Preservation, with the exceptions near the
32 Columbia River as discussed in the Columbia River Corridor section below. The major reason
33 for designating this area as Preservation would be to provide protection for sensitive areas or
34 species of concern (e.g., wetlands, sand dunes, steep slopes, or the White Bluffs) from impacts
35 associated with intensive land-disturbing activities.
36

37 A CCP (see Area Management Plans, Chapter 6) for the Wahluke Slope would be
38 developed by USFWS in accordance with the *National Wildlife Refuge System Improvement Act*
39 *of 1997*. This Act provides significant guidance for management and public use of refuges
40 allowing for wildlife-dependent recreation uses such as hunting, fishing, wildlife observation and
41 photography, and environmental education and interpretation. The USFWS would consult with
42 DOE during the development of this plan to ensure necessary and appropriate buffer zones for
43 ongoing and potential future missions at the Hanford Site.
44

45 **3.3.2.3.2 The Columbia River Corridor.** The Columbia River Corridor has historically
46 contained reactors and associated buildings to support Hanford's former defense production and
47 energy research missions. Nevertheless, remediation planning documents, public statements of
48 advisory groups, and such planning documents as the *Environmental Impact Statement: The*
49 *Decommissioning of Eight Surplus Reactors* (DOE 1992a) have determined that remediation and
50 restoration of the Columbia River Corridor would return the corridor to a nondeveloped, natural
51 condition. Restrictions on certain activities may continue to be necessary to prevent the
52 mobilization of contaminants, the most likely example of such restrictions being on activities that
53 discharge water to the soil or excavate below 4.6 m (15 ft). Although the Surplus Reactor NEPA

1 ROD calls for the reactor buildings to be demolished and the reactor blocks to be moved to the
 2 Central Plateau, this action might not take place until 2068 or until a new Tri-Party Agreement
 3 milestone is negotiated. As a result, the reactor buildings could remain in the Columbia River
 4 Corridor throughout the 50-year-plus planning period addressed by the HCP EIS and would be
 5 considered a pre-existing nonconformance into the future.
 6

7 The Columbia River Corridor would include High-Intensity Recreation, Low-
 8 Intensity Recreation, Conservation (Mining), and Preservation land-use designations. The river
 9 islands and a quarter-mile buffer zone would be designated as Preservation to protect cultural
 10 and ecological resources. Those islands not in Benton County would be included in the Refuge.
 11

12 C Four sites, away from existing
 13 contamination, would be designated
 14 High-Intensity Recreation to support
 15 visitor-serving activities and facilities
 16 development. The B Reactor would be
 17 converted into a museum and the
 18 surrounding area would be available for
 19 museum-support facilities (see text box,
 20 "B Reactor Museum Proposal"). The
 21 High-Intensity Recreation area near
 22 Vernita Bridge (where the current
 23 Washington State rest stop is located)
 24 would be expanded across State
 25 Highway 240 and to the south to include
 26 a boat ramp and other visitor-serving
 27 facilities. Two areas on the Wahluke
 28 Slope would be designated as High-
 29 Intensity Recreation for potential
 30 exclusive Tribal fishing villages.
 31

32 C Six areas would be designated for
 33 Low-Intensity Recreation. The area
 34 west of the B Reactor would be used as
 35 a corridor between the High-Intensity
 36 Recreation areas associated with the
 37 B Reactor and the Vernita Bridge rest
 38 stop and boat ramp. A second area
 39 near the D/DR Reactors site would be
 40 used for visitor services along a
 41 proposed recreational trail as
 42 conceptualized on Alternative Three's
 43 map. The third and fourth areas, the
 44 White Bluffs boat launch, and its
 45 counterpart on the Wahluke Slope, are
 46 located between the H and F Reactors
 47 and would be used for primitive boat
 48 launch facilities. A fifth area, near the
 49 old Hanford High School, would
 50 accommodate visitor facilities and
 51 access to the former town site and
 52 provide visitor services for hiking and
 53 biking trails that could be developed

B Reactor Museum Proposal
<p>Preserving the history of the Hanford Site, and the public's knowledge and understanding of the events that occurred during World War II and the years which followed are the basis for the existence of the B Reactor Museum Association (BRMA). The primary mission of the organization is the long-term preservation of the retired B Reactor at the Hanford Site, and the upgrading of the structure to allow public access and unrestricted tours.</p>
<p>The B Reactor produced the plutonium for the first manmade nuclear explosion – the Trinity test – in New Mexico on July 16, 1945. The second bomb used in World War II contained plutonium produced by B Reactor. That bomb was dropped on Nagasaki on August 9, 1945, and was credited with bringing about the final surrender of Japan and the ending of the war. Plutonium production operation of the B Reactor was permanently stopped in 1968, and the reactor is currently functioning as a controlled-access museum in the 100-B/C Area of the Hanford Site.</p>
<p>As envisioned by the BRMA, the museum would be within the 105-B Reactor building itself, near the east end of a proposed State park. The new park would include the south shore of the Columbia River extending from the Vernita Bridge rest area on State Highway 240, eastward to the 100-B Area (a distance of about 6 km [4 mi]). The park area, the road providing access from Highway 240, and the museum area would be fenced off from the adjacent Hanford area. Ideally, access would be by private automobile, by train across the Hanford Site from Richland, and by boat from the Columbia River.</p>
<p>The B Reactor was entered into the National Register of Historic Places on April 3, 1992, by the National Park Service. Because of this placement, DOE must comply with the <i>National Historic Preservation Act</i> (16 U.S.C. 470) prior to taking any action on the historic site. A report, entitled <i>105-B Reactor Facility Museum Phase I Feasibility Study Report</i> (BHI 1995a), concluded that the use of the facility as a museum is feasible.</p>

1 along the Hanford Reach. A sixth site, just north of Energy Northwest (formerly known
 2 as WPPSS), would also provide visitor services for recreational trails (e.g., hiking and
 3 biking) along the Hanford Reach. On the Wahluke Slope side of the Columbia River,
 4 the White Bluffs boat launch would remain managed as is, with a Low-Intensity
 5 Recreation designation. A Low-Intensity Recreation designation for the water surface
 6 of the Columbia River would be consistent with current management practices and
 7 the wishes of many stakeholders in the region.

8
 9 C The remainder of land within the Columbia River Corridor outside the quarter-mile
 10 buffer zone would be designated for Conservation (Mining). This designation would
 11 allow for DOE-permitted mining activities and support BLM's mission of multiple use.
 12 Mining would be permitted only in support of governmental missions or to further the
 13 biological function of wetlands (i.e., conversion of a gravel pit to a wetland by
 14 excavating to groundwater). Should DOE determine that some or all of the withdrawn
 15 lands are surplus to DOE's needs and releases the Public Domain lands back to the
 16 DOI, then the DOI could determine if the Tribal treaty language – “the privilege of
 17 hunting, gathering roots and berries, and pasturing their horses and cattle upon open
 18 and unclaimed land” – is applicable. A Conservation (Mining) designation would allow
 19 DOE to provide protection to sensitive cultural and biological resource areas, while
 20 allowing access to geologic resources.

21
 22 C A Preservation land-use designation for the Columbia River islands would be
 23 consistent with the Hanford Reach EIS ROD (DOI 1996) and would provide additional
 24 protection to sensitive cultural areas, wetlands, floodplains, Upper Columbia Run
 25 steelhead, and bald eagles from impacts associated with intensive land-disturbing
 26 activities. Remediation activities would continue in the 100 Areas (i.e., 100-B/C,
 27 100-KE, 100-KW, 100-N, 100-D, 100-DR, 100-H, and 100-F), and would be
 28 considered a pre-existing, nonconforming use in the Preservation land-use
 29 designation.

30
 31 **3.3.2.3.3 The Central Plateau.** The Central Plateau (200 Areas) geographic area would
 32 be designated for Industrial-Exclusive use. An Industrial-Exclusive land-use designation would
 33 allow for continued Waste Management operations within the Central Plateau geographic area.
 34 This designation would also allow expansion of existing facilities or development of new
 35 compatible facilities. Designating the Central Plateau as Industrial-Exclusive would be consistent
 36 with the Working Group's recommendations, current DOE management practice, other
 37 governments' recommendations, and many public stakeholder values throughout the region.

38
 39 To keep the 1975 I&I commitments (see text box in Section 3.3.1.1) and to help maintain
 40 the current Waste Management mission, there have been several Notices of Deed Restriction
 41 placed with the Benton County Assessor's Office and the Benton County Planning Office. The
 42 No-Action Alternative (Figure 3-2) shows where these Notice of Deed Restrictions have been
 43 placed across the Hanford Site. They are currently being used mainly for asbestos left in landfills
 44 (e.g., the HRL and the Central Waste Complex Landfill) and concrete structures that were
 45 surface contaminated (e.g., the 183-H Solar Basins) (BHI 1997). As remediation continues, DOE
 46 expects to file more restrictions that would institutionalize the 5-m (15-ft) depth restriction for
 47 excavation in the 100 Areas CERCLA RODs, the Industrial land-use restriction CERCLA ROD in
 48 the 300 Area, the expected Industrial land-use RODs for the Central Plateau, and point-of-
 49 compliance boundaries for groundwater remediation or LLW disposal facility performance

1 assessment purposes. After incorporating by reference the previous 1975 ERDA 1538
2 irreversible and irretrievable (I&I) commitments and other documented commitments into this EIS
3 (see Section 1.3), future individual project land-use requirements would be I&I committed through
4 the appropriate NEPA and CERCLA/RCRA/NEPA integrated processes.

5
6 **3.3.2.3.4 The All Other Areas.** Within the All Other Areas geographic area, the Preferred
7 Alternative would include Industrial, Research and Development, High-Intensity Recreation,
8 Low-Intensity Recreation, Conservation, and Preservation land-use designations. The majority of
9 the All Other Areas would be designated Conservation (Mining) to support a possible BLM's
10 mission of multiple uses.

11
12 Several areas that would be designated as Conservation (Mining) would be unable to fulfill
13 the designated land use:

- 14
15 C A Notice of Deed Restriction would be placed in those areas where vadose zone
16 contamination remained in-place, according to the CERCLA ROD or RCRA Closure
17 Permit (e.g., the HRL, Central Waste Complex, 183-H Solar Basins, etc.), foreclosing
18 the mining option.
- 19
20 C The section of Washington State land that is deed restricted to waste management
21 activities would be designated as Conservation (Mining) consistent with Benton
22 County's Alternative Three (GMA authority) and, therefore, could not fulfill any waste
23 management purpose.

24
25 Other land-use designations would introduce new land management priorities into the All
26 Other Areas. These designations and the areas affected are as follows:

- 27
28 C Two distinct areas, one located east of the 200 Areas (i.e., May Junction) and the
29 other located north of Richland, would be designated for Industrial use to support new
30 DOE missions or economic development. This designation would provide additional
31 industrial development and/or expansion area for current facilities.
- 32
33 C An area west of State Highway 10 and east of State Highway 240 would be designated
34 for Research and Development to support economic diversification and DOE's
35 Energy Research mission. This area would allow for the development of R&D
36 facilities, such as LIGO, which could require substantial buffer zones for operation. In
37 addition, R&D facilities not requiring large areas for operation would also be located
38 within this area.
- 39
40 C A small area at the junction of State Highway 10 and State Highway 240 would be
41 designated High Intensity Recreation to allow for visitor serving facilities at the gateway
42 to the Hanford Reach, ALE, Horn Rapids Park and other recreational activities.
- 43
44 C Gable Mountain, Gable Butte, the area west of State Highway 240 from the Columbia
45 River across Umtanum Ridge to the ALE Reserve, and the active sand dunes areas
46 would be designated for Preservation, which would provide additional protection of
47 these sensitive areas. The extant railroad grade across the Riverlands area would be
48 considered an active permitted infrastructure.

49
50 After incorporating by reference the previous 1975 ERDA 1538 irreversible and
51 irretrievable (I&I) commitments and other documented commitments into this EIS (see Section
52 1.3), future individual project land-use requirements would be I&I committed through the
53 appropriate NEPA and CERCLA/RCRA/NEPA integrated processes.

1 **3.3.2.3.5 The Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve).** Nearly
2 all of the ALE Reserve geographic area would be designated as Preservation. This designation
3 would be consistent with current management practices of the Rattlesnake Hills Research
4 Natural Area and the USFWS permit. A portion of the ALE Reserve would be managed as
5 Conservation (Mining) during the remediation of the Hanford Site as a trade-off developed during
6 the cooperating agencies discussions for preservation of a wildlife corridor through the McGee
7 Ranch and after public comment, the inclusion of the McGee Ranch within the Refuge
8 designation. The wildlife corridor through the McGee Ranch/Umtanum Ridge area had been
9 identified by DOE as the preferred quarry site for basalt rock and silty soil materials that could be
10 required for large waste-management area covers (RCRA caps or the Hanford Barrier) in the
11 Central Plateau. In addition to the wildlife corridor function, the mature shrub-steppe vegetation
12 structure in the McGee Ranch area has greater wildlife value (i.e., BRMaP Levels III and IV) than
13 the cheat grass (BRMaP Level I) in the ALE Reserve quarry site (see Section 5.1.2). The BRMaP
14 (DOE-RL 1996c) levels of concern run from Level I through Level IV, increasing in biological
15 importance as the numbers increase, with Level I being the level of least importance.

1 **3.3.3 Alternative One**

2
3 **3.3.3.1 Planning Goals, Objectives, and**

4 **Values (Vision).** Alternative One represents a
5 Federal stewardship role for managing national
6 resources on the Hanford Site with the
7 acknowledged consumptive treaty-reserved “right
8 of taking fish at all usual and accustomed places
9 in common with citizens of the Territory; and of
10 erecting temporary (suitable instead of temporary
11 for the CTUIR) buildings for curing.” This does not
12 include the tribal vision of consumptive non-fishing
13 activities by tribal member’s exercising their
14 reserved treaty rights, implicit in Alternatives Two
15 and Four. Specifically these rights are, “the
16 privilege of hunting, gathering roots and berries,
17 and pasturing their horses and cattle (stock
18 instead of horses and cattle for the CTUIR) upon
19 open and unclaimed land” (just unclaimed and not open and unclaimed for the CTUIR). The DOE
20 regards Alternative One as the Environmentally Preferable Alternative.
21

Environmentally Preferable Alternative

Section 1505.2(b) of CEQ’s NEPA regulations requires that in cases where an EIS has been prepared, the Record of Decision (ROD) must identify all alternatives that were considered, “. . .specifying the alternative or alternatives which were considered to be environmentally preferable.” The environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA’s Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources.

22 The land-use designations included in Alternative One are presented in Figure 3-4. This
23 alternative considers Hanford resources (i.e., ecological, historic, cultural, and economic
24 resources) in a regional context. Enlarging the existing Federal Saddle Mountain NWR, to include
25 all of the undisturbed natural area north and east of the Columbia River and west of State
26 Highways 24 and 240, is seen as the best way to preserve these resources. The vision of
27 Alternative One is to preserve the Hanford Site shrub-steppe ecosystem by protecting the high-
28 quality habitat that runs contiguously along the west of the Site from the Wahluke Slope to the
29 ALE Reserve, and at the same time, protect the Hanford Reach of the Columbia River.
30

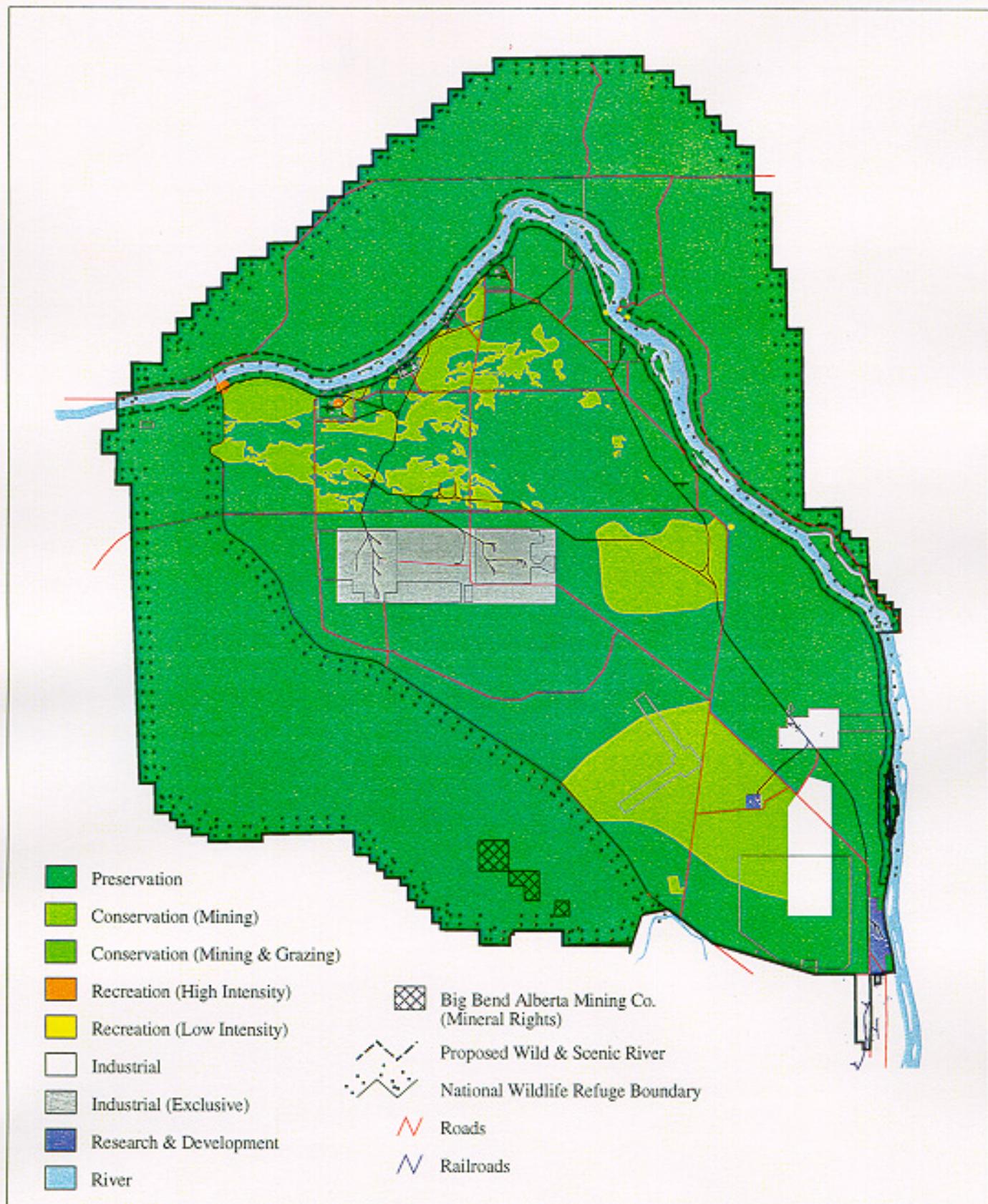
31 Alternative One was developed using the seven land-use planning goals listed below:

- 32
- 33 C Integrate mission, economic,
- 34 ecological, social, and cultural factors
- 35 as stated in the Secretary of Energy’s
- 36 *Land- and Facility-Use Policy* (DOE
- 37 1994b), which includes sustaining the
- 38 valuable biological resources of the
- 39 Hanford Site and supporting
- 40 sustainable economic development.
- 41
- 42 C Support the Rattlesnake Hills
- 43 Research Natural Area, established in
- 44 1971.
- 45
- 46 C Reduce the inappropriate conversion
- 47 of undeveloped land into sprawling,
- 48 low-density development by
- 49 encouraging siting of high-density
- 50 development areas.
- 51
- 52 C Achieve ecosystem planning based on
- 53 a regional perspective.

- Commonly Identified Goals of Alternative One**
- C Encourage economic development and diversification.
 - C Protect the Columbia River.
 - C Use the Central Plateau wisely for Waste Management.
 - C Do no harm during cleanup.
 - C Recognize the importance of ecological diversity and recreational opportunities and that the quality of those resources should be maintained or improved as a result of cleanup and Waste Management decisions.
 - C Protect the integrity of all biological resources, with specific attention given to rare, threatened, and endangered species and their habitats.

Figure 3-4. Alternative One.

1
2
3
4



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- C Preserve the lands, sites, and structures of historical, cultural, or archaeological significance on the Hanford Site.
- C Consider the resource needs of the Hanford cleanup program.
- C Encourage the retention of open space.

The land-use designations in Alternative One incorporate the commonly identified goals of the Working Group, Hanford Tank Waste Task Force, and HAB as well as DOE's adoption of these stakeholder values (see text box, "Commonly Identified Goals of Alternative One").

The objectives of Alternative One are to promote, through the enlargement of an existing Federal wildlife refuge, the protection and recovery of state and federally listed species, a wide range of fish and wildlife recreational opportunities (see text box, "Wildlife Viewing in Washington"), aquatic and terrestrial habitats and associated fish and wildlife populations, and the utilization of the existing infrastructure (especially in the southeast portion of the Site and the Central Plateau) for development. The vision of Alternative One is to conserve the Hanford Site shrub-steppe ecosystem, which provides a sanctuary for River and riparian areas to maintain the high quality of the salmon and steelhead

spawning areas, and to maintain a habitat link between the Hanford Site and the Yakima Training Center, which is Washington State's second largest shrub-steppe ecosystem. This would ensure conservation of the region's shrub-steppe heritage for future generations to enjoy.

3.3.3.2 Assumptions Regarding Future Use. The assumptions used to develop Alternative One are as follows:

- Existing hazardous waste and ongoing remedial actions will require DOE to maintain control of portions of the Site for the proposed planning period.
- DOE control of the Site will be required to provide a safety buffer for the public from unforeseeable accidents that pose health risks to workers and the public (e.g., the Plutonium Reclamation Facility explosion) during the cleanup mission.
- Plutonium production reactor blocks will remain in the 100 Areas throughout the planning period and will be considered a pre-existing, nonconforming use.
- DOE will continue to practice "as low as reasonably achievable" (ALARA) management designed to keep human exposure to a minimum by only approving staff and projects on the Hanford Site necessary for management of radioactive and hazardous wastes. The intent of the ALARA program is to avoid unnecessary exposure and potential risks from radioactive, hazardous, or biological materials to workers, public, and/or the environment. These risks could include unexpected air

Wildlife Viewing in Washington

More than a third of the population in Washington state participates in wildlife viewing and those wildlife watchers spent nearly \$1.7 billion on the pursuit in 1996, according to a 1998 WDFW report.

The "Economic Benefits of Wildlife-Watching Activities in Washington" report found that wildlife watchers spent \$1.1 billion on equipment purchases, \$509 million on trip-related expenses including food and lodging, \$106 million for land-use fees and rentals, and \$59 million for items such as magazines, books, membership dues, and other items.

The popularity of wildlife-viewing activities in Washington translates to:

- S Nearly 8,000 jobs supported by watchable wildlife activities.
- S Destination tourism drawing about 270,000 out-of-state visitors who spent nearly 6 million visitor-days here in 1996.
- S State sales tax proceeds amounting to \$56.9 million.

The growing interest in wildlife viewing prompted WDFW to establish a Watchable Wildlife program in 1997, aimed at providing recreational opportunities to the public, promoting understanding of wildlife habitat needs and linking wildlife conservation and management to economic opportunities in local communities.

1 releases.

- 2
- 3 • DOE will find new missions for buildings in the 300 and 400 Areas for exploring new
- 4 technologies related to the treatment and handling of hazardous waste, developing
- 5 energy technologies, and other DOE missions. These new missions may be
- 6 conducted by Federal and non-Federal entities.
- 7
- 8 • Expansion for future development during the planning period will not exceed historical
- 9 acreage used by DOE and its predecessors. This projected future development
- 10 expansion will occur as high-density development to conserve the other natural
- 11 resources present on the Site.
- 12
- 13 • Stewardship will be based on the principles of ecosystem management and
- 14 sustainable development.
- 15
- 16 • Existing permits and Memoranda of Agreement made by DOE with other entities for
- 17 land-management purposes will continue, with the exception of the Wahluke State
- 18 Wildlife Recreation Area, which be terminated to allow management of the expanded
- 19 Saddle Mountain NWR by the USFWS.
- 20
- 21 • USFWS will manage the ALE Reserve, McGee Ranch site, Riverlands, and Wahluke
- 22 State Wildlife Recreation Area.
- 23
- 24 • The R&D necessary for cleanup will occur in a manner that creates additional private-
- 25 sector economic development opportunities.
- 26
- 27 • Quarry sites will support DOE's remediation construction and infrastructure
- 28 maintenance needs. No commercial use of the quarries will occur during this
- 29 planning period.
- 30

31 **3.3.3.3 Application of the Land-Use Designations.** Alternative One land-use designations
32 include Industrial-Exclusive, Industrial, Research and Development, High-Intensity Recreation,
33 Low-Intensity Recreation, Conservation (Mining), and Preservation. The location, shape, and size
34 of the land-use designations were based on analysis of the existing natural and man-made
35 resources (e.g., infrastructure, topography, and biology, etc.) found in Chapter 4 and land-use
36 projects for economic development, which are also found in Chapter 4.

37
38 **3.3.3.3.1 The Wahluke Slope.** The land-use designation for the Wahluke Slope under
39 Alternative One would be Preservation. The Wahluke Slope is currently administered for wildlife
40 and recreation as the Saddle Mountain NWR and the Wahluke Wildlife Recreation Area under
41 permits granted by DOE to the USFWS and WDFW. Management of the Wahluke Slope would
42 be consolidated under the USFWS as a portion of the Saddle Mountain NWR.

43
44 The Saddle Mountain NWR would be designated Preservation, which is consistent with
45 the current administered land use. Preservation would provide a protective safety buffer zone for
46 DOE remedial activities in the 100 Areas. These DOE activities are expected to continue for the
47 planning period, and would continue to provide a sanctuary for shrub-steppe dependent species
48 that inhabit the area. Preservation would also prevent activities within the BoR's Red Zone (an
49 area where irrigation is restricted because it accelerates mud slides along the Columbia River)
50 that could jeopardize stability of the White Bluffs. Preservation would not interfere with the BoR's
51 management of the Columbia Basin Project's irrigation wasteways because they would be
52 considered a pre-existing, nonconforming use. An agreement would be
53 established by the DOI between its four agencies (i.e., USFWS, BoR, NPS, and BLM) to enable

1 all to fulfill their Congressionally mandated missions
 2 on the Wahluke Slope.

3
 4 Agriculture (cropland) is a feature of some
 5 refuges, and was considered for portions of the
 6 Wahluke Slope consistent with currently
 7 administered wildlife sharecropping programs (see
 8 text box, "*Cropland Management on National Wildlife
 9 Refuges*"). Currently, there is a significant amount of
 10 privately held agricultural lands in the region that the
 11 U.S. Department of Agriculture is protecting (i.e., the
 12 lands are not being used for agriculture) for either
 13 environmental or cultural reasons under the
 14 Conservation Reserve Enhancement Program
 15 (CREP) (see Table 3-2). In addition, the markets for
 16 apples, potatoes, and wheat are currently soft with
 17 the apple industry examining the need to take trees
 18 out of production (TCH 1998a).

19
 20 In consideration of the natural resource
 21 trustee's Congressional mandate to preserve and
 22 protect endangered ecosystems such as the shrub-
 23 steppe, expanding the agricultural base in the region
 24 -- while possible under a NWR scenario -- is not
 25 considered to be an appropriate use of the Wahluke
 26 Slope lands and their dependent fisheries resources.

27
 28 **3.3.3.3.2 The Columbia River Corridor.**

29 Land-use designations for the Columbia River
 30 Corridor under Alternative One wo'uld include High-
 31 Intensity Recreation, Low-Intensity Recreation,
 32 Conservation (Mining), and Preservation.

**Cropland Management on
National Wildlife Refuges**

In 1992, estimated cropland in the NWR System was approximately 82,556 ha [204,000 ac] (1.4% of refuge system lands outside of Alaska), down from 8,903 ha (222,000 ac) (1.9% of refuge system lands outside of Alaska) in 1974. Former croplands have been allowed to undergo natural succession, have been planted with desired grasses, trees, or shrubs; or have been converted in some cases to managed moist soil wetland units, according to a USFSW report.

Of the 181 refuges with farming programs in 1989, 129 refuges (and 61,917 ha [153,000 ac]) were farmed by permittees who retained a share of the crop in return for costs incurred to farm the land. On the remaining refuges, USFWS personnel conduct farming operations with government equipment.

Soil preparation, manipulation and treatment practices on refuge croplands are based on sound land-use soil conservation practices. Techniques used include contour farming, cover cropping, windrow planting, sodding waterways, eliminating fall and spring plowing, stubble mulching, and using shallow water retention structures.

On many refuges, crops are systematically rotated and legumes are incorporated with grain crops to improve soil tilth and nutrient content and to reduce weed problems. Biological farming is the preferred farming method on refuges.

33
 34
 35 **Table 3-2. 1997 Regional Conservation Reserve
 36 Enhancement Program (CREP) (USDA 1998).**

County	Acres	Rental Payment per Acre in 1997	CREP Cost in 1997
Adams County	91,794.00	\$45.45	\$4,172,037.00
Benton County	29,703.00	\$40.63	\$1,206,833.00
Franklin County	32,524.00	\$48.95	\$1,592,050.00
Grant County	25,891.00	\$44.64	\$1,155,774.00
Hanford Region	179,912.00	\$44.92	\$8,126,694.00

37
 38
 39
 40
 41
 42
 43
 44
 45 The Columbia River islands within the Hanford Site boundary would be designated for
 46 Preservation and included in the Saddle Mountain NWR to maintain important areas for wildlife.
 47 Wildlife species using these islands include mule deer, American white pelicans, sandhill cranes,
 48 waterfowl, and ring-necked pheasant. A significant area of the Upper Columbia River
 49 summer/fall-run chinook salmon spawning habitat is located near these islands, as well as

1 potential juvenile rearing habitat for the federally listed Upper Columbia River spring-run chinook
2 salmon (Endangered listed -3/99), Middle Columbia River steelhead (Threatened listed-3/99), and
3 Upper Columbia River steelhead (Endangered listed-8/97).
4

5 The Columbia River Corridor itself includes Low-Intensity Recreation, High-Intensity
6 Recreation, Conservation (Mining), and Preservation land-use designations. The Low-Intensity
7 Recreation areas would include an existing unimproved boat ramp on the Benton County side of
8 the corridor at the White Bluffs. Use of the boat ramp would be restricted to emergency
9 responses to protect suitable bald eagle nesting habitat. Restrictions would be consistent with
10 the *Hanford Site Bald Eagle Management Plan* (DOE-RL 1994b). The High-Intensity Recreation
11 area currently includes an existing highway rest area on the west side of State Highway 240 at
12 Vernita Bridge. The rest area is leased from DOE by the Washington Department of
13 Transportation. A boat ramp facility has been proposed east of the highway across from the rest
14 area on the Benton County side. The Preservation designation would provide protection for
15 ecologically and culturally sensitive areas being considered for protection under the Wild and
16 Scenic Recreational River designation (DOI 1996) and would be consistent with the current
17 management of the Saddle Mountain NWR.
18

19 The 100 Areas would include High-Intensity Recreation, Conservation (Mining), and
20 Preservation land-use designations. The B Reactor would be designated High-Intensity
21 Recreation to allow tourism of the federally registered landmark and would be consistent with the
22 B Reactor Museum proposal. Radioactive contamination would remain below 4.6 m (15 ft) in the
23 100 Areas vadose zone. During the planning period for this document (at least the next
24 50 years), the spent fuel will be removed from the K Basins. Associated environmental risks
25 were evaluated in the K Basin EIS (DOE 1996b).
26

27 **3.3.3.3 The Central Plateau.** The Central Plateau would include Industrial-Exclusive
28 and Preservation land-use designations. The Central Plateau includes undeveloped and
29 uncontaminated land, the majority of which has been designated priority shrub-steppe habitat by
30 the WDFW. Potential future Hanford Site projects include a full-scale, low-level vitrification plant
31 and a burial ground for eight reactor cores (DOE 1992a). The remaining undeveloped areas
32 would be considered sufficient for the preferred regional alternative of DOE's Programmatic
33 Waste Management EIS (DOE 1997a). Under the Programmatic EIS preferred regional
34 alternative, the Central Plateau would be committed to waste management from other DOE sites.
35 Although this land-use designation does not include Research and Development, R&D projects
36 specific to DOE waste management activities would be allowed. Mitigations for impacts from all
37 the previously mentioned, and any unforeseeable projects, would be consistent with the Draft
38 *Hanford Site Biological Resources Management Plan* (BRMaP) (DOE-RL 1996c).
39

40 Land west of the currently developed 200 West Area within the Central Plateau
41 geographic area would be designated Preservation. This area contains high-quality mature
42 sagebrush, which provides essential habitat for shrub-steppe dependent species. This
43 designation would prevent additional sprawl to the west and encourage siting of new projects
44 between the 200 East and 200 West Areas.
45

46 **3.3.3.4 The All Other Areas.** The All Other Areas geographic area under Alternative
47 One would include Industrial, Research and Development, Low-Intensity Recreation,
48 Conservation (Mining), and Preservation land-use designations. All development (i.e., Industrial,
49 and Research and Development) would occur south of Energy Northwest (formerly known as
50 WPPSS), inclusive. This development would include transition of existing facilities in the 1100,
51 300, and 400 Areas and the Energy Northwest area to potential uses such as high technology
52 incubators, manufacturing, and medical isotope production. The majority of non-Federal uses
53 would occur offsite or within a portion of the area identified by the City of Richland's urban growth

1 area (UGA) boundary in the southeast portion of the Site. This reduced UGA would include
2 Industrial and Research and Development. The DOE's industrial needs could also be met within
3 the approximately 5.2 km² (4 mi²) of land identified for industrial use between Energy Northwest
4 and the UGA boundary. This 5.2 km² (4 mi²) area contains low-quality habitat. Just west of the
5 Industrial designation is an extensive tract of seral shrub-steppe habitat which has been
6 designated Conservation (Mining). As the canopy cover increases, this seral shrub-steppe
7 habitat will become more important for shrub-steppe dependent species as additional shrub-
8 steppe habitat is destroyed offsite.
9

10 Wildlife corridors designated as Preservation would be located around this industrial
11 development to allow wildlife movements between the ALE Reserve, the Columbia River, and the
12 Saddle Mountain NWR. Between the western boundary and State Highway 240, a wildlife
13 corridor would run north from the ALE Reserve to the Columbia River. This northwestern wildlife
14 corridor would include the areas known as McGee Ranch and the river lands. Within the
15 southeastern wildlife corridor north of the Yakima River, a small area would be designated
16 Conservation (Mining) to allow potential extraction of geologic materials for use in the 200 Areas
17 remedial efforts. Considering this as a quarry site for basalt and soil provides DOE with the
18 option to designate Gable Mountain, Gable Butte, and West Haven as Preservation because of
19 their significant cultural value; and also to designate, as Preservation, the McGee Ranch site
20 (which is DOE land north and west of Highway 24 and south of the Columbia River). This
21 Preservation designation, including the McGee Ranch site as part of the expansion of the Saddle
22 Mountain NWR, would help preserve and protect an important habitat link between the Hanford
23 Site and the Yakima Training Center.
24

25 **3.3.3.3.5 The Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve).** The
26 ALE Reserve geographic area would be designated Preservation consistent with the
27 management of the expanded Saddle Mountain NWR. Preservation and management of the ALE
28 Reserve as an expansion of the Saddle Mountain NWR would protect the rare and high-quality
29 shrub-steppe plant communities and unique and rare fauna that reside on this portion of the Site.
30 Many of these plant communities and fauna are found nowhere else in the state of Washington or
31 in the Columbia Basin eco-region. Providing an expanded Saddle Mountain NWR for a biological
32 sanctuary of shrub-steppe dependent species would assist agricultural and industrial
33 development in other areas of the Columbia Basin's shrub-steppe community by partially fulfilling
34 the mandate to preserve species under the *Endangered Species Act of 1973*.

3.3.4 Alternative Two

3.3.4.1 Planning Goals, Objectives, and Values (Vision). Alternative Two presents the vision of the Nez Perce Tribe, Department for Environmental Restoration and Waste Management and incorporates their vision of Federal trust responsibility to the Indian Tribes (Figure 3-5). This vision calls for preservation of the natural and cultural resources at the Hanford Site. Traditional Tribal use is consistent with the Preservation land-use designation. Protection of cultural resources at the Hanford Site is the top priority of Alternative Two. Sharing the Nez Perce Tribe's knowledge and point of view about sacred sites and nature with everyone is vitally important. Cultural resources remain important to the Nez Perce Tribe's way of life and are part of the Tribe's tradition.

The Hanford Site, including the Columbia River, has a history of serving as a gathering place for Indian Nations to hunt, fish, trade, and feast. The Nez Perce have shared and participated in these known ancient and traditional activities with other Tribes when and where there were no fences, boundary lines, or treaties. The Hanford Site is one of the largest areas of land in the Pacific Northwest region that has not been developed, with agriculture being the principal development on surrounding lands. The Hanford Site contains the last nontidal, unimpounded section of the Columbia River in the United States, and the Hanford Reach is the only remaining area on the Columbia River where Chinook salmon still spawn naturally. The ALE Reserve geographic area contains one of the few resident elk herds in the world that inhabit a semi-arid area, and the ALE Reserve is one of the largest remnants of relatively undisturbed shrub-steppe ecosystem in the State of Washington. Approximately 50 species of animals that are classified as "sensitive species" currently reside at the Hanford Site. The largest population of sage sparrows in Washington State can also be found at Hanford.

The Nez Perce have always considered that the land and its creatures are essential to everyday life. Humans are considered to be only one small part of a much larger circle of life on the earth. Nez Perce stories exemplify this intimate relationship between humans and the earth, and traditional Nez Perce culture weaves an intimate relationship between humanity and nature. In all phases of their daily lives, the Nez Perce recognize the spirits of the forces and objects around them as supernatural guardian forms, which they call in a personal way their *Wyakin*. The Nez Perce identify themselves with all the natural features of the earth. In the Nez Perce's belief, the earth is the ever-nourishing mother, as any mother provides for a child. We must continue to be caretakers of the earth, or life will surely soon end. These values are used in developing Alternative Two.

3.3.4.2 Assumptions Regarding Future Use. The assumptions used to develop Alternative Two are as follows:

- C Potential industrial and recreational development of the City of Richland and Benton County will primarily occur outside of the Hanford Site's boundary and close to Benton County's population centers.
- C Remediation of the Hanford Site will continue, and the security measures currently in place will continue to be required.
- C Plutonium production reactor blocks will remain in the 100 Areas throughout the planning period and will be considered a pre-existing, nonconforming use.
- C The last nontidal, unimpounded section of the Columbia River, and the salmon habitat found therein, as well as cultural resources of the indigenous people who pre-date the Federal government will be protected.

4 **Figure 3-5. Alternative Two.**



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- 1 C The retained rights to the area, as recognized and affirmed by the Federal government
- 2 in treaties with the affected Native American Tribes, will be protected.
- 3 C International treaties concerned with protecting salmon and other wildlife will be
- 4 honored.
- 5 C With DOE’s mission change from defense production to environmental restoration,
- 6 the land needs of future DOE missions could be contained in the Central Plateau,
- 7 400 Area, and 300 Area.
- 8 C Major portions of the Site could not be conveyed to private ownership due to soil
- 9 contamination left at depth after remediation.
- 10 C Existing contaminated groundwater conditions would not preclude development in any
- 11 given location but would be considered a constraint to groundwater use and prevent
- 12 transfer to private ownership, as the private sector would be unable and unwilling to
- 13 accept the environmental liabilities.

14 **3.3.4.3 Application of the Land-Use Designations.** Alternative Two’s land-use designations
 15 include Industrial-Exclusive, Industrial, Research and Development, High-Intensity Recreation,
 16 and Preservation. The location, shape, and size of the land-use designations were influenced by
 17 a thorough analysis of the existing cultural resources, the hazards and resources created by
 18 humans, and the geology.

19 **3.3.4.3.1 The Wahluke Slope.** Alternative Two would designate the entire Wahluke
 20 Slope as Preservation. Preservation would prohibit irrigation of the Wahluke Slope because
 21 irrigation is accelerating sloughing of the White Bluffs along the Hanford Reach of the Columbia
 22 River. Sloughing of the bluffs, or other activities that change the course of the Columbia River
 23 such as dredging or mining, could release chemical and radioactive contaminants that have been
 24 entombed within the fine sediments of the Hanford Reach.

25 Preservation would protect the last nontidal, unimpounded section of Columbia River and
 26 the salmon habitat found within, as well as the cultural resources of the indigenous people who
 27 pre-date the Federal government. Preservation would honor retained Tribal rights as recognized
 28 and affirmed by the United States of America in the *Treaties of 1855* with the affected Tribes
 29 (Appendix A), as well as complying with international fishing treaties. Preservation would prevent
 30 an additional appropriation of water from the Columbia River in order to support development of
 31 lands on the Wahluke Slope. The Wahluke Slope is not in acreage that has been appropriated
 32 water from the (57 U.S.C. 14). Finally, a Preservation designation would be appropriate because
 33 a large portion of the Wahluke Slope is too steep to develop (see Section 4.2).

34 **3.3.4.3.2 The Columbia River Corridor.** The Columbia River Corridor would include
 35 High-Intensity Recreation, Low-Intensity Recreation, Research and Development, and
 36 Preservation land-use designations. The Columbia River (surface water only) would be
 37 designated for Low-Intensity Recreation. The Nez Perce Tribe supports a Preservation
 38 designation for the islands in the Columbia River and the designation of the Hanford Reach as a
 39 “wild and scenic” river under Federal control. The B Reactor and surrounding area, which are
 40 located within the Columbia River Corridor, would be designated for High-Intensity Recreation
 41 and would allow conversion of the reactor into a museum with museum-related facilities. The
 42 B Reactor was the first full-scale nuclear reactor in the world and was critical in the development
 43 of the first nuclear weapons. The K Reactor area would be designated for Research and
 44 Development. The K Reactor area could be used by the Tribes and others for fish farming or for
 45 aquaculture and aquatic research.

1 The remainder of land within the 100 Areas would be designated Preservation.
 2 Preservation would protect retained rights of American Indian Tribes to the area and would
 3 protect sensitive cultural and biological resource areas. Prohibiting further irrigation and other
 4 land uses that increase infiltration on both sides of the Hanford Reach would aid in the
 5 stabilization of the Columbia River shoreline. Prohibiting irrigation would protect public health and
 6 the environment by preventing remobilization of contaminants entombed within the river's
 7 sediment and the shoreline's soil column, and would prevent siltation and destruction of salmon
 8 spawning beds. Preservation prohibiting irrigation near the reactor areas would mitigate
 9 mobilizing contaminants left behind at depth long after cleanup efforts have ceased (see
 10 Section 4.11). Because the cleanup efforts in the 100 Area's soil column are limited to a depth of
 11 about 6.1 m (20 ft) below ground surface, the contaminants remaining in the soil column below
 12 6.1 m (20 ft) will not be remediated.

13 **3.3.4.3.3 The Central Plateau.** The majority of land within the Central Plateau
 14 geographic area would be designated Industrial-Exclusive, allowing for continued management of
 15 radioactive and hazardous waste. These management activities include collection and disposal
 16 of radioactive and hazardous waste materials that remain onsite, contaminated soil and
 17 groundwater containment and cleanup, and other related and compatible uses. Deed restrictions
 18 or covenants could be applied to this area through the CERCLA and RCRA processes. This
 19 designation would allow for expansion of existing facilities or the development of new facilities for
 20 Waste Management or other DOE missions.

21 Land west of the currently developed 200 West Area within the Central Plateau
 22 geographic area would be Preservation. This area contains high-quality mature sagebrush,
 23 which provides this essential habitat for shrub-steppe dependent species. This designation
 24 would prevent additional sprawl to the west and encourage siting of new projects between the
 25 200 East and 200 West Areas.

26 **3.3.4.3.4 The All Other Areas.** The All Other Areas geographic area would include
 27 Industrial, Research and Development, and Preservation. Alternative Two designates, as
 28 Industrial, the City of Richland UGA, the 400 Area (including the Fast Flux Test Facility), and
 29 Energy Northwest (formerly known as WPPSS) to allow for future economic development. An
 30 Industrial designation would accommodate economic development of the area identified by the
 31 City of Richland's UGA boundary at the southeast portion of the Site for at least the next 50 years.
 32 An Industrial designation would also reserve the 400 Area for DOE missions and the Energy
 33 Northwest (formerly known as WPPSS) area for use by Energy Northwest. The area around
 34 LIGO within the All Other Areas geographic area would be designated Research and
 35 Development, consistent with current management practices.

36 The remainder of the All Other Areas geographic area would be designated Preservation.
 37 Major constraints identified in the *Draft Hanford Remedial Action Environmental Impact*
 38 *Statement and Comprehensive Land-Use Plan* (DOE 1996) demonstrated that the majority of the
 39 Hanford Site is unsuitable for economic development, and that the best future land use would be
 40 Preservation. Designating the majority of the All Other Areas as Preservation is appropriate
 41 because, while portions of the All Others Areas geographic area have a well-developed
 42 transportation network, these areas are remote from population centers thus limiting their
 43 economic potential. A sand dune complex and vegetation-stabilized sand dunes, which extend
 44 from the Columbia River westward across the Site to State Highway 240 (see Section 4.5),
 45 should not be developed because vegetation-disturbing activity might reactivate stabilized dune
 46 fields. Soil and groundwater contamination remaining at depth after remediation prevents these
 47 lands from being exploited for economic reasons due to the difficulties involved in transferring
 48 public lands with environmental liabilities to private ownership. For example, the widespread
 49 environmental contamination from the 200-BC cribs is approximately 32.1 km² (12 mi²).

1 A Preservation designation also precludes extensive economic development of the All Other
2 Areas geographic area because of the large exclusive-use zones (safety buffers) around the
3 Hanford Site's existing nuclear facilities (see Section 4.11). Additionally, the nature of the
4 research conducted at LIGO requires a substantial seismic buffer zone for operation.

5 The promontories of Gable Mountain, Gable Butte, Umtanum Ridge, and a large portion of
6 their viewsheds would be designated Preservation, consistent with traditional Tribal use. The *Old*
7 *Indians* went to high mountains seeking vision sites and to fast for a few days to seek a vision or
8 a *Wyakin* (which is the Nez Perce word for your personal vision spirit that will protect you for the
9 rest of your life). The *Wyakin* could be a bird, four-legged animal, plant, or root, and it will be your
10 personal medicine. During a vision quest, one looks at the big picture or the view as far as the
11 eye can see. This view encompasses the big river, creeks, springs, the various grasses, shrubs,
12 animals, birds, and even insects such as ants. These things and objects all have their place and
13 souls on the mother earth; one prays to the Creator to bless you and ask him to take care of all
14 these things.

15 To preserve these cultural resources (including wildlife), the large contiguous tract of
16 shrub-steppe habitat in the All Other Areas surrounding the Central Plateau is designated
17 Preservation. The resident elk herd, one of the largest remnants of relatively undisturbed shrub-
18 steppe ecosystem, and viewsheds for American Indian vision sites (e.g., Gable Butte and Gable
19 Mountain) would all be protected by a Preservation land-use designation. The Preservation land-
20 use designation would also ensure that wildlife corridors are maintained.

21 **3.3.4.4 The Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve).** The ALE
22 Reserve geographic area would be designated Preservation in accordance with its management
23 as the Rattlesnake Hills Research Natural Area. Currently, the USFWS manages the ALE
24 Reserve for DOE. Privately owned mineral rights exist on the ALE Reserve that were not
25 conveyed to the Federal government when the Hanford Site was formed. The ALE Reserve
26 contains one of the few resident elk herds in the world that inhabit a semiarid area, and the ALE
27 Reserve is one of the largest remnants of relatively undisturbed shrub-steppe ecosystem in
28 Washington State.

3.3.5 Alternative Three

3.3.5.1 Planning Goals, Objectives, and Values (Vision). Benton, Franklin, Grant, and Adams counties and the City of Richland contain portions of the Hanford Site. Alternative Three represents the individual planning efforts of these local governments. The procedures used by these governments to develop Alternative Three vary by each planning jurisdiction. The designations in Grant County reflect the Wahluke 2000 Plan prepared by farming interests in 1992 and supported by Grant County (NPS 1996). The designations in Franklin County result from a land-use analysis conducted by the Franklin County Planning Department; and designations within Benton County were developed per the procedure outlined below:

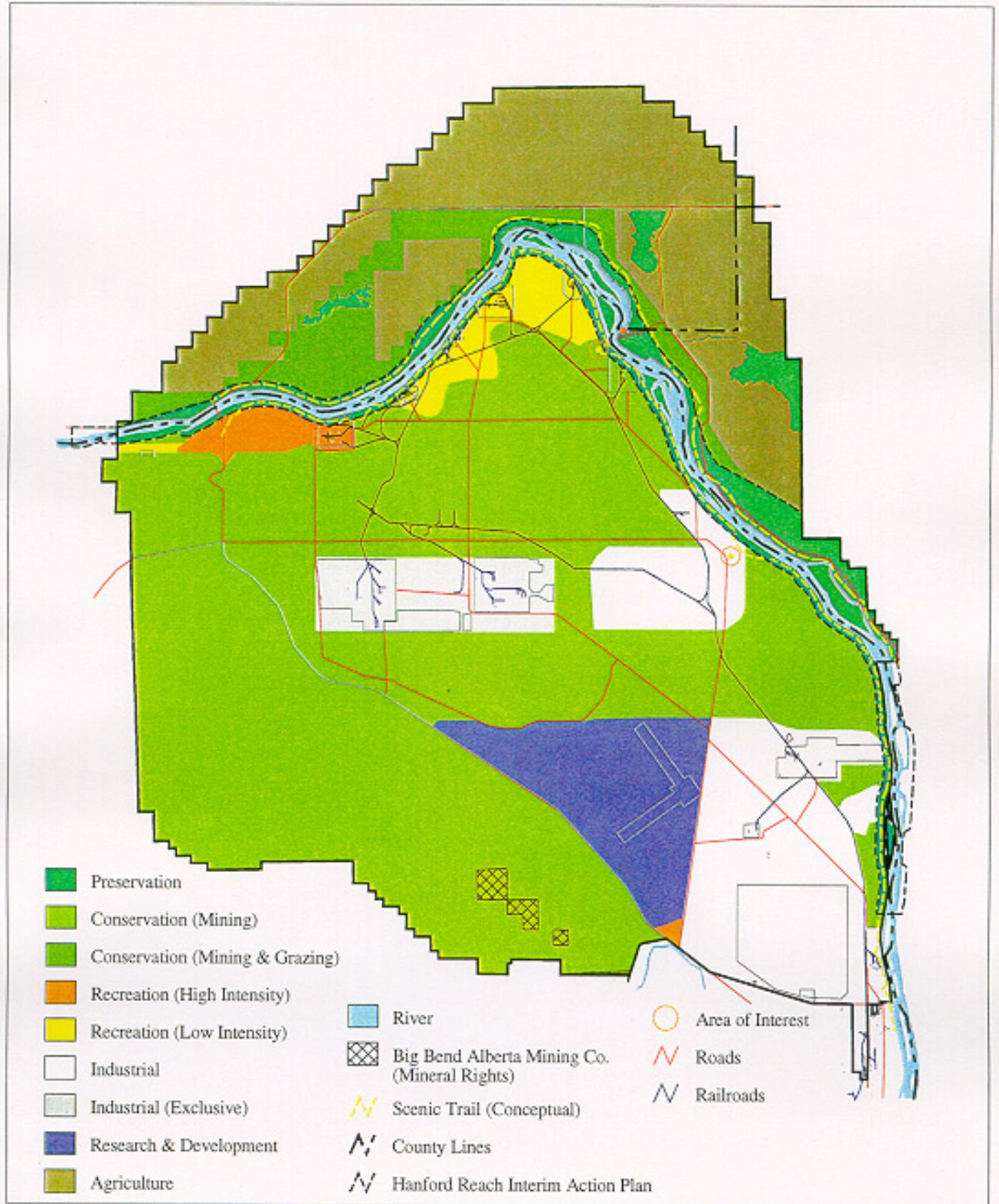
- C Existing Hanford Site resources were inventoried, mapped, and characterized.
- C Biological resources were identified per the WDFW priority habitat and species data base.
- C Natural and biological resources were then translated into five “critical resources,” consistent with the GMA, including wetlands, fish and wildlife conservation areas, frequently flooded areas, geologically hazardous areas, and critical aquifer recharge areas.
- C An opportunities and constraints analysis was performed using the assembled Hanford Site information.
- C Critical resources were placed in a single contiguous designation (i.e., the Conservation land-use designation).
- C Areas remaining outside of the Conservation designation were identified as suitable for development and analyzed to determine the appropriate “intensity” of use within the designated area.
- C After appropriate intensities were identified for each area suitable for development, land uses were designated consistent with “opportunities and constraints” (e.g., availability of infrastructure, nearness of urban areas, soils capabilities, and current use patterns/future options).

The land-use designations included in Alternative Three are presented in Figure 3-6. The county and city governments believe that the land-use designations for the Hanford Site address identified goals and values of DOE, the City of Richland, Benton County, and the HAB. The goals and values include economic diversification, increased public use for recreation and private enterprise, private-sector utilization of infrastructure, and the protection of biological and cultural resources (see text box, “Goals and Objectives”).

3.3.5.2 Assumptions Regarding Future Uses. The assumptions used to develop Alternative Three are as follows:

- C The Hanford Site will eventually be remediated as recommended by the Working Group.
- C Major portions of the Site will be used for multiple private and Federal uses after remediation.

3
2
Figure 3-6. Alternative Three.



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- C Existing contaminated groundwater conditions will not preclude development in any given location, but will be considered a constraint to groundwater use.
- C Plutonium production reactor blocks will remain in the 100 Areas throughout the planning period and will be considered a pre-existing, nonconforming use.

3.3.5.3 Application of the Land-Use

Designations. Alternative Three land-use designations include Industrial-Exclusive, Industrial, Agriculture, Research and Development, High-Intensity Recreation, Low-Intensity Recreation, Conservation (Mining), Conservation (Mining and Grazing), and Preservation.

For Site lands within Benton County, the location, shape, and size of the land-use designations were determined by analyzing the existing natural and man-made resources (e.g., infrastructure, topography, and biology) described in Chapter 4 (see text box, “Allowable and Permitted Uses within the Land-Use Designations of Alternative Three”). For lands within the Grant County portion of the Site, land-use designations were influenced by the input and analysis resulting from the Benton, Franklin, and Grant County Hanford Reach Citizens Advisory Panel, the Wahluke 2000 Plan, and the Wahluke Slope Element of the Grant County Comprehensive Plan. The lands within the Franklin County portion of the Site went through an analysis similar to that described above. The designations of Preservation, Conservation, Low-Intensity Recreation, and Agriculture on this portion of the Site were developed from onsite analysis and with input from the Benton, Franklin, and Grant County Hanford Reach Citizen’s Advisory Panel and the Wahluke 2000 Plan. In addition, the WDFW, the BoR, and the South Columbia Basin Irrigation District provided information.

Alternative Three would accommodate both future Federal missions and private activities, such as business-related industry and R&D enterprises, in the southeastern portion of the Site (north of the City of Richland). This area would be adjacent to essential services and large-capacity infrastructure. Accommodations for the expansion of public and commercial recreational activities would be focused on the northern portion of the Site (i.e., primarily in the vicinity of the Vernita Bridge). The largest land-use designation would be Conservation (Mining), which would represent a single continuous area that would extend over all geographic areas except the southern portion of the Site. Generally, the shape and extent of this designation would

Goals and Objectives	
County and City Objectives (GMA Mandates *)	
C	Designate city urban growth areas in cooperation with cities.*
C	Designate and conserve, by regulation, natural resource lands (i.e., agricultural lands and mineral resources).*
C	Designate and conserve, by regulation, critical resources.*
C	Protect the environmental, cultural, historical, and economic resources.*
C	Maintain functional infrastructure and utilities currently on the Site.
C	Provide for Low-Intensity Recreation.
Hanford Advisory Board	
C	Historic and cultural resources have value. They should not be degraded or destroyed. Appropriate access to those resources is a part of their value.
C	The importance of ecological diversity and recreational opportunities should be recognized; these resources should be enhanced as a result of cleanup and Waste Management decisions.
C	Cleanup and Waste Management decisions should be coordinated with the efforts of the affected communities to shift toward more private business activity and away from dependence on Federal projects that have adverse environmental or economic impact.
C	Cleanup activities should protect to the maximum degree possible the integrity of all biological resources, with specific attention to rare, threatened, and endangered species and their habitats.
C	Use the Central Plateau wisely for Waste Management.
Hanford Future Site Uses Working Group (1992)	
C	Deal realistically and forcefully with groundwater contamination.
C	Use the Central Plateau wisely for Waste Management.
C	Do no harm with cleanup or new development.
Commonly Identified Goals	
C	Economic development and diversification
C	Protect the Columbia River
C	Clean up areas for future use.

1 include sensitive biological, physical, and cultural
 2 features on the landscape (e.g., rare, threatened,
 3 or endangered flora/fauna and their habitats; unique
 4 geologic hazards and features; and wetland and
 5 riverine environments), and would be intended to
 6 protect these resources over the long term.
 7

8 In the southern portion of the Site, located
 9 north and northwest of Richland, is a large area
 10 designated for Industrial, and Research and
 11 Development land uses. Within these land-use
 12 designations, a large area of seral-stage, shrub-
 13 steppe habitat exists. Given the existence of other
 14 planning considerations identified in the All Other
 15 Areas geographic area, this area was not included
 16 with the Conservation (Mining) land-use designation, and would be considered suitable for future
 17 development. However, the importance of this habitat would be recognized and impacts to
 18 shrub-steppe habitat would require mitigation.
 19

20 **3.3.5.3.1 The Wahluke Slope.** The soil,
 21 climate, and topography of the Wahluke Slope
 22 make it potentially one of the most productive
 23 agricultural areas in the Pacific Northwest. Prior to
 24 its inclusion in the Hanford control zone, the BoR
 25 had purchased over 10,927 ha (27,000 ac) of the
 26 Wahluke Slope for agricultural development.
 27 Development of land within the Site that is
 28 appropriate for agriculture would result in the
 29 completion of the vision for agricultural economy
 30 benefitting the citizens of the area. The land-use
 31 proposal for the Wahluke Slope seeks to provide
 32 balanced and compatible economic development,
 33 conservation of critical resource lands, and the
 34 protection of the Columbia River Corridor. The
 35 Wahluke Slope contains expansive critical
 36 resource lands not suitable for farming, but these
 37 lands are ideally suitable for wildlife habitat and
 38 Low-Intensity Recreation. Such areas constitute
 39 an ideal buffer providing protection between
 40 agricultural land and the Columbia River Corridor.
 41

42 The largest land-use designation would be
 43 approximately 23,951 ha (59,184 ac), designated
 44 as Agriculture. Development of land for agriculture
 45 would be based upon an opportunities and
 46 constraints analysis. Land designated as
 47 Agriculture within the “Red Zone” consists of
 48 approximately 10,813 ha (26,720 ac) that would be
 49 conserved under a “no-action” scenario pending
 50 initiation and completion of geotechnical studies
 51 analyzing the impacts of irrigation to the White
 52 Bluffs and the Columbia River. Approximately
 53 6,476 ha (16,003 ac) are designated Conservation (Mining and Grazing), including land providing

**Allowable and Permitted Uses within the
 Land-Use Designations of Alternative Three**

Allowable and permitted uses within any land-use designation would correspond to those listed in Table 3-1, except that within the Industrial, Research and Development, and High-Intensity Recreation land-use designations, dryland agricultural and commercial grazing would be considered an allowable use (typically interim). Irrigated agriculture would be considered an interim conditionally permitted use, which would be subject to existing deed restrictions or covenants standards that prohibit activities that impact contaminated soil and groundwater. Basalt outcrops and other culturally significant landscape features would not be available for mining.

Hanford’s Agricultural Opportunity Cost

In a May 18, 1995, letter response to the Benton County Assessor, the Washington State University Area Extension Horticulturist, John W. Watson, estimated the present value of crops that could be grown on the Benton County portion of the Hanford Site. Watson’s report estimated the farm gate income from arable Hanford acreage (79,737 ha [197,035 ac], or 73 percent of the area) under three assumption scenarios:

- C Assumption 1.** Benton County has 26 major crops currently being grown on irrigated land. Growing those crops on the Hanford Site, Hanford agricultural income would equal \$121,491,340.
- C Assumption 2.** If the crops that are expanding the fastest in the county are the only crops used to estimate potential income, the lost farm gate income in 1994 would be as follows:
 - 50% apples would be 98,517 acres at \$5,000/acre for \$492,800,000
 - 25% cherries would be 49,258 acres at \$7,000/acre for \$344,806,000
 - 25% grapes would be 49,258 acres at \$4,000/acre for \$197,032,000
 (resulting in a total of \$1,034,638,000).
- C Assumption 3.** If the total acreage was planted to high-income-producing apple varieties (e.g., Gala, Fuji, and Braeburn), then Hanford lands could produce an income of \$2,955,525,000 (assuming 197,035 ac at \$15,000/ac).

1 for wildlife refuge and Low-Intensity Recreational activities. Approximately 9,002 ha (22,244 ac)
 2 would be designated as Preservation. Generally, the shape and extent of this designation would
 3 include sensitive biological, physical, and cultural features on the landscape (e.g., rare,
 4 threatened or endangered flora/fauna and their habitats, unique geologic hazards and features,
 5 and wetland and riverine environments), and would be intended to protect these resources over
 6 the long term. Agriculture designated within the Franklin County portion of the Site is just outside
 7 of the BoR's Red Zone.

8
 9 **3.3.5.3.2 The Columbia River Corridor.** Land-use designations included in the
 10 Columbia River Corridor under Alternative Three would support conservation of the Columbia
 11 River, and would maintain and support high-quality aquatic and riparian habitats. These land-use
 12 designations within the Columbia River Corridor geographic area are described below.

13
 14 The Preservation land-use designation follows the boundaries of the locally proposed
 15 Hanford Reach Interim Protection Plan, which is an initial phase of the *Hanford Reach Protection
 16 And Management Plan* proposed by Benton, Franklin, and Grant counties to protect and manage
 17 the Hanford Reach jointly with Federal, state, and local authorities. The second phase of this
 18 proposal, which has legislation pending before Congress, is to appoint a Commission consisting
 19 of appointees from Federal and state agencies, and local jurisdictions, which would devise and
 20 implement the *Hanford Reach Protection and Management Plan*. The Preservation designation
 21 would extend upland 400 m (0.25 mi.) from the average high-water line of the river, except in
 22 Franklin and Grant counties, where the boundary would extend further inland to include specific
 23 sensitive features, such as the White Bluffs and several upland wetlands. Permitted uses would
 24 be similar to those within the Conservation land-use designation, except mining would be
 25 prohibited by the permitting process. Although Preservation is not a land-use term used under
 26 county-wide planning ordinances, Conservation is a recognized land-use term. The
 27 Conservation (Mining) land-use designation would include those areas that extend upland of the
 28 Preservation land-use designation. Within the Conservation (Mining) land-use designation,
 29 Mining would be allowed as a conditionally permitted use. Agriculture uses would be prohibited.
 30 The primary purpose would be to protect and manage fish and wildlife.

31
 32 Areas surrounding the K, N, D, and H Reactor sites would be designated as Low-Intensity
 33 Recreation. This area has minimal biological sensitivity and contains unique natural features
 34 potentially suitable for public enjoyment. The Low-Intensity Recreation designation would begin
 35 400 m (0.25 mi.) upland from the average high-water line of the river except in small isolated
 36 areas such as the former White Bluffs town site, and the existing recreational access corridors to
 37 the Columbia River. Environmental restoration activities would continue in the 100 Areas (i.e.,
 38 100-BC, 100-KE, 100-KW, 100-N, 100-D, 100-DR, 100-H, and 100-F). These uses would be
 39 considered a pre-existing, nonconforming use in the Low-Intensity Recreation land-use
 40 designation.

41
 42 A hiking and biking recreational trail along the entire river corridor would be proposed from
 43 North Richland to the Vernita Bridge, which would allow public access along the river corridor and
 44 connect important historic and natural resources, such as the former Hanford and White Bluffs
 45 townsites, the Bruggerman Warehouse, and the B Reactor Museum, and would connect the rest
 46 stop and boat launch area located at the Vernita Bridge. This trail would be sited to avoid impact
 47 to, or contact with sensitive biological, cultural, hazardous, and/or natural resource-sensitive
 48 areas. This trail would connect to the river shore trails in Richland at the southern boundary.

49
 50 **3.3.5.3.3 The Central Plateau.** The DOE would be expected to continue all Waste
 51 Management and disposal activities in the Central Plateau. As a result, the Central Plateau
 52 geographic area would be designated for Industrial-Exclusive Use.

1 **3.3.5.3.4 The All Other Areas.** The majority of the All Other Areas geographic area
2 would be designated Conservation (Mining). Within the Conservation land-use designation,
3 mining would be allowed as a conditionally permitted use. Agricultural uses would be prohibited.
4 A small area along the southern boundary of the Site near the Yakima River would be designated
5 High-Intensity Recreation. This area, adjacent to the Benton County Horn Rapids Park, is
6 currently “master planned” as a regional park. A High-Intensity Recreation land-use designation
7 would provide commercial use support for the expected increase in recreational and visitor use in
8 the park area (a central feature of the Tapteal Greenway), which would extend along the lower
9 Yakima River from Benton City to Columbia Point. The area adjacent to the Vernita rest stop,
10 east of State Highway 240 (which includes the B Reactor site), would also be designated as
11 High-Intensity Recreation. The Vernita rest stop, the proposed B Reactor Museum, and the
12 proposed boat launch are all expected to increase demand for recreational and visitor use of the
13 Vernita area. The strip designated for the west 135 ha (333 ac) of the Vernita Terrace would be
14 designated Low-Intensity Recreation, primarily for limited activities such as biking, hiking, fishing,
15 hunting, boat launching facilities, primitive day camping, and nature viewing, while maintaining the
16 natural resource values upon which those uses are based.
17

18 Areas north of the City of Richland would be designated as Industrial, and Research and
19 Development. This area would be accessible using the State Highway 240 corridor, State
20 Highway 10, and existing railroad infrastructure. Existing municipal water and sewer
21 infrastructure is located nearby within the City of Richland’s UGA boundary. Industrial use also
22 would be proposed for the area east of the 200 Area (i.e., May Junction), which contains
23 low-quality biological resources and existing rail and road infrastructure.
24

25 **3.3.5.3.5 The Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve).** This
26 area would be designated as Conservation (Mining) due to the existing unique and sensitive
27 biological, ecological, and cultural resources.

3.3.6 Alternative Four

3.3.6.1 Planning Goals, Objectives, and Values (Vision). Alternative Four represents the vision of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) for the management of the Hanford Site for the next 50 years (Figure 3-7). The alternative is based on a detailed knowledge of Site resources and upon experience gained from many years participating in a host of Hanford Site planning forums.

In the view of the CTUIR, the greatest value provided to the region and the nation by the Hanford Site is its role as a natural and cultural resource reserve. The CTUIR recognizes, nevertheless, that there are other services provided by the Hanford Site that are not compatible with this primary value, and that a rational land-use plan for Hanford must take into account these other services. In the CTUIR's review of the Hanford Site's resources, and of the current and potential services provided or potentially provided by the Site, we have striven to find the most rationally justifiable balance between these interests.

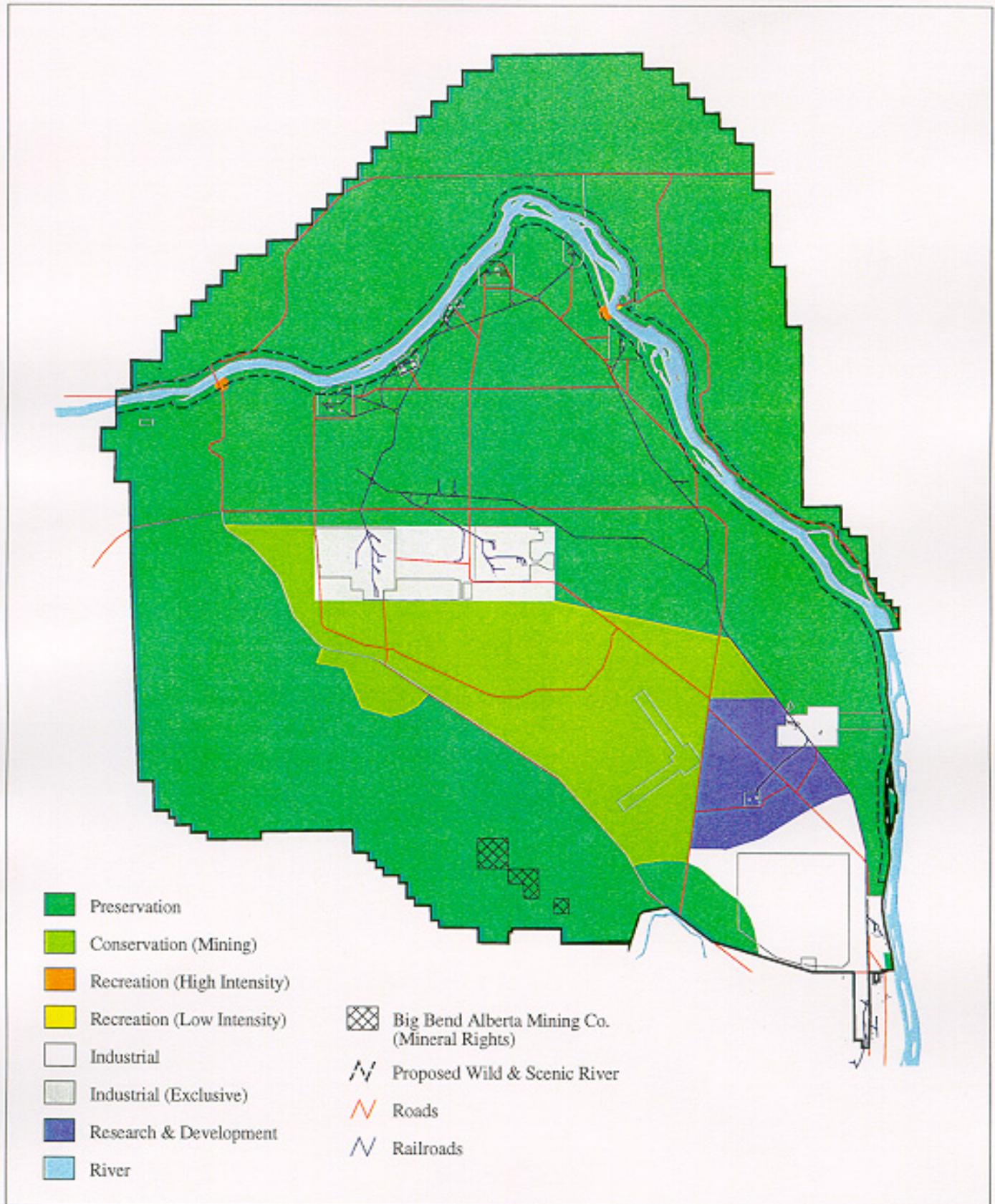
The result is a land-use plan that protects a significantly greater amount of Hanford resources than is protected under DOE's Preferred Alternative. Nevertheless, Alternative Four provides opportunities for waste management, commercial industry, and recreation that by the CTUIR's estimates would meet or exceed actual demand. In the view of the CTUIR (and consistent with the *Final Report of the Hanford Future Site Uses Working Group* [FSUWG 1992]), all permanent waste disposal sites at Hanford should be located in the Central Plateau waste management area. While Alternative Four provides opportunity for R&D activities, the CTUIR has intentionally provided an area for these activities that may not accommodate all proposals received over the next 50 years. The CTUIR has limited the size of this area because, in its view, the value provided by these activities does not justify the consumption of a large amount of Hanford Site resources. The CTUIR wants to ensure that Hanford lands would only be available to support the most valuable R&D activities, and that any future R&D activities on the Site would make efficient use of Hanford Site resources. Finally, Alternative Four provides no opportunity for agriculture on the Hanford Site. In the view of the CTUIR, agricultural development at Hanford is not justified. Any value that would be added to the region by allowing agricultural development at Hanford is grossly outweighed by the value presently provided by the natural and cultural services of the Site.

3.3.6.2 Assumptions Regarding Future Use

Remediation and Waste Management:

1. Remediation activities on the Hanford Site will continue as planned.
2. The remediation process will generally impose no long-term restrictions on future land use, with the exception of (a) activities that disturb capped permanent waste sites, (b) activities that disturb contaminants which remain in place 4.6 m (15 ft) or more below the ground surface in some areas, and (c) activities that would affect groundwater contaminant plumes.
3. Plutonium production reactor blocks will remain in the 100 Areas throughout the planning period and will be considered a pre-existing, nonconforming use.

Figure 3-7. Alternative Four.



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4. All permanent waste disposal activities (e.g., all capped permanent waste sites) will be located in the Central Plateau.
5. Geologic material will need to be mined onsite for the construction of caps over disposal sites.

Local Economic Transition:

1. The Tri-Cities area will need to develop a stable economic base that is independent of DOE activities and budgets. Economic considerations will cause most of that new development to take place within the City of Richland's UGA. Available projections indicate that, at the most, only 809 ha (2,000 ac) to 1,619 ha (4,000 ac) of the Hanford Site will be needed for private commercial development over the next 50 years.
2. Much development in the Tri-Cities area has made inefficient use of available lands, resulting in sprawl. Future land-use regulation should ensure more efficient use of available lands.

Research and Development Activities:

For practical reasons, DOE will locate the R&D activities needed to assist in Hanford remediation, restoration, and Waste Management in the following manner by one of these actions:

1. In sophisticated laboratory facilities within the City of Richland (e.g., EMSL)
2. In the 300 Area
3. Within the Central Plateau Waste Management area, or
4. As field studies with little environmental impact.

From time to time proposals are advanced for R&D activities at Hanford that are unrelated to remediation, Waste Management, or the restoration of the Site. Some of these proposals are rejected as making poor use of Hanford Site resources, but others are developed on the Site. This trend is likely to continue. The land-use planning process should ensure that only proposals that provide a clear value and make efficient use of available Hanford resources are accepted.

Natural and Cultural Resource Values, Management, and Use:

1. The Hanford Site and the U.S. Department of the Army's Yakima Training Center constitute the only large, relatively undisturbed areas of natural shrub-steppe habitat remaining in Central Washington.
2. The Hanford Reach will be designated as a Recreational River under the *Wild and Scenic Rivers Act* or other analogous legislation. Demand for (and the need to manage) recreational activity on the Reach and associated Hanford lands will steadily increase.
3. A public desire for low-impact recreation (including hunting) on the uplands of the

1 Hanford Site already exists and will increase over time.

- 2
- 3 4. The gathering, processing, distribution, and use of natural resources, and the
- 4 cultural and religious laws governing these activities, are at the core of the
- 5 traditional culture of the CTUIR and other Hanford-affected Tribes. The survival of
- 6 the CTUIR's culture depends upon the availability of, access to, and traditional use
- 7 of native natural resources. As a result, protection of native ecosystems and of
- 8 Tribal member access to such resources is a priority for the CTUIR and other
- 9 Tribal governments. As areas of the Hanford Site are determined to be clean, and
- 10 as administrative mechanisms are put in place, members of the CTUIR and other
- 11 Hanford-affected Tribes will make increasing use of the Hanford Site for the
- 12 gathering of natural resources. Such activities will include subsistence plant
- 13 gathering and hunting, as well as subsistence and commercial fishing.
- 14
- 15 5. The Hanford Site contains numerous places of religious importance to members
- 16 of the CTUIR who practice traditional Indian religions. These places include the
- 17 major basalt outcrops, the active dunes area, and other sites. These sites have
- 18 been used by members of the CTUIR and other Hanford-affected Tribes from time
- 19 immemorial for a wide variety of religious activities. In addition, the Prophet
- 20 Smohalla, a founder of the Washat, or Seven Drums, religion, received his
- 21 principal visions and teachings at places now located within the boundaries of the
- 22 Hanford Site. Many members of the CTUIR are members of the Washat religion.
- 23 Protection of these sites, and of Tribal members' access to these sites, is of great
- 24 importance to the CTUIR and its members (as well as to other Hanford-affected
- 25 Tribes) and will continue to be an issue of great importance.
- 26
- 27 6. The area currently occupied by the Hanford Site has been used by American
- 28 Indian Tribes for at least the past 13,000 years, and likely much longer than that.
- 29 Cultural resources such as cemeteries, village sites, and archaeological resources
- 30 are abundant on the Hanford Site because of the area's abundance of natural
- 31 resources, its central location on transportation routes, and its climate. The
- 32 locations of many of these sites are presently unknown. Federal law mandates
- 33 the protection of these resources. Moreover, the protection of these resources is
- 34 very important to members of the CTUIR and other Hanford-affected Tribes.
- 35 Respect for and non-disturbance of these resources is a fundamental religious
- 36 value of members of the CTUIR who practice traditional religion. These
- 37 management principles will continue to be defended by the CTUIR and other
- 38 Hanford-affected Tribes.
- 39

40 **3.3.6.3 Application of the Land-Use Designations.** Alternative Four land-use designations

41 include Industrial-Exclusive, Industrial, Research and Development, High-Intensity Recreation,

42 Low-Intensity Recreation, Conservation (Mining), and Preservation. Low-Intensity Recreation,

43 while generally not appearing as a separate land use in Alternative Four, would occur in all land-

44 use designations, as long as protected resources are not placed at risk, and so long as

45 incompatible development has not already occurred. Specific planning for support of Low-

46 Intensity Recreation would take place as part of the implementation of the CLUP (see Chapter 6).

47

48 **3.3.6.3.1 The Wahluke Slope.** Alternative Four would manage the entire Wahluke Slope

49 area as Preservation due to the outstanding value of its natural and cultural resources, which

50 would be destroyed by more consumptive land uses. These resources include wetlands,

51 uplands, and the White Bluffs. The White Bluffs are a unique geologic, paleologic, and cultural

52 feature. The Bluffs, in particular, are highly susceptible to collapse due to activities that increase

53 groundwater flow. Such collapses have occurred in recent years and their impacts continue.

1 Aside from causing the loss of this irreplaceable resource, such collapses bury salmon habitat
 2 under tons of silt and alter the course of the Columbia River. The alteration of the river's course
 3 causes new erosion which, in turn, destroys cultural resources on the islands and shore of the
 4 Columbia River, and potentially mobilizes contaminants that are currently stabilized. Managed,
 5 Low-Intensity Recreation (including hunting) and other activities would take place on Preservation
 6 lands.

7
 8 Preservation is the land-use designation which bears the strongest resemblance to the
 9 land-use alternative chosen by the *Hanford Reach of the Columbia River, Comprehensive River
 10 Conservation Study and Environmental Impact Statement, Record of Decision* (NPS 1996). That
 11 Department of the Interior NEPA ROD determined that the best use of the Wahluke Slope is as a
 12 NWR. The DOE concurred that the Wahluke Slope should be a NWR. The CTUIR supported
 13 that decision, as did other Tribes, governments, and stakeholder groups.

14
 15 Moreover, as the No-Action Alternative indicates, the Saddle Mountain NWR, which is
 16 managed by the USFWS, is currently managed in a manner that is most analogous to
 17 Preservation. Likewise, the Wahluke Wildlife Recreation Area is managed in the same manner.
 18 In both of these areas, as well as under the Hanford Reach ROD (DOI 1996), grazing is only
 19 allowed as a tool to improve wildlife habitat. Grazing solely for commercial production is not
 20 allowed anywhere on the Site.

21
 22 In practice, none of the Saddle Mountain NWR has been grazed for many years.
 23 Likewise, the portion of the Wahluke Wildlife Recreation Area south of State Highway 24 is not
 24 grazed. Only the portion of the Wahluke State Wildlife Recreation Area north of State Highway 24
 25 has been grazed in order to control cheatgrass. The WDFW lease allowing grazing on the
 26 Wahluke State Wildlife Recreation Area was allowed to expire on December 31, 1998 but, under
 27 SEPA regulations for up to 10 years after the expiration of the lease, the WDFW can reinstate the
 28 grazing lease without public review. Under this Preservation designation, grazing would be
 29 barred entirely. This would result in no changes to the current management of 26,000 ha (64,247
 30 ac) or 73 percent of the Wahluke Slope. In the area north of State Highway 24, alternative
 31 methods for controlling cheatgrass would be adopted.

32
 33 **3.3.6.3.2 The Columbia River Corridor.** Alternative Four would designate almost the
 34 entire Columbia River Corridor as Preservation due to its outstanding natural and cultural
 35 resources. The Columbia River Corridor contains a wealth of aquatic and terrestrial natural
 36 resources, including salmon, sturgeon, mule deer, bald eagles, and many others. The Columbia
 37 River Corridor is also an area where cultural resources such as cemeteries and archaeologic
 38 resources are highly concentrated.

39
 40 The Corridor has historically contained reactors and associated buildings to support
 41 Hanford's former defense production and energy research missions. Nevertheless, remediation
 42 planning documents, public statements of advisory groups, and planning documents such as the
 43 "Record of Decision: Decommissioning of Eight Surplus Production Reactors at the Hanford
 44 Site, Richland, Washington, Environmental Impact Statement" (58 FR 48509, dated
 45 September 16, 1993), have determined that remediation and restoration of the Columbia River
 46 Corridor would return the corridor to a non-developed, natural condition. Restrictions on certain
 47 activities may continue to be necessary to prevent the mobilization of contaminants, the most
 48 likely example of such restrictions being on activities that discharge water to the soil. Although
 49 the Surplus Reactor NEPA ROD calls for the reactor buildings to be demolished and the reactor
 50 blocks to be moved to the Central Plateau, this action might not take place until 2068 or a new
 51 Tri-Party Agreement milestone is negotiated. As a result, the reactor buildings will remain in the
 52 Columbia River Corridor throughout the 50-year planning period addressed by the Final HCP EIS.
 53

1 The Preservation designation would allow managed recreation within the Corridor. This
2 activity would include the continued operation of the White Bluffs boat launch, managed as Low-
3 Intensity Recreation, on the east side of the river. Other infrastructure to support Low-Intensity
4 Recreation would be identified during implementation of the CLUP.
5

6 Alternative Four provides for a High-Intensity Recreation public boat launch located near
7 the Vernita Bridge on the south side of the river. Alternative Four provides another High-Intensity
8 Recreation boat launch, located at the White Bluffs boat launch on the west side of the river. The
9 White Bluffs boat launch would support Tribal treaty-reserved fishing activity throughout the
10 Reach, and would contain appropriate support facilities for that purpose.
11

12 Alternative Four does not provide for the creation of a High-Intensity Recreation tourist
13 facility at the B Reactor. The CTUIR prefers to remove all vestiges of nuclear weapons
14 production from the Hanford Reach.
15

16 **3.3.6.3.3 The Central Plateau.** Consistent with the findings of the *Final Report of the*
17 *Future Site Uses Working Group* (FSUWG 1992), subsequent planning documents, and the
18 general consensus of governments and stakeholders, the Central Plateau would be used for
19 waste management activities, designated in this EIS as Industrial-Exclusive. All permanent
20 waste disposal at the Hanford Site would take place within the Central Plateau. Likewise, R&D
21 activities associated with waste management would take place within this geographic area. Land
22 use within this area would have to be carefully planned during implementation of the CLUP to
23 ensure that DOE would not run short of area for waste management activities. Since the Central
24 Plateau currently contains natural resources of high value, developments that impact these
25 resources would be mitigated using the BRMaP.
26

27 **3.3.6.3.4 The All Other Areas.** The All Other Areas geographic area contains a variety
28 of natural and cultural environments, including large stands of mature sagebrush-steppe, basalt
29 outcrops, an active dune complex, stabilized dunes, a wide variety of archaeological resources,
30 American Indian cemeteries, former agricultural lands, the remains of former DOE facilities, and
31 the remains of two former small towns. Because of the diversity of the All Other Areas,
32 Alternative Four applies a variety of land-use designations to this area. While Low-Intensity
33 Recreation generally does not appear as a separate land use in this geographic area, it is
34 anticipated that during the implementation of the CLUP (Chapter 6), opportunities for compatible
35 Low-Intensity Recreation would be established throughout much of the All Other Areas
36 geographic region.
37

38 Alternative Four recognizes that the area within 3.2 km (2 mi) of the Columbia River (an
39 area much larger than the 400 m [0.25 mi.] area protected by proposed legislation for the Hanford
40 Reach, or considered to be part of the Columbia River Corridor) contains a disproportionately
41 high share of the archaeological resources and cemeteries on the Hanford Site. This area also
42 has high natural resource value as a wildlife corridor. In recognition of these facts and the
43 importance of protecting these resources, Alternative Four designates this expanded corridor
44 area as Preservation.
45

46 Alternative Four also recognizes that the area north of Gable Butte and Gable Mountain
47 (but outside of the expanded corridor area), contains large blocks of mature, relatively
48 undisturbed sagebrush-steppe habitat. Alternative Four places these areas under the
49 Preservation designation because of the increasing rarity of such resources in Central
50 Washington, the need to avoid fragmentation, and the value of these areas as wildlife corridors.
51 Alternative Four differs from Alternative One by including areas of lower quality habitat within this
52 Preservation area. Alternative Four does this in the interest of avoiding fragmentation. Under
53 Alternative Four, these lower quality areas would be prime sites for the location of restoration

1 projects initiated under BRMaP as mitigation for development in other parts of the Hanford Site.
2 Likewise, such areas would be appropriate for natural resource restoration initiated under the
3 natural resource damage restoration provisions of CERCLA. The area north of the ALE Reserve
4 and south of Umtanum Ridge (also known as McGee Ranch) would be designated Preservation
5 because of its value as a wildlife corridor and in the interest of avoiding fragmentation. This area
6 would also be a suitable location for habitat impact mitigation activities.
7

8 Alternative Four recognizes that the basalt outcrops beginning with Gable Mountain in the
9 east and moving west through Gable Butte and Umtanum Ridge have been of great religious and
10 cultural importance to members of the CTUIR, members of other Hanford-affected Tribes, and
11 their ancestors for many millennia. These sites continue to be of great religious importance to
12 many members of the CTUIR and other Hanford-affected Tribes. In addition to religious
13 importance, these sites are of great cultural and archaeologic value to members of the CTUIR in
14 general. These outcrops also have distinct habitat value, such as providing raptor perching area
15 and talus slope habitat. In recognition of the irreplaceable cultural value of these resources and
16 their biological importance, Alternative Four designates these areas as Preservation.
17

18 An important part of cultural and religious use of a basalt outcrop such as Gable Mountain
19 is the view such areas provide of the surrounding landscape. When this landscape is damaged
20 by development -- especially when that development occurs relatively near the viewpoint -- the
21 cultural use of the Site is seriously injured. The CTUIR members' use of Gable Mountain and
22 Gable Butte has already been significantly injured by the development of the Central Plateau. To
23 prevent further injuries to the central basalt outcrops' viewshed, Alternative Four designates the
24 area north of the Central Plateau and south of the outcrops, as well as the area east of the
25 Central Plateau (also known as May Junction), as Preservation. Designation of the May Junction
26 area as Preservation is especially critical, due to its close proximity to Gable Mountain (see
27 Chapter 4, Figure 4-33). The designation as Preservation of other portions of the All Other Areas
28 geographic region, mentioned above, also supports the protection of the central basalt outcrops'
29 viewsheds.
30

31 Existing structures on Gable Mountain itself also injure CTUIR members' cultural and
32 religious use of the mountain. Under Alternative Four, structures not currently in use would be
33 removed. During implementation (Chapter 6), further steps would be taken to facilitate the
34 relocation of pre-existing, nonconforming structures to more appropriate locations.
35

36 Alternative Four recognizes that the area of active dunes, located north of Energy
37 Northwest (formerly known as WPPSS), is similar to the basalt outcrops in being an area of great
38 religious and cultural significance as well as being an area of distinct habitat value. Alternative
39 Four would treat these dunes in a similar manner to the basalt outcrops, designating the dune
40 area as Preservation.
41

42 This alternative anticipates that work in the Central Plateau Industrial-Exclusive waste
43 management area may require the consumption of large quantities of sand, gravel, and basalt for
44 capping material. Economic considerations would likely require that these materials come from
45 areas near the Central Plateau. While making it clear that the basalt outcrops and the active
46 dunes area are fundamentally inappropriate for such consumptive uses, Alternative Four does
47 anticipate the need to make such materials available. As a result, Alternative Four designates a
48 large area near the Central Plateau and between the Plateau and the southeastern border of the
49 Hanford Site as Conservation (Mining). This area contains a variety of soil and rock types
50 allowing DOE several options for locating quarries which would meet anticipated waste
51 management specifications and quantities.

1
2 While the Conservation (Mining) designation provides DOE with the means to satisfy its
3 need for geologic materials, the designation also reflects the high quality of the habitat in this
4 area. Portions of this area contain some of the largest and highest quality mature sagebrush
5 communities on the Hanford Site. Were it not for the need to supply DOE with geologic material,
6 much of this area would most appropriately be designated Preservation. As a result, DOE would
7 need to make prudent choices regarding the removal of needed material, so as to minimize
8 impacts to this generally high-quality habitat. Such decisions would be made during
9 implementation of the CLUP (Chapter 6). Likewise, the provisions of BRMaP would provide
10 incentive for DOE to minimize these impacts, while also providing the assurance that such
11 impacts would be appropriately mitigated. If these geologic materials are not needed to support
12 the Waste Management and cleanup mission, the land-use designation for this area should revert
13 to Preservation.

14
15 The southern portion of the area, which Alternative Four designates Conservation
16 (Mining), contains the existing LIGO facility. Alternative Four treats LIGO as a pre-existing,
17 nonconforming use. The LIGO facility would continue to operate throughout its life span, but its
18 use could not be altered to increase its nonconformity, and similar R&D facilities could not be
19 located in this area. This area also contains the square mile of land owned by the State of
20 Washington, but not currently developed. The State of Washington's reason for purchasing this
21 land was to build a hazardous waste treatment, storage and disposal facility on this site (State of
22 Washington 1980). In the view of the CTUIR, such a facility would be a poorly reasoned use of
23 the land. Because this square mile of land is not owned by DOE, this EIS apparently cannot
24 determine the land use on this land. It appears that such a determination can only be made by
25 Benton County. The CTUIR urges Benton County and the State of Washington to agree to a
26 land-use designation for this square mile which is consistent with the designation for the
27 surrounding land adopted in the ROD for this Final HCP EIS.

28
29 Alternative Four designates the portion of the All Other Areas geographic area that is
30 south and east of the Wye Barricade (between State Highway 10 and the Hanford Site rail line) as
31 Research and Development and Industrial in roughly equal amounts. Alternative Four provides
32 4,388 ha (10,843 ac) for Research and Development. The primary purpose of this land would be
33 to meet any future DOE need for additional research facilities to support the remediation, Waste
34 Management, and restoration mission. Nevertheless, Alternative Four recognizes that from time
35 to time, proposals will be made for the development of R&D facilities on the Hanford Site that are
36 unrelated to the cleanup mission. Alternative Four provides adequate land for the development of
37 facilities that make efficient use of available resources, while screening out facilities that are
38 highly consumptive of Hanford resources. Such facilities could also be located on available land
39 within the Industrial designation.

40
41 While current studies (e.g., the *City of Richland's Comprehensive Plan* [CoR 1997] and
42 the *Draft Benton County Comprehensive Plan* [BCPD 1997]) indicate there will be little or no
43 demand for industrial sites in this area in the next 20 years, Alternative Four recognizes that when
44 private commercial industrial development begins onsite, it would most likely occur in the area
45 immediately north of the City of Richland. Length of commute, distance required for the
46 extension of utilities, and similar factors would encourage private commercial development to
47 take place in this area. While the demand for such land is at this point highly speculative,
48 Alternative Four recognizes that the CLUP adopts a 50-year planning horizon, and that such
49 development may occur within that time frame. As a result, Alternative Four provides 6,882 ha
50 (17,006 ac) for Industrial development. Planning concerning the provision of infrastructure to
51 support industrial development in this area, planning determining the sequence of development in
52 this area, and planning aimed at discouraging sprawl would all occur during implementation of the
53 CLUP (see Chapter 6).

1 Finally, Alternative Four designates a 3.2 km (2 mi) corridor along the Yakima River as
2 Preservation for the same reasons a similar corridor along the Columbia River was designated
3 Preservation (i.e., the density of archaeological sites combined with the area's value as a wildlife
4 corridor).

5
6 **3.3.6.3.5 The Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve).** The
7 same cultural and religious values that pertain to the central basalt outcrops apply with equal
8 force to Rattlesnake Ridge, the dominant feature of the ALE Reserve. The ALE Reserve is
9 currently managed by the USFWS. In recognition of the ALE Reserve's outstanding natural and
10 cultural resource value, the ALE Reserve geographic area has been managed for the past
11 30 years in a manner that is consistent with the Preservation designation. Alternative Four would
12 continue that mode of management, designating this area Preservation. The sole exception is an
13 area of the ALE Reserve bordering State Highway 240 near the 200 West Area that would be
14 designated Conservation (Mining). This area contains large near-surface basalt and soil sources
15 which would provide an adequate and economic source for Central Plateau waste management
16 needs. Since no siting decision has been made, it is not certain that this area would be used as
17 a quarry site. If the site is not used as a source for waste site capping material, the land-use
18 designation should revert to Preservation. This analysis would occur during implementation of
19 the CLUP (see Chapter 6).

20
21 The ALE Reserve geographic area contains buildings and structures that are currently not
22 in use. Structures that are nonconforming and which are not in use at the time the CLUP is
23 finalized cannot be used in a nonconforming manner after the adoption of the CLUP in the ROD
24 for this EIS (see Chapter 6). Under Alternative Four, structures not currently in use would be
25 removed. During implementation, further steps would be taken to facilitate the relocation of pre-
26 existing, nonconforming structures to more appropriate locations.

1 **3.4 Summary of Potential Environmental Impacts**
2

3 The CEQ NEPA implementing procedures (40 CFR 1500-1508) require a comparative
4 summary of potential environmental impacts and mitigation measures be presented in the
5 alternatives chapter. Table 3-3 contains a summary of land-use designation areas by alternative.
6 For ease in understanding, the table is repeated in hectares, acres, square miles, and
7 percentages. Table 3-4 contains a summary of potential cumulative impacts from the land-use
8 alternatives by impacted resource. Detailed analyses of potential environmental impacts for each
9 of the land-use alternatives are given in Chapter 5 of this document.

10
11 **3.4.1 Comparison of Affected Areas by Alternative**
12

13 Table 3-3 is a comparative summary of the amount of acreage under each alternative that
14 would be potentially subject to impacts from development. In addition to the 148,080 ha (572 mi²)
15 of land surface areas, this EIS affects 3,642.3 ha (14.1 mi²) of surface water, almost all of which
16 is the Columbia River (i.e., a navigable river) where access cannot be controlled. Because
17 access cannot be controlled on the Columbia River, it has no land-use designation. For this EIS,
18 the 1,517 km² (586 mi²) area within the boundary of the Hanford Site includes both the land area
19 and the river area.
20

21 **3.4.2 Comparison of Affected Environmental Resources and Other NEPA Values**
22

23 The effects of choosing a land-use alternative are discussed for the following subject
24 areas: (1) geologic resources, (2) water resources, (3) biological resources, (4) cultural
25 resources, (5) aesthetic resources, (6) socioeconomic resources, (7) environmental justice, and
26 (8) human health. Many of the potentially significant adverse impacts would occur as a result of
27 disturbances of relatively pristine natural areas on the Hanford Site.
28

29 Natural plant and wildlife communities have flourished, sensitive species have been
30 preserved, and archaeological and cultural resources have been protected because historically
31 large areas of the Hanford Site have been used solely for security buffers. Each alternative uses
32 an unique balance of impact avoidance (i.e., committing the land to preservation or conservation)
33 versus impact mitigation. This balance is based on the planning goals, objectives, and values
34 (i.e., vision) of each alternative. For example, Alternative Two relies almost exclusively on
35 avoidance by designating 95 percent of the Hanford Site as Preservation. Therefore, among the
36 alternatives, Alternative Two provides the highest level of resource protection. But this resource
37 protection is at the sacrifice of multiple-use goals where the Hanford Site's natural and
38 infrastructure resources could be used for economic development. Mitigation of disturbance
39 effects through the use of policies and implementing procedures as an augmentation to the
40 alternative map, is an alternate means of resource protection exemplified best by Alternative
41 Three. Mitigation is the form of resource protection employed by more development-oriented or
42 multiple-use oriented alternatives. Successful mitigation depends on the adopted CLUP map
43 working in concert with the CLUP policies and implementing procedures to protect unique,
44 cultural, or sensitive resources through avoidance of impacts after site-specific considerations or
45 mitigation of the impacts by prescribed mitigation procedures. The Implementing Procedures
46 (e.g., project review, resource management plans (RMPs), AMPs, and NEPA or SEPA reviews)
47 provide mitigation guidelines where avoidance is less desirable than project implementation with
48 mitigation.
49

50 The alternatives vary in their reliance on avoidance or mitigation as the principal means of
51 protection. Because it has no land-use designations, policies, or implementing procedures
52 based on a CLUP, the No-Action Alternative relies almost exclusively on mitigation through NEPA.
53 All the other alternatives fall between Alternative Two and the No-Action Alternative with respect to
54 the balance used between impact avoidance and mitigation.

1 The DOE intends to prepare a Mitigation Action Plan after the ROD for this EIS is issued
 2 which would address mitigation commitments made in the ROD. In general, these mitigation
 3 commitments can be expected to include updating the existing resource management plans
 4 such as the CRMP, BRMaP, and *Hanford Bald Eagle Management Plan*; and committing to a
 5 schedule to develop additional resource management plans (e.g., Minerals Resources
 6 Management Plan) under the procedures outlined in Chapter 6. The resource impact analyses in
 7 Chapter 5 of this Final HCP EIS include ranges of potential mitigation measures for each land-
 8 use alternative.

9
10
11 **Table 3-3. Comparisons of Affected Areas by Alternative. (4 pages)**

	No-Action ^a	Preferred Alt.	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Areas in Hectares						
Agriculture	0	0 (0) ^b	0	0	23,951	0
Conservation (Mining and Grazing)	0	0 (43,857) ^b	0	0	6,476	0
Conservation (Mining)	0	44,183 (1,005) ^b	15,921	0	72,685	19,341
Industrial	22,534	15,335 (15,378) ^b	2,542	1,830	17,860	6,882
Industrial-Exclusive	5,064	5,064	4,593	4,593	5,064	5,064
Preservation	46,366	78,127 (77,449) ^b	124,517	140,767	9,002	112,321
High-Intensity Recreation	0	125 (82) ^b	64	191	1,768	77
Low-Intensity Recreation	1	334	29	0	3,097	7
Research and Development	0	4,912	414	699	8,177	4,388
Open Space Reserved	74,115	0	0	0	0	0
TOTAL^c	148,080	148,080	148,080	148,080	148,080	148,080

26 ^a The No-Action Alternative does not have land-use designations. It has areas administered similar to
 27 land-use designations (see Figure 3-2).

28 ^b Areas in Revised Draft EIS.

29 ^c In addition to the 148,080 ha (572 mi²) of land surface areas, this EIS affects 3,642.3 ha (14.1 mi²) of
 30 surface water, almost all of which is the Columbia River.
 31

Table 3-3. Comparisons of Affected Areas by Alternative. (4 pages)

	No-Action ^a	Preferred Alt.	Alt. 1	Alt. 2	Alt. 3	Alt. 4
1	Areas in Acres					
2	Agriculture	0 (0) ^b	0	0	59,184	0
3	Conservation (Mining and Grazing)	0 (108,371) ^b	0	0	16,003	0
4	Conservation (Mining)	0	109,179 (2,483) ^b	39,342	0	179,609 47,793
5	Industrial	55,684	37,894 (38,000) ^b	6,281	4,522	44,133 17,006
6	Industrial-Exclusive	12,513	12,323	11,350	11,350	12,513 12,513
7	Preservation	114,573	193,056 (191,381) ^b	307,688	347,843	22,244 277,551
8	High-Intensity Recreation	0	309 (203) ^b	158	472	4,369 190
9	Low-Intensity Recreation	2	825	72	0	7,653 17
10	Research and Development	0	12,138	1,023	1,727	20,206 10,843
11	Open Space Reserved	183,142	0	0	0	0 0
12	TOTAL^c	365,914	365,914	365,914	365,914	365,914

^a The No-Action Alternative does not have land-use designations. It has areas administered similar to land-use designations (see Figure 3-2).

^b Areas in Revised Draft EIS.

^c In addition to the 148,080 ha (572 mi²) of land surface areas, this EIS affects 3642.3 ha (14.1 mi²) of surface water, almost all of which is the Columbia River.

Table 3-3. Comparisons of Affected Areas by Alternative. (4 pages)

	No-Action ^a	Preferred Alt.	Alt. 1	Alt. 2	Alt. 3	Alt. 4
1	Areas in Square Miles					
2	Agriculture	0 (0) ^b	0	0	92	0
3	Conservation (Mining and Grazing)	0 (169) ^b	0	0	25	0
4	Conservation (Mining)	0 (4) ^b	61	0	281	75
5	Industrial	87 (59) ^b	10	7	69	27
6	Industrial-Exclusive	20	20	18	18	20
7	Preservation	179 (299) ^b	481	544	35	434
8	High-Intensity Recreation	0	0	1	7	0
9	Low-Intensity Recreation	0	1	0	12	0
10	Research and Development	0	19	2	3	32
11	Open Space Reserved	286	0	0	0	0
12	TOTAL^c	572	572	572	572	572

^a The No-Action Alternative does not have land-use designations. It has areas administered similar to land-use designations (see Figure 3-2).

^b Areas in Revised Draft EIS.

^c In addition to the 148,080 ha (572 mi²) of land surface areas, this EIS affects 3642.3 ha (14.1 mi²) of surface water, almost all of which is the Columbia River.

Table 3-3. Comparisons of Affected Areas by Alternative. (4 pages)

	No-Action ^a	Preferred Alt.	Alt. 1	Alt. 2	Alt. 3	Alt. 4	
1	Percentage of Area						
2	Agriculture	0.00%	0.00% (0.00%) ^b	0.00%	0.00%	16.17%	0.00%
3	Conservation (Mining and Grazing)	0.00%	0.00% (29.62%) ^b	0.00%	0.00%	4.37%	0.00%
4							
5	Conservation (Mining)	0.00%	29.84% (0.68%) ^b	10.75%	0.00%	49.08%	13.06%
6	Industrial	15.22%	10.36% (10.38%) ^b	1.72%	1.41%	12.06%	4.65%
7	Industrial-Exclusive	3.42%	3.42%	3.10%	3.10%	3.42%	3.42%
8	Preservation	31.31%	52.76% (52.30%) ^b	84.09%	94.89%	6.08%	75.85%
9	High-Intensity Recreation	0.00%	0.08% (0.06%) ^b	0.04%	0.13%	1.19%	0.05%
10	Low-Intensity Recreation	0.00%	0.23%	0.02%	0.00%	2.09%	0.00%
11	Research and Development	0.00%	3.32%	0.28%	0.47%	5.52%	2.96%
12	Open Space Reserved	50.05%	0.00%	0.00%	0.00%	0.00%	0.00%
13	TOTAL	100.00%	100.00	100.00	100.00	100.00	100.00

^a The No-Action Alternative does not have land-use designations. It has areas administered similar to land-use designations (see Figure 3-2).

^b Areas in Revised Draft EIS.

^c In addition to the 148,080 ha (572 mi²) of land surface areas, this EIS affects 3642.3 ha (14.1 mi²) of surface water, almost all of which is the Columbia River.

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Table 3-4. Summary of Potential Impacts to Hanford Site Resources. (8 pages)

Resource	Preferred Alternative	Alternative One	Alternative Two	Alternative Three	Alternative Four	No-Action Alternative
GEOLOGIC RESOURCES						
Features	Unique geologic features such as Gable Mountain, Gable Butte, the White Bluffs; and active sand dunes would be protected.	Same as the Preferred Alternative.	Same as the Preferred Alternative. Stabilized sand dunes would also be protected.	Unique geologic features could be developed to obtain materials for remediation and economic development.	Same as the Preferred Alternative except stabilized sand dunes would also be protected.	Unique geologic features could be developed.
Missoula Flood Deposits	Missoula Flood features would be protected by Plan Policies and Procedures.	Missoula Flood features would be protected by Plan Policies and Procedures.	Missoula Flood features would be protected by Plan Policies and Procedures.	Missoula Flood features would be protected by Plan Policies and Procedures.	Missoula Flood features would be protected.	Same as Preferred Alternative because of their cultural significance.
Geologic Materials	Viable sources of geologic materials for governmental purposes could be developed.	Geologic materials could be developed only from existing quarries and to support remediation.	Geologic resources to support remediation would need to be obtained from offsite sources.	Same types of impacts as the Preferred Alternative, but applied to 66% more surface area.	Geologic materials could be developed only to support remediation.	Commercial development of geologic resources would not be restricted.
Natural Gas	Existing natural gas claims on the ALE Reserve could be developed, but the Preservation designation surrounding those claims would preclude construction of an access road.	Same as Preferred Alternative.	Same as Preferred Alternative.	Existing natural gas claims could be developed and an access road could be constructed under the Conservation (Mining) designation.	Same as Preferred Alternative.	Existing natural gas claims could be developed and an access road could be constructed.
Soils	Soil compaction and erosion could occur around quarry sites.	Soil compaction and erosion could occur around quarry sites.	The potential for soil erosion and compaction would be minimized by maintaining existing vegetative cover and precluding development.	Soil compaction and erosion could occur around quarry sites. Cultivated agriculture would increase soil erosion through removal of existing cover and tillage.	The potential for soil erosion and compaction would be minimized. Some soil erosion and compaction could occur as a result of mining in support of remediation.	Mining, grazing, and cultivated agriculture could increase soil compaction or erosion.

Table 3-4. Summary of Potential Impacts to Hanford Site Resources. (8 pages)

Resource	Preferred Alternative	Alternative One	Alternative Two	Alternative Three	Alternative Four	No-Action Alternative
1 WATER RESOURCES						
2 3 4 Surface Water	Runoff from mining operations located close to the Columbia River could lead to water quality degradation.	Mining restricted to upland areas would have little impact on water quality.	Mining, grazing, and agriculture would not be allowed; therefore, there would be no impacts to surface water.	Mining prohibited within 1/4 mile of the Columbia River, would have little impact on water quality.	Same as Alternative One.	Same as the Preferred Alternative.
	Grazing would not be allowed, so no impacts would result from this activity.	Grazing would not be allowed, so no impacts would result from this activity.	Experimental aquaculture could increase the nutrient load in the Columbia River.	Grazing permitted in irrigation flow returns on the Wahluke Slope, potentially leading to increased siltation.	Grazing would not be allowed, so no impacts would result from this activity.	Same as the Preferred Alternative.
	Increased recreational access to the Columbia River could increase shoreline erosion from boating wake and could generate additional pollution, such as oil, gas, and engine exhaust.	Similar to the Preferred Alternative, but fewer access points would be provided and use of the river might not increase as much.	Recreational access to the Columbia River would not be increased.	Same types of impacts as the Preferred Alternative, but applied to 66% more surface area.	Similar to the Preferred Alternative.	Same as Alternative Two.
5 Groundwater	Mining operations could require groundwater withdrawal for material washing and dust control. Surface water could also collect in quarry sites increasing groundwater recharge locally.	Similar to the Preferred Alternative.	Mining operations would not be allowed.	Same types of impacts as the Preferred Alternative, but applied to 66% more surface area.	Same as the Preferred Alternative.	Same as the Preferred Alternative.
	Groundwater withdrawal for industrial uses could alter flow patterns. Discharges to the soil column could mobilize contaminants in the vadose zone and accidental releases could contaminate groundwater.	New impacts to groundwater from industrial development would be minimal.	New impacts to groundwater from industrial development would be minimal.	Same as the Preferred Alternative. Agricultural chemicals could impact Wahluke groundwater and recharge from Wahluke irrigation could alter flow patterns and lead to slumping in the White Bluffs.	Same as the Preferred Alternative.	Same potential impacts as the Preferred Alternative, but new impacts could be distributed across the Hanford Site. Potential impacts from Agriculture similar to Alternative Three.

Table 3-4. Summary of Potential Impacts to Hanford Site Resources. (8 pages)

Resource	Preferred Alternative	Alternative One	Alternative Two	Alternative Three	Alternative Four	No-Action Alternative
1 BIOLOGICAL RESOURCES						
2 3 Federal Endangered Species	Increased protection of the river from development would ensure salmon and steelhead spawning areas are protected. Increased recreational access to the Columbia River could adversely affect salmonid spawning areas and the proposed Tribal Village and White Bluffs boat launch could impact the Bald Eagle nesting attempts.	Protects all species from development and restricts access to the Columbia River. Does not assume consumptive use of species through treaty-reserved rights. Is the Environmentally Preferable Alternative.	Protects all species from development and restricts access to the Columbia River. Allows consumptive use of species through treaty-reserved rights.	Increased threat to habitat from Wahluke Slope development. Increased protection of the river from development would help protect salmon and steelhead spawning areas. Increased recreational access to the Columbia River could adversely affect salmonid spawning areas. Proposed High Intensity Recreation Area and White Bluffs boat launch could impact the Bald Eagle nesting attempts.	Protects all species from development and restricts access to the Columbia River. Allows consumptive use of species through treaty-reserved rights.	Between Preferred Alternative and Alternative One.
4 Vegetation	Surface clearing would eliminate vegetation and wildlife habitat in areas designated for development.	Much lower than the Preferred Alternative.	Much lower than the Preferred Alternative.	Greater impacts than the Preferred Alternative. Clearing of vegetation for cultivated agriculture.	Less than the Preferred Alternative.	Greater than the Preferred Alternative.
5 Habitat	Utility corridors and access roads could fragment habitat within areas designated for industrial development. Generally protected by Plan's Policies that designate development in habitat that is of lower biological value.	Lower than under the Preferred Alternative.	Potential impacts restricted to urban growth area.	Same as the Preferred Alternative, but larger areas designated for development, so potential greater need for new infrastructure.	Less than the Preferred Alternative.	Greater than Preferred Alternative.
6 Grazing	Grazing would not be allowed under this alternative.	Commercial grazing is not allowed under this alternative.	Commercial grazing would not be allowed under this alternative.	Grazing is a permitted interim use for other than Preservation or Conservation uses under this alternative's Policies.	Grazing is not allowed under this alternative.	Grazing impacts restricted to the Wahluke Slope north of State Highway 24.

Table 3-4. Summary of Potential Impacts to Hanford Site Resources. (8 pages)

	Resource	Preferred Alternative	Alternative One	Alternative Two	Alternative Three	Alternative Four	No-Action Alternative
1	Aquatic Resources	Increased recreational access to the Columbia River could adversely affect salmonid spawning areas, aquatic plant communities, and other resources associated with the river.	Lower than the Preferred Alternative.	No increase in recreational access under this alternative, so no new impacts.	Same impact as the Preferred Alternative.	Similar, but potentially lower, impacts than the Preferred Alternative.	Less than the Preferred Alternative because no new boat ramps.
2 3	Wildlife Migration Corridor	The integrity of the wildlife migration corridor associated with McGee Ranch would be maintained.	Same as the Preferred Alternative.	Same as the Preferred Alternative.	McGee Ranch available for development.	Same as the Preferred Alternative.	McGee Ranch available for development.
4 5 6	Preservation of BRMaP Level III and Level IV Resources	Preservation designation would protect 66% of BRMaP Level III, and 85% of BRMaP Level IV resources.	Preservation designation would protect 92% of BRMaP Level III and 85% of BRMaP Level IV resources.	Preservation designation would protect 96% of BRMaP Level III and 85% of BRMaP Level IV resources.	Preservation designation would protect 5% of BRMaP Level III and 13% of BRMaP Level IV resources.	Preservation designation would protect 85% of BRMaP Level III and 85% of BRMaP Level IV resources.	The No-Action Alternative does not specifically designate land for Preservation.
7	CULTURAL RESOURCES						
8	Religious Sites	Cultural resources and religious sites associated with basalt outcrops such as Gable Butte and Gable Mountain would be protected.	Same as the Preferred Alternative.	Same as the Preferred Alternative.	Cultural resources and religious sites associated with basalt outcrops such as Gable Butte and Gable Mountain would be protected by Plan Policies and Procedures.	Same as the Preferred Alternative.	Cultural resources and religious sites associated with basalt outcrops such as Gable Butte and Gable Mountain would be protected by CRMP Plan Policies and Procedures.
9	Viewsheds	Mining and industrial development could occur within viewsheds from high promontories.	Area that could be developed within viewsheds is smaller than for the Preferred Alternative.	Viewsheds would be protected. Impacts would be less than for the Preferred Alternative.	Development could occur within viewsheds to a greater extent than for the Preferred Alternative.	Same as Alternative Two. Less than the Preferred Alternative.	Development not precluded at any location. Greater than for the Preferred Alternative.
10 11	Natural Resource Gathering Areas	Damage to natural resource gathering areas from development and increased recreational use of the Columbia River.	Less than the Preferred Alternative.	Impacts to natural resource gathering areas would be minimal.	Damage to natural resource gathering areas from development, increased recreational use of the Columbia River, and grazing.	Less than the Preferred Alternative.	Greater than the Preferred Alternative.

Table 3-4. Summary of Potential Impacts to Hanford Site Resources. (8 pages)

	Resource	Preferred Alternative	Alternative One	Alternative Two	Alternative Three	Alternative Four	No-Action Alternative
1	Cultural Sites	Damage to cultural sites from development. Increased access to the Columbia River could result in damage from artifact collection, vandalism, and erosion.	Less than the Preferred Alternative.	Commercial grazing would not be allowed and impacts to cultural sites from development would be minimal. Access to the Columbia River would not be increased.	Impacts to the Wahluke Slope and White Bluffs only. Damage to cultural sites on the Wahluke Slope from agriculture (including grazing), and could lead to loss of the White Bluffs.	Less than the Preferred Alternative. No grazing would be allowed.	Greater than the Preferred Alternative.
2 3	Salmonid Spawning Sites	No impact to salmonid spawning sites.	No impact to salmonid spawning sites.	No impact to salmonid spawning sites.	Increased sediment loading from White Bluffs irrigation sloughing, and grazing could damage salmonid spawning sites.	Same as Alternative Two.	Between Alternative Three and Preferred Alternative.
4	AESTHETIC RESOURCES						
5 6	Viewsheds	Viewing locations associated with Gable Butte and Gable Mountain would be protected. Locations associated with the Columbia River would be disrupted. Viewsheds could be disrupted.	Same as the Preferred Alternative.	Minimal impacts; less than the Preferred Alternative.	Viewing locations associated with basalt outcrops could be adversely impacted, but locations along the river would be protected. Viewsheds could be disrupted.	Viewing locations would be protected. Minimal impacts to viewsheds. Less than the Preferred Alternative.	Viewing locations and viewsheds could be adversely impacted. Greater than the Preferred Alternative.
7 8	Ambient Visibility	Visibility could be impacted by releases of fugitive dust from construction sites and pollutants from new industrial sources.	Similar to, but less than, the Preferred Alternative.	Minimal impacts; less than the Preferred Alternative.	Greater than the Preferred Alternative.	Less than the Preferred Alternative.	Greater than the Preferred Alternative.
9	Ambient Noise	Blasting, industrial sites, and increased use of motorized water craft could increase noise levels, disrupt wildlife, and detract from recreational experiences.	Less than the Preferred Alternative.	Minimal impacts; less than the Preferred Alternative.	Greater than the Preferred Alternative.	Less than the Preferred Alternative.	Same as the Preferred Alternative.

Table 3-4. Summary of Potential Impacts to Hanford Site Resources. (8 pages)

Resource	Preferred Alternative	Alternative One	Alternative Two	Alternative Three	Alternative Four	No-Action Alternative
1 2 3 SOCIOECONOMICS AND INDUSTRIAL DEVELOPMENT	15,335 ha available for industrial development, which would meet the need forecasted by the Benton County Planning Department and provide ample area to support possible future DOE missions. This amount of land would support employment of 1,000 or more.	2,542 ha available for industrial development, which would meet the forecasted need and provide 1,615 ha for possible future DOE missions. This land could support employment of 100 to 1,000.	1,830 ha available for industrial development, but much of the land is already developed. Would not provide sufficient vacant land to meet Benton County's estimated future needs or provide for possible future DOE missions. Employment limited to less than 100.	17,860 ha available for industrial development, which would meet the need forecasted by the Benton County Planning Department and provide ample area to support possible future DOE missions. This amount of land would support employment of 1,000 or more.	6,882 ha available for industrial development, meeting the estimated future need and providing land for future DOE missions. This land could support employment of 100 to 1,000.	Facility planning and siting conducted on a project-by-project basis as guided by the 1996 <i>Hanford Strategic Plan</i> . At least 22,534 ha available to support future Industrial or Research and Development DOE missions
4 5 RESEARCH AND DEVELOPMENT	4,912 ha designated for Research and Development could support up to 300 employees.	414 ha designated for Research and Development, but limited to previously developed areas.	Research and Development limited to 699 ha of existing uses at LIGO and the K Reactor water supply used for fish rearing.	Greater than the Preferred Alternative 8,177 ha designated for Research and Development could support up to 600 employees	4,388 ha designated for Research and Development could support up to 300 employees	Facility siting conducted on a project-by-project basis. Ample land available. At least 22,534 ha available to support future Industrial or Research and Development DOE missions
6 7 GRAZING AND AGRICULTURE	No lands designated for grazing or cultivated agriculture.	No lands designated for commercial grazing or cultivated agriculture.	No lands designated for commercial grazing. Cultivated agriculture would not be allowed.	1,059 AUM with a value of \$12,700. Cultivated agriculture could generate from \$16 to \$88 million in additional revenue depending on the scenario.	No lands designated for grazing or cultivated agriculture.	Lack of a plan may discourage multiple use of Hanford lands and grazing and agriculture would be considered under individual proposals. Lands permitted for grazing could support 1,655 AUM with a value of \$19,900. Cultivated agriculture would be allowed.
8 9 10 MINERAL RESOURCES (Privately Held)	Existing natural gas claims could be developed, but the Preservation designation in the surrounding area would preclude construction of an access road.	Same as the Preferred Alternative.	Same as the Preferred Alternative.	Existing claims could be developed and access roads could be constructed. Additional development of natural gas could be encouraged.	Same as the Preferred Alternative.	Existing natural gas claims could be developed and access roads could be constructed.

Table 3-4. Summary of Potential Impacts to Hanford Site Resources. (8 pages)

Resource	Preferred Alternative	Alternative One	Alternative Two	Alternative Three	Alternative Four	No-Action Alternative
1 RECREATION	Increased recreation could increase revenues generated by tourism.	Less than the Preferred Alternative.	Less than the Preferred Alternative.	A destination resort/conference center at Vernita Terrace could generate up to \$2 million to \$4 million in payroll.	Less than the Preferred Alternative.	New revenue generating recreational opportunities would be unlikely.
2 ENVIRONMENTAL 3 JUSTICE	Increased access to the Columbia River would potentially increase exposure and health risk. Minority or low-income populations may be more prone to adopt a subsistence lifestyle, but a particular population would not necessarily be affected.	Because the purpose of a Federal Wildlife Refuge is to conserve native ecological systems, consumption of those systems would be limited and therefore provide better protection from contamination than the Preferred Alternative.	Access to the Columbia River would be limited. No disproportionately high and adverse impacts would occur.	Same as the Preferred Alternative.	Same as the Preferred Alternative.	Same as the Preferred Alternative.
	Areas of cultural value to American Indians would be protected, but development would be allowed within the viewscape of some of those areas.	Same as the Preferred Alternative.	Same as the Preferred Alternative, but viewsapes would also be protected.	Areas of cultural value to American Indian Tribes could be developed and development could occur within culturally significant viewsapes.	Same as Alternative Two.	Same as Alternative Three.
	Economic development of Hanford Site lands would be neutral in low-income and minority communities within the assessment area.	Limitation on development could adversely impact low-income populations. However, local low-income populations are not greatly influenced by Hanford Site spending.	Same as Alternative One.	Same as Preferred Alternative.	Same as Preferred Alternative.	Same as Preferred Alternative.
	Prohibiting agriculture on the Wahluke Slope would not change the current condition.	Same as the Preferred Alternative.	Same as the Preferred Alternative.	Agriculture would be allowed on the Wahluke Slope, potentially benefitting low-income and minority populations..	Same as the Preferred Alternative.	Same as the Preferred Alternative.

Table 3-4. Summary of Potential Impacts to Hanford Site Resources. (8 pages)

Resource	Preferred Alternative	Alternative One	Alternative Two	Alternative Three	Alternative Four	No-Action Alternative
1	HUMAN HEALTH Increased access to Hanford Site lands would increase the potential for health risks.	Less than the Preferred Alternative.	Access to Hanford would be limited and the potential for health risks would be minimized.	Greater than the Preferred Alternative because of the intensity of use.	Less than the Preferred Alternative.	Access would be restricted and risks would be less than for the Preferred Alternative.
	New developments on the Hanford Site could lead to an increase in occupational injuries and fatalities associated with mining and industrial activities.	Less than the Preferred Alternative.	Much less than the Preferred Alternative.	Greater than the Preferred Alternative and would have the additional risk of occupational injuries from agriculture.	Less than the Preferred Alternative.	Potentially greater risk than for the Preferred Alternative.
	Increased recreational activities could increase the risk of injury from recreational accidents.	Less than the Preferred Alternative.	No increase in recreational use and the risk of recreational accidents would be minimized.	Greater than the Preferred Alternative.	Less than the Preferred Alternative.	Minimal increase in recreational use. Risk of recreational accidents would not increase.
2	HUMAN HEALTH Remediation to an Industrial standard in the 300 and 200 Areas would involve less remediation worker risk from hazardous materials exposure and cumulative equipment operation time than some of the CRCIA scenarios could require for non-industrial uses. Actual remediation scenario will be picked through the CERCLA/RCRA process which could require more or less remediation based on the scenario chosen.	Minimum Industrial development could require more remediation worker risk exposure than Preferred Alternative.	Minimum Industrial development could require the most remediation worker risk exposure.	Maximum Industrial development could require the least remediation worker risk exposure.	Industrial development between Alternative One and the Preferred Alternative.	Minimal increase in changes of land use from open space reserved designation. The validity of an Industrial remediation scenario could be questioned without an integrated GMA Industrial designation. Actual remediation scenario will be picked through the CERCLA/RCRA process which could require more or less remediation based on the scenario chosen.

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4.0 Affected Environment

The Hanford Site lies within the semi-arid Pasco Basin of the Columbia Plateau in southeastern Washington State. The Hanford Site occupies an area of approximately 1,517 square kilometers (km²) (586 square miles [mi²]) north of the confluence of the Yakima River with the Columbia River. Within the geographic boundary of the Site, there are 36.42 km² (14.1 mi²) of Columbia River surface water, and one section (1 mi²) of land owned by the State of Washington.

The Hanford Site is about 50 km (30 mi) north to south and 40 km (24 mi) east to west. The Columbia River flows through the northern part of the Hanford Site and, turning south, forms part of the Hanford Site's eastern boundary. The Yakima River runs near the southern boundary and joins the Columbia River below the City of Richland, which bounds the Hanford Site on the southeast. Rattlesnake Mountain, Yakima Ridge, and Umtanum Ridge form the southwestern and western boundaries, and the Saddle Mountains form the Hanford Site's northern boundary. Two small east-west ridges, Gable Butte and Gable Mountain, rise above the plateau of the central part of the Hanford Site. Adjoining lands to the west, north, and east are principally agricultural and range land. The cities of Richland, Kennewick, and Pasco (also referred to as the Tri-Cities) constitute the nearest population center and are located immediately southeast of the Hanford Site. Figure 4-1 depicts the Hanford Site and the surrounding area.

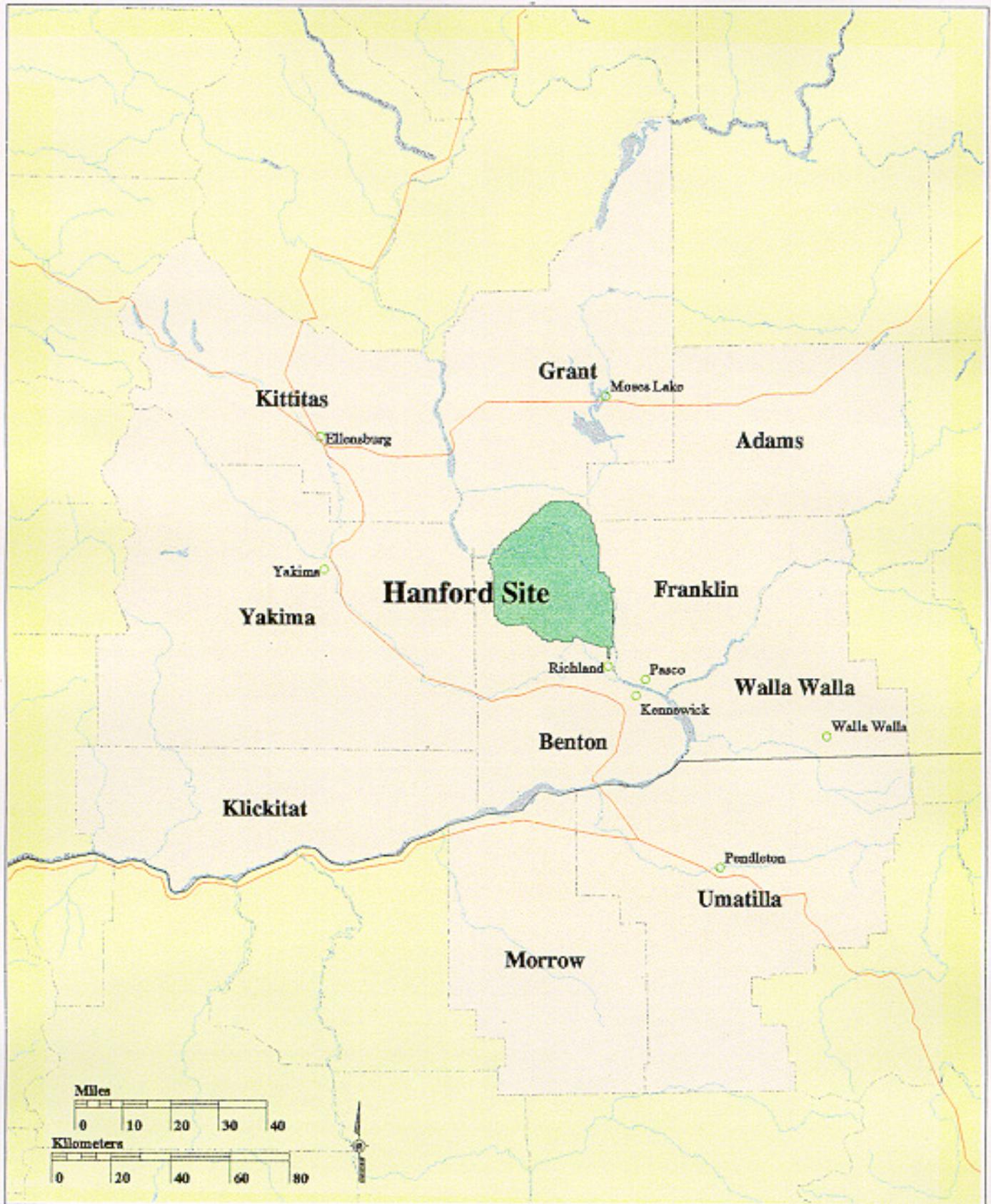
The production of defense nuclear materials at the Hanford Site since the 1940s has necessitated the exclusion of public access and most non-government-related development on the Hanford Site. As a result of its defense-related mission, the Hanford Site has also provided *de facto* protection of the natural environment and cultural resources (NPS 1994); however, the defense nuclear production mission has left the Hanford Site with an extensive waste legacy. Nuclear weapons material production and associated activities at the Hanford Site during the past five decades have generated a variety of radioactive, hazardous, and other wastes that have been disposed of or discharged to the air, soil, and water at the Hanford Site.

4.1 Land Uses

For many years, the area along the Columbia River was used extensively by Tribal members for fishing, hunting, and gathering. Pasturing of livestock became important in pre-contact times. The Cayuse, Umatilla, Walla Walla, and Nez Perce people became very skillful at breeding horses (in the 1700s). When Lewis and Clark first came down the Columbia River, there were great herds of horses grazing the rich hills of southeastern Washington and northeastern Oregon. Although the horse meant greater mobility, these people maintained traditional migratory patterns. The Columbia River supplied an endless cycle of vegetable crops. Most bands gathered at winter sites on or near the Columbia River. Culturally, these sites were used by the same people and their ancestors before them for thousands of years. The routes of migration followed ancient patterns with the band stopping at the same spot it camped the year before. In the early spring, family bands would leave the main encampment on the river and travel to the uplands to dig roots. They timed their returns to utilize the main salmon run in the spring and fall. When they had a sufficient stockpile of dried salmon, they would return to the mountains to gather berries and hunt for game until the snows would push them back to the lowlands near or on islands in the Columbia where they would gather together in the large wintering sites and spend the colder months. Mission, Oregon; Walla Walla, Washington; Pasco, Washington; and Umatilla, Oregon, are just a few of the modern-day names of where some of those old winter camping sites were located.

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Figure 4-1. Hanford Site and the Vicinity.



BHI: rpp 04/22/96 clup/region2.amfDatabase: 08-SEP-1997

1 Land uses at the Hanford Site have changed dramatically over the past 100 years. By the
2 turn of the century, settlers had moved into the area, developing irrigated farmland and practicing
3 extensive grazing (see Figure 1-4). In 1943, the Federal government acquired the Hanford Site
4 for production of nuclear materials to be used in the development of the atomic bomb.
5

6 **4.1.1 Existing Land Uses in the Vicinity of the Hanford Site**

7

8 Existing land uses within the vicinity of the Hanford Site include urban and industrial
9 development, wildlife protection areas, recreation, irrigated and dryland farming, and grazing.
10 According to the 1992 Census of Agriculture (USDA-NASS 1992), Benton, Franklin, and Grant
11 counties had a total of 958,626 hectares (ha) (2,396,564 acres [ac]) (9,586 square kilometers
12 [km²]/3,745 square miles [mi²]) of land in farms, of which 667,027 ha (1,667,568 ac) (6,670 km²/
13 2,606 mi²) were in crop land. Approximately 46 percent of crop land was irrigated in 1992, and
14 approximately 40 percent of crop land in 1992 was used as pastureland. According to the 1992
15 census, the total market value of agricultural products in the three counties was \$935 million,
16 including \$758 million for crops and \$177 million for livestock. In 1994, wheat represented the
17 largest single crop (in terms of area) planted in Benton and Franklin counties. The total area
18 planted in the two counties was 97,490 ha (240,900 ac) (975 km²/376 mi²) and 12,020 ha
19 (29,700 ac) (120 km²/46.4 mi²) for winter and spring wheat, respectively. Other major crops
20 such as alfalfa, apples, asparagus, cherries, corn, grapes, and potatoes are also produced in
21 Benton and Franklin counties (PNNL 1996a). In 1994, the Conservation Reserve Program of the
22 U.S. Department of Agriculture (USDA)¹ included 10,279.8 ha (25,382.3 ac) [102.8 km²/
23 39.7 mi²] in Benton County, 9,359.3 ha (23,109.3 ac) [93.6 km²/ 36.1mi²] in Franklin County, and
24 10,116.8 ha (24,979.8 ac) (101.1km²/39.0 mi²) in Grant County.²
25

26 In 1992, the Columbia Basin Project, a major irrigation project to the north of the Tri-Cities,
27 produced gross crop returns of \$552 million, representing 12.5 percent of all crops grown in
28 Washington State. Also, in that year, the average gross crop value per irrigated acre was \$1,042.
29 The largest percentage of irrigated acres produced alfalfa hay (26.1 percent of irrigated acres),
30 wheat (20.2 percent), and feed-grain corn (5.8 percent). Other significant crops are apples, dry
31 beans, potatoes, and sweet corn (PNNL 1996a).
32

33 Other land uses in the vicinity of the Hanford Site include a planned, low-level radioactive
34 waste decontamination, super-compaction, plasma gasification and vitrification unit (operated by
35 Allied Technology Group Corporation); and a commercial nuclear fuel fabrication facility (operated
36 by Siemens Power Corporation).
37

38 **4.1.2 Existing Hanford Site Land Uses**

39

40 Land-use categories at the Hanford Site include reactor operations, waste operations,
41 administrative support, operations support, sensitive areas, and undeveloped areas. Remedial
42 activities are currently focused within or near the disturbed areas. Much of the Hanford Site is
43 undeveloped, providing a safety and security buffer for the smaller areas used for operations.
44 Public access to most facility areas is restricted.
45

46 **4.1.2.1 Wahluke Slope.** The area north of the Columbia River encompasses approximately 357
47 km² (138 mi²) of relatively undisturbed or recovering shrub-steppe habitat. The northwest portion
48 of the area is managed by the U.S. Fish and Wildlife Service (USFWS) under a permit issued by
49 DOE in 1971 as the Saddle Mountain National Wildlife Refuge (NWR). The permit conditions

1 Agricultural lands at risk for soil erosion set aside to enhance wildlife.

2 Personal conference with Rod Hamilton, Conservation Program Specialist with the USDA, Farm Service Agency, in Spokane, Washington, October 1997.

1 require that the refuge remain closed to the public as a protective perimeter surrounding Hanford
2 operations. The closure has benefitted migratory birds, such as curlews, loggerhead shrikes,
3 and waterfowl.
4

5 Until recently, in the northeast portion of the Wahluke Slope, the Washington State
6 Department of Fish and Wildlife (WDFW) operated the Wahluke State Wildlife Recreation Area,
7 which was established in 1971. In April 1999, the WDFW and the USFWS notified the DOE of
8 their intent to modify their management responsibilities on the Wahluke Slope under the 1971
9 agreement leaving only a small portion (about 324 ha (800 ac)) northwest of the Vernita bridge
10 under WDFW permit. The USFWS informed the DOE that it intends to allow essentially the
11 same uses permitted by the State of Washington under the WDFW's management of the
12 Wahluke Slope. Therefore, transfer of management of the Wahluke Slope from the WDFW to
13 the USFWS involves only a change in the agency managing the property and does not involve
14 any change in the management activities for the Wahluke Slope. Management of the entire
15 Wahluke Slope by the USFWS as an overlay wildlife refuge is consistent with the 1996 DOI
16 Hanford Reach EIS ROD. The ROD recommended the Wahluke Slope be designated a wildlife
17 refuge and the Hanford Reach a Wild and Scenic River, and that the wildlife refuge be managed
18 by the USFWS.
19

20 The WDFW had leased a total of approximately 43 ha (107 ac) of the Wahluke State
21 Wildlife Recreation Area for sharecropping. The purpose of these agricultural leases is to
22 produce food and cover for wildlife and manage the land for continued multi-purpose recreation.
23 In addition, the WDFW issued a grazing permit for approximately 3,756 ha (9,280 ac), allowing up
24 to 750 animal-unit-months to graze the parcel (WDFW Grazing Permit #W5-01, and WDFW
25 Agricultural Leases #R-01, #WB-01, and #WB-02). This WDFW grazing lease was allowed to
26 expire on December 31, 1998 but, under SEPA regulations for up to 10 years after the expiration
27 of the lease, the WDFW can reinstate the grazing lease without public review.
28

29 The Wahluke Wildlife Recreation Area is open to the public for recreational uses during
30 daylight hours. According to data published in the *Hanford Reach of the Columbia River,*
31 *Comprehensive River Conservation Study and Environmental Impact Statement Final -*
32 *June 1994* (NPS 1994), the Wahluke State Wildlife Recreation Area has more than 40,000 visits
33 per year by recreationists. Most recreational visits are related to sport fishing in the Columbia
34 River.
35

36 The Wahluke Slope once contained small, nonradioactively contaminated sites (i.e.,
37 landfills). These sites were subject to an expedited response action and were remediated by
38 DOE in 1997. Although remediation took place, the landfills could still have hazardous materials
39 that would cause injury to trust resources. The DOE is not planning to alter the current land uses
40 of the Wahluke Slope and is specifically prohibited from causing any adverse impacts on the
41 values for which the area is under consideration for Wild and Scenic River or NWR status (DOI
42 1996).
43

44 **4.1.2.2 Columbia River Corridor.** The 111.6 km² (43.1 mi²) Columbia River Corridor, which is
45 adjacent to and runs through the Hanford Site, is used by the public and Tribes for boating, water
46 skiing, fishing, and hunting of upland game birds and migratory waterfowl. While public access is
47 allowed on certain islands, access to other islands and adjacent areas is restricted because of
48 unique habitats and the presence of cultural resources.
49

50 The 100 Areas occupy approximately 68 km² (26 mi²) along the southern shoreline of the
51 Columbia River Corridor. The area contains all of the facilities in the 100 Areas, including nine
52 retired plutonium production reactors, associated facilities, and structures. The primary land
53 uses are reactor decommissioning and undeveloped areas. Future use restrictions have been
54 placed in the vicinity of the 100-H Area, which is associated with the 183-H Solar Evaporation

1 Basins. Additional deed restrictions or covenants for activities that potentially extend beyond
2 4.6 meters (m) (15 feet [ft]) below ground surface are expected for other *Comprehensive*
3 *Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) remediation areas.
4 Additional information is provided in Section 3.3.1.4.2.
5

6 The area known as the Hanford Reach includes an average of a 402-m (1,320-ft) strip of
7 public land on either side of the Columbia River. The Hanford Reach is the last unimpounded,
8 nontidal segment of the Columbia River in the United States. In 1988, Congress passed Public
9 Law 100-605, *Comprehensive River Conservation Study*, which required the Secretary of the
10 Interior to prepare an environmental impact study (in consultation with the Secretary of Energy) to
11 evaluate the outstanding features of the Hanford Reach and its immediate environment.
12

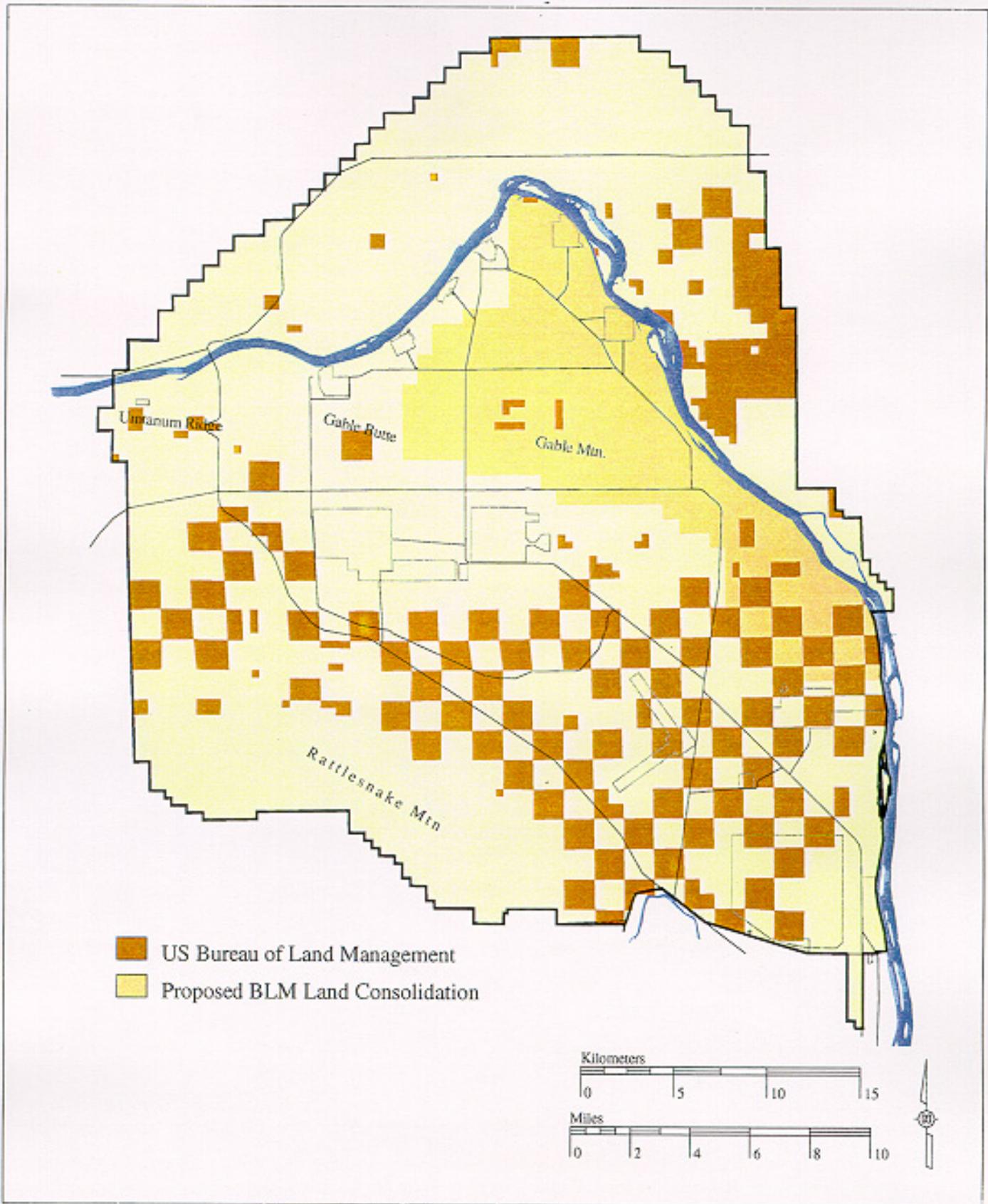
13 Alternatives for preserving the outstanding features also were examined, including the
14 designation of the Hanford Reach as part of the National Wild and Scenic Rivers system. The
15 results of the study can be found in the *Hanford Reach of the Columbia River, Comprehensive*
16 *River Conservation Study and Environmental Impact Statement Final - June 1994* (NPS 1994).
17 The Record of Decision (ROD) DOI issued as a result of this EIS in 1996 recommended that the
18 Hanford Reach be designated a “recreational river,” as defined by the *National Wild and Scenic*
19 *Rivers Act of 1968*. The ROD also recommended that the remainder of the Wahluke Slope be
20 established as a National Fish and Wildlife Refuge. Finally, the ROD recommended that the
21 approximately 728 ha (1,800 ac) of private land located in the Hanford Reach Study Area be
22 included in the recreational river boundary, but not the refuge boundary. The final designation will
23 require Congressional legislation.
24

25 There are two proposals currently under consideration in Congress. The primary
26 differences between the proposals include the extent of the geographic scope (whether the
27 Wahluke Slope is addressed in addition to the river corridor) and the designation of the land
28 manager (e.g., local vs. Federal control).
29

30 In addition to the control and Wahluke Slope issues, the proposed Wild and Scenic
31 legislation contains a provision for transferring administrative jurisdiction over certain parcels of
32 land in the State of Washington from the Secretary of Energy to the Secretary of the Interior,
33 affecting underlying ownership of about 19,943 ha (49,280 ac, 197 km², 75 mi²) of the Hanford
34 Site. This swap would consolidate the scattered Benton County portion of Hanford’s Bureau of
35 Land Management (BLM) Public Domain lands, into an area beginning near 100-D, running south
36 and east along the Columbia River shore, to just north of Energy Northwest (formerly known as
37 the Washington Public Power Supply System, or WPPSS) and then west to Gable Mountain (see |
38 Figure 4-2). As long as these lands are needed (e.g., still withdrawn from BLM by DOE), this |
39 legislative action would not affect DOE’s administration of the areas involved. The DOE’s use of
40 withdrawn BLM Public Domain lands is consistent with most land-use designations with the
41 exceptions of Industrial Exclusive, Research and Development, or Industrial designations where
42 BLM’s multiple-use mandate would be limited by an extensive infrastructure.
43

44 **4.1.2.3 Central Plateau.** The 200 East and 200 West Areas occupy approximately 51 km²
45 (19.5 mi²) in the Central Plateau of the Hanford Site. Facilities located in the Central Plateau were
46 built to process irradiated fuel from the production reactors. The operation of these facilities
47 resulted in the storage, disposal, and unplanned release of radioactive and nonradioactive waste.
48 The primary land uses are waste operations and operations support. Deed restrictions or
49 covenants for activities that potentially may extend beyond 4.6 m (15 ft) below ground surface are
50 expected for CERCLA remediation areas in the Central Plateau geographic study area.
51

Figure 4-2. Proposed BLM Land Swap.



BHI:pp 01/13/98 draft_2/landownswap1.aml Database: 06-AUG-1998

1
2 In 1964, a 410-ha (1,000-ac) tract was leased to the State of Washington to promote
3 nuclear-related development. A commercial low-level radioactive waste disposal facility, run by
4 U.S. Ecology, Inc., currently operates on 41 ha (100 ac) of the leasehold. The rest of the
5 leasehold was not used by the State, and this portion of the leasehold recently reverted to DOE.
6 The DOE constructed the Environmental Restoration Disposal Facility (ERDF) on this tract.
7

8 The ERDF is operated on the Central Plateau to provide disposal capacity for
9 environmental remediation waste (e.g., low-level, mixed low-level, and dangerous wastes)
10 generated during remediation of the 100, 200, and 300 Areas of the Hanford Site. The facility is
11 currently about 65 ha (160 ac) and can be expanded up to 414 ha (1.6 mi²) as additional waste
12 disposal capacity is required.
13

14 **4.1.2.4 All Other Areas.** The All Other Areas geographic area is 689 km² (266 mi²) and contains
15 the 300, 400 and 1100 Areas, Energy Northwest (formerly known as WPPSS) facilities, and a
16 section of land currently owned by the State of Washington.
17

18 The 300 Area is located just north of the City of Richland and covers 1.5 km² (0.6 mi²).
19 The 300 Area is the site of former reactor fuel fabrication facilities and is also the principal
20 location of nuclear research and development (R&D) facilities serving the Hanford Site. Kaiser
21 Aluminum and Chemical Corporation is leasing the 313 Building in the 300 Area to use an
22 extrusion press that was formerly owned by DOE. The Environmental Molecular Sciences
23 Laboratory (EMSL) and associated research programs provide research capability to advance
24 technologies in support of DOE's mission of environmental remediation and Waste Management.
25

26 The 400 Area, located southeast of the 200 East Area, is the site of the Fast Flux Test
27 Facility (FFTF). The FFTF is a 400 megawatt thermal, liquid metal (sodium-cooled) nuclear
28 research test reactor that was constructed in the late 1970s and operated from 1982 to 1992.
29 Although not designed nor operated as a breeder reactor, the FFTF operated during these years
30 as a national research facility for the Liquid Metal Fast Breeder Reactor Program to test
31 advanced nuclear fuels, materials, components, systems, nuclear operating and maintenance
32 procedures, and active and passive safety technologies. The reactor was also used to produce a
33 large number of different isotopes for medical and industrial users, generate tritium for the United
34 States fusion research program, and conduct cooperative, international research.
35

36 In December 1993, the FFTF was shutdown due largely at that time from determinations
37 that the facility could not continue to operate economically. In April 1995, defueling was
38 completed and usable fuel is stored on site in fuel storage vessels or in the secure vault at the
39 Plutonium Finishing Plant at the Hanford Site. Unusable spent nuclear fuel (SNF) has been
40 thoroughly washed to remove all sodium residuals, dried, and placed in approved, 50-year Interim
41 Storage Casks on the 400 Area Interim Storage Area pad. In November 1995, the reactor was
42 placed in standby mode with the main cooling system operating at approximately 200°C (400°F)
43 to keep the sodium coolant liquid and circulating to maintain DOE's option to restart and operate
44 the reactor in the future. Essential systems, staffing, and support services are being maintained
45 in a manner that will support either timely restart or deactivation of the FFTF. In January 1997,
46 the Secretary of Energy officially directed that the FFTF be maintained in a standby condition
47 while an evaluation was conducted of any future role the facility might have in the DOE's national
48 tritium production strategy. In December 1998, the Secretary determined that the FFTF would
49 not play a role in the nation's tritium production strategy.
50

51 In May 1999, the Secretary announced that DOE would ask the Pacific Northwest National
52 Laboratory (PNNL) to complete a 90-day study that would resolve outstanding informational
53 needs for the FFTF. Results of this study were completed and documented in a program
54 scoping plan presented by PNNL to DOE in early August 1999. As a result of this study, the

1 Secretary decided, on August 18, 1999, that DOE would conduct a programmatic *National*
2 *Environmental Policy Act* (NEPA) review, including an Environmental Impact Statement (EIS),
3 evaluating the potential environmental impacts associated with proposed expansion of
4 infrastructure, including the possible role of the FFTF, for civilian nuclear energy research and
5 development activities; production of isotopes for medical, research, and industrial uses; and
6 production of plutonium-238 for use in advanced radioisotope power systems for future National
7 Aeronautic and Space Administration (NASA) space missions. The Notice of Intent for this
8 programmatic EIS is planned for publication in the *Federal Register* on September 15, 1999. The
9 Final EIS (FEIS) is planned for completion in the Fall of 2000; a Record of Decision utilizing the
10 NEPA review (including the FEIS), is planned by December 2000.

11
12 The 1100 Area, located just north of Richland, served as the central warehousing, vehicle
13 maintenance, and transportation operations center for the Hanford Site. A deed restriction has
14 been filed with Benton County for the Horn Rapids Asbestos Landfill, which restricts future land
15 uses in the vicinity of the landfill. Also, DOE transferred the 1100 Area to the Port of Benton. The
16 DOE prepared an environmental assessment that resulted in a finding of no significant impact on
17 August 27, 1998, for the transfer of the 1100 Area and the Southern rail connection to the Port of
18 Benton (DOE/RL EA-1260). The Port officially took ownership and control of the 1100 Area
19 (consisting of 318 ha [786 ac], 26 buildings, and 26 km [16 mi] of rail tract) on October 1, 1998.
20 Although the 1100 Area is no longer under DOE control, it is included in this EIS to support the
21 local governments with their SEPA EIS analyses of the Hanford sub-area of Benton County under
22 the State of Washington's Growth Management Act.

23
24 Together with the Washington State Department of Transportation and Legislature
25 Transportation Committee, the Port of Benton is currently funding a major study (\$600,000) to
26 determine the feasibility of reconnecting the Hanford main rail line to Ellensburg, Washington (as
27 it was in the 1970s), as an alternative route for Yakima Valley rail traffic flowing between the
28 Puget Sound and the Tri-Cities. The current Yakima Valley route passes directly through all the
29 cities in the Valley, including the cities of Yakima and Kennewick which have plans to develop
30 their downtown areas to be more people friendly. Specifically, the Port has expressed a desire to
31 use the Hanford rail system and extend the current system upriver where there is currently only
32 an abandoned railroad grade.

33
34 Additional land uses in the All Other Areas geographic area include the following:

- 35
36 C The Hazardous Materials Management and Emergency Response (HAMMER)
37 Volpentest Training and Education Center, which is used to train hazardous materials
38 response personnel. The HAMMER Volpentest Training and Education Center is
39 located north of the 1100 Area and covers about 32 ha (80 ac).
40
41 C Land was leased to Energy Northwest (formerly known as WPPSS) to construct three
42 commercial power reactors in the 1970s. One plant, Washington Nuclear Plant
43 Number 2 (WNP-2), was completed and is currently operating. Activities on the other
44 two plants were terminated and the plants will not be completed. The DOE is
45 considering a proposal from Energy Northwest to allow a sublease for siting,
46 construction, and operation of an aluminum smelter (see Section 1.3).
47
48 C In 1980, the Federal government sold a 259 ha (640 ac) section of land south of the
49 200 East Area, near State Route (SR) 240, to the State of Washington for the purpose
50 of nonradioactive hazardous waste disposal. This parcel is uncontaminated (although
51 the underlying groundwater is contaminated) and undeveloped. The deed requires
52 that if it is used for any purpose other than hazardous waste disposal, ownership
53 would revert to the Federal government.
54

- 1 c The Laser Interferometer Gravitational-Wave Observatory (LIGO), built by the National
2 Science Foundation on the Hanford Site, detects cosmic gravitational waves for
3 scientific research. The facility consists of two underground optical tube arms, each 4
4 km (2.5 mi) long, arrayed in an “L” shape. The facility is sensitive to vibrations in the
5 vicinity, which can be expected to constrain nearby land uses.
6

7 **4.1.2.5 The Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve).** The
8 Fitzner/Eberhardt Arid Lands Ecology Reserve (also designated as the Rattlesnake Hills
9 Research Natural Area, or the ALE Reserve), encompasses 308.7 km² (119.2 mi²) in the
10 southwestern portion of the Hanford Site and is managed as a habitat and wildlife reserve and
11 environmental research center. A “research natural area” is a classification used by Federal land
12 management agencies to designate lands on which various natural features are preserved in an
13 undisturbed state solely for research and educational purposes. The ALE Reserve remains the
14 largest research natural area in the State of Washington (PNL 1993a).
15

16 The mineral rights to a 518 ha (1,280 ac) area on the ALE Reserve are owned by a private
17 company. The company has been free to enter this area and explore for oil or gas since 1977.
18 Additional information is provided in Section 4.2.3. There are also two ongoing R&D projects
19 under way on the ALE Reserve: gravity experiments in underground Nike bunkers located in the
20 southern portion of the Reserve, and on-line science education, teacher training, and astronomy
21 research in the observatory on the top of Rattlesnake Mountain. Both are long-term projects
22 using existing facilities.
23

24 Because public access to the ALE Reserve has been restricted since 1943, the shrub-
25 steppe habitat is virtually undisturbed and is part of a much larger Hanford tract of shrub-steppe
26 vegetation. This geographic area contained a number of small contaminated sites that were
27 remediated in 1994 and 1995 and have been revegetated. There are two landfills on the ALE
28 Reserve, at least one of which was used for disposal of a nonradioactive hazardous waste.
29 Although remediated, one of the landfills may still contain hazardous materials that could cause
30 injury to trust resources.
31

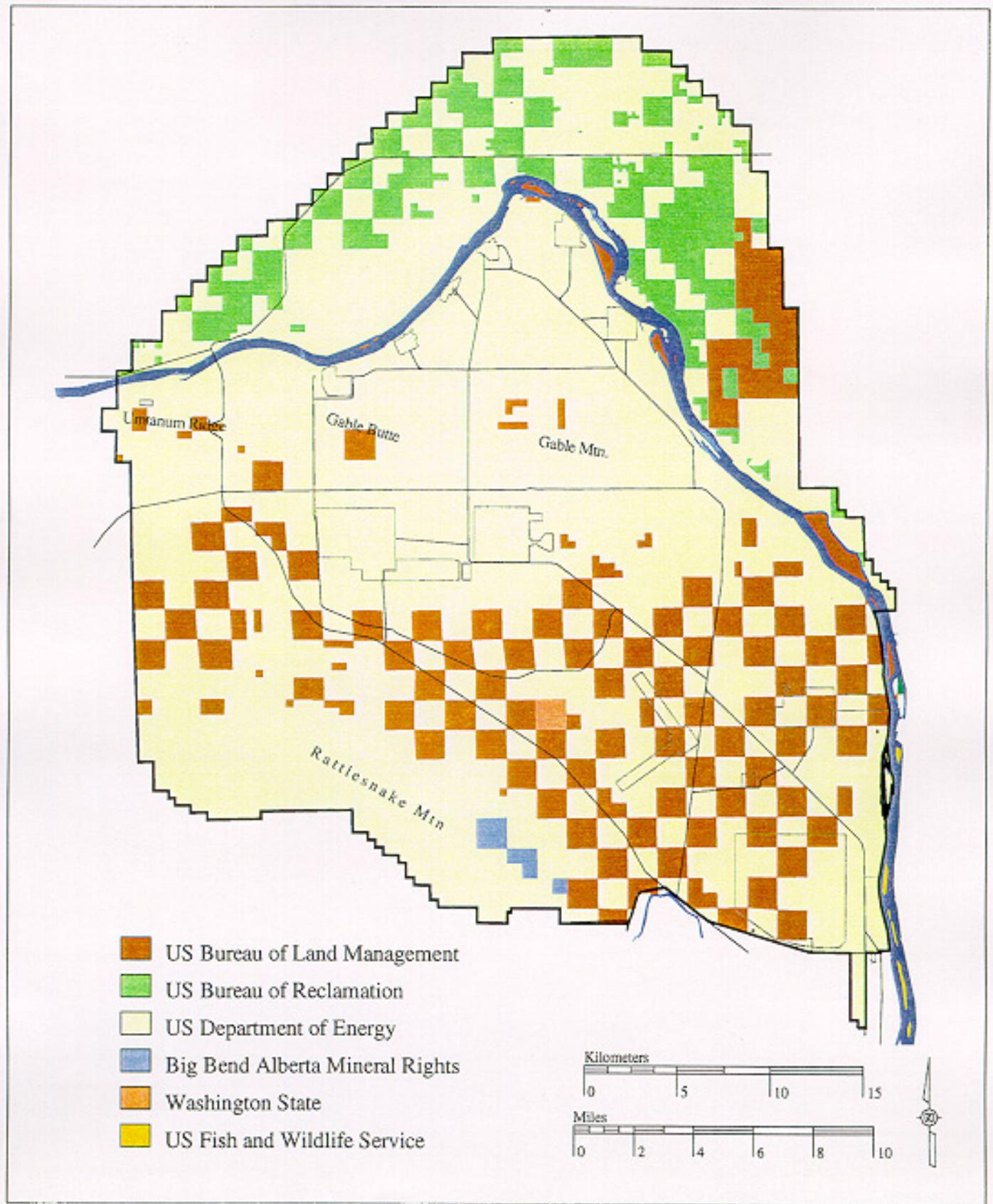
32 In 1997, DOE granted a permit and entered into an agreement with USFWS to manage
33 the ALE Reserve consistently with the existing ALE Facility Management Plan. Under this
34 framework, USFWS is preparing a Comprehensive Conservation Plan (CCP) pursuant to the
35 *National Wildlife Refuge Improvement Act of 1997* to identify refuge management actions and to
36 bring the ALE Reserve into the NWR System.
37

38 **4.1.3 Hanford Site Land Ownership**

39

40 The Hanford Site land holdings consist of three different real property classifications:
41 (1) lands acquired in fee by DOE or its predecessor agencies, (2) BLM Public Domain lands
42 withdrawn from the Public Domain for use as part of the Hanford Site, and (3) lands the Bureau of
43 Reclamation (BoR) has withdrawn from the Public Domain or acquired in fee as part of the
44 Columbia Basin Project (Figure 4-3). All lands in the Hanford area were ceded to the United
45 States by the Treaties of 1855 (see Appendix A), and these treaties contain

Figure 4-3. Hanford Site Land Ownership.



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1 reserved rights for perpetuity. All Federal agencies
2 and projects, including the BoR and BLM, have a
3 Federal trust responsibility to protect the rights of
4 the Indian Tribes.

5
6 The BoR agreed in a Memorandum of
7 Agreement (MOA) to transfer custody, possession,
8 and use of certain acquired and withdrawn lands
9 situated within the control zone of the Hanford
10 Works to the U.S. Atomic Energy Commission
11 (AEC) on February 27, 1957. These lands
12 consisted of a checkerboard pattern of alternating
13 square-mile sections on the Wahluke Slope. The
14 BoR retained the right to construct, operate, and
15 maintain the Wahluke Canal and related facilities
16 and any necessary wasteways and drainage ways
17 through the Wahluke Slope in connection with
18 irrigation of lands outside of the control zone. These
19 lands were included in the South Columbia Basin
20 Irrigation District and the East Columbia Irrigation
21 District at the time of district formation. In the MOA,
22 the BoR identified a continued interest in
23 development of irrigable lands on the Wahluke
24 Slope as part of the Columbia Basin Project. The
25 AEC acknowledged the interest of the BoR and
26 reaffirmed a policy of keeping DOE land ownership
27 and restrictions of land use on the Wahluke Slope to
28 a minimum.

29
30 The BoR continues to retain an interest in
31 the ultimate development of the irrigable lands within
32 the Wahluke Slope as part of the Columbia Basin
33 Project. The interest of the BoR pertains not only to
34 irrigation development, but also to other project purposes (e.g., fish and wildlife protection) and to
35 resource management and environmental concerns. The BoR maintains that the agreement with
36 the AEC assures return of the lands when the lands are no longer necessary to support DOE's
37 mission for the Hanford Site. Furthermore, the BoR would not concur with any change in the
38 present use of the lands until technical and environmental studies were completed.

39
40 The alternating square-mile sections that would eventually revert to the BLM or BoR are
41 an important consideration that complicates land-use planning. Because the lands are owned by
42 another government agency (i.e., BLM), DOE cannot authorize uses of the property beyond the
43 mission needs of the DOE. Typically, after getting the land back, the BLM evaluates current
44 use(s) of the land, compatibility of uses, and suitability of the land for different uses (i.e., mining,
45 grazing, recreation, and preservation) (see text box, "*Withdrawn Public Domain Lands.*")

46 47 48 **4.2 Geological Resources**

49
50 Geologic considerations for the Hanford Site include physiography, stratigraphy, structural
51 geology, seismic and volcanic hazards, and soil characteristics. The *Hanford Site National*
52 *Environmental Policy Act (NEPA) Characterization* report (Neitzel 1998) provides the basis for
53 the following discussions.

Withdrawn Public Domain Lands

In addition to the lands acquired by DOE through condemnation during and after World War II (WW II), the Hanford Reservation includes: (1) Bureau of Land Management (BLM) administered lands withdrawn from the Public Domain by DOE during and following WW II, (2) BLM lands withdrawn from the Public Domain by the Bureau of Reclamation (BoR) prior to WW II as part of the Columbia Basin Reclamation Project (CBRP), and (3) lands acquired in fee by the BoR prior to WW II as part of the CBRP. The withdrawn lands and non-withdrawn lands form a checkerboard pattern over large portions of the Hanford Site.

The lands in category (2) (as listed above) were subsequently affected by a second overlapping withdrawal by DOE during and following WW II. When DOE relinquishes its withdrawals on lands that were historically Federal, those lands withdrawn only by DOE would revert to the Public Domain and management by BLM. Those lands withdrawn by the overlapping DOE and BoR withdrawals would remain withdrawn and managed by the BoR.

The BoR's use of the withdrawn Public Domain lands (after the relinquishment of DOE's overlapping withdrawal) must be consistent with the purposes for which they were originally withdrawn from BLM by BoR. If they are not, the BoR could be expected to relinquish or renegotiate its withdrawal notice and the lands could be returned to the Public Domain and management by the BLM, or BoR could negotiate a new withdrawal order with the BLM.

1 **4.2.1 Landscape**
2

3 The landscape of the Hanford Site is dominated by the low-relief plains of the Central
4 Plains and the anticlinal ridges of the Yakima Folds physiographic regions. The surface
5 topography has been modified within the past several million years by several geomorphic
6 processes: (1) Pleistocene cataclysmic flooding, (2) Holocene eolian activity, and (3) landsliding. |
7 Cataclysmic flooding occurred when ice dams in western Montana and northern Idaho were
8 breached and allowed large volumes of water to spill across eastern and central Washington.
9 This flooding formed the channeled scablands and deposited sediments in the Pasco Basin. The
10 last major flood occurred about 13,000 years ago, during the late Pleistocene Epoch. Braiding
11 flood channels, giant current ripples, and giant flood bars are among the landforms created by the
12 floods. Anastomosing flood channels, giant current ripples, bergmounds, and giant flood bars are |
13 among the land forms created by the floods. The 200 Area Waste Management facilities are |
14 located on one prominent flood bar, the Cold Creek bar (Figure 4-4).
15

16 Since the end of the Pleistocene, winds have locally reworked the flood sediments and
17 have deposited dune sands in the lower elevations and loess (windblown silt) around the margins
18 of the Pasco Basin. Many sand dunes have been stabilized by anchoring vegetation, except
19 where they have been reactivated by human activity disturbing the vegetation. |
20

21 A series of bluffs occurs for a distance of approximately 56 km (35 mi) along the eastern
22 and northern shores of the Columbia River. In the northern portion of the area, these bluffs are
23 known as the White Bluffs.
24

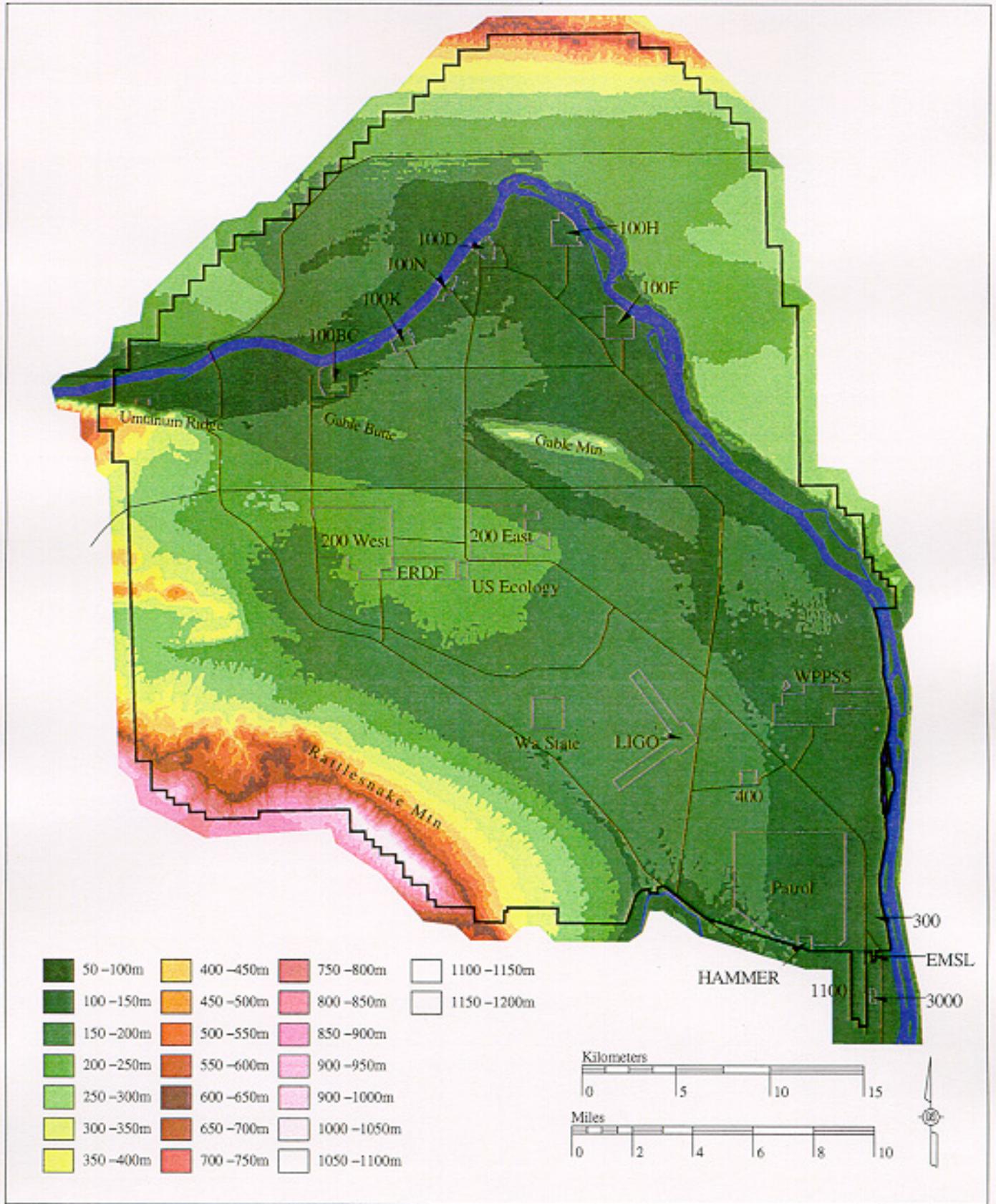
25 Landslides occur along the north limbs of some Yakima Folds and along steep river
26 embankments such as White Bluffs. Landslides on the Yakima Folds occur along contacts
27 between basalt flows or sedimentary units between the basalt, whereas active landslides at
28 White Bluffs occur in sediments above the basalt flows. A study of the Hanford Reach by
29 U. S. Geological Survey geologists (Shuster and Hays 1987) concluded that nearby irrigation has
30 accelerated the rate of landslides occurring in the area. The active landslides at White Bluffs are
31 the result of irrigation activity east of the Columbia River.
32

33 **4.2.2 Stratigraphy**
34

35 The stratigraphy of the Hanford Site consists of Miocene-age and younger rocks. Older
36 Cenozoic sedimentary and volcanoclastic rock underlie the Miocene and younger rocks but are
37 not exposed at the surface. The Hanford Site stratigraphy is described in the following
38 subsections and is summarized in Figures 4-5 and 4-6.
39

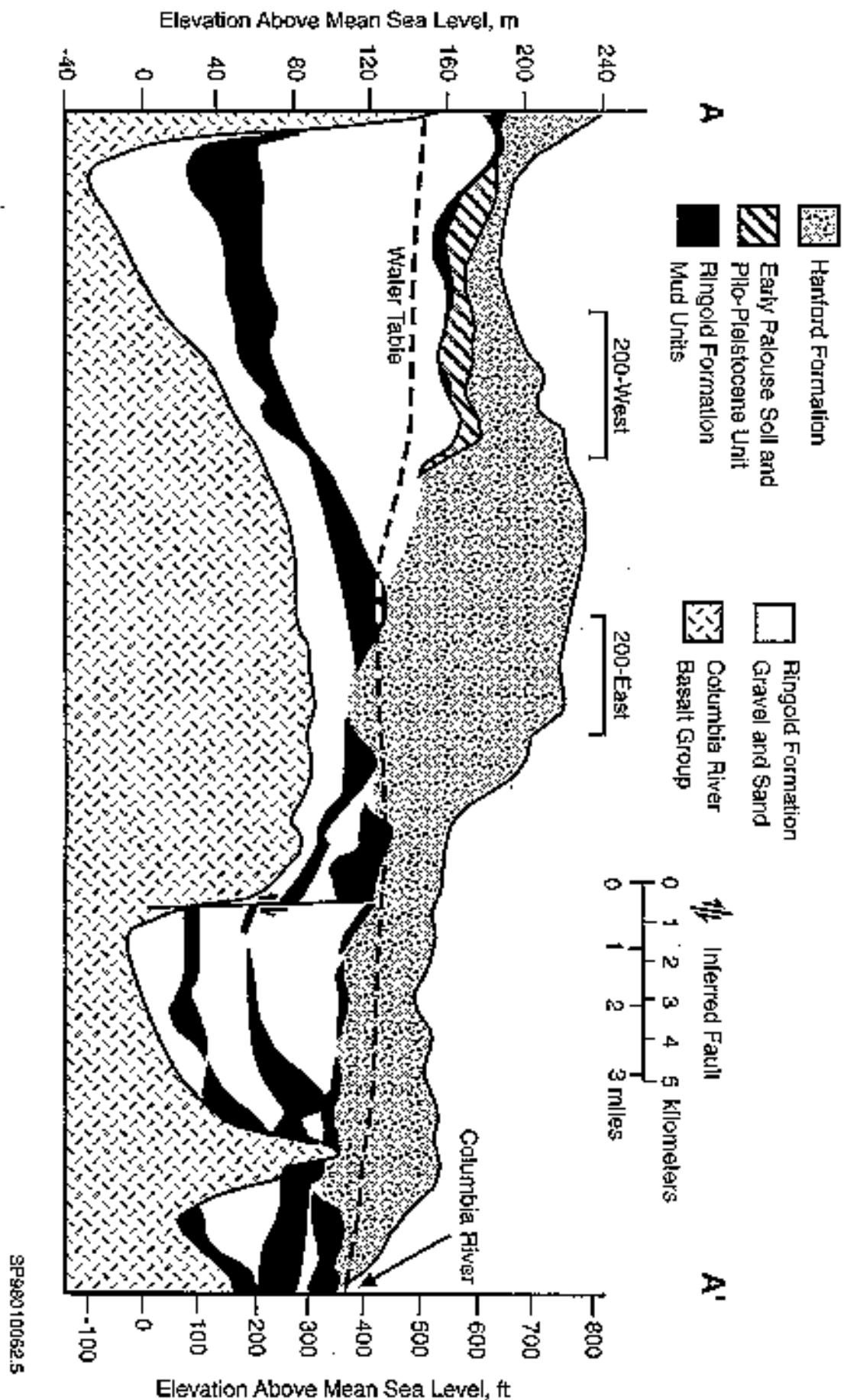
40 **4.2.2.1 Columbia River Basalt Group.** The Columbia River Basalt Group consists of an
41 assemblage of continental flood basalts of the Miocene age. These basalts cover an area of
42 more than 163,170 km² (63,000 mi²) in Washington, Oregon, and Idaho, and have an estimated
43 volume of about 174,000 km³ (67,200 mi³). Isotopic age determinations suggest flows of the
44 Columbia River Basalt Group were erupted during a period from approximately 17 to 6 million
45 years ago, with more than 98 percent by volume being erupted in a 2.5 million-year period (17 to
46 14.5 million years ago).

Figure 4-4. Topography of the Hanford Site (WHC 1991a).



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Figure 4-6. Geologic Cross-Section of the Hanford Site (PNNL 1996c).



1 Columbia River basalt flows were erupted from north-northwest-trending fissures (linear
2 vent systems) in north-central and northeastern Oregon, eastern Washington, and western
3 Idaho. The Columbia River Basalt Group is formally divided into five formations (listed in order
4 from the oldest to the youngest): Imnaha Basalt, Picture Gorge Basalt, Grande Ronde Basalt,
5 Wanapum Basalt, and Saddle Mountains Basalt. Of these, only the Grande Ronde, Wanapum,
6 and Saddle Mountains Basalts are present in the Pasco Basin. The Saddle Mountains Basalt
7 forms the uppermost basalt unit in the Pasco Basin, with the exception that some of the bounding
8 ridges where the Wanapum and Grande Ronde Basalt flows are exposed.

9
10 **4.2.2.2 Ellensburg Formation.** The Ellensburg Formation includes sedimentary rocks
11 interbedded with the Columbia River Basalt Group in the central and western part of the Columbia
12 Plateau. The age of the Ellensburg Formation is principally Miocene, although locally it may be
13 equivalent to early Pliocene. The thickest accumulations of the Ellensburg Formation lie along
14 the western margin of the Columbia Plateau where Cascade Range volcanic materials interbed
15 with the Columbia River Basalt Group. The lateral extent and thickness of interbedded sediments
16 generally increase upward in the section.

17
18 **4.2.2.3 Suprabasalt Sediments.** The suprabasalt (above the basalt) sediments within and
19 adjacent to the Hanford Site are dominated by the Ringold and Hanford formations, with other
20 minor deposits (PNNL 1996a).

21
22 **4.2.2.3.1 Ringold Formation.** Late Miocene to Pliocene deposits, younger than the
23 Columbia River Basalt Group, are represented by the Ringold Formation within the Pasco Basin.
24 The Ringold Formation was deposited in east-west trending valleys by the ancestral Columbia
25 River and its tributaries in response to development of the Yakima Fold Belt. Exposures of the
26 Ringold Formation are limited to the White Bluffs within the central Pasco Basin and to the
27 Smyrna and Taunton Benches located north of the Pasco Basin. Extensive data on the Ringold
28 Formation are available from boreholes on the Hanford Site.

29
30 Flood-related deposits of the Ringold Formation can be broken into different associations
31 based on proximity to the ancestral Columbia and/or Snake River channels. Gravel and
32 associated sand and silt represent a migrating channel deposit of the major river systems and
33 generally are confined to the central portion of the Pasco Basin. Overbank sand, silt, and clay
34 reflect occasional deposition and flooding beyond the influence of the main river channels, and
35 generally are found along the margins of the Pasco Basin. Over time, the main river channels
36 moved back and forth across the basin, causing a shift in location of the various facies.
37 Periodically, the river channels were blocked and caused lakes to develop where mud (with minor
38 amounts of sand) was deposited.

39
40 **4.2.2.3.2 Plio-Pleistocene Unit.** A locally derived unit consisting of an alluvium and/or
41 pedogenic calcrete occurs at the unconformity between the Ringold Formation and the Hanford
42 formation. The sidestream alluvial facies are derived from Cold Creek and its tributaries and are
43 characterized by relatively thick zones of unweathered basalt clasts along with wind-blown
44 materials and soil. The calcrete is relatively thick and impermeable in areas of the western
45 Pasco Basin, often forming an aquitard to downward migration of water in the vadose zone where
46 artificial recharge is occurring.

47
48 **4.2.2.3.3 Early Palouse Soil.** Overlying the Plio-Pleistocene unit in the Cold Creek
49 syncline area is a fine-grained sand to silt. It is believed to consist mainly of eolian (derived from
50 wind deposits) origin, derived from either an older reworked Plio-Pleistocene unit or upper
51 Ringold Formation. The early Palouse soil differs from the overlying slackwater flood deposits by
52 a greater calcium-carbonate content, massive structure in core samples, and a high natural
53 gamma response in geophysical logs.

1 **4.2.2.3.4 Quaternary Deposits.** Repositioning of sediments resumed during the
2 Quaternary Period, following the period of late-Pliocene to early-Pleistocene erosion. In the
3 Columbia Plateau, the Quaternary record is dominated by cataclysmic flood deposits with lesser
4 amounts of sediments deposited by water and wind lying below, between, and above flood
5 deposits.
6

7 Sand and gravel river sediments, referred to informally as the pre-Missoula gravels, were
8 deposited after incision of the Ringold Formation and before deposition of the cataclysmic flood
9 deposits. The pre-Missoula gravels are similar to the Ringold Formation main-channel gravel
10 facies, consisting of dominantly nonbasaltic clasts. These sediments occur in a swath that runs
11 from the old Hanford townsite on the eastern side of the Hanford Site, across the Site toward
12 Horn Rapids on the Yakima River.
13

14 Cataclysmic floods inundated the Pasco Basin a number of times during the Pleistocene,
15 beginning as early as one million years ago. The last major flood sequence is dated at about
16 13,000 years ago by the presence of erupted material from Mount Mazama interbedded with the
17 flood deposits. The number and timing of cataclysmic floods continues to be debated. As many
18 as 10 flood events have been documented during the last ice age. The largest and most frequent
19 floods came from glacial Lake Missoula in northwestern Montana; however, smaller floods may
20 have escaped down valley from glacial Lakes Clark and Columbia along the northern margin of
21 the Columbia Plateau, or down the Snake River from glacial Lake Bonneville. The flood deposits,
22 informally called the Hanford formation, blanket low-lying areas over most of the central Pasco
23 Basin (Neitzel 1997).
24

25 Cataclysmic floodwaters entering the Pasco Basin quickly became impounded behind
26 Wallula Gap (located about 32 km [20 mi] downstream from the Hanford Site), which was too
27 restrictive for the volume of water involved. Floodwaters formed temporary lakes with a shoreline
28 up to 381 m (1,250 ft) in elevation, which lasted only a few weeks or less. Two types of flood
29 deposits predominate: (1) a sand-and-gravel main-channel facies, and (2) a mud-and-sand
30 slackwater facies. Within the Pasco Basin, these deposits are referred to as the Pasco Gravels
31 and slackwater deposits of the Hanford formation. Sediments with intermediate grain sizes (e.g.,
32 sand-dominated facies) also are present in areas throughout the Pasco Basin, particularly on the
33 south, protected half of Cold Creek Bar.
34

35 Landslide deposits in the Pasco Basin are of variable age and genesis. Most of these
36 deposits occur within the basalt outcrops along the ridges (e.g., on the north side of Rattlesnake
37 Mountain) or steep river embankments (e.g., White Bluffs), where the Upper Unit Ringold
38 Formation crops out in the Pasco Basin.
39

40 **4.2.3 Structure**

41
42 The Hanford Site is located near the junction of the Yakima Fold Belt and the Palouse
43 structural subprovinces (DOE 1988a). These structural subprovinces are defined on the basis of
44 their structural fabric, unlike the physiographic provinces that are defined on the basis of
45 landforms. The Palouse subprovince is a regional paleoslope that dips gently toward the
46 Columbia Plateau and exhibits only relatively mild structural deformation. The Palouse Slope is
47 underlain by a wedge of Columbia River basalt that thins gradually toward the east and north, and
48 laps onto the adjacent highlands.
49

50 The principal characteristics of the Yakima Fold Belt are a series of segmented, narrow,
51 asymmetric anticlines. These anticlinal ridges are separated by broad synclines or basins that, in
52 many cases, contain thick accumulations of Eocene- to Quaternary-age sediments. The
53 deformation of the Yakima Folds occurred under north-south compression. The fold belt was
54 growing during the eruption of the Columbia River Basalt Group and continued to grow into the

1 Pleistocene and probably into the present. Thrust or high-angle reverse faults with fault planes
2 that strike parallel or subparallel to the axial trends are found principally along the limbs of the
3 anticlines (Figure 4-7) (PNNL 1996a). The amount of vertical stratigraphic offset associated with
4 these faults varies but commonly exceeds hundreds of meters.
5

6 **4.2.3.1 Mineral Development.** Directly after the discovery of gold in British Columbia and
7 Oregon in the 1850s, gold was discovered in eastern Washington. In 1862, the first very
8 successful strike in Washington was made near the mouth of the Methow River. Strikes were
9 also made on the Clearwater River near present-day Orofino, Idaho, in 1860 and in the Boise
10 Basin (“Treasure Valley”) in 1862. These discoveries caused prospectors to explore the
11 mid-Columbia region in the 1860s, upstream from the Dalles to the Canadian border. Between
12 Vantage and Alderdale, Washington, at least seven sites along the Columbia River have had past
13 placer mining activity and gold production. The Chinaman’s Bar Placer (located on the south side
14 of the river directly upstream of the Vernita Bridge, partially on the Hanford Site) supported a
15 small operation from 1939 to 1941 with an unknown amount of production (NPS 1994).
16

17 In addition to gold mining along the Columbia River, natural gas was discovered on
18 Rattlesnake Mountain in 1913. The small, shallow field was developed in 1929 and produced until
19 it was closed in 1941, yielding a total of approximately 0.07 billion m³ (2.5 billion ft³) of gas (NPS
20 1994). Twenty-four wells were drilled, with the main gas field located on the ALE Reserve.
21 Although intensive exploration occurred, deposits proved to be small.
22

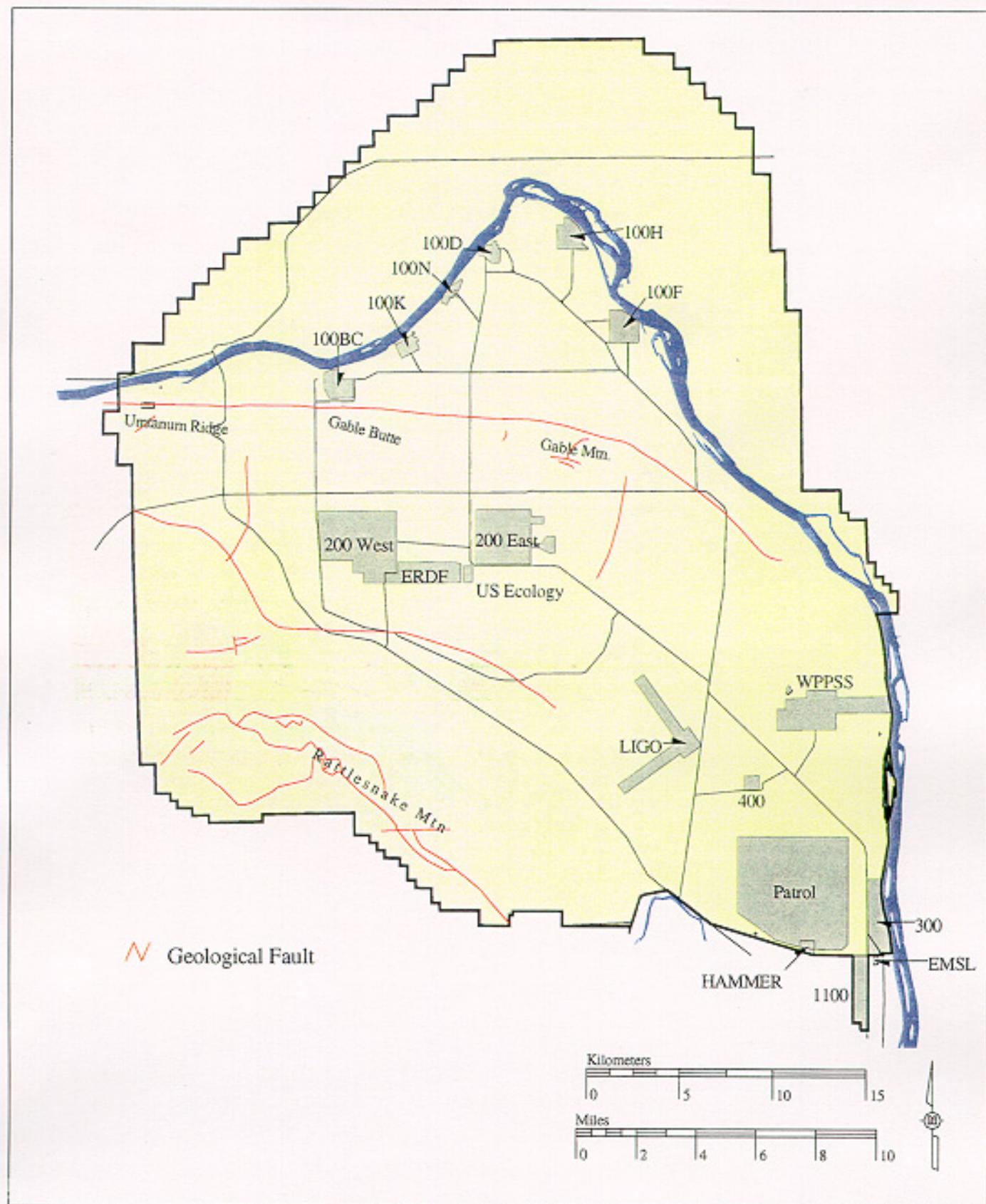
23 Oil exploration was also conducted in the Rattlesnake Mountain and Rattlesnake Hills area
24 in the 1920s and 1930s, but useful deposits were not found (Gerber 1997). The mineral rights to
25 a 518 ha (1,280 ac) area are still owned by a private company, the Big Bend Alberta Mining
26 Company. The surface title to this acreage was acquired by the AEC by condemnation in 1952.
27 At that time, the final judgment of the court vested in the owners (at that time, the Big Bend
28 Land Company) the gas and oil rights in the land providing, however, that all rights of ingress and
29 egress over the surface of the land for exploration or exploitation of such rights were prohibited for
30 25 years from the date of the judgment (January 14, 1952). Presently, the Big Bend Alberta
31 Mining Company is free to enter on the lands at will to explore for oil or gas. The company holds
32 all the oil and mineral rights on one section, the oil and mineral rights on three-quarters of a
33 second section, and the soil and mineral rights on one-quarter of a third section.
34

35 **4.2.4 Geologic Hazards** 36

37 The White Bluffs represent a geologic hazard resulting from certain types of land uses,
38 such as irrigated farming and other forms of intensive development (Figure 4-8). The White
39 Bluffs are composed of claystones and siltstones that are relatively strong when dry but lose
40 considerable strength when wet. Visual evidence of recent, suspected human-induced landslide
41 activity has developed over the past two decades. Irrigation water applied to croplands
42 immediately east of the White Bluffs has raised the water table significantly, resulting in local
43 saturation, increased pore pressures, reduced shear strength, and instability of slopes above the
44 river. Leaks in local irrigation canals and irrigation waste water are believed to be contributing
45 groundwater to the slide area, but a regional aquifer may also be responsible (NPS 1994).
46

47 Based on studies in the early 1970s, the BoR determined that irrigation would increase
48 the potential for landslide activity along the White Bluffs. Also, a detailed drainage investigation
49 completed in 1967 found a large portion of “red zone” area infeasible to drain based on economic
50 criteria. As part of its effort to restrict irrigation in this area, the BoR rescinded the plats for two
51 irrigation blocks (blocks 36 and 55) and acquired private lands on a “willing seller” basis
52 (NPS 1994).

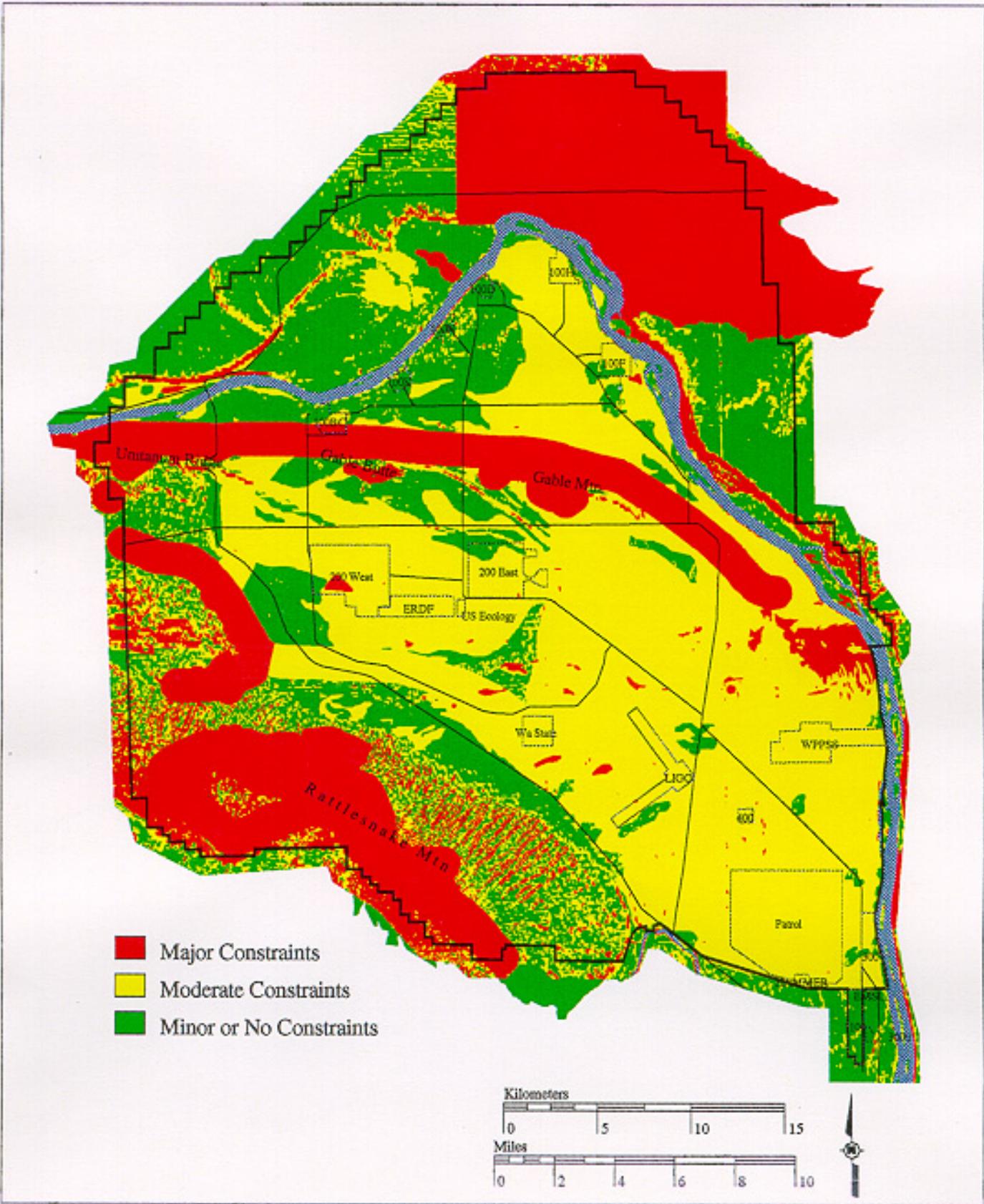
1 **Figure 4-7. Map of the Hanford Site Region Showing**
 2 **Known Faults.**
 3
 4
 5



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1
2
3
4
5

Figure 4-8. Geologic Hazards Related to Economic Land Uses.



1 Ringold Formation sediments that make up a large portion of the White Bluffs are largely
2 unconsolidated and uncemented (BHI 1995a). These sediments were deposited between 6 and
3 3.5 million years ago. During and following deposition of Ringold sediment, the floor of the Pasco
4 Basin was subsiding while the surrounding highlands were rising. Consequently, the Ringold
5 sediment layers dip toward the center of the Pasco Basin, which lies in the east-central part of
6 the Hanford Site. The angle of dip of these layers is less than 2 degrees. Ringold sediment
7 layers dip down from the northern and eastern edges of the basin toward the Columbia River.
8 Ringold sediments found in the bluffs consist predominantly of layers of river-deposited sand,
9 ancient soils (paleosols), and sand, silt, and clay deposited in lakes (BHI 1995a).

10
11 Throughout the Hanford Site, a series of catastrophic flood deposits, informally known as
12 the Hanford formation, lies atop the Ringold Formation sediments. The Hanford formation
13 consists of fine-grained sediments know as Touchet beds and gravel beds known as the Pasco
14 ravel. The sediments of the Hanford formation are unconsolidated, uncemented, and highly
15 transmissive for the flow of water.

16
17 Shuster and Hays (1987) concluded that the entire area of the bluffs along the northern
18 and eastern shores of the Columbia River is susceptible to landslides. Recent landslides have
19 occurred in four areas along the bluffs; these areas are the Locke Island, Savage Island,
20 Homestead Island, and Johnson Island slide areas. The length of the slide areas parallel to the
21 river shoreline ranges from more than a mile at Locke Island to about 0.4 km (0.25 mi) of a mile
22 near Homestead Island.

23
24 The Hanford powerline area shows evidence of Late Pleistocene landslides, and the area
25 coincides with lack of irrigation adjacent to the bluffs (Shuster and Hays 1987). The landslides,
26 both active and inactive, total about 11.2 km² (4.3 mi²) in area, and the total landslide susceptible
27 area is about 15.1 km² (5.8 mi²) (Shuster and Hays 1987). These slide areas are characterized
28 by major cracks about two-thirds of the way up the bluff face, surface areas on the slopes below
29 the cracks with an irregular ground surface, and mud flows at the base of the slope. The irregular
30 surface forms as the bluff face slides away and begins to break up. The mud flows occur as a
31 result of a process known as liquefaction, which is water-saturated soil that flows similar to a
32 liquid. Some of the slide areas, such as Savage Island and Locke Island slides, are rimmed by a
33 scarp or cliff. Surface cracks located upland of the bluff face can be found, which indicate the
34 slopes behind the bluffs are very unstable and prone to future landslides.

35
36 Examination of slide areas reveals the universal presence of water seeping from the bluffs
37 in springs and marshes. Observation of these springs, saturated cliff faces, and mud flows
38 indicates that water plays a role in producing landslides along the bluffs. The water found in the
39 bluffs reduces the strength, decreases frictional resistance, and adds weight to the
40 unconsolidated Ringold Formation. Because the transmissivity of the Ringold layers varies,
41 water accumulates in certain sediment layers within the bluffs. This wet layer is the plane on
42 which the slide begins. The bluff above a wet layer will slide when the water-laden and lubricated
43 layer fails under the weight of the overburden.

44
45 Sources of water on the bluffs are natural precipitation, irrigated farmlands, irrigation and
46 wastewater canals, and irrigation wastewater ponds located up-slope and east of the bluffs and
47 on the Wahluke Slope. Water from these activities percolates through the soil to the Ringold
48 Formation. Some of the layers within the formation resist the downward flow of water, forcing the
49 water to flow laterally. Ringold Formation layers dip toward the Columbia River and the water that
50 collects above less transmissive Ringold Formation layers moves downslope toward the bluffs.
51 Eventually, this water reaches the bluffs and increases the potential for a landslide.

52
53 Shuster and Hays (1987) concluded, "In the present climate, most of these bluffs are very
54 stable under natural conditions, but irrigation of the upland surface to the east, which began in the

1 1950s and has been greatly expanded, led to increased and more widespread seepage in the
2 bluffs and to a spectacular increase in slope failures since 1970. With continuing irrigation, areas
3 of the bluff wetted by seepage will be subject to landslides wherever slopes exceed about 15
4 degrees and, on lesser slopes, wherever the surficial material is old landslide debris.”
5

6 The hazards posed by landslides in bluffs range from minor to catastrophic. Economic
7 loss from landslides in the bluffs has not been large because the area is relatively undeveloped.
8 Road closures have occurred. A concrete flume, part of the Ringold wasteway, was destroyed
9 by the Homestead Island slide in the late 1960s (Shuster and Hays 1987). Encroachment up-
10 slope by the Savage Island slide destroyed the riverward margins of irrigated fields along the top
11 of the bluffs (Shuster and Hays 1987).
12

13 Perhaps the most unlikely occurrence would be an earthquake-triggered, massive slope
14 failure caused by liquefaction of the White Bluffs, which would temporarily block the Columbia
15 River. Hanford facilities on the west side of the river could be endangered, as well as citizens
16 and property located downstream of this temporary dam. Also, contaminants left at depth in the
17 soil column would be further mobilized by the subsequent rise in groundwater levels on the
18 Hanford facilities side of the river.
19

20 The Locke Island slide caused the loss of cultural artifacts on the island by changing the
21 channel of the river and causing erosion to occur on Locke Island. Since its beginning in the mid-
22 1970s, the Locke Island slide has extended 150 m (492 ft) into the channel of the Columbia River
23 (Neitzel 1997). Since November 1995, Locke Island has an actively eroding cut bank that is
24 400 m (1,312 ft) in length, with a horizontal loss of 16 m (53 ft) (Neitzel 1997). These slides can
25 disturb and destroy salmon spawning beds by siltation, and the increase in sediment load in the
26 Hanford Reach could potentially adversely affect the Energy Northwest (formerly known as
27 WPPSS) reactor cooling-water intake systems (Shuster and Hays 1987).
28

29 The Hanford Dune Field, located north of the Energy Northwest (formerly known as
30 WPPSS) reactor, also represents a hazard to certain types of land uses. The Hanford Dune
31 Field is one of three great dune fields in the Columbia River Basin. It is an active area of
32 migrating barchan dunes and partially stabilized transverse dunes derived from alluvium, with
33 bare rock-rubbed areas between dunes. In the late 1970s, a study performed by the Heritage
34 Conservation and Recreation Service determined this dune field to be of national significance and
35 proposed a 2,560 ha (6,320 ac) protected area for inclusion in the National Natural Landmark
36 system. For security purposes and other reasons, DOE requested that the site not be
37 designated as such, and the request was honored (NPS 1994).
38

39 There is also an extensive dune system that is stabilized with vegetation, located south of
40 the 200 Areas, trending to the northeast toward the Columbia River. This stabilized dune system,
41 which forms hummocky terraces and dune-like ridges, also represents a potential geologic
42 hazard to development. Should the vegetation on the dune system be altered, cleared, or
43 otherwise disturbed, the dunes might remobilize, resulting in dune sand movement and blowing
44 sand during windy weather.
45

46 **4.2.4.1 Seismic and Volcanic Hazards.** The historic record of earthquakes in the Pacific
47 Northwest dates from about 1840. The early part of this record is based on newspaper reports of
48 structural damage and human perception of the shaking and structural damage as classified by
49 the Modified Mercalli Intensity (MMI) scale and is probably incomplete because the region was
50 sparsely populated. Seismograph networks did not start providing earthquake locations and
51 magnitudes in the Pacific Northwest until about 1960. A comprehensive network of seismic
52 stations, which provide accurate locating information for most earthquakes greater than a
53 magnitude of 2.5 on the Richter scale, was installed in eastern Washington in 1969.
54

1 Seismicity of the Columbia Plateau, as determined by the rate of earthquakes per area
2 and the historical magnitude of these events, is relatively low when compared to other regions of
3 the Pacific Northwest, the Puget Sound area, and western Montana/eastern Idaho. The largest
4 known earthquake in the Columbia Plateau occurred in 1936 near Milton-Freewater, Oregon. |
5 This earthquake had a Richter scale magnitude of 5.75 and a maximum MMI of VII and was |
6 followed by a number of aftershocks that, when analyzed, indicated a northeast-trending fault
7 plane. Other earthquakes with Richter scale magnitudes greater than 5.0 and/or MMIs of VI have
8 occurred along the boundaries of the Columbia Plateau in a cluster near Lake Chelan extending
9 into the northern Cascade Range, in northern Idaho and Washington, and along the boundary
10 between the western Columbia Plateau and the Casade Range.. Three MMI VI earthquakes have
11 occurred within the Columbia Plateau, including one in the Milton-Freewater region in 1921; one
12 near Yakima, Washington, in 1892; and one near Umatilla, Oregon, in 1893. In the central portion
13 of the Columbia Plateau, the largest earthquakes near the Hanford Site are two that occurred in
14 1918 and 1973. These two events were at Richter scale magnitude of 4.4 and MM of V, and were
15 located north of the Hanford Site, near Othello, Washington.
16

17 Earthquakes often occur in spatial and temporal clusters in the Columbia Plateau and are
18 termed “earthquake swarms.” The region north and east of the Hanford Site is concentrated with
19 earthquake swarm activity; however, earthquake swarms also have occurred in several locations
20 within the Hanford Site. Earthquakes in a swarm tend to gradually increase and decay in
21 frequency of events, and usually no outstanding large event is present within the sequence.
22 These earthquake swarms occur at shallow depths, with 75 percent of the events located at
23 depths less than 4 km (2.5 mi). Each earthquake swarm typically lasts several weeks to months,
24 may consist of anywhere from several to more than 100 earthquakes, and is clustered in an area
25 5 to 10 km (3 to 6 mi) in lateral dimension. Often, the longest dimension of the swarm area is
26 elongated in an east-west direction.
27

28 Earthquakes in the Columbia Plateau also occur to depths of approximately 30 km
29 (18 mi). These deeper earthquakes are less clustered and occur more often as single, isolated
30 events. Based on epicenter studies and refraction surveys in the region, the shallow earthquake
31 swarms occur in the Columbia River Basalts and the deeper earthquakes occur in crustal layers
32 below the basalts.
33

34 Several major volcanoes are located in the Cascade Range west of the Hanford Site. The
35 nearest volcano, Mount Adams, is about 165 km (102 mi) from the Hanford Site. The most active
36 volcano, Mount St. Helens, is located approximately 220 km (136 mi) west-southwest of the
37 Hanford Site.
38

39 Because of their close proximity, the volcanic mountains of the Cascades are the
40 principal volcanic hazard at the Hanford Site. The major concern is that ash fall could affect
41 Hanford Site communications equipment and electronic devices, as well as the movement of
42 truck and automobile traffic in and out of the area.
43

44 **4.2.5 Soils**

45
46 The *Soil Survey Hanford Project in*
47 *Benton County Washington*, BNWL-243 (PNL 1966),
48 describes 15 different soil types on the Hanford Site,
49 varying from sand to silty and sandy loam. The soil
50 classifications given in BNWL-243 have not been
51 updated to reflect current reinterpretations of soil
52 classifications (see text box, “*Hanford Site Quick*
53 *Facts: Soils*”). Until soils on the Hanford Site are

<i>Hanford Site Quick Facts: Soils</i>	
c	Fifteen types of soils identified
c	Textures range from sand to silty and sandy loam
c	Most common soil type: Quincy Sand

1 resurveyed, the descriptions presented in BNWL-243 will continue to be used (see Table 4-1 and
2 Figure 4-9). No soils on the Hanford Site are currently classified as prime farmlands because
3 (1) there are no current soil surveys, and (2) the only prime farmland soils in the region are
4 irrigated (August 1996 Draft HRA-EIS).

5
6 The parent material for predominant soil types at the Hanford Site consists of the Hanford
7 formation and Holocene surficial deposits (Cushing 1992). Soils with well-developed profiles
8 occur only where fine and poorly-drained sediments have been deposited and typically are low in
9 organic matter (PNL 1991a).

10
11 Wind and water erosion have been key factors in modifying developed soil profiles on the
12 Hanford Site, and have resulted in the loss of soil down to parent material in some areas and the
13 creation of large active sand dunes in other areas. Currently stabilized dune complexes can
14 potentially be reactivated as a result of surface disturbances.

15 16 17 **4.3 Water Resources**

18
19 This section provides an overview of the Hanford Site hydrologic setting, which includes
20 surface water and groundwater resources, and a discussion of existing water rights.

21
22 In 1980, Congress enacted the *Northwest Power Act* (NPA) (16 U.S.C. 839-839h), which
23 “marked an important shift in Federal policy.” Continually declining fish runs had revealed the
24 failures of previous legislative efforts requiring that “equal consideration” be given to fish and
25 wildlife affected by resource exploitation. The NPA created “a pluralistic intergovernmental and
26 public review process.” At the hub of this process, Congress established the Pacific Northwest
27 Electric Power and Conservation Planning Council (Council), directing it to create “a program to
28 protect, mitigate, and enhance” the Columbia River Basin’s fish and wildlife “to the extent affected
29 by the development and operation of the Basin’s hydropower system.” The Council’s authority
30 with respect to fish and wildlife measures is contained; the Council “can guide, but not command,
31 Federal river management.”

32
33 In addition, Canada and the United States signed the Pacific Salmon Treaty in 1985. The
34 Pacific Salmon Treaty has provided for improved conservation and management of the resource.
35 The Treaty covers five species of Pacific salmon and steelhead (two of which -- the Upper
36 Columbia steelhead and the Redfish Lake sockeye salmon -- are now also covered by the
37 *Endangered Species Act of 1973*), and applies to fisheries in Southeast Alaska, British Columbia,
38 Washington, and Oregon.

39
40 There is no single “law of the river” on the Columbia River. Instead, there is a maze of
41 overlapping treaties, laws, and regulations, which together attempt to balance the varied interests
42 on the river. (See text box, “*Columbia River Flow – Who Controls It?*”)

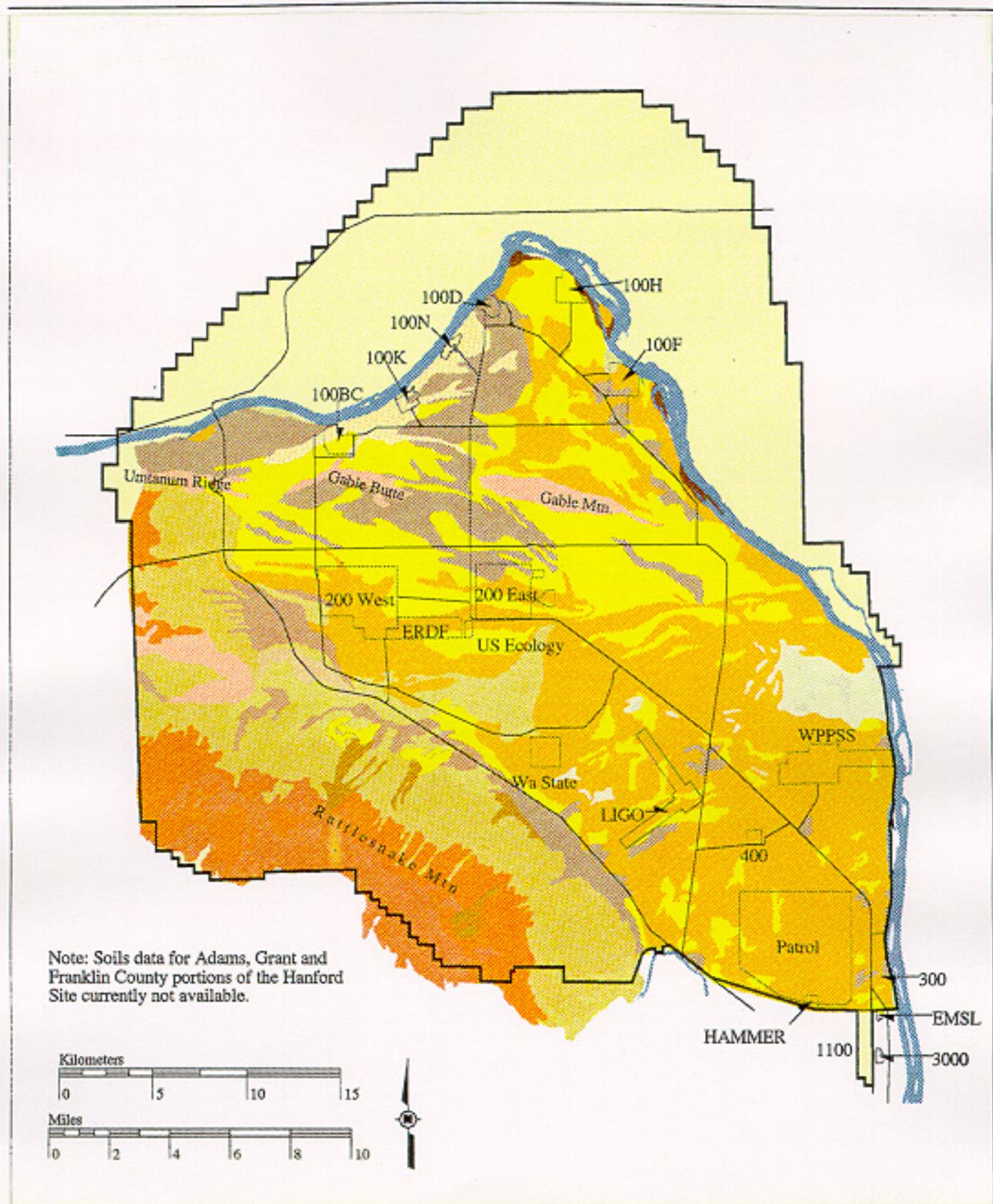
43 44 **4.3.1 Surface Water**

45
46 The Pasco Basin occupies about 4,900 km² (1,900 mi²) and is located centrally within the
47 Columbia Basin. Elevations within the Pasco Basin generally are lower than other parts of the
48 Columbia Plateau, and surface drainage enters the Pasco Basin from other basins. Within the
49 Pasco Basin, the Columbia River is joined by three major tributaries: the Yakima River, the
50 Snake River, and the Walla Walla River.

Table 4-1. Soil Types on the Hanford Site (adapted from PNNL 1996a).

Name (Symbol)	Description
Ritzville silt loam (Ri)	Dark-colored silt loam soils midway up the slopes of the Rattlesnake Hills. Developed under bunchgrass from silty wind-laid deposits mixed with small amounts of volcanic ash. Characteristically greater than 150-cm (59-in.) deep; bedrock may occur at less than 150 cm (59 in.) but greater than 75 cm (30 in.).
Quincy (Rupert) sand (Rp)	One of the most extensive soils on the Hanford Site. Brown to grayish-brown coarse sand grading to dark grayish-brown at approximately 90 cm (35 in.). Developed under grass, sagebrush, and hopsage in coarse, sandy, alluvial deposits that were mantled by wind-blown sand. Hummocky terraces and dune-like ridges.
Hezel sand (He)	Similar to Rupert sands; however, a laminated grayish-brown strongly calcareous silt loam subsoil usually is encountered within 100 cm (39 in.) of the surface. Surface soil is very dark brown, and was formed in wind-blown sands that mantled lake-laid sediments.
Koehler sand (Kf)	Similar to other sandy soils on the Hanford Site. Developed in a wind-blown sand mantle. Differs from other sands because the sand mantles a lime-silica-cemented layer "hardpan." Very dark grayish-brown surface layer is somewhat darker than Rupert Sand. Calcareous subsoil usually is dark grayish-brown at approximately 45 cm (18 in.).
Burbank loamy sand (Ba)	Dark, coarse-textured soil underlain by gravel. Surface soil usually is 40-cm (16-in.) thick, but can be 75-cm (30-in.) thick. Gravel content of subsoil ranges from 20 to 80 percent.
Kiona silt loam (Ki)	Located on steep slopes and ridges. Surface soil is very dark grayish-brown and approximately 10-cm (4-in.) thick. Dark brown subsoil contains basalt fragments 30 cm (12 in.) and larger in diameter. Many basalt fragments found in surface layer. Basalt rock outcrops present. A shallow stony soil normally occurring in association with Ritzville and Warden soils.
Warden silt loam (Wa)	Dark grayish-brown soil with a surface layer usually 23-cm (9-in.) thick. Silt loam subsoil becomes strongly calcareous at approximately 50 cm (20 in.) and becomes lighter in color. Granitic boulders are found in many areas. Usually greater than 150-cm (59-in.) deep.
Ephrata sandy loam (Ei)	Surface is dark colored, and subsoil is dark grayish-brown medium-textured soil underlain by gravelly material, which may continue for many meters (feet). Level topography.
Ephrata stony loam (Eb)	Similar to Ephrata sandy loam. Differs in that many large hummocky ridges presently are made up of debris released from melting glaciers. Areas between hummocks contain many boulders several meters (feet) in diameter.
Scootenev stony silt loam (Sc)	Developed along the north slope of Rattlesnake Hills; usually confined to floors of narrow draws or small fan-shaped areas where draws open onto plains. Severely eroded with numerous basaltic boulders and fragments exposed. Surface soil usually is dark grayish-brown, grading to grayish-brown in the subsoil.
Pasco silt loam (P)	Poorly drained, very dark grayish-brown soil formed in recent alluvial material. Subsoil is variable, consisting of stratified layers. Only small areas found on the Hanford Site, located in low areas adjacent to the Columbia River.
Esquatzel silt loam (Qu)	Deep dark-brown soil formed in recent alluvium derived from loess and lake sediments. Subsoil grades to dark grayish-brown in many areas, but color and texture of the subsoil vary because of the stratified nature of the alluvial deposits.
Riverwash (Rv)	Wet, periodically flooded areas of sand, gravel, and boulder deposits that make up overflowed islands in the Columbia River and adjacent land.
Dune sand (D)	Miscellaneous land type that consists of hills or ridges of sand-sized particles drifted and piled up by wind, and are either actively shifted or so recently fixed or stabilized that no soil horizons have developed.
Lickskillet silt loam (Ls)	Located on ridge slopes of Rattlesnake Hills and slopes greater than 765 m (2,509 ft) in elevation. Similar to Kiona series except surface soils are darker. Shallow over basalt bedrock, with numerous basalt fragments throughout the profile.

1 **Figure 4-9. Soil Map of the Hanford Site (adapted from**
 3 **PNNL 1996a).**



Columbia River Flow — Who Controls It?

On the Columbia River above the Hanford Site, there are dams such as the Grant County Public Utility District (PUD) Rock Island Dam and Rocky Reach Dam; the Douglas County PUD Wells Dam; the U.S. Army Corps of Engineers Chief Joseph Dam; the BoR Grand Coulee Dam; and the British Columbia Hydro Keenleyside Dam, Revelstoke Dam, and Mica Dam.

The 1964 Columbia River Treaty between the United States and Canada provided for building four storage reservoirs: three in Canada (Mica, Keenleyside, and Duncan) and one in the United States (Libby). The reservoirs that were built and operated under the Treaty represent almost half the water storage on the Columbia River System. The Treaty required over 15.5 million acre-feet of Canadian storage, but reservoirs actually built contained storage capacity of 20.5 million acre-feet. The excess storage capacity, most of which is behind Mica Dam, is referred to as non-Treaty storage. The Non-Treaty Storage Agreements made by DOE's BPA were necessary to govern the rights to this additional storage capacity. Nothing in the Treaty prevented Canada from using all of the non-Treaty storage unilaterally, although the United States argued it had the right to compensation if use of the non-Treaty storage resulted in reduced Columbia River flows into the United States.

The three dams in British Columbia were developed to provide water storage for power generation in the United States. Mica Dam has the highest "head" at 200 m (656.2 ft) and is the only installation of the three to have a powerhouse. In return for building the three dams (Mica, Keenleyside, and Duncan), B.C. Hydro was entitled to half the additional power generated in the United States that resulted from storage operations in Canada. These "downstream benefits" were sold to a group of American utilities for 30 years. This share, known as the "Canadian Entitlement," is owned by B.C. Hydro. In September 1994, British Columbia and the United States signed a Memorandum of Agreement which outlines new arrangements for the return of the Canadian Entitlement, beginning in 1998.

The Vernita Bar Agreement (signed June 16, 1988, by the U.S. Department of Energy, Federal and state agencies, Tribal governments, and public utility districts in Grant, Chelan, and Douglas counties) was entered into by the dam owners to prevent salmon eggs from being left high and dry when river flows fluctuate to meet peak power demands.

The overall water flow in the Columbia River is precisely controlled with cooperation from all dam owners from the U.S. Army Corps of Engineers Operations Center in Portland, Oregon.

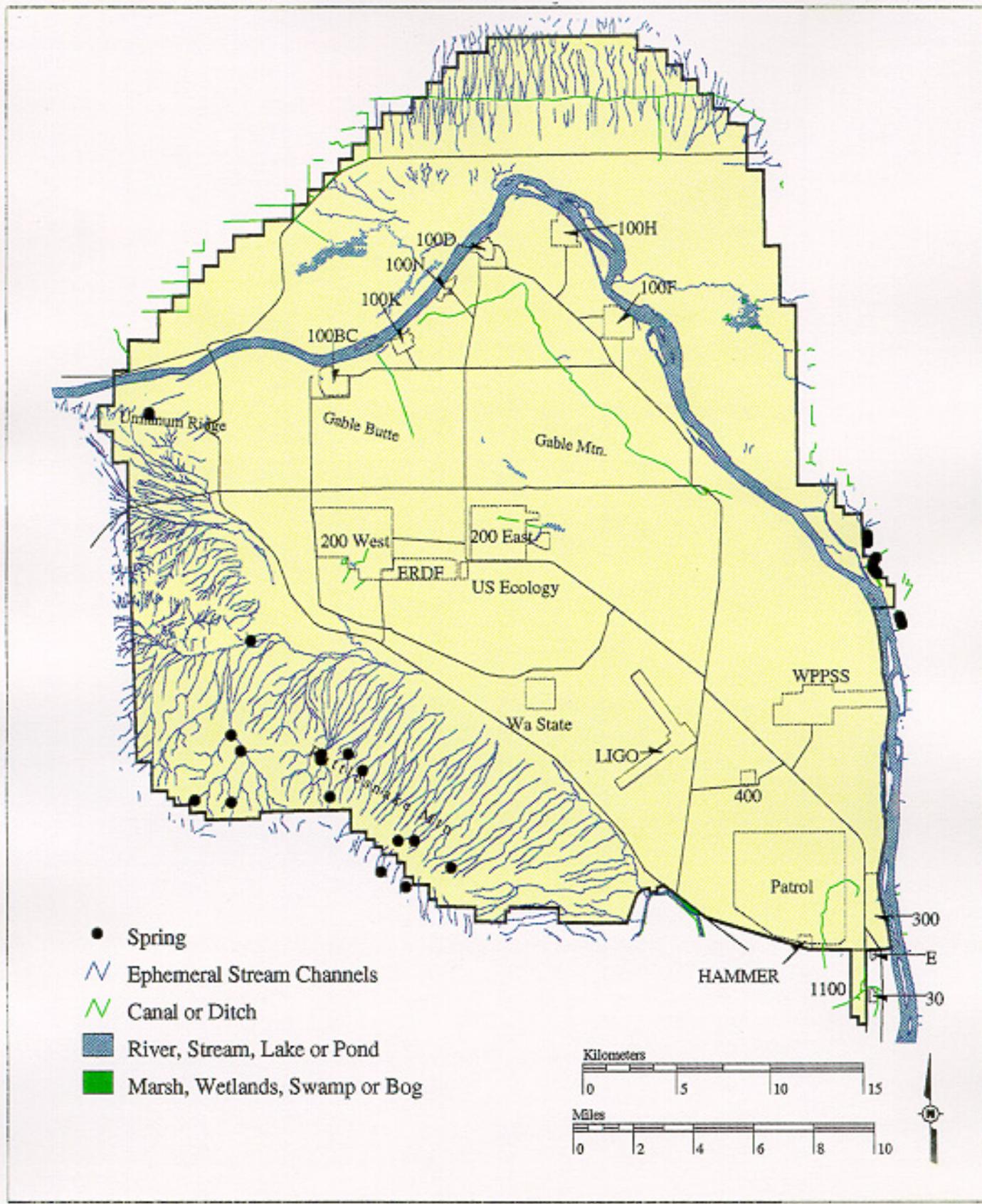
1 The Hanford Site occupies approximately
2 one-third of the land area within the Pasco Basin.
3 Primary surface-water features associated with the
4 Hanford Site are the Columbia and Yakima rivers
5 (see text box, "*Hanford Site Quick Facts: Surface*
6 *Water*"). Several surface ponds and ditches in the
7 200 Areas, which were generally associated with
8 fuel- and waste-processing activities, are shown in
9 their historical locations (Figure 4-10). In the
10 100 Area and 300 Area, historical Hanford irrigation
11 canals are shown. Other active irrigation
12 wasteways (i.e., canals or ditches that carry excess
13 irrigation water back to the Columbia River) that
14 belong to the BoR are shown on the Wahluke Slope.
15 In addition, several small spring-fed streams occur
16 on the ALE Reserve in the southwestern portion of
17 the Hanford Site.

18
19 A network of dams and multi-purpose water
20 resource projects is located along the course of the
21 Columbia River. Water storage behind
22 Grand Coulee Dam, combined with storage
23 upstream in Canada, totals $3.1 \times 10^{10} \text{ m}^3$
24 ($1.1 \times 10^{12} \text{ ft}^3$) of usable storage to regulate the
25 Columbia River for power, flood control, and
26 irrigation.

27
28 The flow of the Columbia River has been
29 inventoried and described in detail by the U.S. Army
30 Corps of Engineers (USACE) (DOE, DOA, and
31 DOI 1995). Flows through the Hanford Reach
32 fluctuate significantly and are controlled primarily by
33 releases from the Priest Rapids Dam. Recorded
34 flow rates in the Hanford Reach have ranged from
35 4,500 to 18,000 m^3/s (approximately 158,900 to
36 635,600 ft^3/s) during the runoff in spring and early
37 summer, and from 1,000 to 4,500 m^3/s (35,300 to
38 158,900 ft^3/s) during the low-flow period of late
39 summer and winter.

40
41 Annual flows near Priest Rapids during the
42 68 years prior to 1985 averaged nearly 3,360 m^3/s
43 (120,000 ft^3/s) (McGavock et al. 1987). Daily
44 average flows during this period ranged from 1,000
45 to 7,000 m^3/s (36,000 to 250,000 ft^3/s). During the
46 last 10 years, the average daily flow was also about
47 3,360 m^3/s (120,000 ft^3/s). However, larger than
48 normal snowpacks resulted in exceptionally high
49 spring runoff during 1996 and 1997. The peak flow
50 rate during 1997 was nearly 11,750 m^3/s
51 (415,000 ft^3/s) (DART 1998). Normal river elevations range from 120 m (394 ft) above mean sea
52 level where the river enters the Hanford Site near Vernita, to 104 m (341 ft) where the river

Figure 4-10. Surface Water on the Hanford Site.



Hanford Site Quick Facts: Surface Water

- c Columbia River average annual flow:
3,400 m³ (120,100 ft³) per second
- c Yakima River average annual flow:
104 m³ (3,673 ft³) per second

1 leaves the Hanford Site near the 300 Area. Vertical
2 fluctuations of approximately 1.5 m (greater than
3 5 vertical ft) are not uncommon along the Hanford Reach
4 (Dirkes 1993). The width of the river varies from
5 approximately 300 m (1,000 ft) to 1,000 m (3,300 ft)
6 within the Hanford Site.

7
8 Several drains and intakes are present along the
9 Hanford Reach. These include irrigation outfalls from the Columbia Basin Irrigation Project,
10 Hanford Site intakes for the onsite water export system, and Energy Northwest (formerly known
11 as WPPSS) water intakes.

12
13 The primary uses of the Columbia River include the production of hydroelectric power,
14 irrigation of cropland in the Columbia Basin, and transportation of materials by barge. The
15 Hanford Reach is the upstream limit of barge traffic on the main stem of the Columbia River.
16 Barges are used to transport reactor vessels from decommissioned nuclear submarines to
17 Hanford for disposal. Several communities located on the Columbia River rely on the river as
18 their source of drinking water. The Columbia River is also used as a source of both drinking
19 water and industrial water for several Hanford Site facilities (Dirkes 1993). In addition, the
20 Columbia River is used extensively for recreation, which includes fishing, hunting, boating,
21 sailboarding, waterskiing, diving, and swimming.

22
23 The Yakima River, bordering the southern portion of the Hanford Site, has a low annual
24 flow compared to the Columbia River. The average flow, based on nearly 60 years of records, is
25 about 104 m³/s (3,712 ft³/s), with an average monthly maximum of 490 m³/s (17,500 ft³/s) and
26 minimum of 4.6 m³/s (165 ft³/s). Exceptionally high flows were observed during 1996 and 1997.
27 The peak average daily flow rate during 1997 was nearly 1,300 m³/s (45,900 ft³/s). Approximately
28 one-third of the Hanford Site is drained by the Yakima River system.

29
30 An alkaline spring at the east end of Umtanum Ridge was documented by The Nature
31 Conservancy in *Biodiversity Inventory and Analysis of the Hanford Site* (TNC 1998). Several
32 springs are also found on the slopes of the Rattlesnake Hills, along the western edge of the
33 Hanford Site. Cold Creek and its tributary, Dry Creek, are ephemeral streams within the Yakima
34 River drainage system that roughly parallel SR 240 through the Hanford Site. Both streams drain
35 areas to the west of Hanford Site. Surface flow, when it occurs, infiltrates and disappears into the
36 surface sediments in the western portion of the Hanford Site. Rattlesnake Springs, located on
37 the western portion of the Hanford Site, forms a small surface stream that flows for approximately
38 3 km (1.9 mi) before disappearing into the ground.

39
40 There are no currently active ditches on the Hanford Site. The only active pond in Benton
41 County's portion of the Hanford Site is West Lake. West Lake is located north of the 200 East
42 Area and is a natural feature recharged from groundwater (PNNL 1996a). West Lake has not
43 received direct effluent discharges from Hanford Site facilities; rather, its existence is caused by
44 the intersection of the elevated water table with the land surface in the topographically low area
45 south of Gable Mountain (and north of the 200 East Area). The artificially elevated water table
46 occurs under much of the Hanford Site and reflects the artificial recharge from past Hanford Site
47 operations. This elevated water table is dropping and so is the size of West Lake.

48
49 The seepage of groundwater into the Columbia River has been known to occur for many
50 years. The riverbank seep discharges were documented along the Hanford Reach long before
51 Hanford Site operations began during World War II (PNNL 1996a). These relatively small seeps
52 flow intermittently, apparently influenced primarily by changes in river level. Hanford-origin
53 contaminants have been documented in these groundwater discharges along the Hanford Reach
54 (PNNL 1996a).

1 In the 200 West Area, the West Powerhouse Pond, 216-T-1 Ditch, 216-T-4-2 Ditch, and
2 216-Z-21 Basin are active. In the 200 East Area, only the East Powerhouse Ditch and the
3 216-B-3C Pond are active. The 216-B-3C Pond originally was excavated in the mid-1950s for
4 disposal of process cooling water and other liquid wastes occasionally containing low levels of
5 Radionuclides. The FFTF pond is located near the 400 Area and was excavated in 1978 for the
6 disposal of cooling and sanitary water from various facilities in the 400 Area (PNNL 1996a). The
7 ponds are not accessible to the public and do not constitute a direct offsite environmental impact
8 (PNNL 1996a). However, the ponds are accessible to migratory waterfowl, creating a potential
9 pathway for the dispersion of contaminants. Periodic sampling provides an independent check
10 on effluent control and monitoring systems (PNNL 1996a).
11

12 Among the most interesting discoveries of the 1997 field season were three previously
13 undocumented clusters of approximately 20 vernal pools. Vernal pools are associated more
14 typically with arid areas in California and Oregon. Vernal pools in Washington are little known or
15 studied; therefore, their occurrence on the Hanford Site is significant (TNC 1998). The Hanford
16 Site pools were located on the eastern end of Umtanum Ridge, in the central part of Gable Butte,
17 and at the eastern end of Gable Mountain. Each cluster of pools was situated on top of an
18 impermeable basalt layer that enabled water to pond in shallow depressions during wetter winter
19 seasons. The pools often were characterized by a distinct zonation of species from the bottom
20 of the pool, which might be barren throughout the growing season, to the upper pool edge, which
21 was occupied by various annual plant species. The vernal pools also showed wide variation in
22 their degree of development (i.e., some appeared to be pools that filled intermittently and were
23 invaded by sagebrush during extended dry periods). Most pools apparently filled with water most
24 years.
25

26 Vernal pools on the Hanford Site showed wide variation in regard to a number of traits,
27 including pool size, species composition, dominant species, degree of invasion by weedy (mostly
28 non-native) species, and presence of rare plant species. Pools averaged about 60 by 60 ft (18 by
29 18 m) in size, but ranged from 20 by 20 ft (6 by 6 m) to 150 by 100 ft (46 by 30 m). Dominant
30 species were typically annuals. Some vernal pools had a high cover of moss and lichen species.
31 In addition to their botanical resources, there was ample evidence of avian and other wildlife use
32 of these vernal pools as they often provided water during dry times of the year (TNC 1998).
33

34 The cluster of 10 to 11 vernal pools on the eastern end of Umtanum Ridge were of
35 relatively high quality and appeared to be the most undisturbed (pristine) pools on the Site. Large
36 and vigorous subpopulations of *Mimulus suksdorfii* (Suksdorf's Monkey-flower) were found in
37 almost all of these pools. *Myosurus x clavicaulis* (Tiny mousetail) was located in one of the
38 vernal pools. The pools were spread out over an area of about 1,000 by 3,000 ft (305 by 915 m).
39 The lower, middle portion of Gable Butte supported a cluster of six or seven vernal pools. These
40 pools supported healthy populations of several thousand *Mimulus suksdorfii* (Suksdorf's Monkey-
41 flower) and *Loeflingia squarrosa* var. *squarrosa* (Sagebrush loeflingia) plants. The area was far
42 from current development; however, an old road did cross through the largest vernal pool. The
43 cluster of three pools on the eastern end of Gable Mountain was the least pristine of the three
44 sets of vernal pools. These weedy, intermittently filled pools supported a population of several
45 hundred *Mimulus suksdorfii* (Suksdorf's Monkey-flower) plants. The aggressive weed *Centaurea*
46 *solstitialis* (Yellow Starthistle) posed a serious threat to the native plants at these pools (TNC
47 1998). Because these vernal pools are systems of significant quality, good management
48 practices would include careful monitoring for invasive species. Immediate management action
49 would be needed to stop invasive plants, if detected.
50

51 An alkaline spring and marshy area was found in a large shallow basin at the east end of
52 Umtanum Ridge. This previously unknown spring did not appear to have been significantly
53 damaged by past grazing. It is perhaps the only spring of its kind on the Hanford Site. This
54 spring supports a population of *Castilleja exilis* (Foothill Indian Paintbrush) and other alkali-

1 tolerant plant species. There also were a number of weedy species present that could threaten
2 the persistence of native plant species at the spring. The alkaline spring, as well as the vernal
3 pool clusters, are considered to be special habitat areas (TNC 1998).

4
5 West Lake and its adjacent wetlands also were surveyed during the 1997 field season. A
6 highly alkaline lake, West Lake results from an artificially elevated rise in the water table due to
7 historic waste management practices on Hanford's central plateau (Cushing 1994). There also
8 was evidence of significant groundwater changes in the area, probably due to recent changes in
9 waste management activities that have reduced groundwater discharges on the central plateau.
10 Native plant communities at West Lake appeared to be substantially degraded (TNC 1998). A
11 historic siting of *Castilleja exilis* and many other species for the Hanford Site that had been
12 documented at West Lake in the past (Sackschewsky et al. 1992) were not located during the
13 1997 survey. Much of the lake basin was invested with weedy species, primarily *Bassia*
14 *hyssopifolia* (smotherweed).

15
16 Other than rivers and springs, there are no naturally occurring bodies of surface water
17 adjacent to the Hanford Site. However, there are artificial wetlands (caused by irrigation) exist on
18 the east and west sides of the Wahluke Slope portion of the Hanford Site, which lies north of the
19 Columbia River. Hatcheries and canals associated with the Columbia Basin Irrigation Project
20 constitute the only other artificial surface water expressions in the area. The Ringold Hatchery,
21 located just south of the Hanford Site boundary on the east side of the Columbia River (northeast
22 of the 300 Area), is the only local fish hatchery. In addition to the public hatchery, the Yakama
23 Nation raised several species of fish in settling pools in the 100-K Area as part of an experimental
24 program.

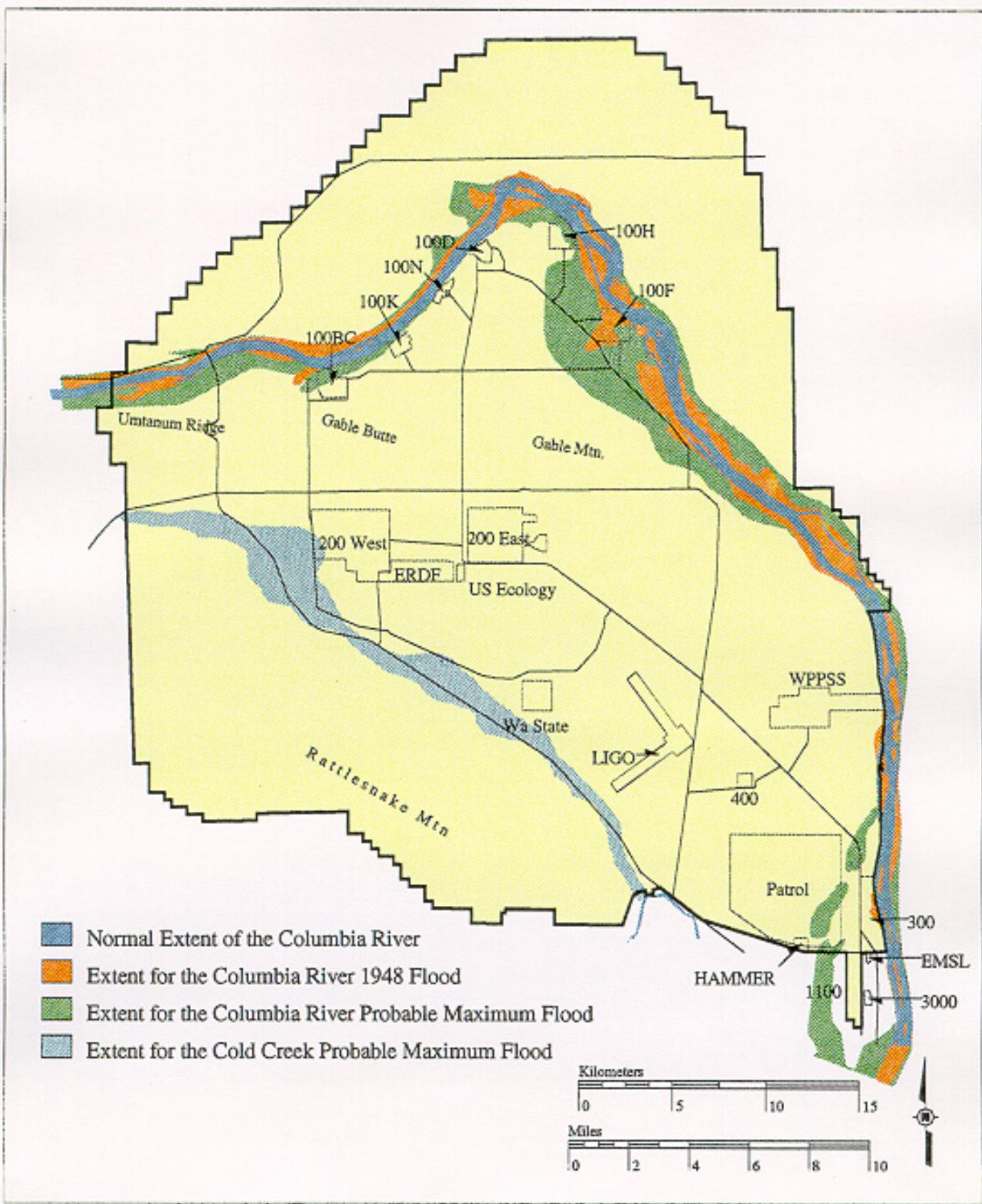
25
26 Total estimated precipitation over the Pasco Basin is about $9 \times 10^8 \text{ m}^3$ ($3.2 \times 10^{10} \text{ ft}^3$)
27 annually, averaging less than 20 cm/yr (approximately 8 in./yr). Mean annual runoff from the
28 Pasco Basin is estimated at less than $3.1 \times 10^7 \text{ m}^3/\text{yr}$ ($1.1 \times 10^9 \text{ ft}^3/\text{yr}$), or approximately 3 percent
29 of the total precipitation. The basin-wide runoff coefficient is zero for all practical purposes. The
30 remaining precipitation is assumed to be lost through evapotranspiration, with less than 1 percent
31 recharging the groundwater system. Precipitation contributes recharge to the groundwater in
32 areas where soils are coarse-textured and bare of vegetation (PNNL 1996a).

33
34 **4.3.1.1 Flooding.** Large Columbia River floods have
35 occurred in the past, but the likelihood of recurrence of
36 large-scale flooding has been reduced by the
37 construction of several flood control and water storage
38 dams upstream of the Hanford Site. Major floods on
39 the Columbia River typically result from rapid melting of
40 the winter snowpack over a wide area, augmented by
41 above-normal precipitation. The maximum historical
42 flood on record occurred June 7, 1894, with a peak
43 discharge at the Hanford Site of $21,000 \text{ m}^3/\text{s}$ ($742,000 \text{ ft}^3/\text{s}$). The largest recent flood took place
44 in 1948, with an observed peak discharge of $20,000 \text{ m}^3/\text{s}$ ($706,280 \text{ ft}^3/\text{s}$) at the Hanford Site
45 (PNNL 1996a). The exceptionally high runoff during the spring of 1996 resulted in a maximum
46 discharge of nearly $11,750 \text{ m}^3/\text{s}$ ($415,000 \text{ ft}^3/\text{s}$) (DART 1998). The floodplain associated with the
47 1948 flood is shown in Figure 4-11 (see text box, "*Hanford Site Quick Facts: Columbia River*
48 *Floods*").

Hanford Site Quick Facts: Columbia River Floods	
C	Largest flood on record: 1894 at $21,000 \text{ m}^3/\text{s}$
C	Largest recent flood: 1948 at $20,000 \text{ m}^3/\text{s}$
C	Probable maximum flood: $40,000 \text{ m}^3/\text{s}$

1
2
3
4
5
6

Figure 4-11. Probable Maximum Flood of the Columbia River and Cold Creek, and the Actual 1948 Flood of the Columbia River (adapted from PNNL 1996a).



1 The Federal Emergency Management Agency has not prepared floodplain maps for the
2 Hanford Reach because they only prepare maps for areas that are being developed (a criterion
3 that specifically excludes the Hanford Reach).
4

5 Evaluation of flood potential is conducted, in part, through the concept of the probable
6 maximum flood, which is determined from the upper limit of precipitation falling on a drainage
7 area and other hydrologic factors (e.g., antecedent moisture conditions, snowmelt, and tributary
8 conditions) that could result in maximum runoff. The probable maximum flood for the Columbia
9 River below the Priest Rapids Dam has been calculated at 40,000 m³/s (1.4 million ft³/s) (see
10 Figure 4-11) and is greater than the 500-year flood. This flood would inundate some portions of
11 the 100 Area that are located adjacent to the Columbia River; but the central portion of the
12 Hanford Site would remain unaffected (PNNL 1996a). Floodplain issues are further discussed in
13 Appendix C.
14

15 The USACE has derived the Standard Project Flood with both dam-regulated and
16 unregulated peak discharges given for the Columbia River below Priest Rapids Dam
17 (PNNL 1996a). The regulated Standard Project Flood for this portion of the river is given as
18 15,200 m³/s (540,000 ft³/s), and the 100-year regulated flood as 12,400 m³/s (440,000 ft³/s).
19

20 Potential dam failures on the Columbia River have been evaluated (PNNL 1996a).
21 Upstream failures could arise from a number of causes, with the magnitude of the resulting flood
22 depending on the degree of breaching at the dam. The USACE evaluated a number of scenarios
23 for failure of the Grand Coulee Dam, assuming flow conditions of 11,000 m³/s (400,000 ft³/s). For
24 purposes of emergency planning, they hypothesized that 25 and 50 percent breaches (the
25 instantaneous disappearance of 25 or 50 percent of the center section of the dam) would result
26 from the detonation of nuclear explosives in sabotage or war. The discharge or floodwave from
27 such an instantaneous 50 percent breach at the outfall of the Grand Coulee Dam was determined
28 to be 600,000 m³/s (21 million ft³/s). In addition to the areas inundated by the probable maximum
29 flood, the remainder of the 100 Areas, the 300 Area, and nearly all of Richland, Washington,
30 would be flooded (PNNL 1996).
31

32 Determinations were not made for (1) failures of dams upstream, (2) associated failures
33 downstream of Grand Coulee, or (3) breaches greater than 50 percent of Grand Coulee, because
34 the 50 percent scenario was believed to represent the largest realistically conceivable flow that
35 could result from a natural or human-induced breach; that is, it was not considered credible that a
36 structure as large as the Grand Coulee Dam would be 100 percent destroyed instantaneously.
37 The analysis also assumed that the 50 percent breach would occur only as the result of direct
38 explosive detonation, not because of a natural event (i.e., an earthquake), and that even a
39 50 percent breach under these conditions would indicate an emergency situation in which other
40 overriding major concerns might be present.
41

42 The possibility of a landslide resulting in river blockage and flooding along the Columbia
43 River also has been examined for an area bordering the east side of the river upstream from the
44 City of Richland (PNNL 1996a). The possible landslide area considered was the 75-m (250-ft)-
45 high bluff (generally known as White Bluffs). Calculations were made for an 8×10^5 m³
46 (1×10^6 yd³) landslide volume with a concurrent flood flow of 17,000 m³/s (600,000 ft³/s) (a
47 200-year flood) that results in a flood wave crest elevation of 122 m (400 ft) above mean sea
48 level. Areas inundated upstream from such a landslide event would be similar to a 50 percent
49 breach of the Grand Coulee Dam. A flood-risk analysis of Cold Creek was conducted in 1980 as
50 part of the characterization of a geologic repository for high-level radioactive waste. This design
51 work evaluated the probable maximum flood rather than the worst-case and/or 100-year flood
52 scenarios. Therefore, in lieu of 100- and 500-year floodplain studies, a probable maximum flood

1 evaluation was made for a reference repository located directly west of the 200 East Area that
2 encompasses the 200 West Area (PNNL 1996a). Figure 4-11 identifies the extent of this
3 probable maximum flood.
4

5 **4.3.1.2 Surface Water Quality.** The Washington State Department of Ecology (Ecology)
6 classifies the Columbia River, from Grand Coulee to the Washington-Oregon border, which
7 includes the Hanford Reach, as Class A (excellent) (PNNL 1996a). Class A waters are suitable
8 for essentially all uses, including raw drinking water, recreation, and wildlife habitat. Federal and
9 state drinking water standards, as well as DOE Order 5400.5 (DOE 1993a), apply to the
10 Columbia River and are currently being met.
11

12 Pacific Northwest National Laboratory (PNNL) conducts routine monitoring (for both
13 radiological and nonradiological water quality parameters) of the Columbia River. A yearly
14 summary of these monitoring results has been published since 1973 (PNNL 1996b). Numerous
15 water quality studies have been conducted on the Columbia River during the past 37 years.
16 Three outfalls, located in the 100-K, 100-N, and 300 Areas of the Hanford Site, are covered by a
17 National Pollutant Discharge Elimination System Permit (Permit No. WA-000374-3). These
18 discharge locations are monitored for various measures of water quality, including nonradioactive
19 and radioactive pollutants. The estimated dose from radionuclide releases is presented in
20 environmental reports such as the *Hanford Site Environmental Report for Calendar Year 1996*
21 (PNNL 1997a). In 1994, monitored liquid discharges resulted in a dose of 0.016 mrem to the
22 downstream maximally exposed individual (PNL 1995).
23

24 Radiological monitoring of the Columbia River continues to show low levels of
25 radionuclides. Although radionuclides associated with Hanford Site operations continued to be
26 identified in Columbia River water in 1994, concentrations remained well below applicable
27 standards at all monitored locations (PNL 1995). In 1995, tritium, iodine-129, and uranium
28 concentrations downstream of the Hanford Site were found to be slightly higher than upstream
29 concentrations, but these concentrations were well below guidelines established by DOE through
30 DOE Order 5400.5 (DOE 1993a) and the U.S. Environmental Protection Agency (EPA) drinking
31 water standards (Table 4-2). In 1995, the average annual strontium-90 and technetium-99
32 concentrations were essentially the same at Priest Rapids Dam (upstream of the Hanford Site)
33 and at the Richland pump house (PNNL 1996b).
34

35 Total alpha and beta measurements are useful indicators of the general radiological
36 quality of the river that provide an early indication of changes in radioactive contamination levels
37 because results are obtained quickly. Total alpha and beta measurements for 1996 were similar
38 to the previous year, and were approximately 5 percent or less of the applicable drinking water
39 standards of 15 and 50 pCi/L, respectively. Tritium measured at the Richland pump house was
40 significantly higher than at Vernita Bridge, but continued to be well beyond the state and Federal
41 drinking water standards (Dirkes 1997). The presence of a ³H concentration gradient at the
42 Richland pump house supports previous conclusions made by Backman (1962) and Dirkes
43 (1993) that contaminants in the 200 Area groundwater plume entering the Columbia River at and
44 upstream of the 300 Area are not completely mixed by the time the river reaches the Richland
45 pump house.

1 **Table 4-2. Annual (1995) Average Concentrations of Radionuclides in the**
 2 **Columbia River (adapted from PNNL 1996b).**

Radionuclides	Water Concentrations (pCi/L)			Downstream Concentration as Percentage of Drinking Water Standard
	Upstream Concentration (Priest Rapids Dam)	Downstream Concentration (Richland Pump House)	EPA Drinking Water Standard	
H-3	34	79	20,000	0.40
Sr-90	0.08	0.09	8.0	1.1
U	0.40	0.50	20.0 (ug/L) ^a	2.5
Tc-99	ND	0.06	900	--
I-129	3.6 x 10 ⁻⁶	5.7 x 10 ⁻⁵	0.48	0.01

9 ^a Proposed
 10 ND = Not Detected.

11
 12
 13 For nonradiological water quality parameters measured in Columbia River water during
 14 1995, concentrations of metals and anions were similar upstream and downstream and were
 15 found to be in compliance with applicable primary drinking water standards. Concentrations of
 16 volatile organic compounds (VOCs) also were below regulatory standards (PNNL 1996b).
 17

18 **4.3.2 Groundwater**

19
 20 The following sections describe the groundwater resources at the Hanford Site. Ground-
 21 water under the Hanford Site occurs under unconfined and confined conditions. The uppermost
 22 aquifer beneath most of the Hanford Site is unconfined and is composed of unconsolidated to
 23 semi-consolidated sediments deposited on the basalt bedrock. In some areas, deeper parts of
 24 the aquifer are locally confined by layers of silt and clay. Groundwater in the unconfined aquifer
 25 systems generally moves from recharge areas along the western boundary of the Hanford Site to
 26 the east and north toward the Columbia River, which is the major discharge area. This natural
 27 flow pattern was altered by the formation of groundwater mounds created by the discharge of
 28 large volumes of wastewater at disposal facilities. These mounds are declining, however, and
 29 groundwater flow is gradually returning to earlier patterns.
 30

31 The confined aquifers consist of sedimentary interbeds and/or interflow zones that occur
 32 between dense basalt flows in the Columbia River Basalt group. The main water-bearing
 33 portions of the interflow zones occur within a network of interconnecting vesicles and fractures of
 34 the basalt flow tops or flow bottoms. Figure 4-6 presents a generalized subsurface cross-section
 35 of the Hanford Site.
 36

37 **4.3.2.1 Groundwater Hydrology.** The multi-aquifer system within the Pasco Basin has been
 38 conceptualized as consisting of four geohydrologic units: (1) Grande Ronde Basalt,
 39 (2) Wanapum Basalt, (3) Saddle Mountain Basalt, and (4) Hanford and Ringold formation
 40 sediments lying above the basalt units (see Figure 4-5). Geohydrologic units older than the
 41 Grande Ronde Basalt probably are of minor importance to the regional hydrologic dynamics and
 42 system. Together, the Grande Ronde, Wanapum, Saddle Mountains, and Imnaha Basalts
 43 compose the Columbia River Basalt group.
 44

45 The Grande Ronde Basalt is the most voluminous and widely spread formation within the
 46 Columbia River Basalt group and has a thickness of at least 2,745 m (9,000 ft). The Grande
 47 Ronde Basalt is composed of the basalt flows and minor intercalated sediments that are

1 equivalent to or part of the Ellensburg Formation (DOE 1988a). More than 50 flows of Grande
2 Ronde Basalt underlie the Pasco Basin, but little is known of the lower 2,200 to 2,500 m (7,216 to
3 8,200 ft). Groundwater in these basalts is confined to semi-confined and is recharged along the
4 margins of the Columbia Plateau where the basalt is at, or close to, the land surface and by
5 surface-water and groundwater inflow from lands adjoining the plateau. Vertical movement into
6 and out of this system is known to occur. Groundwater within the Grande Ronde Basalt in the
7 eastern Pasco Basin is believed to originate from groundwater inflow from the east and the
8 northeast.

9
10 The Wanapum Basalt consists of basalt flows intercalated with minor and discontinuous
11 sedimentary interbeds of the Ellensburg Formation or equivalent sediments. In the Pasco Basin,
12 the Wanapum Basalt consists of three members, each consisting of multiple flows. The
13 Wanapum Basalt underlies the entire Pasco Basin and has a maximum thickness of 370 m
14 (1,215 ft). Groundwater within the Wanapum Basalt is confined to semi-confined.

15
16 The Saddle Mountain Basalt is composed of the youngest formation of the Columbia River
17 Basalt group and several thick sedimentary beds of the Ellensburg Formation or equivalent
18 sediments, which comprise up to 25 percent of the unit. Within the Pasco Basin, the Saddle
19 Mountain Basalt contains seven members, each with one or more flows. This Saddle Mountain
20 Basalt underlies most of the Pasco Basin, attaining a thickness of about 290 m (950 ft), but is
21 absent along the northwest part of the basin and along some anticlinal ridges. Groundwater in
22 the Saddle Mountain Basalt is confined to semi-confined, with recharge and discharge believed to
23 be local (PNL 1991a).

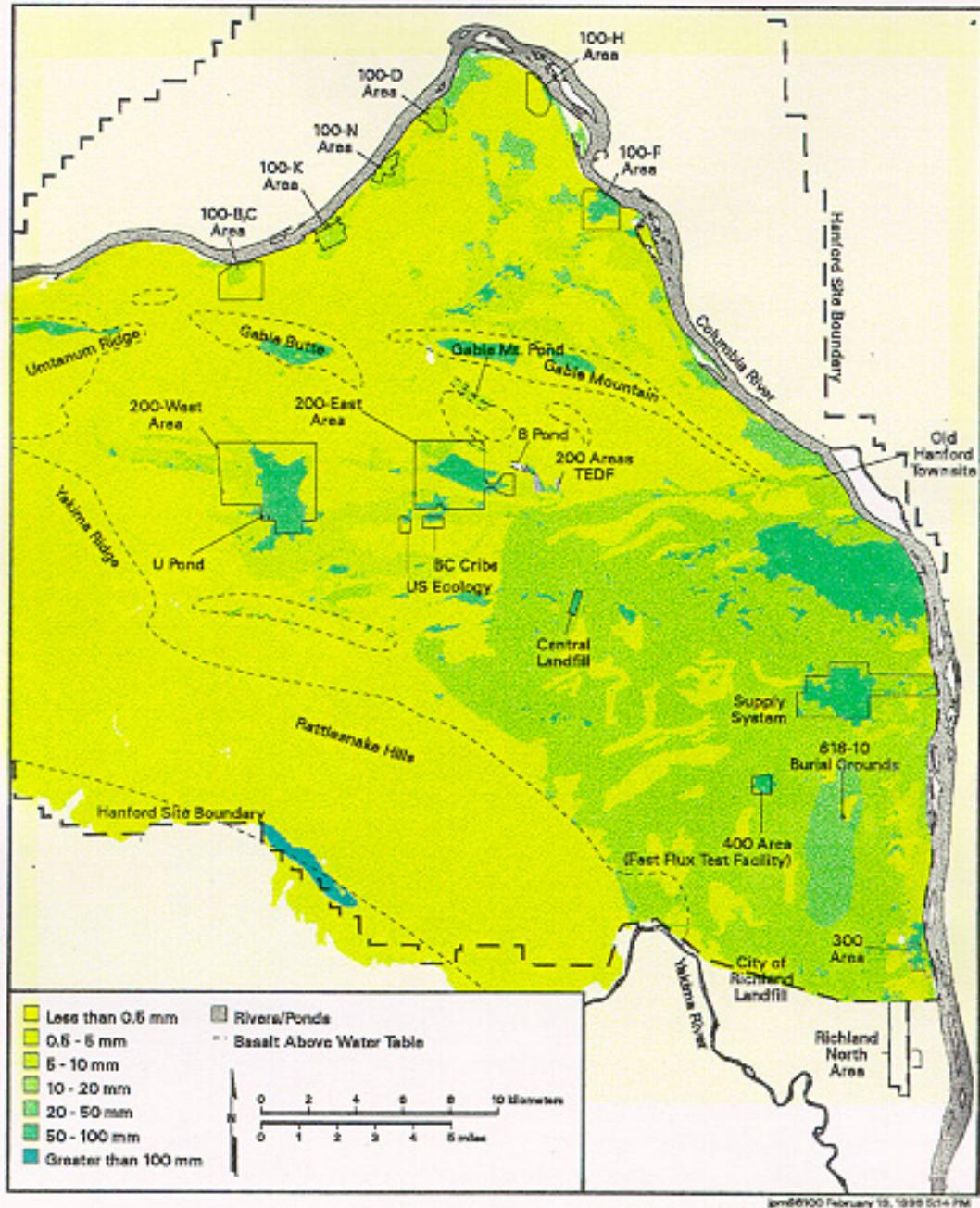
24
25 The rock materials that overlie the basalts in the structural and topographic basins within
26 the Columbia Plateau generally consist of Miocene-Pliocene sediments, volcanics, Pleistocene
27 sediments (including those from catastrophic flooding), and Holocene sediments consisting
28 mainly of alluvium and eolian deposits. The suprabasalt sediment (referred to as the
29 Hanford/Ringold unit) consists principally of the Miocene-Pliocene Ringold Formation stream,
30 lake, and alluvial materials, and the Pleistocene catastrophic flood deposits informally called the
31 Hanford formation. Groundwater within the suprabasalt sediment is unconfined, with recharge
32 and discharge usually coincident with topographic highs and lows (PNL 1991a). The
33 Hanford/Ringold unit is restricted to the Pasco Basin; principal recharge occurs (along the
34 periphery of the basin) from precipitation and ephemeral streams.

35
36 **4.3.2.2 Groundwater Recharge.** Little, if any, natural recharge occurs within the Hanford Site,
37 but artificial recharge occurs from liquid waste disposal activities (PNNL 1996b) (Figure 4-12).
38 Recharge from irrigation occurs east and north of the Columbia River and in the synclinal valleys
39 west of the Hanford Site. Within the Pasco Basin, recharge occurs along the anticlinal ridges to
40 the north and west and from groundwater inflow from the east and northeast. Sources of natural
41 recharge to the unconfined aquifer are rainfall and runoff from the higher bordering elevations,
42 water infiltrating from small ephemeral streams, and river water along influent reaches of the
43 Yakima and Columbia rivers. To define the movement of water in the unsaturated (vadose) zone,
44 the movement of precipitation through the vadose zone has been studied at several locations on
45 the Hanford Site. Conclusions from these studies vary depending on the location studied.

46
47 From the recharge areas to the west, groundwater flows downgradient to the discharge
48 areas, primarily along the Columbia River (Figure 4-13a and 4-13b). This general west-to-east
49 flow pattern is interrupted locally by the groundwater mounds in the 200 East and
50 200 West Areas. From the 200 East and 200 West Areas, a component of groundwater also
51 flows to the north, between Gable Mountain and Gable Butte. These flow directions represent
52 current conditions; the aquifer is dynamic, and responds to changes in natural and artificial
53 recharge (see Figures 4-14 and 4-15, respectively).

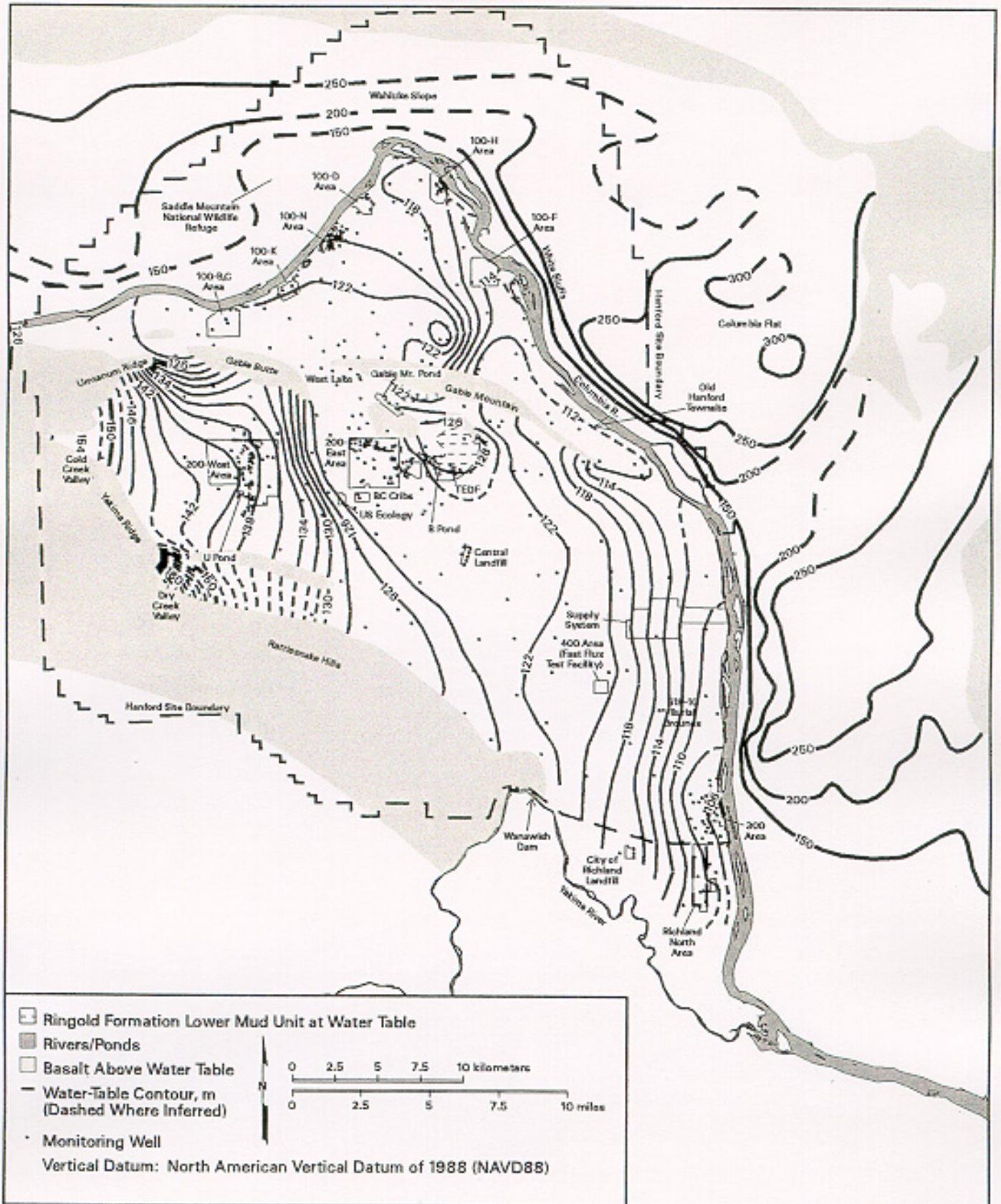
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Figure 4-12. Estimated Recharge from Infiltration of Precipitation and Irrigation on the Hanford Site.



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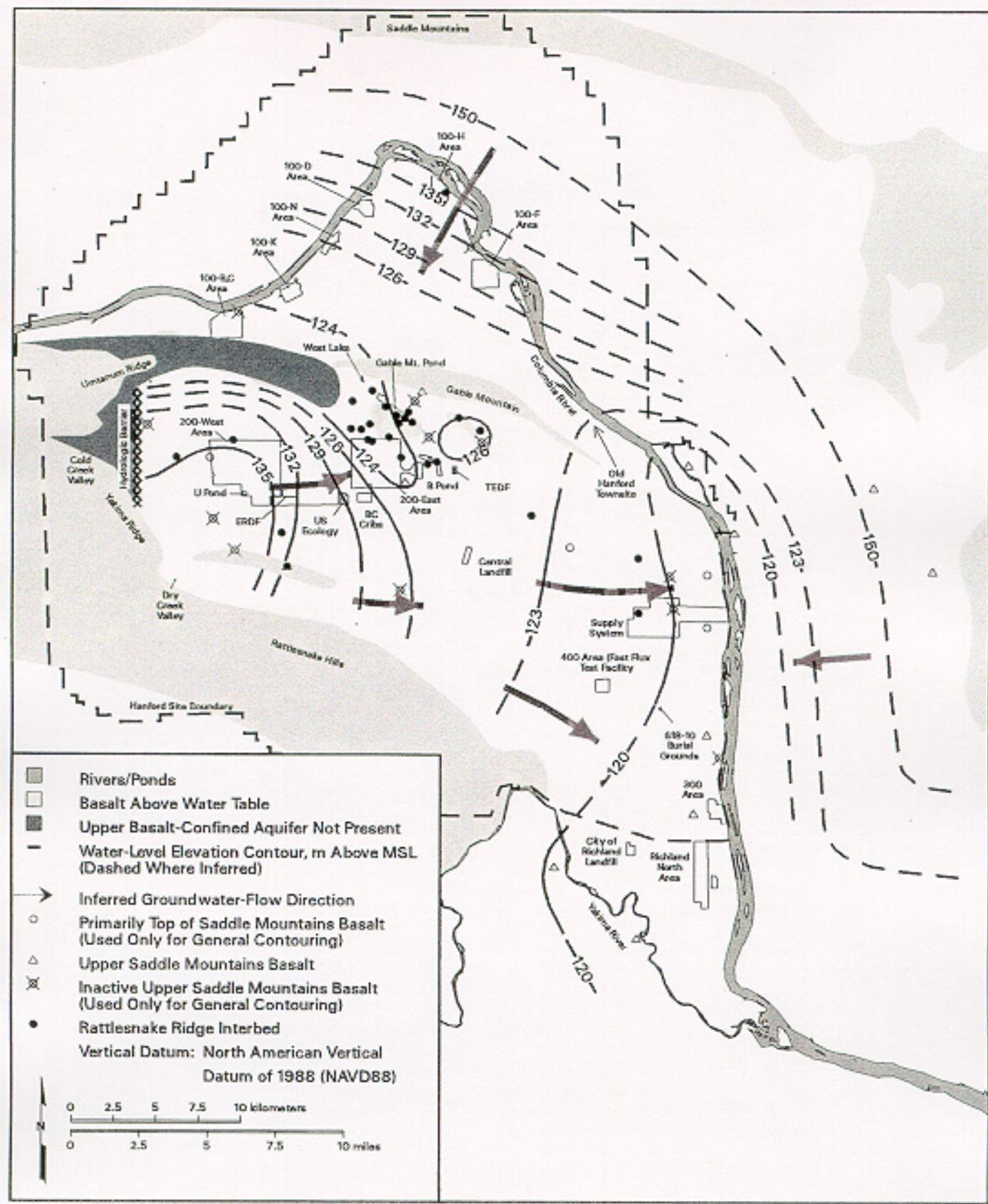
Figure 4-13a. Hanford Site and Outlying Areas Water Table Map -- June 1998 (PNNL 1998).



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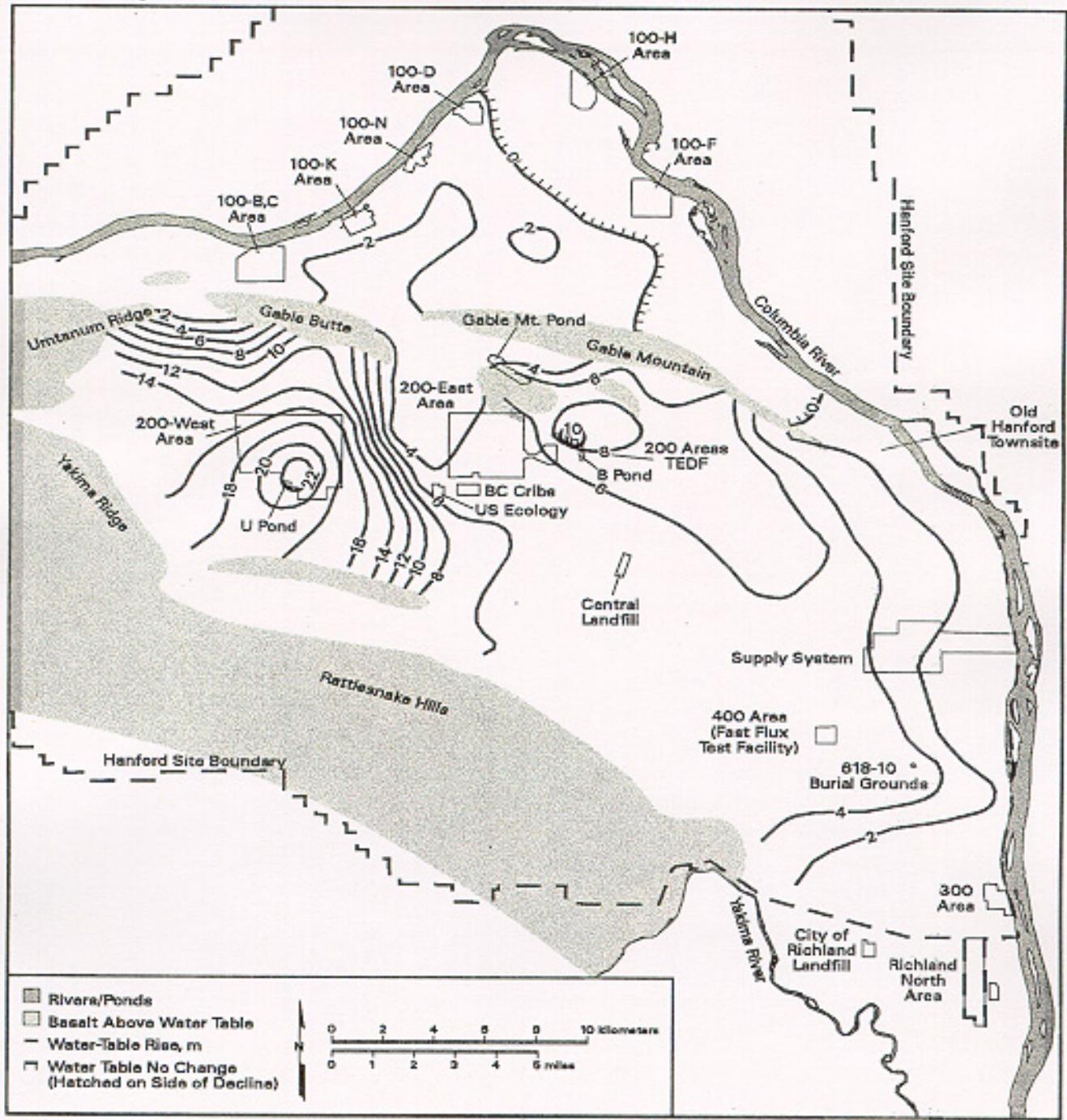
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Figure 4-13b. Potentiometric Map of Upper Basalt-Confining Aquifer System -- June 1998 (PNNL 1998).



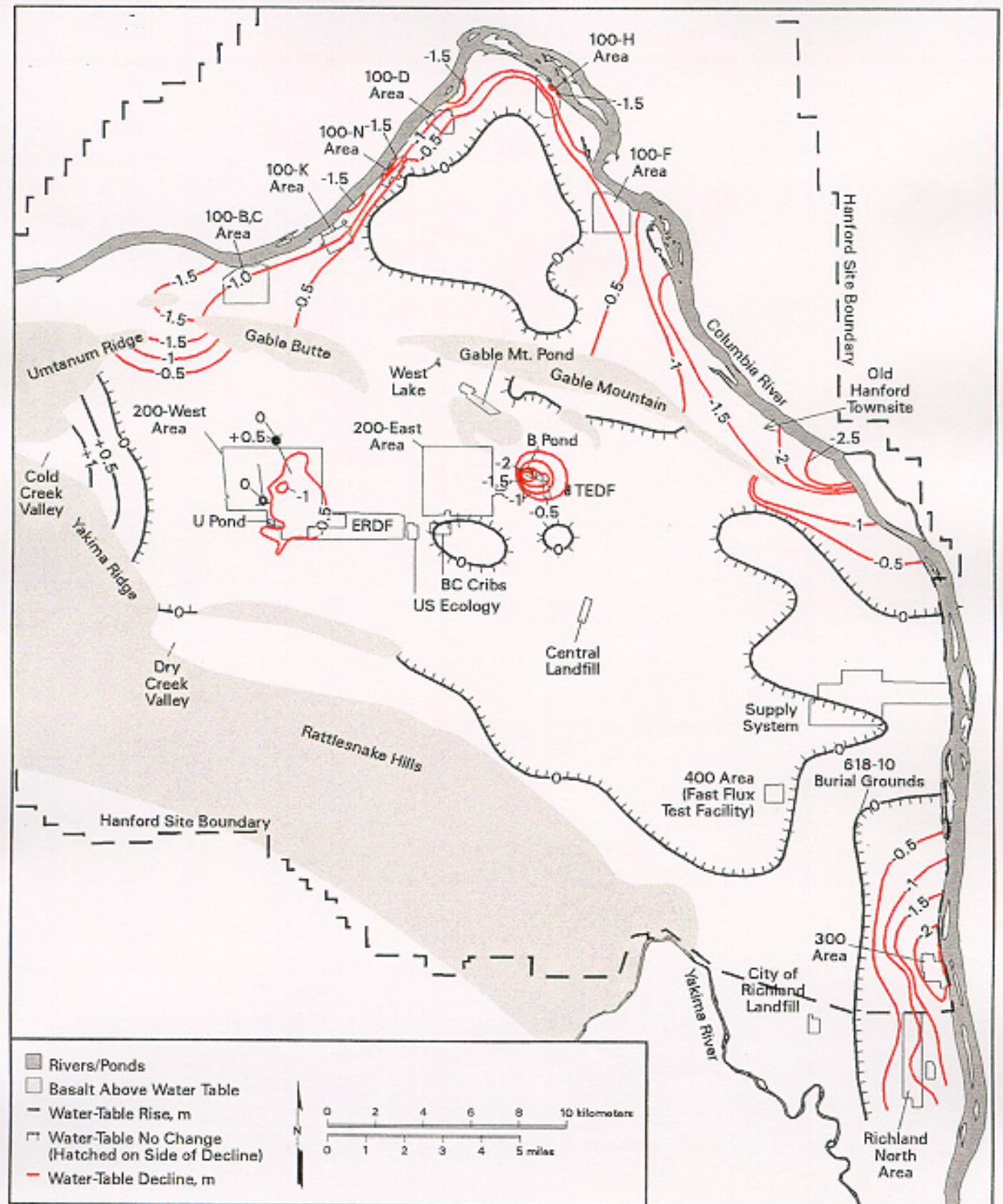
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Figure 4-14. Water Table Change Map for 1944 - 1979.



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Figure 4-15. Water Table Change Map for 1997 - 1998.



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1 Studies indicate that local recharge to the shallow basalts results from infiltration of
 2 precipitation and runoff along the margins of the Pasco Basin. Regional recharge of the deep
 3 basalts is thought to result from interbasin groundwater movement that originates northeast and
 4 northwest of the Pasco Basin in areas where the Wanapum and Grande Ronde Basalt outcrops
 5 are extensive (Neitzel 1997). Groundwater is discharged from the shallow basalt to the overlying
 6 unconfined aquifer and the Columbia River. In some cases, well bores may have allowed water
 7 movement between the unconfined aquifer and the confined aquifer.

8
 9 The major recharge sources of the Hanford and Ringold formations are as follows: inflow |
 10 from Dry Creek, which average 0.035 cm/s; inflow from Cold Creek, which averages 0.028 cm/s; |
 11 and inflow around Rattlesnake Hills, which averages 0.032 cm/s. |

12
 13 **4.3.2.3 Groundwater Quality.** The quality of the groundwater at the Hanford Site has been
 14 affected by many of the activities related to the production
 15 of nuclear materials. Due to the arid climate, natural
 16 recharge of the groundwater on the Hanford Site is low.
 17 Artificial recharge has occurred in the past from the
 18 disposal of liquid waste associated with processing
 19 operations in the 100, 200, and 300 Areas, which created
 20 mounds of water underlying discharge points. Large areas
 21 underlying the Hanford Site have elevated levels of both
 22 radiological and nonradiological constituents. The liquid
 23 effluents discharged into the ground have carried with them
 24 a variety of radionuclides and chemicals that move through
 25 the soil column at differing rates, eventually entering the
 26 groundwater and forming plumes of contamination (see
 27 text box, "*Hanford Site Quick Facts: Principal*
 28 *Groundwater Contaminants*").
 29

<i>Hanford Site Quick Facts: Principal Groundwater Contaminants</i>	
c chromium	c cobalt-60
c nitrate	c strontium-90
c trichloroethylene	c tritium
c fluoride	c uranium
c carbon tetrachloride	c cesium-137
c cyanide	c carbon-14
c tetrachloroethylene	c iodine-129
c chloroform	c plutonium
c cis-1, 2-dichloroethylene	c technetium-99

30
 31 **4.3.2.3.1 Unconfined Aquifer.** As part of the continuing environmental monitoring
 32 program at the Hanford Site, groundwater monitoring reports are published in the *Hanford Site*
 33 *Environmental Report* (PNNL 1996b), and in the *Hanford Site Groundwater Monitoring Report* |
 34 (PNNL 1998), which are issued each calendar year. The shallow, unconfined aquifer in the |
 35 Pasco Basin and on the Hanford Site contains waters of a dilute (less than or approximately
 36 350 mg/L total dissolved solids) calcium bicarbonate chemical type. Other principal constituents
 37 include sulfate, silica, magnesium, and nitrate. Variability in chemical composition exists within
 38 the unconfined aquifer because of natural variation in the composition of the geologic strata, and
 39 irrigation and other agricultural practices north, east, and west of the Hanford Site, and on the
 40 Hanford Site, because of liquid waste disposal.

41 The uppermost aquifer beneath most of the Hanford Site is unconfined and is composed |
 42 of unconsolidated to semi-consolidated sediments deposited on the basalt bedrock. In some |
 43 areas, deeper parts of the aquifer are locally confined by layers of silt and clay. Confined aquifers |
 44 occur within the underlying basalt flows and associated sedimentary interbeds. Groundwater in |
 45 the unconfined aquifer system generally moves from recharge areas along the western boundary |
 46 of the Site to the east and north toward the Columbia River, which is the major discharge area.
 47 This natural flow pattern was altered by the formation of groundwater mounds created by the
 48 discharge of large volumes of wastewater at disposal facilities. These mounds are declining, and
 49 groundwater flow is gradually returning to earlier patterns.

50
 51 Water levels are monitored across the Hanford Site and to the east and north of the
 52 Columbia River. The purpose of these measurements is to monitor changes in the water table
 53 elevations that affect the direction and velocity of groundwater flow and transport of contaminants,
 54 and to assess impacts of the changes on monitoring networks. A Site water table map for June

1 1998 was constructed and used to infer groundwater-flow directions (see Figure 4-13). Water
2 levels over most of the Site declined during fiscal year 1998, continuing the trend caused by
3 reduction in liquid effluent disposal. Water levels are also measured in wells completed in the
4 upper basalt-confined aquifer. Several areas showed declines in the confined-aquifer
5 potentiometric surface associated with declines in the water table of the overlying unconfined
6 aquifer (PNNL 1998).

7
8 Radioactive and nonradioactive liquid effluents were discharged to the environment from
9 facilities in the 100 and 300 Areas, as well as facilities in the Central Plateau (PNNL 1996b).
10 Contamination of the groundwater exceeds drinking water standards in more than 220 km²
11 (85 mi²) of the Hanford Site. The U.S. Department of Energy, Richland Operations Office (RL)
12 has committed to implement the best available technology and all known and reasonable
13 methods of prevention, control, and treatment for several of the effluent streams, and to obtain
14 permits for the waste streams under the "State Waste Water Discharge Permit Program,"
15 *Washington Administrative Code (WAC) 173-216*. The goal associated with the use of
16 best available technology is to eliminate, minimize, or treat effluents discharged to the ground.

17
18 **4.3.2.3.2 Confined Aquifer.** The uppermost confined aquifer (Rattlesnake Ridge) was
19 sampled to determine what extent of groundwater contamination occurred from interaction
20 between the confined and unconfined aquifers. Groundwater samples from selected confined
21 aquifer wells were analyzed for a variety of radionuclides and hazardous chemicals. In most
22 cases, no indication of contamination was observed. Detection of radionuclides in
23 well 299-E33-12 (the Central Plateau) was attributed to contamination by high-salt waste that
24 migrated by density flow into the borehole when it was open to both the unconfined and the
25 confined aquifer during drilling (PNNL 1996b). The 1995 samples from well 299-E33-12
26 contained up to 458 pCi/L of tritium, similar to levels detected since 1982. The 1995 samples
27 from this well also contained cobalt-60 at levels up to 31.4 pCi/L, nitrate at levels up to 11 mg/L,
28 technetium-99 at levels up to 1,560 pCi/L, and cyanide at levels up to 20.7 µg/L. Although all of
29 these constituents are indicators of contamination, only nitrate and technetium-99 were detected
30 at levels greater than drinking water standards.

31
32 The upper basalt-confined aquifer system is defined as the groundwater occurring within
33 basalt fractures and joints, interflow contacts, and intercalated sedimentary interbeds within the
34 upper Saddle Mountains Basalt. The thickest and most widespread sedimentary unit is the
35 Rattlesnake Ridge Interbed. Groundwater is confined by the dense, low-permeability, interior
36 portions of basalt flows and by Ringold Formation silt and clay units overlying the basalts.

37
38 In 1993, hydraulic head distribution and flow dynamics of the upper basalt-confined aquifer
39 system were evaluated and reported in PNL-8869, which identified the following prominent
40 hydrologic features:

- 41
42 C A broad recharge mound extending northeastward from Yakima Ridge in the
43 200 West Area
- 44
45 C A small recharge mound (now subsiding) immediately east of the 200 East Area in
46 the vicinity of B Pond
- 47
48 C A subsurface hydrogeologic barrier (i.e., an impediment to groundwater flow),
49 believed to be related to faulting, near the mouth of Cold Creek Valley
- 50
51 C A region of low hydraulic head (potential discharge) in the Umtanum Ridge-Gable
52 Mountain structural area
- 53

1 c A region of high hydraulic head to the north and east of the Columbia River
2 associated with recharge attributed to agricultural activities.

3
4 Recharge to the upper basalt-confined aquifer system is believed to result from
5 precipitation and surface water infiltration where the basalt and interbeds are exposed at ground
6 surface. Recharge also may occur through the unconfined aquifer system where a downward
7 hydraulic gradient exists between the unconfined and upper basalt-confined aquifers. Hydraulic
8 communication with overlying and underlying aquifers is believed to cause the region of low
9 hydraulic head found in the Umtanum Ridge-Gable Mountain structural area (these relationships
10 are given in more detail in PNL-8869). Maps of the upper basalt-confined and unconfined aquifer
11 potentiometric surfaces indicate that a downward hydraulic gradient from the unconfined aquifer
12 to the upper basalt-confined aquifer occurs in the western portion of the Hanford Site, in the
13 vicinity of the B Pond recharge mound, as well as in the regions north and east of the Columbia
14 River (see PNL-6313, PNL-8869, PNL-10082, PNNL-11470, PNNL-12067, WHC-EP-0142-3,
15 WHC-EP-0142-4, and WHC-EP-0394-3). In the vicinity of B Pond, however, a recent
16 acceleration in head decline within the unconfined aquifer system may soon lead to a reversal in
17 the vertical hydraulic gradient between the unconfined and upper basalt-confined aquifer systems
18 in this region. In other areas of the Hanford Site, the hydraulic gradient is upward from the upper
19 basalt-confined aquifer to the unconfined aquifer system.

20
21 Figure 4-13b, constructed by manual contouring, presents a regional approximation of the
22 potentiometric surface for the upper basalt-confined aquifer system based on water-level
23 measurements taken during June 1998. Measurements in the Rattlesnake Ridge Interbed were
24 primarily used to construct this map, though additional measurements in the upper Saddle
25 Mountains Basalt were used for general contouring. The datum used was NAVD88, which is
26 approximately 1 m higher than the NGVD29 datum used in previous versions of this map (e.g.,
27 PNL-8869, PNL-10817, and PNNL-11793).

28
29 With some exceptions, the major potentiometric map features shown in Figure 4-13b are
30 nearly the same as those exhibited for 1996, as reported in Section 5.5 of PNNL-11470 and
31 Section 3.10 of PNNL-11793. The potentiometric map indicates that, south of the Umtanum
32 Ridge-Gable Mountain structural area, groundwater flows from west to east across the Site
33 toward the Columbia River, which represents the regional discharge area for groundwater-flow
34 systems. In the region northeast of Gable Mountain, the potentiometric contours suggest that
35 groundwater flows southwest and discharges primarily to underlying confined aquifer systems in
36 the Umtanum Ridge-Gable Mountain structural area (PNL-8869). This increased hydraulic head
37 region is associated with recharge from agricultural activities north and east of the Columbia
38 River and has been observed for deeper, confined aquifer systems. Therefore, the Columbia
39 River does not represent a major discharge area for upper basalt-confined groundwater in the
40 northern portion of the Hanford Site.

41
42 Water levels in almost all wells monitoring the upper basalt-confined aquifer system
43 declined from June 1997 to June 1998. The greatest declines occurred near the B Pond (well
44 699-42-40C) and in the eastern portion of the site (wells 699-26-15C and 699-42-E9B).
45 However, water levels in well 699-42-E9B are known to be affected by stage fluctuations in the
46 Columbia River. The river stage was higher than normal during 1996 and 1997 but returned to
47 normal during 1998, thus accounting for the water-level decline in well 699-42-E9B. For this
48 reason, short-term water-level fluctuations in this well and in other wells near the river (i.e., wells
49 199-H4-2 and 399-5-2) mask long-term trends in the upper basalt-confined aquifer system.
50 Water levels in confined aquifer wells near the northern boundary of the 200 East Area and
51 immediately east of the 200 East Area near B Pond continue to show a decline, falling in the
52 range of approximately 0.1 to 0.7 m from June 1997 to June 1998. Water levels in confined
53 aquifer wells near the 200 West Area also continue to show a decline of approximately 0.1 to
54 0.4 m/yr. Water levels in wells located between Gable Mountain and the northern boundary of the

1 200 East Area fell approximately 0.1 to 0.3 m from June 1997 to June 1998. These declines are a
2 response to curtailed effluent-disposal activities in the 200 Areas and are consistent with water-
3 level declines in the overlying unconfined aquifer system.
4

5 **4.3.2.4 Vadose Zone.** The vadose zone is the area between the land surface and the top of the
6 groundwater table. The vadose zone represents the pathway for contaminants to the
7 groundwater for surface and near-surface releases, leaks, and spills of contaminated liquids.
8 The length of time it takes contaminated material to travel through the vadose zone depends on a
9 number of factors including: (1) the depth to the groundwater, (2) characteristics of vadose zone
10 sediment, and (3) chemical interaction of the contaminated material with the soil and subsoil.
11

12 Historically, radioactive contamination was released into the vadose zone sediment (the
13 unsaturated sediment between the ground surface and the top of the unconfined groundwater
14 aquifer) at Hanford from several hundred effluent discharge sites (e.g., cribs and ditches) and
15 from leaks and spills from single-shell radioactive waste tanks. These releases, leaks, and spills
16 represent the largest quantity of radioactive contamination released to the environment from
17 Hanford operations (Dirkes and Hanf 1997).
18

19 Soil vapor extraction continued in the 200-ZP-2 Operable Unit as a CERCLA expedited
20 response action to remove the carbon tetrachloride source from the vadose zone. The mix of
21 extraction wells was changed periodically during fiscal year 1998 to improve performance based
22 on a 1997 rebound study. In fiscal year 1998, 777 kg (1,717 lbs.) of carbon tetrachloride were
23 removed, resulting in a total of 75,490 kg (166,455 lbs) since remediation began in 1992
24 (PNNL1998).
25

26 In 1998, results from 1997 spectral gamma logging of boreholes surrounding the B-BX-BY
27 single-shell tank farm in the 200 East Area became available. The logging was to detect changes
28 in the distribution of man-made radionuclides in the sediments associated with liquid waste
29 disposal facilities adjacent to the tank farm. Spectral gamma logging also was performed at
30 boreholes around the Plutonium Finishing Plant liquid disposal facilities to ascertain any changes
31 in subsurface radionuclide distribution since last logging. Also, baseline characterization logging
32 of all drywells in the BX, C, S, and TY tank farms was completed and the results reported in 1998.
33 In addition, 10 new groundwater-monitoring wells were installed and logged by spectral gamma-
34 ray methods. Historical gross gamma logs from boreholes near the SX, BX, BY, and TY tank
35 farms were analyzed to locate mobile radionuclides.
36

37 Directional well drilling was tested at two sites. The holes were completed, but boulder
38 gravels at one site presented difficulties in drilling and sampling. Control of drilling fluids also
39 presented an obstacle that must be overcome before using this technique to address vadose
40 zone contamination.
41

42 Sediment samples from new vadose-zone or groundwater wells were collected and
43 analyzed for contaminants and physical properties. A vadose-zone borehole near the SX tank
44 farm was extended to groundwater and sediments were analyzed for radionuclides. Cesium-137
45 contamination decreased with depth and was undetectable at the water table (PNNL 1998).
46

47 **4.3.2.4.1 Surface Disposal.** Radioactive and hazardous waste disposed to the soil
48 column have been the dominant contributor to groundwater contamination at Hanford. Even
49 though disposal of untreated waste water stopped in 1995, movement of contaminant in the soil
50 column beneath historical effluent disposal sites still occurs. Large volumes (1,600 billion L
51 [426 billion gal]) of low-level liquid waste were discharged to surface ponds and ditches. In
52 addition 53 billion L (14 billion gal) of low- and intermediate-level liquid waste were discharged to
53 the subsurface in reverse wells, french drains, cribs, and tile fields (PNNL 1997b).
54

1 Early in the Hanford Site's production history, when the bismuth phosphate process was
2 used, the radioactive supernatant from the tanks was discharged directly to soil-column disposal
3 sites. As a result, over 450 million L (120 million gal) of high-level radioactive liquid wastes were
4 discharged to the vadose zone via cribs, trenches, and french drains. Although this disposal
5 practice was terminated over 30 years ago, the residual liquid held in the soil-pore spaces can
6 continue to be a long-term source of groundwater contamination, especially if a source of
7 moisture is available to transport the mobile waste constituents. Some of these sources of
8 moisture include enhanced infiltration from the coarse gravel covering, removal of vegetation, and
9 leaking water lines (Dirkes and Hanf 1998).

10
11 **4.3.2.4.2 Tank Farms.** Contamination was released to the near-surface and subsurface
12 sediment at Hanford Site tank farms as the result of tank leaks, spills, or radioactive effluents on
13 the ground surface, as well as pipe leaks and airborne releases of particulate matter through tank
14 ventilation and access ports. Of the 149 single-shell, and 28 double-shell tanks, 67 single-shell
15 tanks are known or assumed to leak. The estimated volume to date of radioactive waste leakage
16 from single-shell tanks is 2.3 million to 3.5 million L (600,000 to 900,000 gal). A Los Alamos
17 study in 1998 used historical information and new leak models to better define the volume,
18 chemical composition, and radioactive components of leaks from tanks SX-108, SX-109, SX-111,
19 and SX-112. The study estimated that past leaks from the four single-shell tanks likely total
20 between 757,000 and 1,514,00 L (200,000 and 400,000 gal)— about six times more than previous
21 estimates. has recently been reassessed. Airborne releases and surface spills created
22 contaminated plumes in the vadose zone that are generally confined to the near-surface regime,
23 but in some cases surface contamination is known to have migrated deeper into the vadose
24 zone. Pipeline leaks have also occurred either near the ground surface or at a maximum depth
25 of 6 m (20 ft). In some cases, contamination from pipeline leaks has also migrated into the
26 vadose zone; however, tank leaks created the deepest contamination plumes (Dirkes and Hanf
27 1998).

28
29 Spectral gamma log data show that cesium-137 is the most abundant and highly
30 concentrated man-made radionuclide in the vadose zone of several of the tank farms. It was
31 previously believed the cesium-137 was relatively immobile in the sediment and was not
32 expected to migrate more than a few meters from the base of the tanks. In 1996, cesium-137
33 contamination was detected at relatively high concentrations deeper than expected (as deep as
34 73 m [240 ft]).

35
36 Cobalt-60 has also been detected but at a much lower concentration than cesium-137.
37 Cobalt-60 has been found at depths of between 15 and 50 m (50 to 165 ft) and as trace amounts
38 at depths close to the water table at 69 and 71 m (225 to 234 ft). Cobalt-60 was detected at a
39 depth of 65 m (213 ft), immediately above the water table and within the capillary fringe. Some of
40 the cobalt-60 contamination was detected below the Early Palouse/Plio-Pleistocene interval,
41 which has been considered a barrier to downwardly migrating fluids and groundwater. Additional
42 contaminants detected in the vadose zone as detected in monitoring wells include europium-154,
43 antimony-125, uranium-235, uranium-238, potassium-40, and thorium-232 (Dirkes and Hanf
44 1998).

45
46 **4.3.2.4.3 Plutonium Finishing Plant.** The spent-process solutions from the Plutonium
47 Finishing Plant contained carbon tetrachloride, nitric acid, and isotopes of plutonium and
48 americium (transuranic waste). Liquid waste discharges to cribs and trenches in the Plutonium
49 Finishing Plant area resulted in the accumulation of an estimated 20,000 Ci of plutonium-239 and
50 americium-241 in the underlying soil column. Based on relative hazard, the Plutonium Finishing
51 Plant's cribs are some of the most significant sources of radioactive contamination in the vadose
52 zone at the Hanford Site.

1
2 Transuranic concentration in the soil of >100,000 pCi/g were found immediately beneath
3 the tile fields to a depth of 6 m (20 ft). Transuranics were also found in sediment at depths of 20
4 to 30 m (66 to 98 ft). Although transuranics are normally expected to be retained in the first few
5 meters of surface sediment, the combination of high acidity and the presence of complexants
6 apparently allowed the transuranics at these sites to penetrate deeper into the soil column.
7

8 In addition to transuranics, between 1955 and 1973, the 200 West Area's cribs also
9 received 570,000 to 920,000 kg (1.2 million to 2 million lb) of carbon tetrachloride. Carbon
10 tetrachloride was discovered in the groundwater near the plant in the mid-1980s and was later
11 found to be widespread in the 200 West Area. If left unchecked, the carbon-tetrachloride would
12 significantly increase the extent of groundwater contamination because of vapor-phase transport
13 through soil-pore space or by downward migration through the vadose zone as a dense
14 nonaqueous-phase liquid or dissolved in natural recharge water.
15

16 Soil vapor extraction is being used to remove the carbon tetrachloride source from the
17 vadose zone as part of the 200 West Area carbon tetrachloride expedited response action.
18 Approximately 75,000 kg (165,000 lb) of carbon tetrachloride have been removed from the
19 subsurface since extraction operations started in 1992 (Dirkes and Hanf 1998).
20

21 **4.3.2.4.3 Other Liquid Waste Disposal Sites.** Along the Columbia River in the vicinity
22 of the now inactive and closed reactors, once-through cooling waters were routinely disposed into
23 cribs and trenches. The disposed cooling water contained low levels of fission and neutron
24 activation products and very low level of some chemicals and actinides. The biggest concern is
25 the impacts of chromate, nitrate, strontium-90, and tritium to groundwater. Leakage from fuel-
26 storage basins in the 100-K Area also contributes potentially significant inventories of fission
27 products and transuranics to the soil column. Thus both historical waste disposal sites and fuel-
28 storage basin leakage are potential vadose-zone sources (Dirkes and Hanf 1998).
29

30 **4.3.2.4.4 Vadose Zone Monitoring.** Two programs currently under way at Hanford
31 characterize and monitor radionuclides in the vadose zone. One program focuses on vadose
32 zone monitoring near single-shell radioactive waste tanks and the other involves monitoring near
33 historical effluent disposal sites, which include cribs, ponds, ditches, injection wells, and french
34 drains. Both programs were designed to characterize and monitor gamma-emitting
35 radionuclides in the vadose zone and focused on establishing existing baseline conditions. Once
36 a baseline is established for a particular tank or effluent discharge site, the facility can be
37 monitored for either long-term or short-term changes. The intent of long-term monitoring is to
38 detect changes over a 5- to 10-year period than can be used for predictive risk assessment.
39 Short-term monitoring is used to identify recent changes in the vadose zone caused by current
40 operations and tank leaks (PNNL 1997b).
41

42 In 1994, the tank farms vadose zone baseline characterization project was begun to
43 perform an initial baseline characterization of the vadose zone gamma-emitting contamination at
44 Hanford Site tank farms. Under the baseline characterization program, approximately 800 pre-
45 existing monitoring boreholes surrounding the single-shell tanks are being logged with gamma-
46 ray logging methods. Borehole logging is used to identify the locations and sizes of the
47 contamination plumes. Once the baseline is established for a particular tank, that tank can be
48 monitored over time (PNNL 1997b).
49

1 **4.3.3 Water Use**
2

3 Water use in the Pasco Basin is primarily from surface diversion, with groundwater
4 diversions accounting for less than 10 percent of the total use (DOE 1988a). Historically,
5 industrial, agricultural, and municipal usage represented about 32, 50, and 9 percent,
6 respectively. Until recently, the Hanford Site used about 81 percent of the water withdrawn for
7 industrial purposes. However, because of the N Reactor shutdown, and considering other data
8 (PNL 1991a), these percentages now approximate 13 percent for industrial, 75 percent for
9 agricultural, and 12 percent for municipal uses, with the Hanford Site accounting for about
10 41 percent of the water withdrawn for industrial use (DOE 1995e). The first downstream drinking
11 water intake below the Hanford Site is the City of Richland intake.
12

13 The largest categories of wells in the Pasco Basin are those used for domestic purposes
14 (approximately 50 percent). Agricultural wells, used for irrigation and stock supply, constitute the
15 second-largest category of well use (about 24 percent for the Pasco Basin). Industrial users
16 account for only about 3 percent of the wells (DOE 1995e).
17

18 Most of the water used by the Hanford Site is withdrawn from the Columbia River. The
19 water distribution systems supplying river water are located at the 100-B, 100-D, 200, and 300
20 Areas at Energy Northwest (formerly known as WPPSS). In addition, wells supply water to the
21 400 Area and a variety of low-use facilities at remote locations. The 700 and 1100 Areas are
22 supplied with water by the City of Richland.
23

24 Regional effects of water-use activities are apparent in some areas where the local water
25 tables have declined because of withdrawals from wells. In other areas, water levels in the
26 shallow aquifers have risen because of artificial recharge mechanisms, such as excessive
27 application of imported irrigation water or impoundment of streams. Waste water ponds on the
28 Hanford Site have artificially recharged the unconfined aquifer below the 200 East and 200 West
29 Areas. The increase in water table elevations was most rapid from 1950 to 1960 and slowed
30 down substantially between 1970 and 1980, when only small increases in water table elevations
31 occurred. Waste water discharges from the 200 West Area were reduced significantly in 1984,
32 with an accompanying decline in water table elevations.
33

34 The Vernita Bar Settlement Agreement, executed June 16, 1988, established a minimum
35 Columbia River flow below Priest Rapids Dam to protect salmon spawning habitat. This
36 Agreement was signed by the Washington Public Utility Districts in Chelan, Grant, and Douglas
37 counties; the Bonneville Power Administration (BPA); National Marine Fisheries Service; WDFW;
38 Oregon Department of Fish and Wildlife; Yakama Nation; the Confederated Tribes of the Umatilla
39 Indian Reservation; and the Colville Confederated Tribes. The Agreement was then approved by
40 the Federal Energy Regulatory Commission as a condition of the license for the Priest Rapids
41 Dam. This minimum flow is in effect from about December 15 to May 31 each year to hold flows
42 down during the fall (which would limit the area of fall chinook salmon spawning to the lower
43 elevations of the Vernita Bar), and then to provide sufficient flows during the winter and spring to
44 assure the survival of the eggs and newly hatched fish. The Vernita Bar Agreement limits river
45 flow in the fall to 1,960 m³/s (70,000 ft³/s). The post-spawning flows are determined annually,
46 based on field surveys that identify when, where, and to what extent spawning has occurred
47 (NPS 1994).
48

49 **4.3.3.1 Water Rights.** Water rights in the state of Washington are determined by the
50 Washington State Superior Courts and regulated by Ecology. Water sources relevant to the
51 discussion in this document include the Columbia River and underground aquifers on the Hanford
52 Site.
53

54 The DOE's past and present water withdrawals at the Hanford Site are based on the

1 “Federal Reserved Water Rights” doctrine. This doctrine, developed as case law from U.S.
2 Supreme Court rulings, holds that the Federal government, when it withdraws public domain
3 lands for the purpose of the creation of a Federal reservation, necessarily withdraws
4 unappropriated water rights sufficient to meet the needs for which the reservation was created.
5 The date of priority of these rights is the date of creation of the reservation. In the case of the
6 Hanford Site, this date is 1943. It is the general rule that Federal reserved water rights cease to
7 exist when the Federal reservation ceases to be used for the purposes for which it was created.
8 The limited exception to the rule is reflected in the *U.S. v. Powers*, 305 U.S. 527 (1939), wherein
9 the Court allowed that a purchaser of agricultural land on an Indian reservation may be entitled to
10 a portion of Federal reserved water rights where the use of the property did not change.

11
12 The Federal government has not established its own water rights regulation. Instead, it
13 uses the regulatory procedures outlined in the State water rights laws to document the extent of
14 its rights. There has been no general adjudication in the State of Washington of the water rights
15 in the Columbia River and, therefore, the reserved water right of the Hanford Site has not been
16 documented. The quantity of that right, however, would be equal to the maximum amounts used
17 at Hanford during its operation, up to the amount of unappropriated water in the Columbia River
18 as of 1943.

19
20 In a report titled, *Hanford Land Transfer* (Ecology 1993), Ecology indicated that if water
21 rights were attached to privately owned parcels of land acquired in fee by the Federal government
22 for the creation of Hanford in 1943, those water rights may continue to be attached to these
23 parcels of land. Ecology has indicated that it has not taken action to extinguish these rights,
24 although under Washington law appropriative water rights are subject to be extinguished if
25 unused for a period of five years.

26
27 Further complications exist regarding non-Federal water rights claims at the Hanford Site.
28 The first is the issue of groundwater contamination at Hanford. The second is that the date for
29 filing a water rights claim in the Hanford sub-basin, for both Columbia River water and
30 groundwater, expired in 1992. No claims for water rights under state law appear to have been
31 filed within the required time period (NPS 1994).

32 33 34 **4.4 Air Resources**

35
36 This section addresses the general air resources at the Hanford Site and the surrounding
37 region. Included in this section are discussions on climate and meteorology, ambient air quality,
38 and atmospheric dispersion.

39 40 **4.4.1 Climate and Meteorology**

41
42 The Hanford Site climate is classified as mid-latitude semiarid or mid-latitude desert,
43 depending on the climatological classification scheme used. Summers are warm and dry, with
44 abundant sunshine. Large diurnal temperature variations result from intense solar heating during
45 the day and radiational cooling at night. Daytime high temperatures in June, July, and August
46 periodically exceed 38EC (100EF). Winters are cool, with occasional precipitation. Outbreaks of
47 cold air associated with modified arctic air masses can reach the area and cause temperatures
48 to drop below -18EC (0EF). Overcast skies and fog occur periodically (PNNL 1996a).

49
50 Topographic features have a significant impact on the climate of the Hanford Site. All air
51 masses that reach the region undergo some modification during their passage over the complex
52 topography of the Pacific Northwest. The climate of the region is strongly influenced by the
53 Pacific Ocean and the Cascade Range to the west. The relatively low annual average rainfall of
54 16.1 cm (6.3 in.) at the Hanford Meteorological Station (HMS) is caused largely by the rain

1 shadow created by the Cascade Range. These mountains limit much of the maritime influence
2 of the Pacific Ocean, resulting in a more continental-type climate than would exist if the
3 mountains were not present. Maritime influences are experienced in the region during the
4 passage of frontal systems and as a result of movement through gaps in the Cascade Range
5 (e.g., the Columbia River Gorge).
6

7 The Rocky Mountains to the east and the north also influence the climate of the region.
8 These mountains play a key role in protecting the region from the more severe winter storms and
9 the extremely low temperatures associated with the modified arctic air masses that move
10 southward through Canada. Local and regional topographical features (e.g., the Yakima Ridge
11 and the Rattlesnake Hills) also impact meteorological conditions across the Hanford Site
12 (PNNL 1996a). In particular, these features have a significant impact on wind directions, wind
13 speeds, and precipitation levels.
14

15 Climatological data are available for the HMS,
16 which is located between the 200 East and
17 200 West Areas. Data collected at this location
18 since 1945 (PNL 1994b) are representative of the
19 general climatic conditions for the region and
20 describe the specific climate of the Central Plateau.
21 Local variations in the topography of the Hanford Site
22 may cause some aspects of the climate to differ
23 significantly from those of the HMS (see text box,
24 “Hanford Site Quick Facts: Meteorology”). For example, winds near the Columbia River are
25 different from those at the HMS. Similarly, precipitation along the slopes of the Rattlesnake Hills
26 differs from that at the HMS.
27

<i>Hanford Site Quick Facts: Meteorology</i>	
C	Average annual precipitation: 16.1 cm (6.3 in.)
C	Prevailing wind direction: Northwest
C	Average monthly temperature: January - 0.9EC (30EF); July - 24.6EC (76EF)

28 **4.4.1.1 Wind.** Prevailing wind directions on the 200 Area Plateau are from the northwest during
29 all months of the year; southwesterly winds occur less frequently. Summaries of wind direction
30 indicate that winds from the northwest quadrant occur most often during the winter and summer.
31 During the spring and fall, the frequency of southwesterly winds increases with a corresponding
32 decrease in northwest flow. Winds blowing from other directions (e.g., the northeast) display
33 minimal variation from month to month. Monthly average wind speeds are lowest during the
34 winter months, averaging 10 to 11 km/hr (6 to 7 mi/hr), and highest during the summer, averaging
35 13 to 15 km/h (8 to 9 mi/hr). Wind speeds that are well above average are usually associated
36 with southwesterly winds. However, the summertime drainage winds generally are northwesterly
37 and can frequently gust to 50 km/hr (30 mi/hr). These winds are most prevalent over the northern
38 portion of the Hanford Site (PNNL 1996a).
39

40 **4.4.1.2 Temperature and Humidity.** Nine separate temperature measurements are made at
41 the 125-m (410-ft) tower at the HMS. Temperatures also are measured at the 2-m (6.5-ft) level
42 on the twenty-six 9.1-m (30-ft) towers located on and around the Hanford Site. The three 60-m
43 (200-ft) towers have temperature-measuring instrumentation at the 2-, 10-, and 60-m (6.5-, 33-,
44 and 200-ft) levels. The temperature data from the 9.1- and 61-m (30- and 200-ft) towers are
45 telemetered to the HMS.
46

47 Ranges of daily maximum and minimum temperatures vary from normal maxima of 2EC
48 (35EF) in late December to 35EC (95EF) in late July (PNL 1994b). On the average, 52 days
49 during the summer months have maximum temperatures greater than or equal to 32EC (90EF),
50 and 12 days have maxima greater than or equal to 38EC (100EF). From mid-November through
51 early March, minimum temperatures average less than or equal to 0 EC (32EF), with the minima
52 in late December and early January averaging -6EC (21EF). During the winter, on average, three
53 days have minimum temperatures less than or equal to -18EC (0EF); however, only about one
54 winter in two experiences such temperatures. The record maximum temperature is 45EC

1 (113EF), and the record minimum temperature is -31EC (-23EF). For the period of 1946 through
2 1998, the average monthly temperatures ranged from a low of -0.9EC (30EF) in January to a high
3 of 24.6EC (76EF) in July. During the winter, the highest monthly average temperature at the HMS
4 was 6.9EC (44EF) in February 1958, and the record average lowest temperature was -11.1EC
5 (12EF) during January 1950. During the summer, the record highest monthly average
6 temperature was 27.9EC (82EF) in July 1985, and the record lowest temperature was 17.2EC
7 (63EF) in June 1953.

8
9 Relative humidity and dew-point temperature measurements are made at the HMS and at
10 the three 60-m (200-ft) tower locations. The annual average relative humidity at the HMS is
11 54 percent. It is highest during the winter months, averaging about 75 percent, and lowest during
12 the summer, averaging about 35 percent. Fog reduces the visibility to 9.6 km (6 mi) during an
13 average of 47 days/yr and to less than 0.4 km (0.25 mi) during an average of 25 days/yr. Other
14 phenomena causing restrictions to visibility (i.e., visibility less than or equal to 9.6 km [6 mi])
15 include dust, blowing dust, and smoke from field burning. There are few such days; an average
16 of 5 days/yr have dust or blowing dust and less than 1 day/yr has reduced visibility from smoke
17 (Neitzel 1998).

18
19 **4.4.1.3 Precipitation.** The average annual precipitation at the HMS is 16 cm (6.3 in). Winter
20 monthly average snowfall ranges from 0.8 cm (0.32 in) in March to 13.7 cm (5 in) in December.
21 The seasonal record snowfall of 142 cm (56 in.) occurred in the winter of 1992-1993. During the
22 months of December, January, and February, snowfall accounts for about 38 percent of all
23 precipitation (PNNL 1996a). Days with greater than 1.3 cm (0.50 in) precipitation occur on
24 average less than one time each year. Rainfall intensities of 1.3 cm/hr (0.50 in./hr) persisting for
25 1 hour are expected once every 50 years (Neitzel 1998).

26
27 **4.4.1.4 Severe Weather.** Severe weather on the Hanford Site may include a variety of
28 meteorological events, which include severe winds, blowing dust, hail, fog, ash falls, extreme
29 temperatures, temperature inversions, and blowing and drifting snow. The HMS climatological
30 summary and the National Severe Storms Forecast Center database list only 24 separate
31 tornado occurrences within 161 km (100 mi) of the Hanford Site from 1916 to 1995
32 (PNNL 1996a). Only one of these tornadoes was observed within the boundaries of the
33 Hanford Site (on the extreme western edge), and no damage resulted. The estimated probability
34 of a tornado striking a point at the Hanford Site is 9.6×10^{-6} /yr (PNNL 1996a). Because tornadoes
35 are infrequent and generally small in the Pacific Northwest (and hurricanes do not reach this
36 area), risk from severe winds normally are associated with thunderstorms or the passage of
37 strong cold fronts. The greatest peak wind gust was 130 km/hr (81 mi/hr), recorded at 15 m
38 (50 ft) above ground level at the HMS. Extrapolations based on 35 years of observations indicate
39 a return period of about 200 years for a peak gust in excess of 145 km/hr (90 mi/hr) at 15 m
40 (50 ft) above ground level.

41
42 **4.4.1.5 Atmospheric Stability.** Atmospheric dispersion is a function of wind speed, duration
43 and direction of wind, atmospheric stability, and mixing depth. Dispersion conditions generally
44 are good if winds are moderate to strong, if the atmosphere is of neutral or unstable stratification,
45 and if there is a deep mixing layer. Good dispersion conditions associated with neutral and
46 unstable stratification exist about 56 percent of the time. Less favorable dispersion conditions
47 might occur when the wind speed is light and the mixing layer is shallow. These conditions are
48 most common during the winter when moderately to extremely stable stratification exists about
49 66 percent of the time. Less favorable conditions also occur periodically for surface and low-level
50 releases in all seasons from about sunset to about 1 hour after sunrise, as a result of
51 ground-based temperature inversions and shallow mixing layers (PNNL 1996a).

1 **4.4.2 Air Quality**
2

3 The EPA has set National Ambient Air Quality Standards (NAAQS) that define levels of air
4 quality that are necessary to protect the public health (primary standards) and the public welfare
5 (secondary standards). Regional air quality is generally good, with the occasional exception due
6 to blowing dust.
7

8 **4.4.2.1 Regional Air Quality.** Air quality in the Hanford region is well within the state and
9 Federal standards for criteria pollutants, except that short-term particulate concentrations
10 occasionally exceed the 24-hour “particulate matter nominally 10 microns or less” (PM₁₀)
11 standard. Because the highest concentrations of airborne particulate material are generally a
12 result of natural events, the area has not been designated nonattainment¹ with respect to the
13 PM₁₀ standard.
14

15 Particulate concentrations can reach relatively high levels in eastern Washington State
16 because of extreme natural events (e.g., dust storms, volcanic eruptions, and large brushfires)
17 that occur in the region. “Rural fugitive dust” from extreme natural events was not considered
18 when estimating the maximum background concentrations of particulates in the area east of the
19 Cascade Mountain crest and when determining Washington State ambient air quality standards.
20 In the past, the EPA has exempted the rural fugitive dust component of background
21 concentrations when considering permit applications and enforcement of air quality standards.
22 However, the EPA is now investigating the prospect of designating parts of Benton, Franklin, and
23 Walla Walla counties as a nonattainment area for PM₁₀. Windblown dust has been identified as a
24 particularly large problem in this area.
25

26 Ecology has been working with the EPA and the Benton County Clean Air Authority under
27 a MOA to characterize and document the sources of PM₁₀ emissions and develop appropriate
28 control techniques in the absence of formally designating the area nonattainment. At this time,
29 the parties are characterizing the sources of PM₁₀ emissions and working through other items in
30 the MOA. A final decision on this issue will be made by the EPA, when the final results of the
31 PM₁₀ characterization analysis are received (PNNL 1996a).
32

33 Ecology conducted the only offsite monitoring (for PM₁₀) near the Hanford Site in 1996. |
34 PM₁₀ was monitored at one location in Benton County – at Columbia Center – located |
35 approximately 17 km (10.5 mi) south-southwest of the 300 Area, in Kennewick, Washington. |
36 During 1996, the 24-hour PM₁₀ standard established by the State of Washington, 150 µg/m³, was |
37 not exceeded. The Site did not exceed the annual primary standard, 50 µg/m³, during 1996. The |
38 arithmetic mean for 1996 was 21 µg/m³ at Columbia Center (Neitzel 1998). |
39

40 During the past 10 years, carbon monoxide, sulfur dioxide, and nitrogen dioxide have been
41 monitored periodically in communities and commercial areas southeast of the Hanford Site.
42 These urban measurements are used to estimate the maximum background pollutant
43 concentrations for the Hanford Site. Because these measurements were made in the vicinity of
44 local sources of pollution, they might overestimate maximum background concentrations for the
45 Hanford Site or at the Hanford Site boundaries. Concentrations of toxic chemicals, as listed in
46 40 CFR 60.1, are not measured and, therefore, are not available for the Hanford Site.
47

48 **4.4.2.2 Hanford Site Nonradiological Air Quality.** The *Clean Air Act* (CAA) requires that
49 Federal activities may not cause or contribute to new violations of air quality standards,
50 exacerbate existing violations, or interfere with timely attainment or required interim emission

¹ A nonattainment area is an area where measured concentrations of a pollutant are above the primary or secondary NAAQS.

1 reductions towards attainment (40 CFR 93.150). A determination of conformity of general
2 Federal actions to state or Federal implementation plans must accompany any major Federal
3 action where air quality might be impacted. Because of the administrative nature of this EIS, and
4 the absence of any on-site nonattainment area, this EIS is exempt from a conformity
5 determination (40 CFR 93.153).
6

7 The NAAQS, set by EPA, must be met at the Hanford Site boundary or other publicly
8 accessible locations (i.e., highways on the Hanford Site). The standards define levels of air
9 quality that are necessary, with an adequate margin of safety, to protect the public health and
10 welfare. Standards exist for sulfur oxides (measured as sulfur dioxide), nitrogen dioxide, carbon
11 monoxide, total suspended particulates (TSP), PM₁₀, lead, and ozone. The standards specify the
12 maximum pollutant concentrations and frequencies of occurrence that are allowed for specific
13 averaging periods (e.g., the concentration of carbon monoxide when averaged over 1 hour is
14 allowed to exceed 40 mg/m³ only once a year). The averaging periods vary from 1 hour to 1 year,
15 depending on the pollutant.
16

17 An exception to the rule for using the Hanford Site boundary as the point of compliance for
18 air pollution can occur if a nonattainment area occurs within 100 km (62 mi) of any significant new
19 source that could be built or any revision to an operating source. As a requirement for new
20 sources in attainment or unclassifiable areas, WAC 173-400-113 mandates that “allowable
21 emissions from the proposed new source or modification will not delay the attainment date for an
22 area not in attainment nor cause or contribute to a violation of any ambient air quality standard.”
23 The Wallula PM₁₀ nonattainment area is within 100 km (62 mi) of all parts of the Hanford Site
24 (62 FR 3800).
25

26 Because the Hanford Site is in an attainment area, this type of action is exempt from
27 conformity determinations for Federal actions. Federal conformity rules (40 CFR 93) require
28 agencies to determine that the proposed Federal action is in conformity with the specific
29 requirements pursuant to the agency’s affirmative obligation under Section 176(c) of the CAA.
30

31 In addition to ambient air quality standards, the EPA has established standards for the
32 Prevention of Significant Deterioration (PSD) of air quality. PSD standards provide maximum
33 allowable increases in concentrations of pollutants for areas already in compliance with NAAQS.
34 The PSD standards are expressed as allowable increments in atmospheric concentrations of
35 specific pollutants (nitrogen dioxide, sulfur dioxide, and PM₁₀) (40 CFR 52). Different PSD
36 standards exist for Class I areas (where degradation of ambient air quality is restricted) and
37 Class II areas (where moderate degradation of air quality is allowed).
38

39 The closest Class I areas to the Hanford Site are as follows:

- 40 C Mount Rainier National Park, approximately 160 km (100 mi) west of the Hanford Site
- 41 C Goat Rocks Wilderness Area, approximately 145 km (90 mi) west of the Hanford Site
- 42 C Mount Adams Wilderness Area, approximately 150 km (95 mi) southwest of the
- 43 Hanford Site
- 44 C Alpine Lakes Wilderness Area, approximately 175 km (110 mi) northwest of the
- 45 Hanford Site.

46 If the Hanford Reach is given Congressional status as a Wild and Scenic River with the Wahluke
47 Slope added as a wildlife refuge, then it would be eligible for Class 1 air shed status.
48
49

50 The PSD standards are presented in Table 4-3. The Hanford Site, which is located in a
51
52
53
54

1 Class II area, operates under a PSD permit (Permit No. PSD-X80-14) issued by the EPA in 1980.
 2 This permit provides specific limits for emissions of nitrogen oxide from the Plutonium-Uranium
 3 Extraction (PUREX) and the Uranium-Trioxide plants, which are now closed and are being
 4 decommissioned.
 5

6 **Table 4-3. Maximum Allowable Increases for Prevention of Significant**
 7 **Deterioration of Air Quality (40 CFR 52).**

Pollutant	Averaging Time	Class I	Class II
Particulate matter ^a (PM ₁₀) (µg/m ³)	Annual	4	17
	24 hours	8	30
Sulfur dioxide (µg/m ³)	Annual	2	20
	24 hours	5	91
	3 hours	25	512
Nitrogen dioxide (µg/m ³)	Annual	2.5	25

14 ^a PM₁₀ is defined as particulate matter nominally 10 microns or less.

15
 16
 17 State and local governments have the authority to impose standards for ambient air
 18 quality that are more stringent than the national standards. Washington State has established
 19 more stringent standards for sulfur dioxide and TSP. In addition, Washington State has
 20 established standards for other pollutants, such as fluoride, that are not covered by national
 21 standards. The state standards for carbon monoxide, nitrogen dioxide, ozone, PM₁₀, and lead are
 22 identical to the national standards. Table 4-4 summarizes the relevant air quality standards
 23 (Federal and supplemental state standards).
 24

25 Emission inventories for permitted pollution sources in Benton County are routinely
 26 compiled by the Benton County Clean Air Authority. The annual emission rates for Hanford Site
 27 sources are reported to Ecology by DOE (Table 4-5).
 28

29 Monitoring of nitrogen oxides was discontinued after 1990, mostly because of the end of
 30 operations at the PUREX facility. Monitoring of TSP was discontinued in early 1988 when the
 31 Basalt Waste Isolation Project ended (for which those measurements were required).
 32
 33

34 **4.5 Biological Resources**

35
 36 As a Federal land manager, DOE is responsible for conserving fish, wildlife, and plant
 37 populations and their habitats on the Hanford Site. Information about these natural resources is
 38 presented below.
 39

40 Figures 4-16, 4-17, and 4-18 show priority habitats and priority species within Washington
 41 State as identified by the WDFW. Because biological resources are temporal, they may not be
 42 found in the same place from year to year or require the same mitigation steps at different times
 43 of the year. Also, because many of the siting data used to develop these maps were obtained
 44 from incidental sightings (e.g., driving [road] surveys) as opposed to thorough surveying, areas
 45 with no record sighting are not necessarily devoid of the species. For these reasons, biological
 46 resources are generally inventoried prior to the undertaking of specific projects.

Table 4-4. National and Washington State Ambient Air Quality Standards.

Pollutant ^a	National Primary	National Secondary	Washington State
Total suspended particulates			
Annual geometric mean	NS	NS	60 µg/m ³
24-hour average	NS	NS	150 µg/m ³
PM₁₀ (fine particulates)			
Annual arithmetic mean	50 µg/m ³	50 µg/m ³	50 µg/m ³
24-hour average	150 µg/m ³	150 µg/m ³	150 µg/m ³
PM_{2.5}			
Annual arithmetic mean	15 µg/m ³	--	--
24-hour average	65 µg/m ³	--	--
Sulfur dioxide			
Annual average	0.03 ppm	NS	0.02 ppm
24-hour average	0.14 ppm	NS	0.10 ppm
3-hour average	NS	0.50 ppm	NS
1-hour average	NS	NS	0.40 ppm ^b
Carbon monoxide			
8-hour average	9 ppm	9 ppm	9 ppm
1-hour average	35 ppm	35 ppm	35 ppm
Ozone			
1-hour average	---	0.12 ppm	0.12 ppm
8-hour average	0.08 ppm ^c	---	---
Nitrogen dioxide			
Annual average	0.05 ppm	0.05 ppm	0.05 ppm
Lead			
Quarterly average	1.5 µg/m ³	1.5 µg/m ³	1.5 µg/m ³
Fluoride			
30-day average			0.84 mg/m ³
7-day average			1.7 mg/m ³
24-hour average			2.9 mg/m ³
12-hour average			3.7 mg/m ³
VOCs			Source-specific standards

^a Annual standards are never to be exceeded; short-term standards are not to be exceeded more than once per year unless otherwise noted (Ecology 1994).

^b 0.25 ppm not to be exceeded more than twice in any 7 consecutive days; not to be exceeded more than 1 day per calendar year.

^c Based on a 3-year average of the annual fourth highest daily maximum 8-hour average.

NS = no standard

ppm = parts per million

µg/m³ = micrograms per cubic meter

VOC = volatile organic compound

**Table 4-5. Nonradioactive Constituents Discharged to the Atmosphere, 1995^a
(Dirkes and Hanf 1996).**

Constituent	Release (kg)		
	200 East Area	200 West Area	300 Area
Particulate matter	3.40 x 10 ²	8.02 x 10 ¹	1.43 x 10 ⁴
Nitrogen oxides	1.77 x 10 ⁵	2.82 x 10 ⁴	4.69 x 10 ⁴
Sulfur oxides	2.25 x 10 ⁵	3.53 x 10 ⁴	2.34 x 10 ⁵
Carbon monoxide	6.43 x 10 ⁴	1.01 x 10 ⁴	4.25 x 10 ³
Lead	1.62 x 10 ²	2.53 x 10 ¹	2.52 x 10 ¹
Volatile organic compounds ^b	6.43 x 10 ²	1.00 x 10 ²	2.38 x 10 ²
Ammonia ^c	6.18 x 10 ³	1.53 x 10 ³	NM
Arsenic	1.73 x 10 ²	2.70 x 10 ¹	1.48 x 10 ¹
Beryllium	2.33 x 10 ¹	3.64 x 10 ⁰	5.46 x 10 ¹
Cadmium	1.37 x 10 ¹	2.18 x 10 ⁰	2.74 x 10 ¹
Carbon tetrachloride ^d	NM	NE	NM
Chromium	5.01 x 10 ²	7.83 x 10 ¹	1.67 x 10 ¹
Cobalt	NE	NE	1.57 x 10 ¹
Copper	3.15 x 10 ²	5.02 x 10 ²	3.62 x 10 ¹
Formaldehyde	7.05 x 10 ¹	1.25 x 10 ¹	5.27 x 10 ¹
Manganese	6.93 x 10 ²	1.08 x 10 ²	9.63 x 10 ⁰
Mercury	5.11 x 10 ⁰	8.08 x 10 ¹	4.16 x 10 ⁰
Nickel	4.12 x 10 ²	6.43 x 10 ¹	3.03 x 10 ²
Polycyclic organic matter	NE	6.00 x 10 ²	7.14 x 10 ³
Selenium	6.26 x 10 ¹	9.84 x 10 ⁰	4.94 x 10 ⁰
Vanadium	4.31 x 10 ¹	7.79 x 10 ⁰	3.93 x 10 ²

^a The estimate of volatile organic compound emissions do not include emissions from certain laboratory operations; NM = not measured; NE = no emissions.

^b Produced from burning fossil fuels for steam generation.

^c Ammonia releases are from the 200 East Area tank farms, 200 West Area tank farms, and the operation of the 242-A Evaporator.

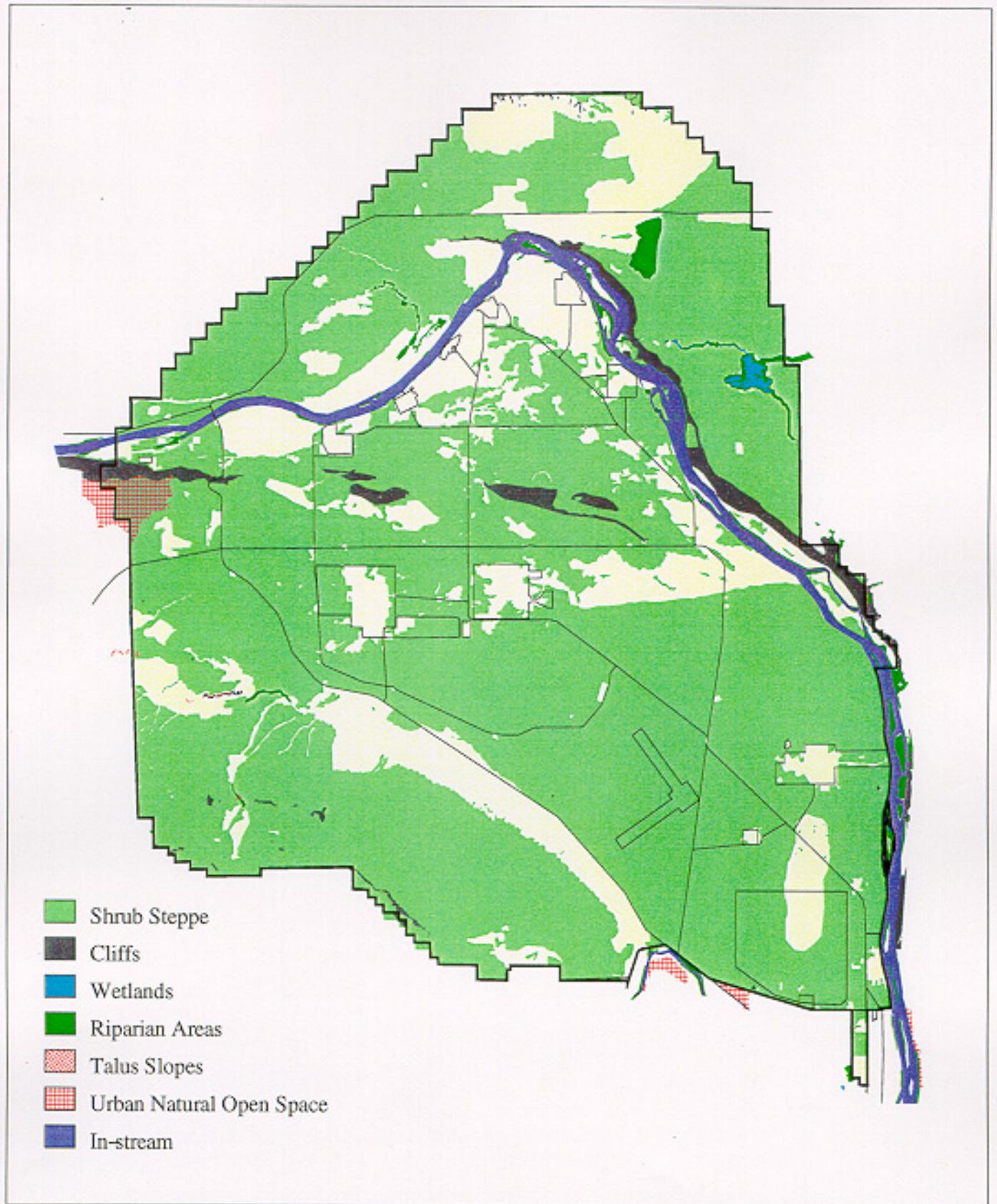
^d Does not include carbon tetrachloride Vapor Extraction Project releases from passively ventilated wells.

The block of habitat directly south of the 200 East and West Areas contains high-quality habitat and some of the Hanford Site's best sage sparrow and loggerhead shrike habitat. However, since some of these areas have never been officially surveyed for these species, the species frequently do not show up on maps even though they most likely occur there. Figure 4-17 shows some, but not all, historic bald eagle nesting sites but does not include current or recent bald eagle nest locations which can't be shown because of their sensitivity to disturbance. Similarly, Figure 4-18 shows some, but not all, great blue heron occurrences.

Counties and cities may use information prepared by the WDFW to classify and designate locally important habitats and species. While these priorities are those of the Department, they and the data on which they are based may be considered by counties and cities when developing their land-use plans under the *Growth Management Act (GMA)* (WAC 365-180-080).

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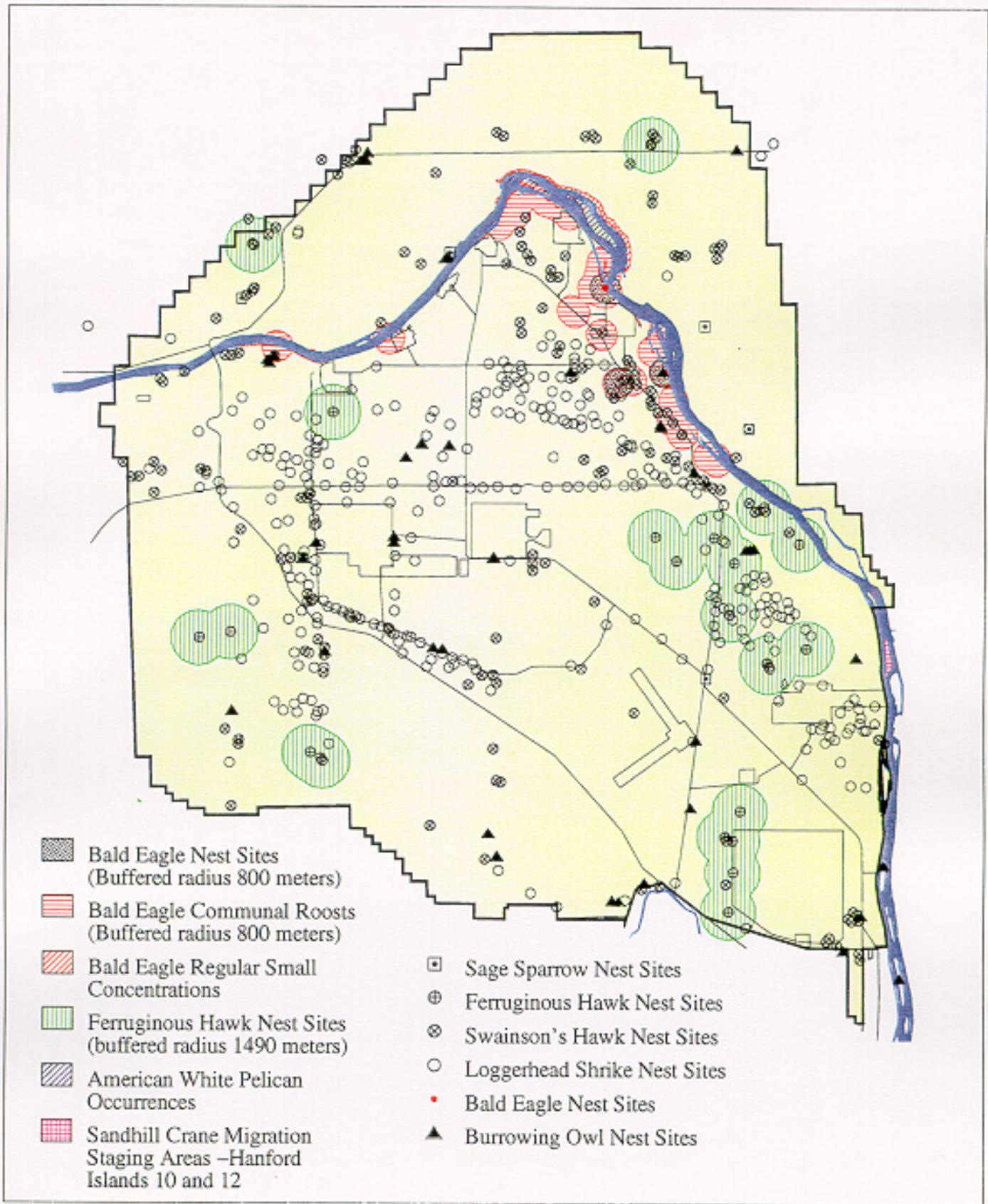
Figure 4-16. WDFW Priority Habitats on the Hanford Site.



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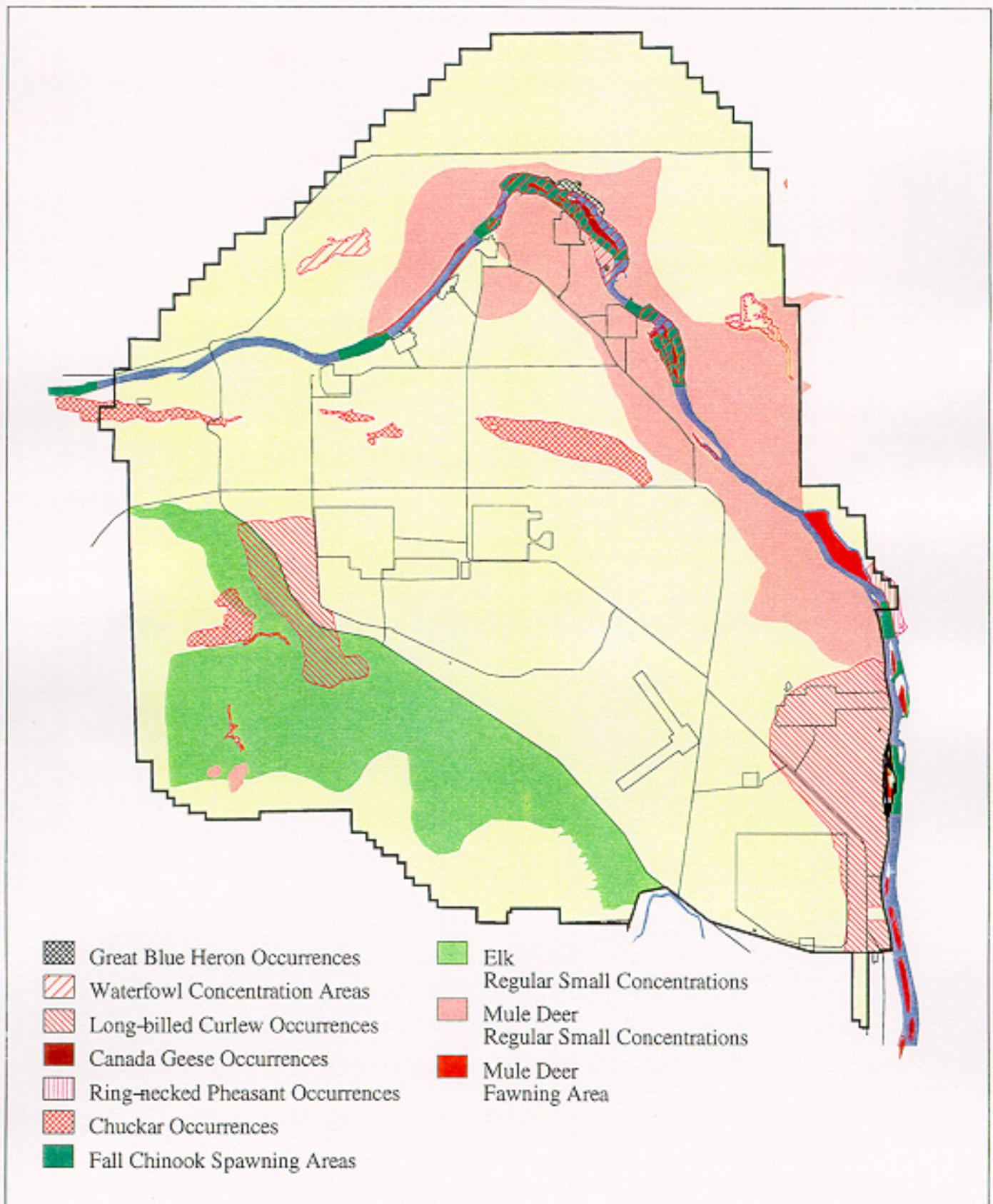
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Figure 4-17. WDFW Priority Species: State Listed and Candidates.



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1 **Figure 4-18. WDFW Priority Species: Vulnerable**
 2 **Aggregations and Species of Recreation, Commercial,**
 3 **and/or Tribal Importance.**



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1 The Hanford Site is located within a region
2 known as the Columbia Basin ecoregion, which
3 occupies an extensive area south of the Columbia
4 River between the Cascade Range and Blue
5 Mountains in Oregon and roughly two-thirds of the
6 area of Eastern Washington. This region has been
7 botanically characterized as a shrub-steppe
8 ecosystem, with various shrub and bunchgrass
9 associations playing dominant roles. The region is
10 often referred to as high desert, northern desert
11 shrub, or desert scrub (Franklin and Dyrness 1973).

12
13 Settlement during the late 19th and early 20th
14 century has resulted in significant changes to
15 vegetation patterns through activities such as
16 farming, dam development, and regional settlement.
17 The State of Washington is rapidly losing much of its
18 remaining steppe habitat and losses are projected to
19 be high for the next 50 years. It has been estimated
20 that approximately 60 percent of the original acreage
21 (4.2 million ha/10.4 million ac) (42,000 km²/
22 16,250 mi²) of shrub-steppe vegetation in Washington
23 has been lost, primarily to agriculture (DOE-RL
24 1996c) (see text box, “*What is Shrub-Steppe?*”).
25

26 An illustration of this habitat alteration can be
27 seen through the use of satellite-based remote
28 sensing data, which can provide images of land surfaces and existing vegetation cover. Using
29 these data, the WDFW has developed land cover classification maps (historic and current) of a
30 portion of the Columbia Basin ecoregion (Figures 4-19 and 4-20, respectively). As indicated in
31 Figure 4-20, the Hanford Site and the Department of Defense Yakima Training Center (located to
32 the west of the Hanford Site) contain the largest remaining remnant of shrub-steppe vegetation in
33 the Columbia Basin.
34

35 The Hanford Site is a relatively large, undisturbed area of shrub-steppe habitat that
36 contains numerous plant and animal species adapted to the semi-arid environment in the region.
37 The Hanford Site consists of mostly undeveloped land, with widely spaced clusters of industrial
38 buildings located along the western shoreline of the Columbia River and at several locations in
39 the interior of the Hanford Site. The industrial buildings are interconnected by roads, railroads,
40 and electrical transmission lines. The major facilities and activities occupy about 6 percent of the
41 total available land area, and their impact on the surrounding ecosystems is minimal from direct
42 discharges or releases attributable to DOE. Most of the Hanford Site has not experienced tillage
43 or livestock grazing since the early 1940s. The Columbia River flows through the Hanford Site,
44 and although the river flow is not directly impeded by dams within the Hanford Site, the historical
45 daily and seasonal water fluctuations have been changed by dams upstream and downstream of
46 the Hanford Site (Cushing 1995).
47

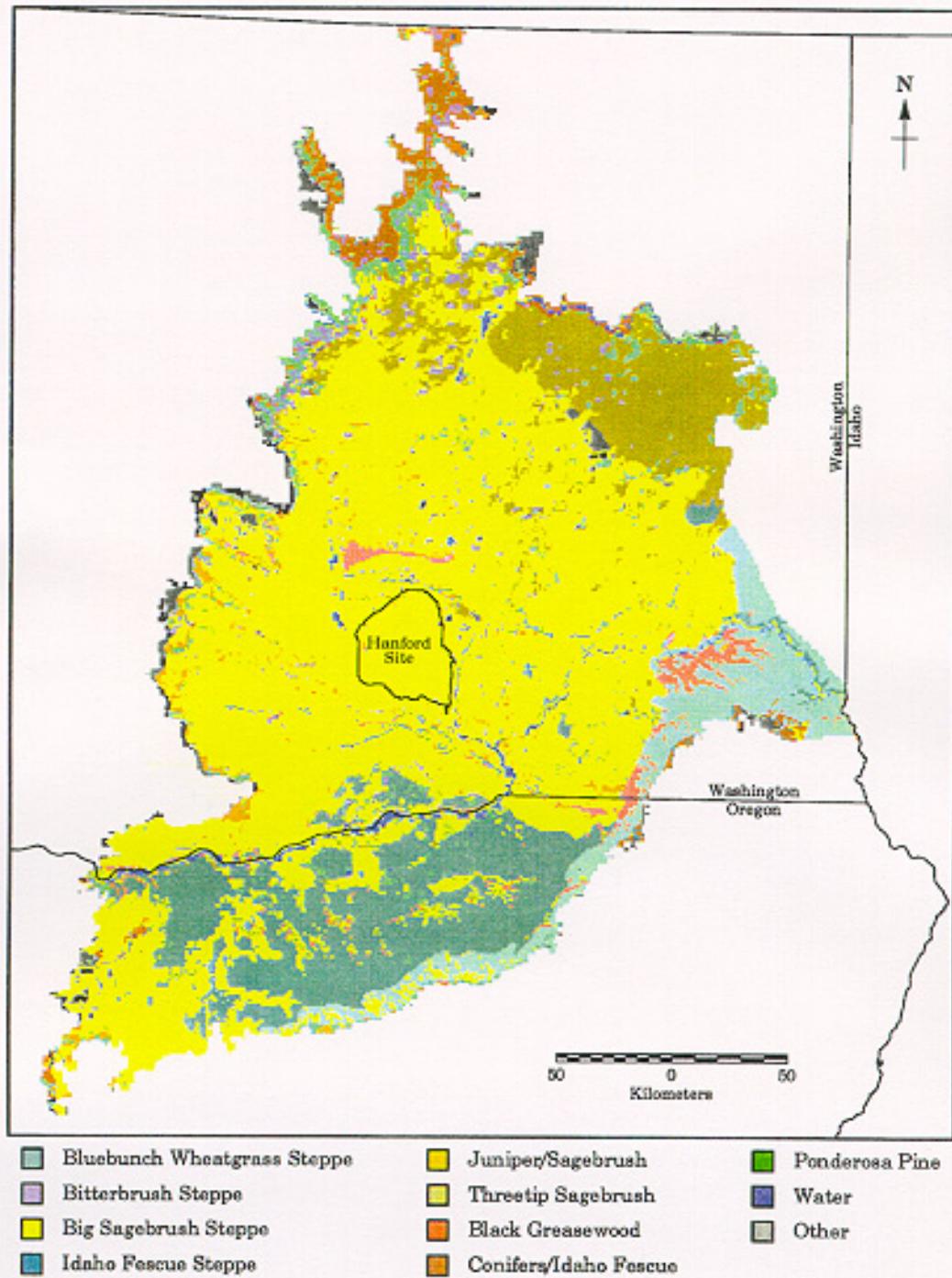
48 The Columbia River and other water bodies on the Hanford Site provide valuable habitat
49 for aquatic organisms. Several large portions of the Site are administered in a manner to protect
50 and preserve biological resources, such as the ALE Reserve and the Wahluke Slope
51 (Figure 4-21).

What is Shrub-Steppe?

The shrub-steppe ecosystem is a vegetation zone occupying most of central and southeastern Washington, part of northeastern Oregon, and portions of Idaho, Utah, and Nevada. It is a region whose native, pre-settlement vegetation consisted primarily of shrubs, perennial bunchgrasses, and a variety of forbs. Typical shrubs include several sagebrush species, rabbitbrush, and bitterbrush. Dominant grasses were bluebunch wheatgrass, Idaho fescue, needle-and-thread grass, and Sandberg's bluegrass. Before European settlement, at least 4.2 million hectares (10.4 million acres) of unaltered shrub-steppe habitat covered much of central and southeastern Washington. With the advent of dryland wheat farming, intensive livestock grazing, irrigation, and altered fire regimes, the landscape is changed to such an extent that the amount of natural shrub-steppe remaining is a small fraction of the original acreage. The average cover of big sagebrush was about 10 percent prior to the introduction of livestock into Washington. Because livestock do not eat it, sagebrush often increases in density in grazed areas, replacing most other plants in badly degraded ranges. Hanford is unique in that it contains large expanses of relatively undisturbed shrub-steppe vegetation and has become a refuge for the native species and habitats comprising the shrub-steppe.

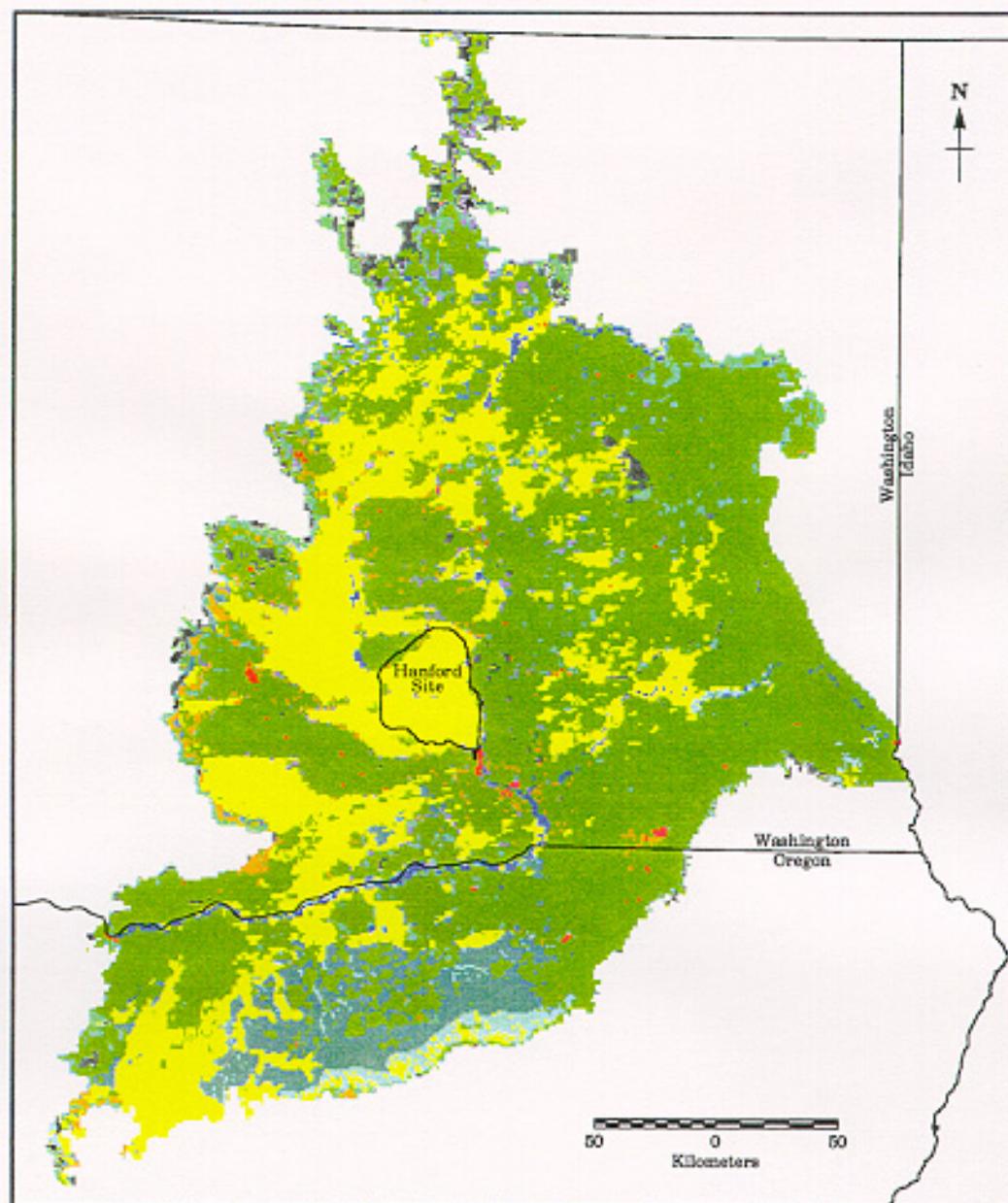
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Figure 4-19. Historic Distribution and Extent of Land Cover Classes within a Portion of the Columbia Basin Ecoregion (DOE-RL 1996c).



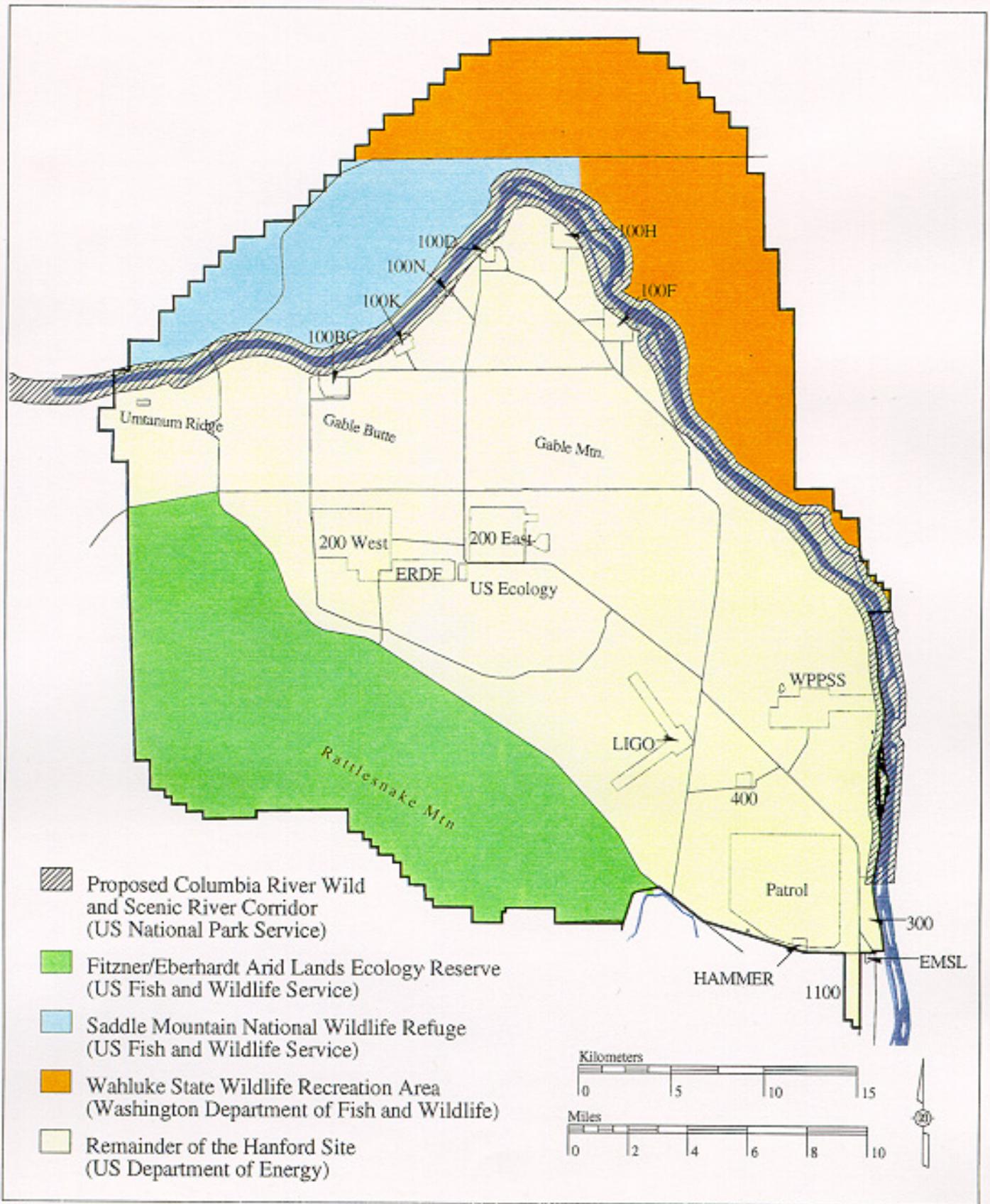
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Figure 4-20. Current Distribution and Extent of Land Cover Classes within a Portion of the Columbia Basin Ecoregion (DOE-RL 1996c).



- | | | |
|-----------------------------|----------------------|-------|
| Bluebunch Wheatgrass Steppe | Juniper/Sagebrush | Water |
| Bitterbrush Steppe | Ponderosa Pine | Other |
| Big Sagebrush Steppe | Cropland/Hay/Pasture | |
| Idaho Fescue Steppe | Urban | |

1 **Figure 4-21. Designated Administrative Areas for the**
 3 **Hanford Site.**



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1 **4.5.1 Administrative Designations for Natural Resource Protection**
2

3 In 1977, the U.S. Energy Research and Development Agency (a predecessor to DOE)
4 designated the entire Hanford Site as one of seven National Environmental Research Park
5 (NERP) sites located in the United States. In addition, two other portions of the Hanford Site are
6 administered under special designations.
7

8 The Wahluke Slope encompasses approximately 365 km² (140 mi²) and is administered
9 as two wildlife areas known as the Saddle Mountain NWR and the Wahluke Wildlife Recreation
10 Area. Under an agreement made between the WDFW and the USFWS in April 1999, the
11 Wahluke State Wildlife Recreation Area will be combined with the Saddle Mountain NWR and
12 managed as a unit by the USFWS. These areas are operated under the terms of a permit issued
13 by the AEC on November 30, 1971, to provide for management of Hanford lands north and east of
14 the Columbia River.
15

16 According to the terms of the permit, the USFWS is required to keep the lands managed
17 as the Saddle Mountain NWR closed to all public access. The closure ensured a security zone
18 for the N Reactor and encompassed an area within a 8.8-km (5.5-mi) radius of the reactor (NPS
19 1994). Although N Reactor is being decommissioned and doesn't require an extensive buffer, the
20 K Basins still require an exclusion zone until the spent nuclear fuel is removed from the basins.
21

22 The ALE Reserve has been used for ecological research dating back to 1952, but it was
23 not until 1967 that the Richland Office of the AEC established the ALE Reserve by administrative
24 order (PNL 1993b). As a result of a Federal interagency cooperative agreement, the ALE
25 Reserve was designated as the Rattlesnake Hills Research Natural Area in 1971. The ALE
26 Reserve currently retains its status as an administratively protected environment and as a
27 valuable ecological study site. Through a MOA with DOE, the USFWS is responsible for
28 management and protection of the ALE Reserve.
29

30 **4.5.2 Terrestrial Vegetation and Habitats**
31

32 The Hanford Site has been botanically characterized as a shrub-steppe ecosystem. In
33 the early 1800s, the dominant plant in the area was big sagebrush with an understory of perennial
34 bunchgrasses, especially Sandberg's bluegrass and bluebunch wheatgrass. With the advent of
35 horses in the 1700s and settlement in the 1800s that brought livestock grazing and crop raising,
36 the natural vegetation mosaic was opened to a persistent invasion by non-native annual species,
37 especially cheatgrass. Of the 590 species of vascular plants recorded for the Hanford Site,
38 approximately 20 percent of all species are considered nonnative. Cheatgrass is the dominant
39 nonnative species. It is an aggressive colonizer and has become well established across the site
40 (Neitzel 1998). Today, cheatgrass is the dominant plant on fields that were cultivated 50 years
41 ago. Cheatgrass is also well established on rangelands at elevations less than 244 m (800 ft)
42 (Cushing 1995).
43

44 The dryland areas of the Hanford Site were treeless in the years before land settlement;
45 however, for several decades before 1943, trees were planted and irrigated on most of the farms
46 to provide windbreaks and shade. Some of the trees died when the farms were abandoned in
47 1943, but others have persisted, presumably because their roots are deep enough to contact
48 groundwater. Today these trees serve as nesting platforms for several species of birds (e.g.,
49 hawks, owls, ravens, magpies, and great blue herons), and as night roosts for wintering bald
50 eagles (Cushing 1995). The vegetation mosaic of the Hanford Site currently consists of a variety
51 of diverse plant communities.
52

1 The State of Washington has designated large and small blocks of shrub-steppe as
2 priority habitat because these areas possess unique or significant value to many species. The
3 State identifies priority habitats based on the quality of the habitat with respect to the following
4 attributes: comparatively high fish and wildlife density; comparatively high fish and wildlife
5 species diversity; important fish and wildlife breeding habitat; important fish and wildlife seasonal
6 ranges; important fish and wildlife movement corridors; limited availability; high vulnerability to
7 habitat alteration; and unique or dependent species (WDFW 1995). Although Washington State
8 priority habitat designations have no associated legal requirements for habitat protection, DOE
9 Order 430.1 (DOE 1995c) requires that DOE consider ecosystem management and preservation
10 values during all phases of Hanford Site operations.
11

12 The DOI National Biological Service identifies native shrub and grassland steppe in
13 Washington and Oregon as an endangered ecosystem (with an 85 to 98 percent decline)
14 (DOI 1995). Almost 600 species of plants have been identified on the Hanford Site
15 (PNNL 1996a). The dominant plants are big sagebrush, rabbitbrush, cheatgrass, and Sandberg's
16 bluegrass, with cheatgrass providing half of the total plant cover on much of the Hanford Site.
17 Cheatgrass and Russian thistle, annuals introduced to the United States from Eurasia in the late
18 1800s, invade areas where the ground surface has been disturbed. Mosses and lichens appear
19 on undisturbed soil surface; lichens commonly grow on the shrub stems and on basalt outcrops.
20 The important desert shrubs, big sagebrush and bitterbrush, are widely spaced and usually
21 provide less than 20 percent canopy cover. The important native understory plants are grasses,
22 especially Sandberg's bluegrass, Indian ricegrass, June grass, and needle-and-thread grass.
23

24 As compared to other semi-arid regions in North America, primary productivity is relatively
25 low and the number of vascular plant species also is low. This situation is attributed to the low
26 annual precipitation (16 cm [6 in.]), the low water-holding capacity of the rooting substrate (sand),
27 and the hot, dry summers and occasionally very cold winters.
28

29 The 100 Areas are located in the vicinity of the Columbia River and encompass both
30 riparian and upland habitats. Riparian habitats are found along the shoreline, slack water, and
31 slough areas. Riparian vegetation includes both woody and herbaceous species. Common plant
32 species occurring in the riparian zone include black cottonwood, mulberry, willow, dogbane, and
33 a variety of grasses and forbs (Cushing 1992). Scattered groves of white mulberry, black locust,
34 Siberian elm, apricot, juniper, and willow were noted in an ecological investigation within the
35 100-BC-5 and 100-HR-3 operable units (WHC 1992c). The upland vegetation within the 100
36 Areas is dominated by the non-native annuals, cheatgrass, and tumble mustard on former
37 agricultural lands that were abandoned in 1943 (DOI 1995).
38

39 More than 100 species of plants have been identified on the Central Plateau
40 (Cushing 1992). Common plant species include sagebrush, rabbitbrush, cheatgrass, and
41 Sandberg's bluegrass. The dominant vegetation type consists of big sagebrush with an
42 understory of cheatgrass and Sandberg's bluegrass (PNNL 1996a). Cheatgrass provides
43 approximately 50 percent of total plant cover. Most of the waste disposal and storage sites are
44 covered by non-native vegetation or are kept in a vegetation-free condition.
45

46 In recent years, a die-off of big sagebrush has been noted on the Hanford Site. A
47 preliminary investigation of the nature and extent of die-off has been conducted. Although the
48 cause remains unknown, early indications focus on the possibility that the die-off might be the
49 result of disease or weather-related stress. The die-off area is estimated to be 1,776 ha
50 (4,390 ac) (Cushing 1992).
51

52 Other vegetation within the Central Plateau includes wetland species associated with
53 man-made ditches and ponds on the Central Plateau and introduced perennial grasses (e.g.,
54 Siberian wheatgrass) that were planted to revegetate disturbed areas. Wetland species (e.g.,

1 cattail and reeds) and trees (e.g., willow, cottonwood, and Russian olive) are established around
2 some of these ponds (PNNL 1996a). However, several of the ponds have been
3 decommissioned, resulting in the elimination of wetland habitat as the supply of industrial waste
4 water feeding the ponds was terminated.
5

6 Sixteen different plant community types have been identified on the Wahluke Slope.
7 Cheatgrass and other nonnative species dominate, most likely because of disturbances caused
8 by military training activities, historical livestock grazing, dry soil, and multiple fires. However, the
9 Wahluke Slope still possesses extensive remnants of the original shrub-steppe ecosystem. For
10 example, the most extensive and highest quality antelope bitterbrush and Indian ricegrass plant
11 community in the State of Washington is found on the Wahluke Slope (TNC and Pabst 1995). In
12 1994, The Nature Conservancy discovered a new plant species of the genus *Lesquerella*. In
13 1997 field surveys, eight new populations of four taxa were located on the Wahluke Unit Columbia
14 Basin Wildlife Area. All of these populations were located on the White Bluffs. One of the new
15 *Gilia leptomeria* populations is the largest currently known in Washington. Also, the remainder of
16 the only known occurrence of *Lesquerella tuplashensis* was mapped and counted. These
17 discoveries, along with its high habitat quality, illustrate the potential ecological value of the
18 Wahluke Slope.
19

20 **4.5.2.1 Newly Documented Plant Species.** During a 1997 rare plant survey of the Hanford Site
21 conducted by The Nature Conservancy, a total of 35 new populations were found of 14 rare plant
22 taxa identified in Washington as either endangered, threatened, sensitive, or Review Group 1 by
23 the State of Washington. (Review Group 1 includes taxa for which more field work is needed to
24 assess their rarity and the degree to which they are threatened.) One species was newly
25 documented at the Hanford Site, and 10 occurrences of eight taxa were revisited and remapped.
26 Finally, a population of an unlisted plant species, previously unknown from Washington, was
27 discovered. A brief review of significant findings from the 1997 survey in regard to individual
28 species is provided below.
29

- 30 C ***Eriogonum codium*** – Previous to biodiversity surveys, this species was
31 undescribed. It is listed as endangered by the state of Washington and identified
32 as a species of concern by the USFWS. Originally discovered during 1995, the
33 only known occurrence of *Eriogonum codium* was resurveyed, remapped, and
34 recounted during 1997. A total of 5200 plants was estimated to be present. Long-
35 term demographic monitoring was initiated on this species in 1997.
36
- 37 C ***Lesquerella tuplashensis*** – Previous to biodiversity surveys, this species also
38 was undescribed, and is listed as endangered by the state of Washington and
39 identified as a species of concern by the USFWS. During 1997 the remainder of
40 the only known occurrence of *Lesquerella tuplashensis* was mapped and counted.
41 The total count of adult plants was estimated to be 50,000 plants. Infestations of a
42 noxious weed, *Centaurea solstitialis* (yellow starthistle), were located within the
43 middle portion of the *Lesquerella* population. Long-term demographic monitoring
44 was initiated on this species in 1997.
45

46 Hanford Site populations of two previously undocumented plant species were identified
47 during 1997 field surveys. The two species are described below:
48

- 49 C ***Camissonia minor*** -- This annual species has a scattered distribution within the
50 Columbia Basin. Its range includes most western states. In Washington, it is at
51 the northern end of its range and is known from only Benton and Kittitas Counties.
52 *Camissonia minor* generally occurs on very dry, often barren, and sometimes
53 disturbed sites. Six relatively small populations were documented. On the
54 Hanford Site, *Camissonia minor* occurred in conjunction with a number of other

1 rare plant species. In Washington State, it is currently placed in Review Group 1.

- 2
3 C ***Myosurus x clavicaulis*** – This annual species (little mousetail; an “x” before the
4 species name indicated that the species evolved as a hybrid of two other species)
5 was previously unknown in the State of Washington. Its assumed range included
6 Baja California, California, and Oregon. *Myosurus x clavicaulis* typically inhabits
7 vernal pools. It occurred on the Hanford Site at a single vernal pool location (see
8 Section 4.3.1). The species also was located during the 1997 field season at five
9 additional vernal pool sites in northeastern Washington. At some locales in the
10 Central Valley of California, the taxonomic status of *Myosurus x clavicaulis* is
11 complicated by the presence of other species of *Myosurus*, whose hybrids
12 produce progeny identical to *Myosurus x clavicaulis*. At Hanford, however, the
13 *Myosurus x clavicaulis* population was self-sustaining and did not occur in the
14 presence of its parental species. The species has no current conservation status
15 in Washington; however, *Myosurus x clavicaulis* will be recommended for future
16 tracking by the Washington Natural Heritage Program.

17
18 The two major vegetation types occurring along the Hanford Reach of the Columbia River
19 are riparian and upland (NPS 1994). Riparian habitats are found along the shoreline, slack water
20 and slough areas, and on islands in the river. Riparian vegetation at these locations includes both
21 woody and herbaceous species maintained by the high water table immediately adjacent to the
22 river. Common plant species occurring in the riparian zone include black cottonwood, mulberry,
23 willow, dogbane, and a variety of grasses and forbs (Cushing 1992). Sensitive habitats within the
24 riparian zone include islands and cobbled shorelines occurring as a narrow band along the
25 Hanford Reach. Plant species occurring in these areas include perennial summer-blooming
26 forbs adapted to seasonal changes in water levels (NPS 1994). Upland habitats along the
27 Hanford Reach are composed of shrub-steppe vegetation similar to that found on the rest of the
28 Hanford Site.

29
30 The ALE Reserve supports one of the largest remnants of relatively undisturbed
31 shrub-steppe ecosystem in the State of Washington. Vegetation on the ALE Reserve includes
32 largely undisturbed stands of several plant communities (e.g., sagebrush-bluebunch wheatgrass,
33 blue bunch wheatgrass, sagebrush-Sandberg’s bluegrass, sagebrush-bitterbrush-
34 needle-and-thread grass, cheatgrass, and cottonwoods and willows) (PNL 1993c). Extensive
35 wildfires have removed the shrub component from large areas of the ALE Reserve. These areas
36 now support stands of perennial bunchgrasses at the upper elevations and cheatgrass and
37 bunchgrasses at the lower elevations (PNL 1993c).

38
39 Special topographic features of the Hanford Site include Gable Butte and Gable Mountain
40 north of the Central Plateau and an extensive series of active sand dunes in the southeast portion
41 of the Site. Vegetation occurring on scree slopes, outcrops, and scarps on Gable Butte and
42 Gable Mountain is limited to scattered individuals or groups of plants. Plant species include
43 squaw currant, bluebunch wheatgrass, rock buckwheat, and thyme buckwheat. Rigid sagebrush
44 occurs at the Hanford Site only on Gable Mountain and Umtanum Ridge (PNL 1993c).

45
46 **4.5.2.2 Fire.** Plant communities within the shrub-steppe have evolved in the presence of natural
47 wildfires. Typically, shrubs are killed by fire, but the perennial bunchgrasses are not killed. The
48 severity of the damage depends upon the intensity and extent of the fire. Hot fires incinerate
49 entire shrubs and damage grass crowns. Less intensive fires leave dead shrub stems standing
50 with prompt recovery of grasses and forbs. The most recent and extensive wildfire on

1 **Figure 4-22. Distribution of Vegetation Types and Cover**
 3 **Classes on the Hanford Site (Legend).**
 4

-  Post-Fire Shrub-Steppe on the Columbia River Plain
-  Rabbitbrush / Bunchgrasses
-  Rabbitbrush / Cheatgrass
-  Big Sagebrush / Bunchgrasses -Cheatgrass
-  Big Sagebrush -Spiny Hopsage / Bunchgrasses -Cheatgrass
-  Threetip Sagebrush / Bunchgrasses
-  Spiny Hopsage / Bunchgrasses
-  Spiny Hopsage / Cheatgrass
-  Black Greasewood / Sandberg's Bluegrass
-  Winterfat / Bunchgrasses
-  Winterfat / Cheatgrass
-  Snow Buckwheat / Indian Ricegrass
-  Bunchgrasses
-  Cheatgrass -Sandberg's Bluegrass
-  Planted Non-native Grass
-  Bitterbrush / Bunchgrasses Sand Dune Complex
-  Bitterbrush / Cheatgrass
-  Alkali Saltgrass -Cheatgrass
-  Riparian
-  Basalt Outcrops
-  Agricultural Areas
-  White Bluffs Cliffs
-  Buildings / Parking Lots / Gravel Pits / Disturbed Areas
-  Abandoned Old Fields and Farms
-  Riverine Wetlands and Associated Deepwater Habitats
-  Non-Riverine Wetlands and Associated Deepwater Habitats

1 the Hanford Site occurred in the summer of 1998 and burned approximately 4,047 ha (10,000 ac). |
2 Previous fires occurred in 1957, 1973, and 1981, and 1984 (see Figure 4-22). The presence of |
3 non-native plant species and changing land-use practices have altered the frequency and severity
4 of wildfires. Less frequent and more severe fires have reduced the ability of the native habitat to
5 recover from fire, as well as the development of late successional shrub-steppe habitat.
6

7 **4.5.2.3 Weeds.** Non-native weedy species have invaded many areas on the Hanford Site. In
8 particular, weeds have invaded areas that have been disturbed by natural (e.g., fire) and human
9 factors (e.g., pre-Hanford agricultural activities, road and facility construction, etc.). The weed
10 species include, but are not limited to, cheatgrass; Russian thistle; Russian, spotted, and diffuse
11 knapweed; yellow star thistle; Rush skeletonweed; and puncture vines. Cheatgrass and Russian
12 thistle, annuals introduced from Eurasia in the late 1800s, invade areas where the ground surface
13 has been disturbed.
14

15 **4.5.3 Wildlife**

16

17 Major habitat types occurring on the Hanford Site include basalt outcrops, scarps and
18 screes, riparian and riverine areas, shrub-steppe, sand dunes and blowouts, and abandoned fields
19 (PNL 1993c). These habitat types support a variety of wildlife.
20

21 **4.5.3.1 Mammals.** Approximately 40 species of mammals have been identified on the
22 Hanford Site (PNNL 1996a). The major predator inhabiting the Hanford Site is the coyote, which
23 ranges all across the Hanford Site. Coyotes have been a major cause of destruction for the nests
24 of Canadian geese on Columbia River islands, especially islands upstream from the abandoned
25 Hanford townsite. Bobcats, cougars, and badgers also inhabit the Hanford Site in low numbers.
26

27 Black-tailed jackrabbits are common on the Hanford Site and are mostly associated with
28 mature stands of sagebrush. Cottontail rabbits also are common but appear to be more closely
29 associated with the buildings, debris piles, and equipment laydown areas associated with the
30 onsite laboratory and industrial facilities.
31

32 Townsend's ground squirrels occur in colonies of various sizes scattered across the
33 Hanford Site. The most abundant mammal inhabiting the Site is the Great Basin pocket mouse.
34 The mouse occurs all across the Columbia River plain and on the slopes of the surrounding
35 ridges. Other small mammals include the deer mouse, harvest mouse, grasshopper mouse,
36 montane vole, vagrant shrew, and Merriam's shrew.
37

38 The Hanford Site has 14 species of bats that are known to be or are potential inhabitants,
39 most of which may be present year-round (PNL 1993d). The pallid bat frequents deserted
40 buildings and is thought to be the most abundant. Other species include the hoary bat,
41 silver-haired bat, California brown bat, little brown bat, Yuma brown bat, and Pacific western
42 big-eared bat.
43

44 A herd of Rocky Mountain elk is present on the ALE Reserve. It is believed these animals
45 migrated to the reserve from the Cascade Mountains in the early 1970s. This herd grew from
46 approximately eight animals in 1975 to approximately 420 animals in December 1996 (after the
47 hunting season).¹ Current projections indicate that the elk herd is composed of approximately 800
48 animals and is still growing. The herd tends to congregate on the ALE Reserve in the winter and |
49 disperses during the summer months onto the Site proper, private land to the west of the ALE |
50 Reserve, and the Yakima Firing Center. Although lack of water and the high level of human activity |
51 presumably inhibit the elk from using other areas of the Hanford Site, the elk are occasionally seen |

1 Personal communication with Brett Tiller, Pacific Northwest National Laboratory, September 22, 1997.

1 on the 200 Area Plateau and have been sighted at the White Bluffs boat launch. Despite the arid
2 climate, these elk appear to be very healthy; antler and body size for some age classes are
3 among the highest recorded for this species (Neitzel 1997). In addition, reproductive output of this
4 species is also among the highest recorded.
5

6 Mule deer are found throughout the Hanford Site, although areas of highest concentrations
7 are on the ALE Reserve and along the Columbia River. Deer populations on the Hanford Site
8 appear to be relatively stable. Islands in the Hanford Reach are used extensively as fawning sites
9 by the deer (Neitzel 1997) and are a very important habitat for this species. Hanford Site deer
10 frequently move offsite and are killed by hunters on adjacent public and private lands (Neitzel
11 1997).
12

13 **4.5.3.2 Birds.** In general, bird species on the Hanford Site include a variety of raptors, songbirds,
14 and other species associated with riparian, riverine, and upland habitats. The Nature
15 Conservancy recently summarized its findings for birds and mammal surveys. These surveys fall
16 short of the number of species that have been documented on site historically. For example, 178
17 species were observed in the bird surveys in 1997. This number falls short of the 246 species
18 identified historically (Neitzel 1998). Species of birds found at or near the Hanford Site include
19 common species and accidental species.
20

21 Twenty-six species of raptors have been sighted on the Hanford Site, 11 of which are
22 known to nest on the Hanford Site (PNL 1981). The nesting species include the great horned owl,
23 long-eared owl, short-eared owl, barn owl, burrowing owl, northern harrier, ferruginous hawk,
24 Swainson's hawk, red-tailed hawk, prairie falcon, and American kestrel. In 1994, nesting by red-
25 tailed, Swainson's, and ferruginous hawks included 41 nests located across the Hanford Site in
26 relation to high voltage transmission towers, trees, cliffs, and basalt outcrops. In recent years the
27 number of nesting ferruginous hawks on the Hanford Site has increased, as a result in part to their
28 acceptance of steel powerline towers in the open grass and shrubland habitats (Neitzel 1998).
29

30 Raptors that may occur year-round on the Hanford Site are the northern harrier, red-tailed
31 hawk, golden eagle, prairie falcon, American kestrel, barn owl, great horned owl, long-eared owl,
32 and burrowing owl (Fitzner and Gray 1991). Raptors use a variety of habitats for nesting and
33 foraging at the Hanford Site. Depending on raptor size and species, prey may include small
34 mammals, birds, reptiles (e.g., snakes), and insects.
35

36 Passerine species known to occur in the shrub-steppe vegetation on the Hanford Site
37 include the loggerhead shrike, sage sparrow, western meadowlark, grasshopper sparrow, horned
38 lark, and sage thrasher. The western meadowlark, sage sparrow, and horned lark are the most
39 abundant shrub-steppe passerine bird species that breed on the Hanford Site (Rickard and
40 Poole 1989). The western meadowlark and horned lark nest on the ground in the open, while
41 shrub-steppe species (e.g., the sage sparrow, sage thrasher, and loggerhead shrike) require
42 sagebrush or bitterbrush for nesting habitat.
43

44 Common upland game species that occur in shrub and grassland habitat include the
45 chukar partridge, California quail, and Chinese ring-necked pheasant. Chukars are most
46 numerous in the Rattlesnake Hills, Yakima Ridge, Umtanum Ridge, Saddle Mountains, and Gable
47 Mountain areas of the Hanford Site. Less common species include western sage grouse,
48 Hungarian partridge, and scaled quail. Western sage grouse were historically abundant on the
49 Hanford Site; however, populations have declined since the early 1800s because of the conversion
50 of sagebrush-steppe habitat. Surveys conducted by the WDFW and PNNL during late winter and
51 early spring 1993, and biodiversity inventories conducted by The Nature Conservancy in 1997 did
52 not reveal presence of western sage grouse in sagebrush-steppe habitat at ALE (Neitzel 1998).
53 The McGee Ranch area is viewed by the WDFW as habitat critical to the natural re-establishment
54 of sage grouse populations on the ALE Reserve by providing a habitat corridor to the U.S. Army's

1 Yakima Training Center.

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In addition to upland bird species, numerous species associated with wetlands and riparian habitats are found along the Columbia River and at isolated wetlands on the Hanford Site. Ring-billed and California gulls, Forster’s terns, and Canadian geese all form nesting colonies on islands in the Hanford Reach. Large numbers of swallows depend on the Columbia River riparian areas during the summer months, eating flying aquatic insects such as caddis flies and collecting mud from wetted areas to build their nests. The Hanford Site is located in the Pacific flyway and, during the spring and fall months, the Hanford Reach serves as a resting area for neotropical migrants, migratory waterfowl, and shorebirds. During the fall and winter months, large numbers of migratory ducks and geese find refuge along the Hanford Reach. Other species observed during winter months include white pelicans, double-crested cormorants, and common loons.

4.5.3.3 Reptiles and Amphibians. Fifteen species of reptiles and amphibians are known to occur on the Hanford Site (PNNL 1996a). The side-blotched lizard is the most abundant reptile and can be found throughout the Hanford Site. Short-horned and sagebrush lizards are also common in selected habitats. The most common snakes are the gopher snake, the yellow-bellied racer, and the Pacific rattlesnake, all of which are found throughout the Hanford Site. Striped whipsnakes and desert night snakes are rarely found, but some sightings have been recorded for the Site. Toads and frogs (e.g., Great Basin spadefoot toad, Woodhouse’s toad, bullfrog, and the Pacific tree frog) are found near the permanent water bodies and along the Columbia River.

4.5.3.4 Insects. Many species of insects occur throughout all habitats on the Hanford Site. Butterflies, grasshoppers, and darkling beetles are among the more conspicuous of the approximately 1,500 species of insects that have been identified from specimens collected on the Hanford Site. The actual number of insect species occurring on the Hanford site may reach as high as 15,000. The recent surveys performed by The Nature Conservancy included the collection of 30,000 specimens and have resulted in the identification of 42 new taxa and 172 new findings in the State of Washington (Neitzel 1998). Insects are more readily observed during the warmer months of the year (see text box, “Hanford Site Quick Facts: Wildlife”).

<i>Hanford Site Quick Facts: Wildlife</i>	
c	44 species of fish
c	40 species of mammals
c	Approximately 238 species of birds
c	15 species of reptiles and amphibians
c	Approximately 1,500 species of insects

4.5.4 Terrestrial Wildlife and Habitat

Terrestrial wildlife species use both shoreline riparian and shrub-steppe habitats occurring along the Columbia River and on the islands occurring in the Hanford Reach. Wildlife reported to use the Hanford Reach include 184 species of birds, 36 species of mammals, nine species of reptiles, and four species of amphibians (NPS 1994). Canada geese use the islands along the Hanford Reach extensively for nesting. Studies on the nesting habits of geese that use the Hanford Site have been ongoing since 1953. These studies indicate a general decline over the years in the number of nests on the islands in the Hanford Reach because of heavy predation by coyotes (PNNL 1996a). Mule deer use the islands and other riparian areas for fawning habitat. Wildlife occurring on the shoreline habitat includes 46 species that use willow communities and 49 species that use grass areas (NPS 1994).

Terrestrial wildlife species found in the 100 Areas generally are the same species found across the Hanford Site (Cushing 1992). Coyotes occurring along the Columbia River reportedly feed on carp and small mammals such as the Great Basin pocket mouse, northern pocket gopher, Nuttall’s cottontail, and black-tailed jack rabbit (Fitzner and Gray 1991). Mule deer may occur almost anywhere on the Hanford Site but prefer habitats along the Columbia River where riparian areas provide abundant food and cover. Mule deer forage on mulberry, Russian olive, and

1 cottonwood trees, and shrubs such as willow (WHC 1992c).

2
3 Wildlife likely to occur in riparian habitat adjacent to the Columbia River includes a variety
4 of birds, mammals, reptiles, and amphibians (Fitzner and Gray 1991). The three known species
5 of amphibians at the Hanford Site use riparian habitat along permanent water bodies and the
6 Columbia River. Medium-size mammals using riparian habitat are the muskrat, raccoon, beaver,
7 weasel, skunk, otter, and porcupine; small mammals include the vagrant shrew and montane
8 meadow mouse. Upland birds likely to occur in habitats in the 100 Areas along the Columbia
9 River are the California quail and ring-necked pheasant (Cushing 1992). Trees along the river,
10 including those found in the 100 Areas, provide habitat for several species of birds. These include
11 the great blue heron, which has colonial nest sites (rookeries) near the White Bluffs ferry landing,
12 and the bald eagle, which uses selected trees for perching and night roosts during the winter
13 (PNNL 1996a).

14
15 Terrestrial wildlife species common to the Hanford Site also can be found in the Central
16 Plateau (Cushing 1992). A characterization study of small mammals that occur near the
17 100-B/C cribs (located south of the 200 East Area) resulted in five species being trapped: Great
18 Basin pocket mouse, deer mouse, northern grasshopper mouse, sagebrush vole, and western
19 harvest mouse (PNL 1977). The Great Basin pocket mouse represented more than 90 percent of
20 the mammals caught. Medium and large-size mammals that may occur in the Central Plateau
21 include rabbits, coyotes, badgers, and mule deer (PNL 1977). Mammals potentially using areas
22 associated with ponds and ditches in the 200 East and 200 West Areas include muskrats,
23 porcupines, and raccoons.

24
25 Many common bird species, such as the western meadowlark and sage sparrow, are likely
26 to occur on the Central Plateau where suitable habitats exist. Thirty-seven species of terrestrial
27 birds were recorded during surveys conducted in the 200 East and 200 West Areas of the
28 Hanford Site in 1986 (Schuller et al. 1993). Bird studies associated with waste water ponds in the
29 Central Plateau reveal that a large number of species, particularly waterfowl, use these ponds
30 during migration (PNL 1977).

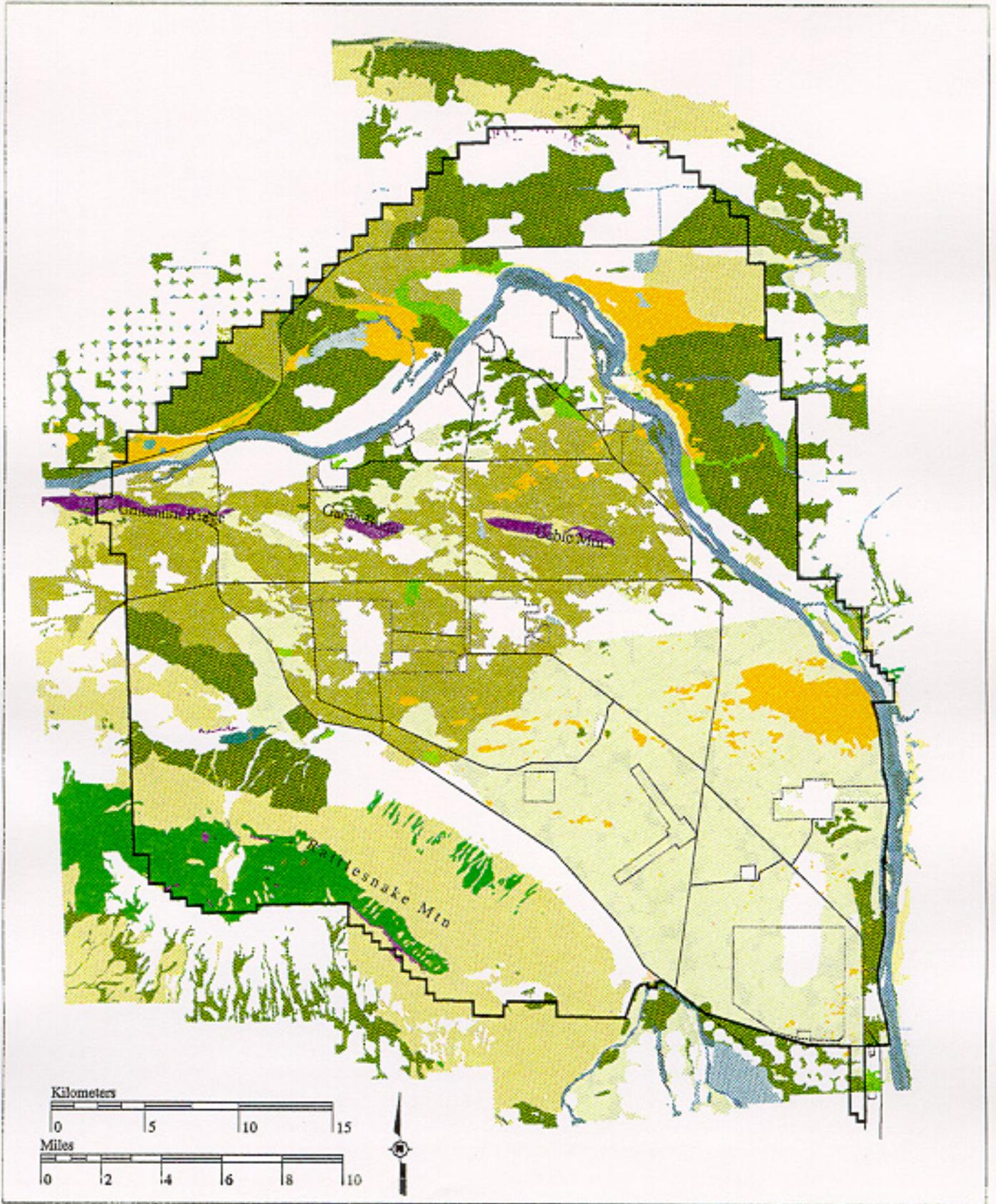
31
32 Unique habitats can be found on Columbia River islands, sand dunes, the cliffs of White
33 Bluffs, and on Gable Butte and Gable Mountain situated north of the Central Plateau (Figure 4-23).
34 The Gable Butte and Gable Mountain unique habitats include basalt outcrops, scarps, and scree
35 slopes. Birds likely to occur in these habitats are the prairie falcon, rock wren, poorwill, and
36 chukar; small mammals include the yellow-bellied marmot and wood rat; reptiles include
37 rattlesnakes, gopher snakes, and horned lizards (PNL 1993c).

38 39 **4.5.5 Species of Concern on the Hanford Site**

40
41 Species of concern on the Hanford Site
42 include federally listed threatened or endangered
43 species, state-listed threatened or endangered
44 species, and state candidate species (see text box,
45 "*Hanford's Federal Threatened and Endangered*
46 *Species*").

<i>Hanford's Federal Threatened and Endangered Species</i>	
Several federally threatened or endangered species might be found at the Hanford Site, including the following:	
C	Steelhead (Upper Columbia River run)
C	Chinook salmon (Upper Columbia River spring-run)
C	Steelhead (Middle Columbia River run)
C	Aleutian Canada goose*
C	Bald eagle*
C	Peregrine falcon ¹
C	Ute Ladies'-tresses
*To be delisted within two years.	
¹ Was delisted August 25, 1999.	

1 **Figure 4-23. Plant Communities of Concern on the Hanford Site.**
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Figure 4-23. Plant Communities of Concern on the Hanford Site (Legend).

-  Post-Fire Shrub-Steppe on the Columbia River Plain
-  Rabbitbrush / Bunchgrasses
-  Big Sagebrush / Bunchgrasses -Cheatgrass
-  Big Sagebrush -Spiny Hopsage / Bunchgrasses -Cheatgrass
-  Threetip Sagebrush / Bunchgrasses
-  Spiny Hopsage / Bunchgrasses
-  Spiny Hopsage / Cheatgrass
-  Black Greasewood / Sandberg's Bluegrass
-  Winterfat / Bunchgrasses
-  Winterfat / Cheatgrass
-  Snow Buckwheat / Indian Ricegrass
-  Bunchgrasses
-  Planted Non-native Grass
-  Bitterbrush / Bunchgrasses Sand Dune Complex
-  Bitterbrush / Cheatgrass
-  Alkali Saltgrass -Cheatgrass
-  Riparian
-  Basalt Outcrops
-  White Bluffs Cliffs
-  Riverine Wetlands and Associated Deepwater Habitats
-  Non-Riverine Wetlands and Associated Deepwater Habitats
-  Habitats of Low Value
 - Rabbitbrush / Cheatgrass
 - Cheatgrass -Sandberg's Bluegrass
 - Agricultural Areas
 - Abandoned Old Fields and Farms
 - Buildings / Parking Lots / Gravel Pits / Disturbed Areas

1 No plants or mammals listed in “Federal List of Endangered and Threatened Wildlife and Plants”
2 (50 CFR 17) are known to occur on the Hanford Site. There are, however, two species of birds, |
3 two fish species (two ESU for steelhead) and one suspected plant that are federally listed, and |
4 several species of plants and animals are under consideration for formal listing by the State of
5 Washington.

6
7 Candidate species occurring on the Hanford Site are considered in the preparation of
8 DOE NEPA documentation. Species of concern occurring on the Hanford Site are listed in
9 Tables 4-6 and 4-7; the tables also include definitions of each category of species of concern.

10
11 No federally listed threatened or endangered plant species occur on the Hanford Reach.
12 Nine species of Hanford Site plants are included in the Washington State listing as threatened or
13 endangered (see Table 4-6). Columbia milk-vetch occurs on dry-land benches along the
14 Columbia River near Priest Rapids Dam, Midway, and Vernita; it also has been found atop
15 Umtanum Ridge and in Cold Creek Valley near the ALE Reserve. Dwarf evening primrose has
16 been found north of Gable Mountain, near the Vernita Bridge, Ringold, and on steep talus slopes
17 near Priest Rapid Dam, Midway, and Vernita. Yellowcress occurs in the wetted zone of the
18 water's edge along the Hanford Reach. Northern wormwood is known to occur near Beverly and
19 could inhabit the northern shoreline of the Columbia River across from the 100 Areas. Umtanum
20 desert buckwheat and White Bluffs bladderpod occur on the Hanford Site and no where else in the
21 world. Leoflingia occurs north of Gable Mountain (Neitzel et al. 1998).

22
23 Wildlife species of concern that may occur along the Hanford Reach include several
24 species of birds associated with riparian and aquatic habitat (PNL 1993c), the Upper Columbia
25 River spring-run chinook salmon and the Upper and Middle Columbia River runs of steelhead from
26 the confluence of the Yakima River and upstream. The Federal government lists the Aleutian
27 Canada goose, the bald eagle, and Middle Columbia River steelhead as threatened, and the Upper
28 Columbia River steelhead, and Upper Columbia River spring-run chinook salmon as endangered.
29 The State of Washington lists, in addition to the peregrine falcon and Aleutian Canada goose,
30 include the white pelican, sandhill crane, and pygmy rabbit as endangered, and the ferruginous
31 hawk and the bald eagle as threatened. The peregrine falcon is a casual migrant to the Hanford
32 Site and does not nest there. The bald eagle is a regular winter resident and forages on dead
33 salmon and waterfowl along the Columbia River; it does not nest on the Hanford Site although it
34 has attempted to for the past several years (see Table 4-7) (Neitzel et al. 1998).

35 The bald eagle, a Federal and Washington State threatened species, is the only federally listed
36 wildlife species known to regularly use the 100 Areas. Bald eagles use groves of trees (e.g., black
37 locust, white poplar, and Siberian elm) along the Hanford Reach for winter perching, night roosts,
38 and nesting sites (DOE-RL 1994b). Buffer zones around primary night roosts and nest sites have
39 been established in consultation with the USFWS. While the night-roost locations are consistent
40 from year to year, the nesting sites have varied and are readjusted in consultation with the
41 USFWS each year (see Figure 4-24).

42
43 Steelhead and salmon are regulated as evolutionary significant units (ESUs) by the National
44 Marine Fisheries Service based on their historic geographic spawning areas. The Upper
45 Columbia River steelhead ESU was listed as threatened in August 1997. Adult steelhead migrate |
46 upstream through the Hanford Reach to spawn in upriver tributaries and juvenile pass through the
47 Hanford Reach on their outward migration to the sea. In March 1999, Upper Columbia River
48 spring run chinook salmon ESU were added as endangered, and the Middle Columbia River
49 steelhead ESU were added as threatened. These races of salmonids utilize habitat in the mid-
50 Columbia River and its tributaries.

1 **Table 4-6. Plant Species of Concern Occurring on the Hanford Site**
2 **(adapted from PNNL 1996a). (2 pages)**

3	Common Name	Scientific Name	Federal Status	State Status
4	Ammania	<i>Ammania robusta</i>		R1
5	Annual Paintbrush	<i>Castilleja exilis</i>		R1
6	Bristly Combseed	<i>Pectocarya setosa</i>		W
7	Bristly cryptantha	<i>Cryptantha spiculifera</i> (= <i>C. interrupta</i>)		S
8	Brittle prickly-pear	<i>Opuntia fragilis</i>		R1
9	Canadian St. John wort	<i>Hypericum majus</i>		S
10	Chaffweed	<i>Centunculus minimus</i>		R1
11	Columbia milk-vetch	<i>Astragalus columbianus</i>		T
12	Columbia river mugwort	<i>Artemisia lindleyana</i>		E
13	Columbia yellowcress	<i>Rorippa columbiae</i>		E
14	Coyote tobacco ^a	<i>Nicotiana attenuata</i>		S
15	Crouching milkvetch	<i>Astragalus succumbens</i>		W
16	Dense sedge ^a	<i>Carex densa</i>		S
17	Desert Cryptantha	<i>Cryptantha scoparia</i>		R1
18	Desert dodder	<i>Cuscuta denticulata</i>		S
19	Desert evening primrose	<i>Oenothera caespitosa</i>		S
20	Dr. Bill's Locoweed	<i>Astragalus conjunctus</i> var. <i>novum</i>		R1
21	Dwarf evening primrose	<i>Oenothera pygmaea</i>		T
22	False pimpernel	<i>Lindernia dubia anagallidea</i>		R2
23	Few-flowered collinsia ^a	<i>Collinsia sparsiflora</i> var. <i>bruceiae</i>		S
24	Fuzzy beardtongue	<i>Penstemon eriantherus whitedii</i>		R1
25	Geyer's milkvetch	<i>Astragalus geyeri</i>		S
26	Gray cryptantha	<i>Cryptantha leucophaea</i>		S
27	Great Basin Gilia	<i>Gilia leptomeria</i>		R1
28	Hedge Hog Cactus	<i>Pediocactus sempsonii</i> var. <i>robustior</i> (= <i>P. nigrispinus</i>)		R1
29	Hoover's desert parsley	<i>Lomatium tuberosum</i>		T
30	Kittitas Larkspur	<i>Delphinium multiplex</i>		W
31	Loeflingia	<i>Loeflingia squarrosa</i> var. <i>squarrosa</i>		T
32	Medic milkvetch ^a	<i>Astragalus speirocarpus</i>		W
33	Northern wormwood ^b	<i>Artemisia campestris borealis</i> var. <i>wormskioldii</i>		E

**Table 4-6. Plant Species of Concern Occurring on the Hanford Site
(adapted from PNNL 1996a). (2 pages)**

	Common Name	Scientific Name	Federal Status	State Status
1	Palouse milkvetch ^a	<i>Astragalus arrectus</i>		S
2	Palouse thistle	<i>Cirsium brevifolium</i>		W
3	Piper's daisy	<i>Erigeron piperianus</i>		S
4	Purple Mat	<i>Nama densum var. parviflorum</i>		R1
5	Robinson's onion	<i>Allium robinsonii</i>		W
6	Rosy balsamroot	<i>Balsamorhiza rosea</i>		W
7	Rosy calyptidium	<i>Calyptidium roseum</i>		S
8	Scilla onion	<i>Allium scillioides</i>		W
9	Shining flatsedge	<i>Cyperus bipartitus (rivularis)</i>		S
10	Small-flowered evening	<i>Camissonia (Oenothera) minor</i>		R1
11	primrose			
12	Small-flowered Hemicarpha	<i>Lipocarpha (=Hemicarpha) aristulata</i>		R1
13	Smooth cliffbrake	<i>Pellaea glabella simplex</i>		W
14	Southern mudwort	<i>Limosella acaulis</i>		W
15	Stalked-pod milkvetch	<i>Astragalus sclerocarpus</i>		W
16	Suksdorf's monkeyflower	<i>Mimulus suksdorfii</i>		S
17	Thompson's sandwort ^a	<i>Arenaria franklinii thompsonii</i>		R2
18	Toothcup	<i>Rotala ramosior</i>		R1
19	Umtanum desert buckwheat	<i>Eriogonum codium</i>		E
20	Ute ladies'-tresses ^a	<i>Spiranthes diluvialis</i>	T	
21	White Bluffs bladderpod	<i>Lesquerella tuplashensis</i>		E
22	White eatonella	<i>Eatonella nivea</i>		T
23	Winged combseed	<i>Pectocarya linearis</i>		R1

24 ^a May inhabit the Hanford Site but have not been recently collected, or the known collections are questionable in
25 terms of location and/or identification.

26 ^b Likely not currently occurring on the Hanford Site.

27 R1 = Review Group 1. Taxa for which there are insufficient data to support listing as threatened, endangered, or
28 sensitive.

29 R2 = Review Group 2. Taxa with unresolved taxonomic questions; once resolved these taxa could qualify for
30 listing as endangered, threatened, sensitive.

31 S = Sensitive. Taxa that are vulnerable or declining, and could become threatened or endangered without
32 active management or removal of threats.

33 T = Threatened; a species native to Washington State likely to become endangered within the foreseeable
34 future throughout significant portions of its range within the state without cooperative management or the
35 removal of threats. Threatened species are designated in WAC 232-12-011.

36 E = Endangered; a species native to Washington State that is seriously threatened with extinction throughout
37 all or a significant portion of its range within the state. Endangered species are designated in
38 WAC 232-12-014.

**Table 4-7. Wildlife Species of Concern Occurring on the Hanford Site
(adapted from Cushing 1995).**

Common Name	Scientific Name	Federal Status	State Status
Molluscs			
Columbia pebble snail	<i>Fluminicola (= Lithoglyphus) columbiana</i>		C
Shortfaced lanx	<i>Fisherola (= Lanx) nuttalli</i>		C
Fish			
Steelhead (Upper Columbia River run)	<i>Onchorhynchus mykiss</i>	E	
Steelhead (Middle Columbia River run)	<i>Onchorhynchus mykiss</i>	T	
Chinook salmon (Upper Columbia spring run)	<i>Onchorhynchus tshawytscha</i>	E	
Birds			
Aleutian Canada goose ^b	<i>Branta canadensis leucopareia</i>	T	E
American white pelican	<i>Pelecanus erythrorhynchos</i>		E
Bald eagle	<i>Haliaeetus leucocephalus</i>	T	T
Ferruginous hawk	<i>Buteo regalis</i>		T
Peregrine falcon ^b	<i>Falco peregrinus</i>		E
Sandhill crane ^b	<i>Grus canadensis</i>		E
Burrowing owl	<i>Athene cunicularia</i>		C
Common loon	<i>Gavia immer</i>		C
Flammulated owl ^b	<i>Otus flammeolus</i>		C
Golden eagle	<i>Aquila chrysaetos</i>		C
Lewis' woodpecker ^b	<i>Melanerpes lewis</i>		C
Loggerhead shrike	<i>Lanius ludovicianus</i>		C
Northern goshawk ^b	<i>Accipiter gentilis</i>		C
Sage sparrow	<i>Amphispiza belli</i>		C
Sage thrasher	<i>Oreoscoptes montanus</i>		C
Western sage grouse ^b	<i>Centrocercus urophasianus</i>		C
Insects			
Columbia River tiger beetle ^b	<i>Cicindela columbica</i>		C
Juniper hairstreak	<i>Mitoura siva</i>		C
Silver-bordered bog fritillary	<i>Boloria selene atrocatalis</i>		C
Reptiles			
Striped whipsnake	<i>Masticophis taeniatus</i>		C
Mammals			
Merriam's shrew	<i>Sorex merriami</i>		C
Pacific (Townsend's) western big-eared bat ^b	<i>Corynorhinus townsendii</i> (also known as		C
Pygmy rabbit ^a	<i>Plecotus townsendii</i>)		
Washington ground squirrel	<i>Brachylagus idahoensis</i>		E
	<i>Spermophilus washingtoni</i>		C

^a Likely not occurring on the Hanford Site.

^b Reported as possibly occurring on the Hanford Site.

C = Candidate; a native species that the state or Federal Departments of Fish and Wildlife has enough substantial information on biological vulnerability to support proposals to list them as endangered or threatened species.

E = Endangered; a species that is seriously threatened with extinction throughout all or a significant portion of its range. Endangered species are designated in WAC 232-12-014 or 50 CFR 17.

T = Threatened; a species that is likely to become endangered within the foreseeable future throughout significant portions of its range without cooperative management or the removal of threats. Threatened species are designated in WAC 232-12-011 or 50 CFR 17.

1 **4.5.6 Aquatic Species and Habitat**
2

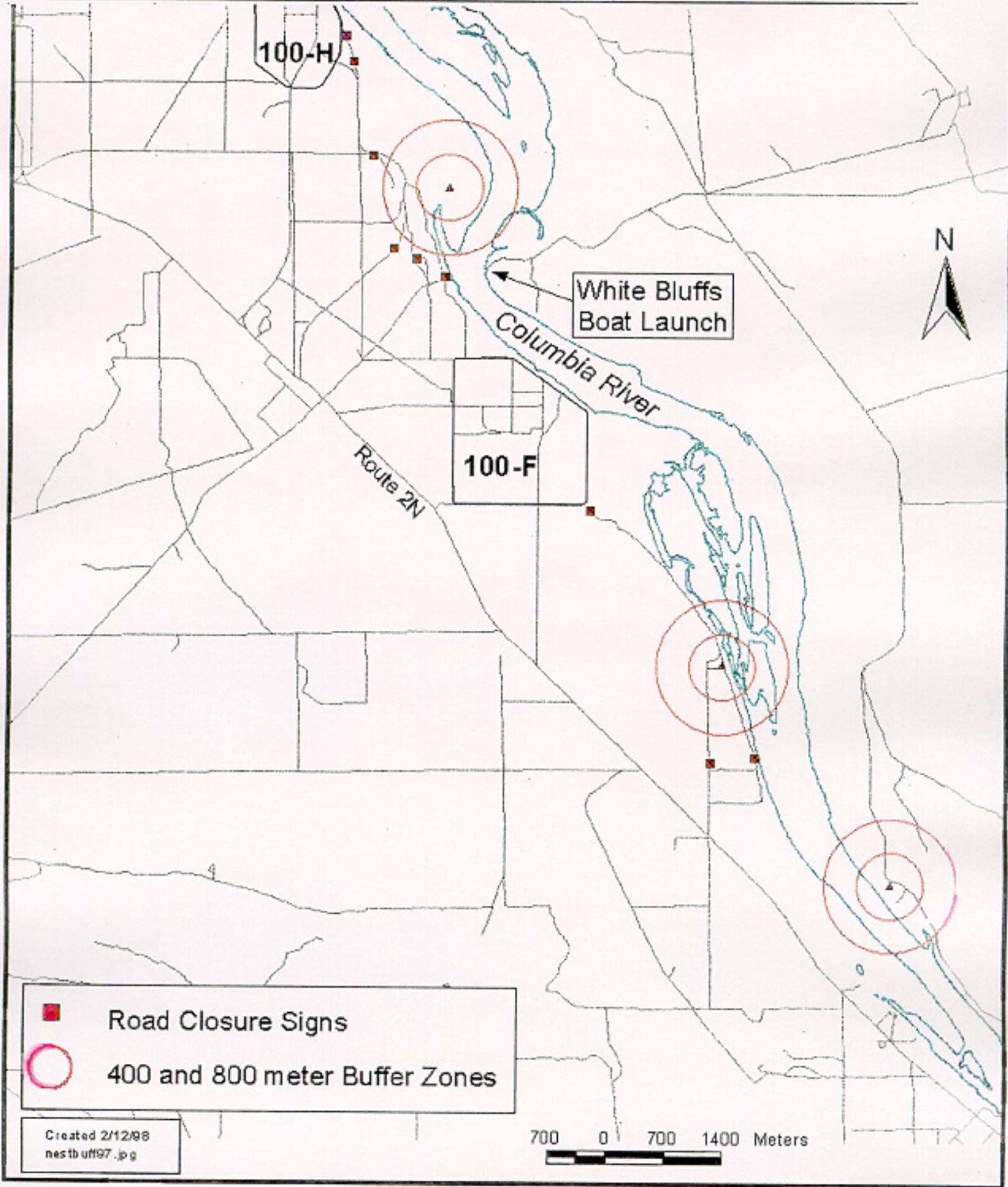
3 There are two primary types of natural aquatic habitats on the Hanford Site: (1) the
4 Columbia River, which flows along the northern and eastern edges of the Hanford Site; and (2) the
5 small spring-streams and seeps located mainly in the Rattlesnake Hills. Several artificial water
6 bodies, both ponds and ditches, have been formed as a result of waste water disposal practices
7 associated with the operation of the reactors and separation facilities. These bodies of water are
8 temporary and will vanish with cessation of activities, but while present, the ponds form
9 established aquatic ecosystems (except the West Pond), complete with representative flora and
10 fauna. The West Pond, also known as West Lake, is created by a rise in the water table in the
11 Central Plateau and is not fed by surface flow; thus, the pond is alkaline and has low species
12 diversity.
13

14 Forty-four species of fish representing 13 families are known to occur in the Hanford Reach
15 (PNNL 1996a). Of these species, chinook salmon, sockeye salmon, coho salmon, steelhead, and
16 Pacific lamprey use the Columbia River as a migration route to upstream spawning areas. Other
17 fish of importance to sport fishermen are whitefish, sturgeon, small-mouth bass, catfish, walleye,
18 and perch. Large populations of rough fish also are present, including carp, shiners, suckers, and
19 squawfish (PNNL 1996a).
20

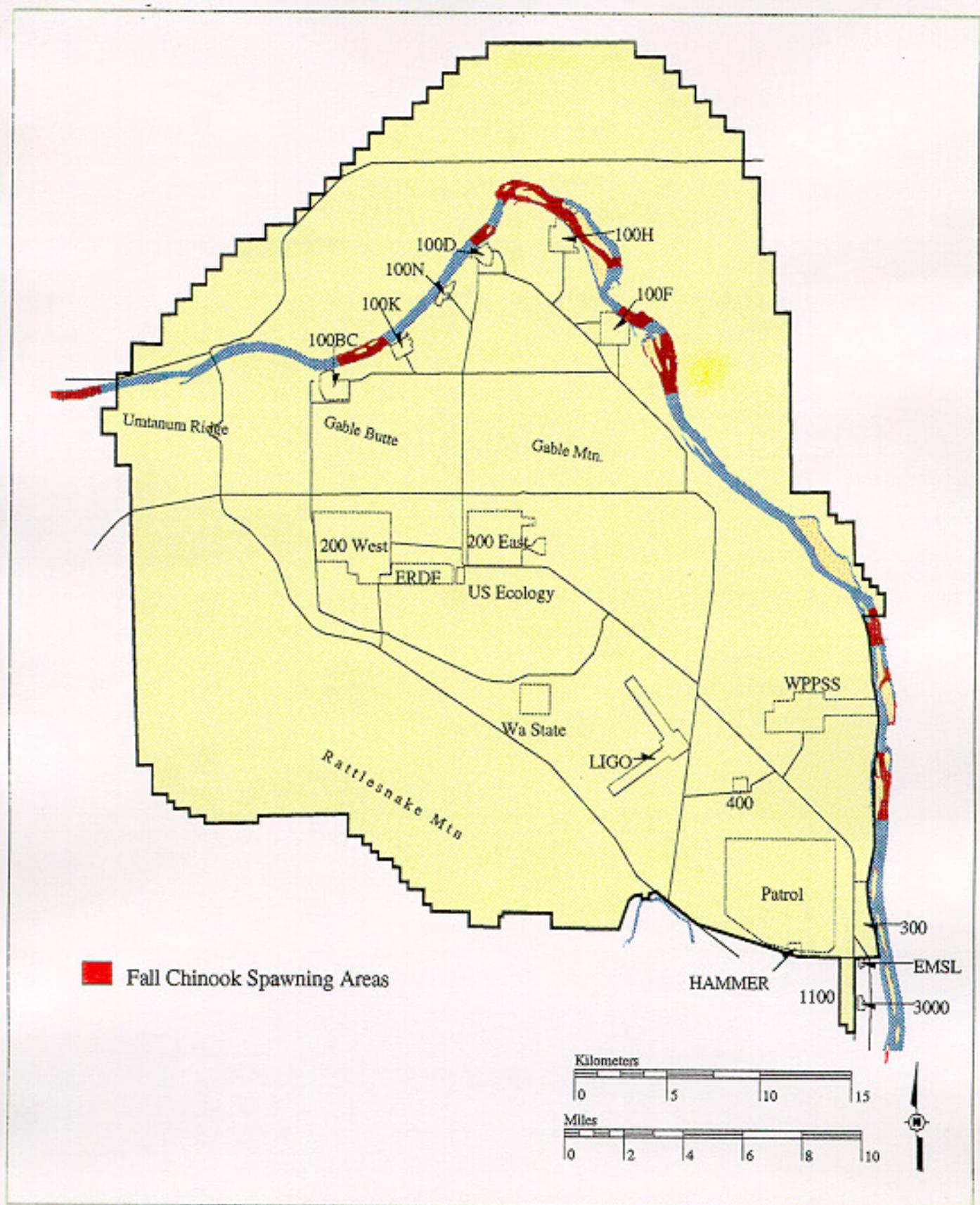
21 The Hanford Reach represents the only remaining significant mainstream Columbia River
22 spawning habitat for stocks of Upper Columbia River summer/fall-run chinook salmon and white
23 sturgeon (PNL 1990a). Since 1948, an annual census of salmon spawning on the Hanford Reach
24 indicates that over 60 percent of fall chinook spawning occurs at Vernita Bar and the Locke Island
25 area near White Bluffs (PNL 1993c). The numbers of fall chinook spawning sites (redds) in the
26 Hanford Reach increased between the late 1940s and the 1980s. In 1988, the Hanford Reach
27 served as the spawning area for 50 to 60 percent of the total fall chinook salmon runs in the
28 Columbia River (Figure 4-25) (PNNL 1996a).
29

30 The Upper Columbia River run of steelhead has been federally listed as endangered.
31 These fish spawn in and migrate through the Hanford Reach. Recent population estimates
32 indicate that Upper Columbia River steelhead run has declined to fewer than 1,400 fish, prompting
33 listing by the National Marine Fisheries Service (62 FR 43974). On March 16, 1999, the Upper
34 Columbia River spring-run chinook salmon was added as endangered, and the Middle Columbia
35 River steelhead was added as threatened.
36

1 **Figure 4-24. Bald Eagle Primary Night Roosts and Nest**
3 **Sites (PNNL database).**



3 **Figure 4-25. Key Fall Chinook Salmon Spawning Areas.**



1 Steelhead follow a life cycle similar to salmon, but with one distinct difference; salmon die
2 after spawning, but steelhead migrate back to the ocean and a small percentage return in
3 subsequent years to spawn again. Little is known about the quality and quantity of steelhead
4 spawning, rearing, and adult holding habitat in the Hanford Reach. Counts from 1972 and 1988
5 indicate that about 20,000 steelhead passed McNary Dam but did not pass Priest Rapids or Ice
6 Harbor Dam. Some of these fish would enter the Yakima River while others would be caught in
7 the Hanford Reach sport fishery. The remainder represent potential spawners. A substantial
8 number of steelhead do terminate their migration in the Hanford Reach.
9

10 Aquatic plants in the Hanford Reach include water milfoil, waterweed, pondweed, Columbia
11 yellowcress, watercress, and duckweed (PNNL 1996a). Aquatic plants generally are more
12 prevalent where currents are less swift (e.g., in slack water areas like sloughs) (WHC 1992c).
13 Aquatic plants are important to resident fish because they provide food, cover, and spawning
14 areas for a variety of species. Water milfoil, an aggressive introduced aquatic plant, is becoming
15 a nuisance in the Columbia River because of its rapid growth and lack of natural control.
16

17 Other aquatic species found in the Hanford Reach include a variety of microflora,
18 zooplankton, and benthic invertebrates. Microflora include both sessile types (periphyton) and
19 free-floating types (phytoplankton). Microflora species include diatoms, golden or yellow-brown
20 algae, green algae, blue-green algae, red algae, and dinoflagellates. Dominant zooplankton taxa
21 include *Bosmina*, *Diaptomus*, and *Cyclops*. Benthic invertebrate taxa occurring in the Hanford
22 Reach include insect larvae such as caddis flies, midge flies, black flies, snails, freshwater
23 sponges, limpets, and crayfish (PNNL 1996a).
24

25 The small spring-streams, such as Rattlesnake and Snively Springs, contain diverse biotic
26 communities and are extremely productive (PNNL 1996a). Dense blooms of watercress occur
27 and are not lost until a major flash flood occurs. The aquatic insect production is fairly high as
28 compared to that in mountain streams (PNNL 1996a). The macrobenthic biota varies from site to
29 site and is related to the proximity of colonizing insects and other factors.
30

31 **4.5.7 Wetland Habitat**

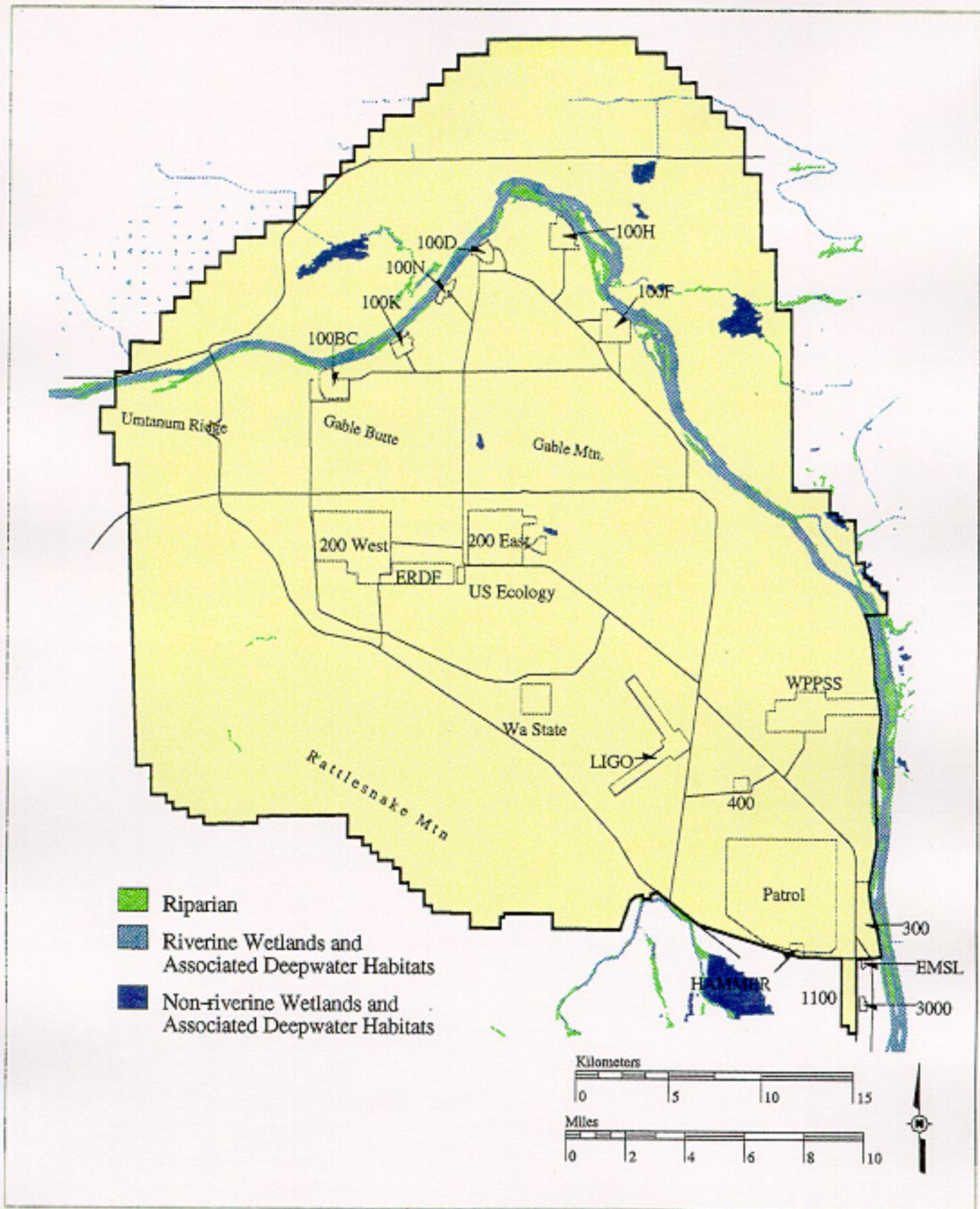
32

33 Wetlands include transitional lands occurring between terrestrial and aquatic ecosystems
34 (Figure 4-26) where the water table usually is close to the surface or where shallow water covers
35 the surface. The primary jurisdictional wetlands found on the Hanford Site occur along the
36 Hanford Reach and include the riparian and riverine habitats located along the river shoreline.
37 Riparian habitat includes the uplands immediately adjacent to the Hanford Reach or its backwater
38 sloughs and supports vegetation typical of a high water table (NPS 1994). Common riparian
39 species found along the Hanford Reach include a variety of woody and herbaceous plant species.
40

41 Other wetland habitats found on the Hanford Site are associated with man-made ponds
42 and ditches occurring on the Hanford Site, including the B Pond Complex located near the
43 200 East Area and a small cooling and waste water pond in the 400 Area. The B Pond complex
44 was constructed in 1945 to receive cooling water from facilities in that area. Since that time,
45 effluent flow to the B Pond has halted. One lobe of the pond received cooling water until very
46 recently; the rest of the B Pond complex is slowly reverting to a shrub-steppe ecosystem.
47

48 The West Lake, a shallow, highly saline, and alkaline pond located southwest of Gable
49 Mountain, fluctuates in size with changes in the water table (PNL 1991b) and is currently less than
50 2 ha (5 ac) in size. Unlike other ponds on the Hanford Site, West Lake does not receive direct
51 effluent discharges from Hanford Site facilities (PNL 1993a). Wetland vegetation found at West
52 Lake is limited to scattered patches of emergent macrophytes, such as cattails and bulrushes.
53

Figure 4-26. Wetlands on the Hanford Site.



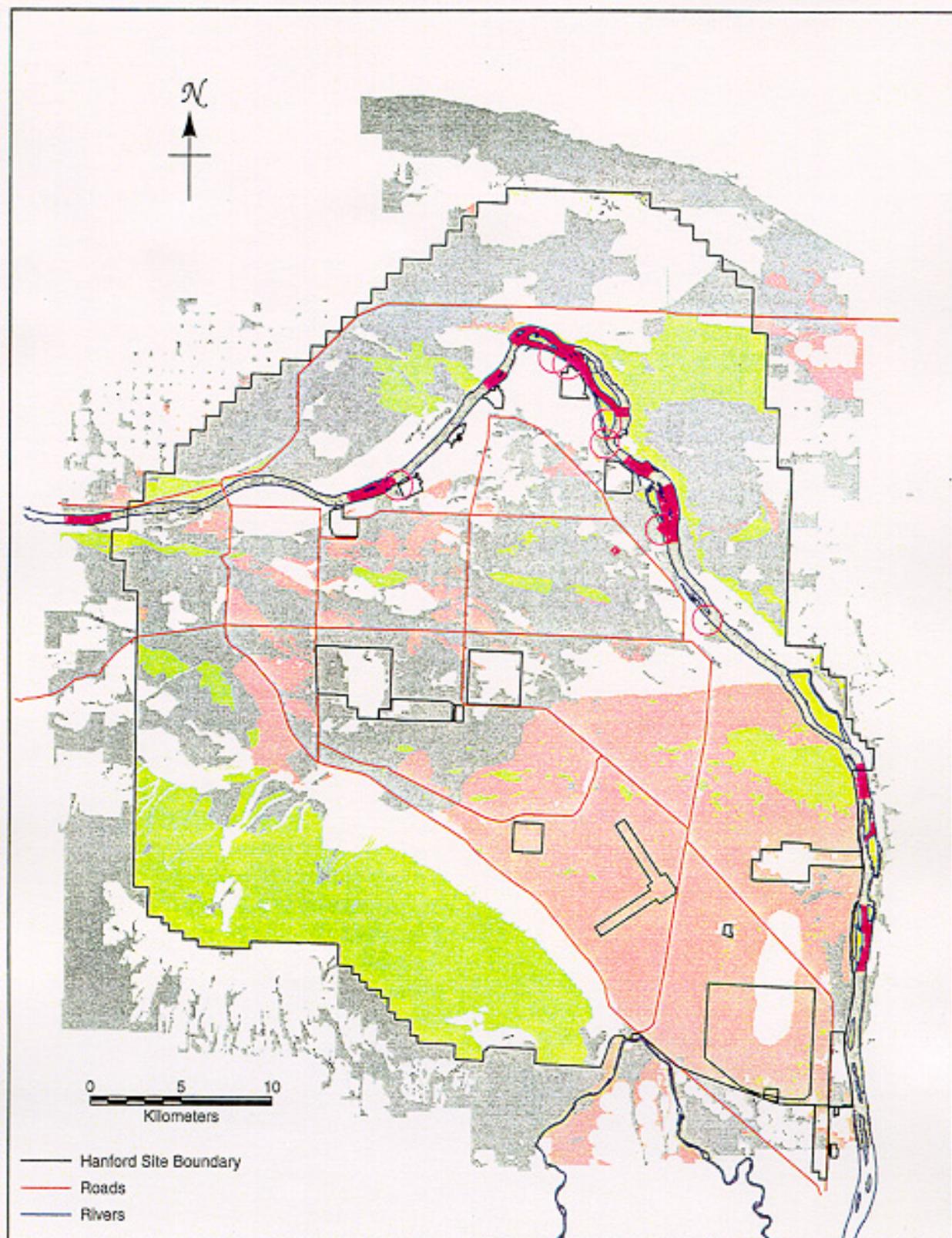
1 **4.5.8 Biological Resources Management**

2
3 The DOE is currently in the process of developing and implementing an overall
4 management strategy for the conservation of fish, wildlife, and plant populations and their habitats
5 on the Hanford Site. The Draft *Hanford Site Biological Resources Management Plan* (BRMaP)
6 (DOE-RL 1996c) was developed to provide DOE and its contractors with a consistent approach to
7 protect biological resources and to monitor, assess, and mitigate impacts from Hanford Site
8 development, and environmental cleanup and restoration activities. The primary purposes of the
9 BRMaP are (1) to support DOE Hanford missions; (2) to provide a mechanism for ensuring
10 compliance with laws that relate to the management of potential impacts to biological resources;
11 (3) to provide a framework for ensuring appropriate biological resource goals, objectives, and tools
12 are in place to make DOE an effective steward of the Hanford Site biological resources; and (4) to
13 implement an ecosystem management approach for biological resources on the Site.
14

15 Plant communities of concern have been identified for the Hanford Site using
16 classifications from BRMaP. These classifications associate different management actions
17 (i.e., monitoring, impact assessment, mitigation, and preservation) with particular sets of biological
18 resources. The BRMaP classifies Hanford Site biological resources into four levels of
19 management concern (Figure 4-27), which can be summarized as follows:
20

- 21 C **Level I** biological resources are resources that require some level of status
22 monitoring because of the recreational, commercial, or ecological role or previous
23 protection status of the resources. Level I includes Washington State Monitor 3
24 species (DOE-RL 1996).
25
- 26 C **Level II** biological resources require consideration of potential adverse impacts
27 from planned or unplanned Hanford Site actions for compliance with procedural and
28 substantive laws such as NEPA, CERCLA, and the *Migratory Bird Treaty Act of*
29 *1918*. Mitigation of potential impacts by avoidance and/or minimization is
30 appropriate for this level; however, additional mitigation actions are not required.
31 Level II resources include Washington State Monitor 1 and 2 species and early
32 successional habitats.
33
- 34 C **Level III** biological resources require mitigation because the resource is listed by
35 the State of Washington; is a candidate for Federal or state listing; is a plant, fish,
36 or wildlife species with unique or significant value; has a special administrative
37 designation (e.g., the ALE Reserve); or is environmentally sensitive. When
38 avoidance and minimization are not possible, or application of these measures still
39 results in adverse residual impacts above a specified threshold value, mitigation by
40 rectification and/or compensation is required. Maintenance of Level III resource
41 values may prevent more restrictive and costly management prescriptions in the
42 future. Level III resources include Washington State candidate and sensitive
43 species, threatened and endangered species, Federal candidate species, wetlands
44 and deep-water habitats, and late-successional habitats.
45
- 46 C **Level IV** biological resources that justify preservation as the primary management
47 option because these resources are federally protected or have regional and
48 national significance. The plant communities and habitats that are defined as
49 belonging to this level are of such high quality and/or rarity that damages to these
50 resources cannot be mitigated except through compensatory mitigation by
51 acquiring and protecting in-kind resources. The legally protected species that are
52 included in Level IV cannot be impacted without the concurrence of the USFWS, so
53 these types of impacts do not jeopardize the continued existence of the

1 **Figure 4-27. Composite Map of Level II, Level III, and**
 3 **Level IV Biological Resources.**



Map Created: September 1996/Pacific Northwest National Laboratory

- Level II Resources
- Level III Resources (Species-Based Resources Not Separately Shown)
- Level IV Habitat-Based Resources
- Level IV Species-Based Resources

1 species. Level IV resources include Federal threatened and endangered species and those
2 species proposed for listing, rare habitats such as the White Bluffs, active and stabilized sand
3 dunes, and basalt outcrops.
4

5 The BRMaP provides a broad, but comprehensive, direction that specifies DOE biological
6 resource policies, goals, and objectives and prescribes how they would be met. Two subordinate
7 implementing documents outline specific management actions necessary to meet the policies,
8 goals, and objectives, as described below:
9

- 10 C The *Ecological Compliance Assessment Management Plan* (DOE-RL 1995a)
11 outlines the methods to be used to evaluate and quantify environmental impacts.
12
- 13 C The Draft *Hanford Site Biological Resources Mitigation Strategy Plan* (BRMiS) |
14 (DOE-RL 1996) is designed to aid DOE in balancing its primary missions of
15 environmental restoration, technology development, and economic diversification
16 with its stewardship responsibilities for the biological resources it administers. The
17 BRMiS would (1) ensure consistent and effective implementation of mitigation
18 recommendations and requirements; (2) ensure that mitigation measures for
19 biological resources meet the responsibilities of DOE under both the *National*
20 *Environmental Policy Act of 1969* (NEPA) and the *Comprehensive Environmental*
21 *Response, Compensation, and Liability Act of 1980* (CERCLA); (3) enable Hanford
22 Site development and cleanup projects to anticipate and plan for mitigation needs
23 through early identification of mitigation requirements; (4) provide guidance to
24 Hanford personnel in implementing mitigation in a cost-effective and timely manner;
25 and (5) preserve Hanford biological resources while facilitating balanced
26 development and Site restoration activities.
27

28 These draft management plans are currently in trial use at the Hanford Site for a one-year
29 period. The plans are presented as guidance, not requirements. The plans have been issued to
30 various resource agencies, organizations, and stakeholders for review and comment, and it is
31 expected that once comments are received and on-the-ground implementation experience is
32 gained, the plans would be revised and issued as Hanford Site requirements.
33

34 **4.5.9 Biodiversity**

35
36 The principles of ecosystem management and sustainable development are the foundation
37 upon which DOE manages its lands and facilities. Comprehensive plans guide land- and facility-
38 use decisions by addressing ecological, social, and cultural factors, as well as Site mission and
39 economics. This DOE policy would result in land and facility uses that support DOE's mission at
40 Hanford, while stimulating the economy and protecting the environment (CEQ 1993).
41

42 Biodiversity, a critical component of comprehensive land-use planning, has been defined
43 as the diversity of ecosystems, species, and genes, and the variety and variability of life
44 (CEQ 1993). Major components of biodiversity are plant and animal species, micro-organisms,
45 ecosystems and ecological processes, and the inter-relationships between and among these
46 components. Biodiversity also is a qualitative measure of the richness and abundance of
47 ecosystems and species in a given area (NPS 1994).
48

49 Features contributing to biodiversity on the Hanford Site include one of the largest
50 undisturbed tracts of native shrub-steppe habitat left in Washington State and the Hanford Reach,
51 which is the last free-flowing nontidal stretch of the Columbia River in the United States
52 (PNNL 1996a). Other influencing factors include topographic features such as Rattlesnake
53 Mountain, Gable Butte, and Gable Mountain; a variety of soil textures ranging from sand to silty and
54 sandy loam; and most importantly, the lack of human use and development over much of the
55 Hanford Site. Specialized terrestrial habitats contributing to the biodiversity of the Hanford Site
56 include areas of sagebrush-steppe, basalt outcrops, scarps (cliffs), scree slopes, and sand

1 dunes. Aquatic components of biodiversity are mainly associated with the Columbia River and
2 include aquatic habitat, wetland and riparian areas, and riverine habitat along Hanford Reach
3 shoreline and islands in the Columbia River. Ecologically important plant and animal species on
4 the Hanford Site include species of concern; commercial and recreational wildlife species (e.g.,
5 anadromous fish, mule deer, and upland game birds); and plant species used as a source of food,
6 medicine, fiber, and dye by native peoples of the Columbia Basin (WHC 1992d).

7
8 In 1992, DOE and The Nature Conservancy entered into a Memorandum of Understanding
9 that called for a cooperative and coordinated inventory of plants, animals, and ecologically
10 significant areas at the Hanford Site. In 1994, DOE awarded The Nature Conservancy a grant to
11 conduct a partial inventory of the Hanford Site on the ALE Reserve and the Wahluke Slope. The
12 inventory, which was conducted from March 1994 to March 1995, showed that the Hanford Site
13 supports a rich mosaic of relatively unaltered and increasingly uncommon native habitats, the
14 quality and extent of which are unequaled within the Columbia Basin (TNC and Pabst 1995).
15 Significant numbers of plant, bird, and insect species, many of which are rare or in declined
16 numbers in Washington State, were found to be associated with or dependent on these habitats.
17 The Hanford Site serves as a genetic bank for both the common and unusual plants and animals
18 that comprise the shrub-steppe ecosystem. This initial inventory can provide only a rough
19 indication of the quality of biodiversity that is to be found on the main part of the Hanford Site,
20 which is more extensively disturbed than the ALE Reserve or the Wahluke Slope. Additional
21 inventories are being performed of the main part of the Hanford Site and may include studies of
22 small mammals, reptiles and amphibians, and nonvascular plants.

23
24 The central portion of the Hanford Site has not been farmed or grazed by livestock for over
25 50 years, allowing the Hanford Site to serve as a refuge for various plant and animal species
26 (PNNL 1996a). However, the invasion and spread of non-native plant species into previously
27 disturbed areas represents a potential threat to biodiversity through displacement of native
28 species, simplification of plant communities, and fragmentation of habitat. Introduced plant
29 species account for approximately 21 percent of the vascular plants found on the Hanford Site and
30 include species such as cheatgrass, Russian thistle, and most of the tree species found on the
31 Hanford Site (WHC 1992f). Most of the disturbed areas on the Hanford Site, including abandoned
32 farmland and areas burned by wildfire, are dominated by nearly pure stands of cheatgrass where
33 the native shrub component has been modified severely or replaced altogether (Cushing 1992).

34
35 Human activities may have profound effects on the biodiversity of an ecosystem or
36 community. Among other factors, these human activities include habitat modification or
37 destruction and habitat fragmentation. Destruction or modification of a habitat can occur when
38 undisturbed areas are harvested or converted to other uses, such as agriculture or industrial
39 facilities. Habitat fragmentation occurs when disturbed areas break up a large community into
40 smaller isolated undisturbed areas. When fragmentation occurs, biodiversity is impacted because
41 the smaller undisturbed areas may not be capable of supporting the same number of species.
42 The edges of the undisturbed area also may be strongly affected by proximity to the disturbed
43 area, further reducing the size of the area that is truly undisturbed. Furthermore, the disturbed
44 areas may serve as migration barriers for some species, effectively blocking recolonization of
45 areas where small localized extinctions have occurred. Areas such as the Hanford Site serve to
46 preserve regional biodiversity by providing refuges for species that have been eliminated by
47 human activities in the surrounding region.

4.6 Cultural Resources

The Hanford Site is known to be rich in cultural resources, with numerous, well-preserved archaeological sites representing the period since American Indian contact with Euro-Americans, and the period prior to that contact. These periods are often referred to as “prehistoric” and “historic,” but these terms do not recognize the fact that members of Tribal Nations have maintained an active oral history for a long period of time that predates the contact with Euro-Americans. For this reason, the EIS will use the terms “post-contact” and “pre-contact” to describe these periods when appropriate. Management of the Hanford Site cultural resources follows the Draft *Hanford Cultural Resources Management Plan* (CRMP) (DOE-RL 1999) and is conducted for DOE by the Cultural Resources staff of the Environmental Restoration Contractor team, in partnership with the Fluor Daniel Hanford, Inc., staff historian and the Hanford Cultural Resources Laboratory (HCRL) of PNNL (see text box, “*Hanford Site Quick Facts: Cultural Resources*”).

Hanford Site Quick Facts: Cultural Resources

About 8 percent of the Hanford Site has been surveyed. From those surveys, 964 cultural resource sites and isolated finds have been recorded to date. Each find of one or more features (nonportable, nondiscrete artifacts), or of three or more artifacts within 10 m (33 ft) of each other, will be designated as a site and duly recorded in the files of the Washington State Office of Archaeology and Historic Preservation. All other objects are isolated finds (i.e., isolates). Forty-nine properties are listed on the National Register.

The CRMP, which was approved by the State Historic Preservation Office (SHPO) in 1989, was developed to establish guidance for the identification, evaluation, recordation, curation, and management of archaeological, historic, and traditional cultural resources as individual entities or as contributing properties within a district. The plan specifies methods of consultation with affected Tribes and Tribal Historic Preservation Officers, government agencies, and interested parties, and includes strategies for the preservation and/or curation of representative properties, archives, and objects.

Cultural resources are defined as any district, Site, building, structure, or object considered to be important to a culture, subculture, or community for scientific, traditional, religious or other reasons. For the purpose of this Final HCP EIS, these resources are divided into several categories: pre-contact and post-contact archaeological resources, architectural resources, and traditional (American Indian) cultural resources. Significant cultural resources are those that are eligible or potentially eligible for listing in *The National Register of Historic Places* (National Register) (NPS 1988).

Consultation is required to identify the traditional cultural properties that are important to maintaining the cultural heritage of American Indian Tribes. Under separate treaties signed in 1855, the Confederated Tribes and Bands of the Yakama Nation and the Confederated Tribes of the Umatilla Indian Reservation ceded lands to the United States that include the present Hanford Site. Under the treaties, the Tribes reserved the right to fish at usual and accustomed places in common with the citizens of the territory, and retained the privilege of hunting, gathering roots and berries, and pasturing horses and cattle upon open unclaimed land. The Tribes also reserved the right to erect temporary buildings at usual and accustomed places. The Treaty of 1855 with the Nez Perce Tribe includes similar reservations of rights, and the Hanford Reach is identified as the location of usual and accustomed places. The Wanapum People are not signatory to any treaty with the United States and are not a federally recognized Tribe; however, the Wanapum People were historical residents of the Hanford Site, and their interests in the area have been acknowledged.

The methodology for identifying, evaluating, and mitigating impacts to cultural resources is defined by Federal laws and regulations including the *National Historic Preservation Act of 1966*, the *Archaeological Resources Protection Act of 1979*, the *Native American Graves Protection and Repatriation Act of 1990*, and the *American Indian Religious Freedom Act of 1978*. A project

1 affects a significant resource when it alters the characteristics of the property, including relevant
2 features of its environment or use, that qualify it as significant according to the National Register
3 criteria. These effects may include those listed in 36 CFR 800.9. Impacts to traditional American
4 Indian properties can be determined only through consultation with the affected American Indian
5 groups.
6

7 In 1995, 964 cultural resource sites and isolated finds were recorded in the files of the
8 Hanford Cultural Resources Laboratory (HCRL) (PNNL 1996a). Forty-eight archaeological sites
9 and one building are included on the National Register. National Register nominations have been
10 prepared for several archaeological districts and sites considered to be eligible for listing on the
11 National Register. While many significant cultural resources have been identified, only a small
12 portion of the Hanford Site has been surveyed by cultural resource specialists and few of the
13 known sites have been evaluated for their eligibility for listing in the National Register. Many
14 additional cultural resources may remain unidentified. Cultural resource reviews are conducted
15 when projects are proposed in areas that have not been previously surveyed. About 100 to
16 120 reviews were conducted annually through 1991; this figure rose to more than 360 reviews
17 during 1995 (PNNL 1996a).
18

19 **4.6.1 Pre-Contact Archaeological Resources**

20
21 People have inhabited the middle Columbia River region since the end of the glacial period.
22 More than 8,000 years of precontact human activity in this largely arid environment have left
23 extensive archaeological deposits. Certain areas inland from the river show evidence of
24 concentrated human activity, and recent surveys indicate extensive, although dispersed, use of
25 arid lowlands for hunting. Graves are common in various settings, as are spirit quest monuments
26 (Neitzel et al. 1998). Throughout most of the region outside of Hanford, hydroelectric
27 development, agricultural activities, and domestic and industrial construction have destroyed or
28 covered the majority of these deposits. Amateur artifact collectors have had an immeasurable
29 impact on the remainder of the resources. Within the Hanford Site, from which the public is
30 restricted, archaeological resources found in the Hanford Reach and on adjacent plateaus and
31 mountains have been spared some of the disturbances that have befallen other sites. The
32 Hanford Site is, thus, a *de facto* reserve of archaeological information of the kind and quality that
33 has been lost elsewhere in the region.
34

35 Currently, about 320 prehistoric archaeological sites have been recorded on the Hanford
36 Site. Forty eight of these sites are included on the National Register of Historic Places; two are
37 single sites and the remainder are located in seven archaeological districts. In addition, several
38 National Register nominations are pending and nine individual archaeological sites have been
39 determined to be eligible for listing. Archaeological sites include the remains of numerous
40 pithouse villages, campsites and graves, spirit quest monuments, hunting camps, game drive
41 complexes, quarries, hunting and kill sites, and small temporary camps (Neitzel et al. 1998).
42

43 Recorded sites were found during archaeological reconnaissance projects conducted
44 between 1926 and 1968. Systematic archaeological surveys conducted from the middle 1980s
45 through 1995 are responsible for the remainder. The 100 Areas were surveyed in the early 1990s,
46 revealing other archaeological sites (DOI 1995a).
47

48 **4.6.2 American Indian Cultural Resources**

49
50 In pre-contact and early contact periods, the Hanford Reach was populated by American
51 Indians of various Tribal affiliations. The Wanapum People and the Chamnapum Band lived along
52 the Columbia River from south of Richland upstream to Vantage (DOI 1995a). Some of their
53 descendants still live nearby at Priest Rapids, and others have been incorporated into the Yakama
54 and Umatilla Reservations. Palus People, who lived on the lower Snake River, joined the
55 Wanapum, Nez Perce, and Chamnapum to fish the Hanford Reach, and some inhabited the east
56 bank of the river (DOI 1995a). Walla Walla and Umatilla People also made periodic visits to fish in

1 the area. These people retain traditional secular and religious ties to the region, and many have
2 knowledge of the ceremonies and lifeways of their culture. The Washani, or Seven Drums
3 religion, which originated among the Wanapum on what is now the Hanford Site, is still practiced
4 by many people on the Yakama, Umatilla, Warm Springs, and Nez Perce Reservations. Native
5 plant and animal foods, many of which are abundant on the Hanford Site, are used in the
6 ceremonies performed by sect members of this religion, as well as other American Indians who
7 conduct traditional activities (Neitzel et al. 1998).

8
9 During public scoping of this EIS, Tribal governments emphatically expressed an interest
10 in renewing their use of these resources in accordance with the Treaties of 1855. The DOE is
11 attempting to address the Tribal governments' concerns by allowing access for the purposes of
12 religious activities and gathering foods and medicines to the extent that these activities are
13 consistent with DOE missions. From a traditional American Indian viewpoint, nature is intrinsically
14 spiritual, as sacredness is embedded in natural phenomena, landforms, plants, and animals.
15 People are one of the thousands of species in a single interconnected system of species
16 relationships. This system of relationships is considered to be based on a sense of reciprocity,
17 and a threat to the land or environment can be perceived as a threat to the entire culture. Impacts
18 to the natural landscape also might be considered impacts to the self-identity of a Tribal
19 community.

20
21 Spirituality is expressly interwoven in the Tribal community's way of life. This attachment
22 to land and water means that sacred sites are not always confined or precisely located and are
23 numerous and diverse in form (DOI 1995a).

24
25 The Hanford Site possesses traditional cultural significance for many members of
26 Columbia Plateau Tribes. Certain sites demonstrate traditional cultural significance for the
27 following reasons:

- 28
29 C American Indians associate certain locations with traditional beliefs about their
30 origin, their cultural history, or the nature of the world.
- 31
32 C American Indian religious practitioners historically have gone, and continue to go, to
33 these locations to perform ceremonial activities in accordance with traditional
34 cultural rules.
- 35
36 C American Indians make use of natural resources in the conduct of traditional
37 activities. Use can be as food, medicine, barter and exchange items (currency),
38 and for artistic and religious purposes. The act and method of gathering,
39 processing, and exchange and use can all carry important cultural significance.

41 **4.6.3 Post-Contact Archaeological and Architectural Resources**

42
43 The first Euro-Americans who came to this region were Lewis and Clark, who traveled
44 along the Columbia and Snake rivers during their 1803 to 1806 exploration of the Louisiana
45 Territory. Lewis and Clark were followed by fur trappers, military units, and miners who also
46 passed through on their way to more productive lands upriver and downstream and across the
47 Columbia Basin. It was not until the 1860s that merchants set up stores, a freight depot, and the
48 White Bluffs Ferry on the Hanford Reach. Chinese miners began to work the gravel bars for gold.
49 Cattle ranches opened in the 1880s and farmers soon followed. Several small, thriving towns,
50 including Hanford, White Bluffs, and Ringold, were established along the riverbanks in the early
51 20th century. Other ferries were established at Wahluke and Richland. The towns and nearly all
52 other structures were razed after the U.S. government acquired the land for the original Hanford
53 Engineer Works in the early 1940s (Neitzel 1997).

54
55 A total of 390 post-contact archaeological sites, 89 post-contact isolated finds, and
56 numerous post-contact properties have been recorded by the HCRL on the Hanford Site. Of

1 these sites, one is included in the National Register. Properties from the pre-Hanford Site era
2 include semi-subterranean structures near McGee Ranch; the Hanford Irrigation and Power
3 Company pumping plant at Coyote Rapids; the Hanford Irrigation Ditch; the old Hanford townsite,
4 pumping plant, and high school; Wahluke Ferry; the White Bluffs townsite and bank; the Richland
5 Ferry; Arrowsmith townsite; a cabin at East White Bluffs ferry landing; the White Bluffs road; the
6 Chicago, Milwaukee, St. Paul, and Pacific Railroad (Priest Rapids-Hanford Line) and associated
7 whistle stops; and the Bruggerman fruit warehouse (Cushing 1995). Historic archaeological sites,
8 including the East White Bluffs townsite and associated ferry landings and an assortment of trash
9 scatters, homesteads, corrals, and dumps, have been recorded by the HCRL since 1987. Minor
10 test excavations have been conducted at some of the historic sites, including the Hanford townsite
11 locality. In addition to the recorded sites, numerous unrecorded areas of gold mine tailings along
12 the river bank and the remains of homesteads, farm fields, ranches, and abandoned U.S. Army
13 installations are scattered over the entire Hanford Site.

14
15 More recent historic structures are the defense reactors and associated materials
16 processing facilities that are present on the Hanford Site. The first reactors (B, D, and F) were
17 constructed in 1943 as part of the Manhattan Project. Plutonium for the first atomic explosion and
18 the bomb that destroyed Nagasaki to end World War II was produced at the B Reactor. Additional
19 reactors and processing facilities were constructed after World War II during the Cold War. All
20 reactor containment buildings still stand, although many ancillary structures have been removed.
21 The B Reactor is listed on the National Register and was given the National Historic Landmark
22 Award (Cushing 1995). About 45 other buildings have been evaluated for National Register
23 eligibility by the SHPO.

24
25 A Historic Buildings Task Force was established to coordinate future evaluations among
26 DOE and the Hanford Site contractors. This task force established the Hanford Site Historic
27 District, identified all contributing and noncontributing buildings and structures within the District,
28 and prepared an Historic Buildings Programmatic Agreement to direct the documentation of the
29 contributing properties.

30
31 After negotiation, the Programmatic Agreement was approved by the Advisory Council on
32 Historic Preservation, the SHPO, and DOE in August 1996. The Programmatic Agreement
33 outlines the methods agreed to by these parties to preserve and protect significant historical
34 resources on the Hanford Site. The Programmatic Agreement stipulates that DOE will document
35 the contributing historic buildings and structures identified in Appendix C of the Programmatic
36 Agreement, which includes about 190 buildings considered to be historically significant. These
37 buildings will require mitigation (i.e., to document the historical character of the building) prior to
38 activities that might adversely affect historic characteristics. The Programmatic Agreement also
39 identifies the form of mitigation required and exemptions to the requirement for mitigation.
40 Evaluation and mitigation will proceed for the identified buildings in accordance with the
41 Programmatic Agreement.

42
43 The Programmatic Agreement allows for: the exemption of property types from review and
44 documentation requirements; the exemption of classes of action from review; the designation of
45 an Historic District; the mitigation of all actions on Site, up to and including demolition of properties,
46 through production of a Site-wide process/events history. Provisions in the Programmatic
47 Agreement are implemented through the "Hanford Site Manhattan Project and Cold War Era
48 Historic District Treatment Plan."

49
50 For the purpose of this discussion, the cultural resources present along the Columbia
51 River and in the 100 Areas are considered together. This allows a discussion of sensitive cultural
52 resources, without providing information sufficient to allow the discovery and/or adverse impact of
53 these resources by unauthorized personnel. Much of the following information has been obtained
54 from the *Hanford Site National Environmental Policy Act (NEPA) Characterization* (PNNL 1996a).

55
56 Intensive field surveys were completed in the 100 Areas from 1991 to 1993. Much of the

1 surface area within and near the 100 Areas fencelines has been disturbed by the industrial
2 activities that have taken place during the past 50 years. Numerous archaeological sites have
3 been encountered, and many are potentially eligible for the National Register. A complete
4 inventory of 100 Area buildings and structures was completed during fiscal year 1996. The former
5 community of Wahluke, which was at the landing of a ferry of the same name, is situated on the
6 north bank of the river.

7
8 The principal post-contact site in the vicinity is the East White Bluffs ferry landing and
9 former townsite, which has been considered for nomination to the National Register. The site was
10 the upriver terminus of shipping during the early and mid-19th century. It was at this point that
11 supplies for trappers, traders, and miners were off-loaded, and commodities from the interior were
12 transferred from pack trains and wagons to river boats. The first store and ferry of the
13 mid-Columbia region were located at this site. A log cabin, thought by some to have been a
14 blacksmith shop in the mid-19th century, still stands. The structure has been recorded according
15 to standards of the Historic American Buildings Survey. The only remaining structure associated
16 with the White Bluffs townsite (near the railroad) is the White Bluffs Bank. A revised historic
17 property inventory form for the bank was completed in 1995. Two Manhattan Project buildings,
18 105-F and 108-F, remain in the 100-F Area. The 108-F Biology Laboratory, originally a chemical
19 pump house, has been determined eligible for the National Register.

20
21 In the vicinity of 100-F, post-contact sites were recorded during 1992, 1993, and 1995 and
22 include 20th century farmsteads, household dumps, and military encampments. None of the sites
23 have been evaluated for eligibility to the National Register. Only three buildings associated with the
24 Cold War era remain in this area. These buildings were inventoried and evaluated in 1996.

25
26 In the 100-K Area, historic sites containing the remains of farms are found in the nearby
27 area; four historic sites and three isolated finds have been recorded as of 1994. Two important
28 linear features, the Hanford Irrigation Ditch and the former Priest Rapids-Hanford railroad, also are
29 present in the 100-K Area. Remnants of the Allard community and the Allard pump house at
30 Coyote Rapids are located west of the K Reactor compound. The Historic Buildings Task Force
31 has recommended that the 105-KW Reactor and the 1706-KE and 1706-KER water recirculation
32 study facilities be listed in the National Register.

33
34 Knowledge about the archaeology of the 100-N Area is based largely on reconnaissance-
35 level archaeological surveys conducted within the last 30 years (PNNL 1996a). These surveys are
36 not complete inventories of the areas covered. Intensive surveys of surrounding areas were
37 conducted during 1991. The Hanford Generating Plant vicinity also has been surveyed intensively
38 for archaeological resources.

39
40 The most common evidence of activities now found near the 100-N Area consists of gold
41 mine tailings on riverbanks and archaeological sites where farmsteads once stood. The
42 significance of the 100-N buildings, their role in the Cold War, and their eligibility for listing in the
43 National Register, have been documented through *The Hanford Site N Reactor Buildings Task*
44 *Identification and Evaluation of Historic Properties* (BHI 1996a), which was conducted during fiscal
45 year 1995. Buildings 105-N, 109-N, 155-N, 185-N, and 1112-N have been determined eligible for
46 the National Register by DOE and the SHPO. Additional determinations for contributing buildings
47 have been submitted to the SHPO, as well as a mitigation plan for the 100-N Reactor complex.

48
49 An archaeological survey conducted of all undeveloped portions of the 200 East Area and a
50 50 percent random sample conducted of undeveloped portions of the 200 West Area have
51 indicated no findings of archaeological sites (PNL 1990b). However, some small sites are known
52 to exist within the boundaries of the 200 East and 200 West Area (PNL 1990b). The only
53 evaluated historic site is the old White Bluffs freight road that crosses diagonally through the
54 200 West Area. The road, which was originally an American Indian trail, has been in continuous
55 use as a transportation route since pre-contact history and has played a role in Euro-American
56 immigration, regional development, agriculture, and the recent Hanford Site operations. As such,

1 the property has been determined to be eligible for the National Register, although the segment
2 that passes through the 200 West Area is considered to be a noncontributing element. A 100-m
3 (328-ft) restricted zone has been created to protect the road from uncontrolled disturbance. In
4 addition, 49 buildings in the 200 East and 200 West Areas have been evaluated; nine of these
5 buildings have been determined as eligible for the National Register.
6

7 Most of the 300 Area has been highly disturbed by industrial activities. Five recorded
8 archaeological sites including campsites, house pits, and a historic trash scatter are recorded at
9 least partially within the 300 Area; any more may be located in subsurface deposits. The historic
10 site contains debris scatter and road beds associated with farmsteads. One archaeological site is
11 recognized as eligible for listing in the National Register. The majority of the buildings in the 300
12 Area were constructed in the Manhattan Project and Cold War eras (1943 through 1989). A total
13 of 158 buildings/structures in the 300 Area have been inventoried on historic property inventory
14 forms. Of that number, 47 buildings/structures have been determined eligible for the National
15 Register as contributing properties within the Historic District recommended for mitigation (Neitzel
16 et al. 1998).
17

18 Most of the 400 Area has been subjected to intensive development-related construction
19 activities. Archaeologists surveying the site in 1978 were able to find only 12 ha (30 ac) that were
20 undisturbed. No cultural resources were found within that small area and no sites have been
21 recorded or are known to exist within 2 km (1.2 mi) of the 400 Area (Cushing 1995). The FFTF
22 and its associated structures have been evaluated by the Historic Buildings Task Force.
23 Buildings 405, 4703, and 4710 have been recommended as contributing properties to the Hanford
24 Site Historic District.
25

26 The 600 Area contains diverse cultural resource sites and traditional cultural properties.
27 Project-driven surveys have been conducted throughout the area, but much of the 600 Area
28 remains unsurveyed.
29

30 Five anti-aircraft artillery sites have been determined eligible for the National Register.
31 Because of the proposed remediation of these sites, mitigation to reduce the adverse effects will
32 be carried out. The Central Shops Complex, in the 600 Area, was determined to be ineligible for
33 the National Register in 1995 (Cushing 1995).
34

35 Historic cultural resources have been identified in or near the 1100 Area. These resources
36 include remnants of homesteads and agricultural structures predating the establishment of the
37 Hanford Site.
38

39 **4.7 Socioeconomic Environment**

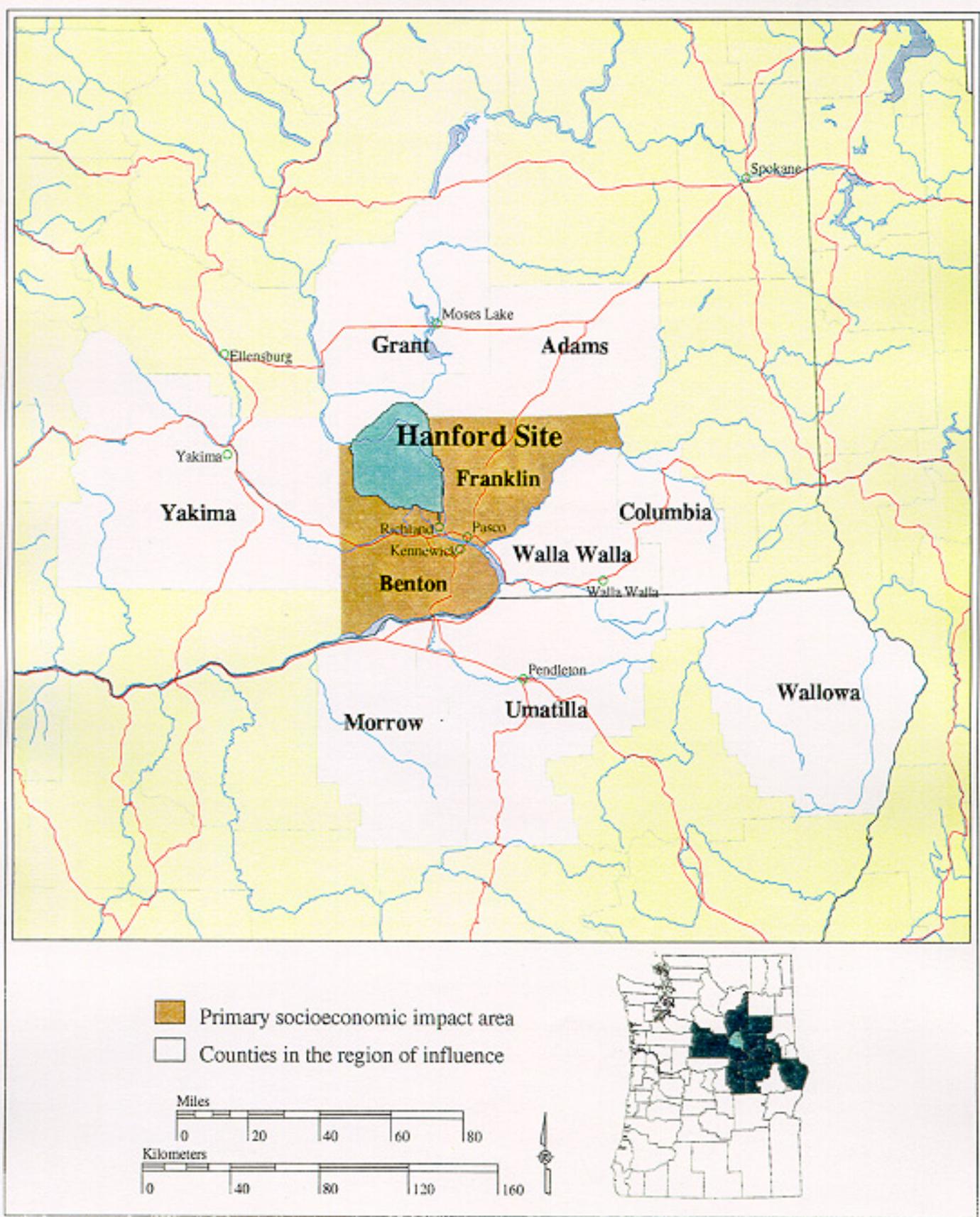
40

41 Activity on the Hanford Site plays a dominant role in the socioeconomics of the Tri-Cities
42 and other parts of Benton and Franklin counties. The Tri-Cities serves as a market center for a
43 much broader area of eastern Washington, including Adams, Columbia, Grant, Walla Walla, and
44 Yakima counties. The Tri-Cities also serves parts of northeastern Oregon, including Morrow,
45 Umatilla, and Wallowa counties. Socioeconomic impacts of changes at Hanford are mostly
46 confined to the immediate Tri-Cities community and Benton and Franklin counties (and Yakima
47 County, to a lesser extent) (PNL 1984; PNL 1987). However, because of the significance of the
48 wider agricultural region and surrounding communities in the Tri-Cities economic base, this
49 section briefly discusses the wider region as well (Figure 4-28). Table 4-8 summarizes the
50 regional (Benton and Franklin counties) jobs from 1995 to 1996.
51

52 Due to the changing Hanford mission, it has been necessary to develop a facility transition
53 plan. The first step would be conversion, which transitions the process from facilities that were
54 developed to support DOE's nuclear production mission to either new Federal or private
55 development. There have been many obstacles to the successful implementation of a facility
56 reuse plan. The objectives of a successful conversion are as follows:

- 1 C Retraining and re-employment of those who have lost jobs, directly or indirectly, as
2 a result of the Federal mission change
3
- 4 C Creation of jobs to replace the revenue lost directly through reductions in payroll
5 taxes and property taxes, as well as through indirect impacts, such as lost sales
6 tax revenue
7
- 8 C Reuse of the facilities on the Hanford Site so the local government might generate
9 revenue to cover the costs involved in its newly acquired responsibilities of
10 maintaining and servicing those facilities, such as the provision of police and fire
11 services and municipal utilities (e.g., water service)
12
- 13 C Using the closure as an opportunity to revitalize the local community
14
- 15 C Mitigating the impacts on the community at large, both from the business and social
16 service perspectives.
17
18

1 **Figure 4-28. Areas of Washington and Oregon Where**
 2 **Socioeconomic Resources Might Be Affected (DOE 1995b).**
 3



BHLpp 02/11/98 clup/socioecon1.amf Database: 03-AUG-1998

Table 4-8. Nonagricultural Workers in Benton and Franklin Counties, 1996 to 1997 (Neitzel et al. 1998).

Industry	1996 Annual Average	1997 Annual Average	% Change 1996-1997
Nonagricultural wage laborers	70,200	70,100	-0.1
Manufacturing	5,800	5,700	-1.7
Construction	4,100	4,100	-0.0
Public utilities	2,900	9000	^b
Wholesale and retail trade	15,600	16,100	3.2
Finance, insurance, and real estate	2,200	2,200	0.0
Services	26,100	19,600	^b
Government	13,400	13,500	0.7
Agricultural ^a	5,500		

^a Source: TRIDEC Tri-City demographics.

^b Reflects change in reporting.

There are several steps that a community may have to take to achieve the objectives of a successful conversion, including some of those outlined below:

- C Improvement of marketing of facilities (i.e., buildings, transportation, and utilities) to new employers
- C Training of potential employees
- C Negotiation of property transfer and leases
- C Negotiation of care and custody agreements
- C Supporting environmental remediation to enable the transfer of property
- C Acquisition of funding for continued conversion efforts (e.g., planning and implementation)
- C Conducting feasibility studies to assist in the successful implementation of specific components of the reuse plan, such as the creation of a historic district or educational programs.

The Hanford Community is working on the Hanford facilities reuse problem through a collation of local cities, port districts, and counties, with assistance from DOE's Office of Worker and Community Transition.

4.7.1 Demographics

Estimates for 1996 placed population totals for Benton and Franklin counties at 134,100 and 43,900, respectively (Neitzel et al. 1998). When compared to the 1990 census data in which Benton County had 112,560 residents and Franklin County population totaled 37,473, the current population totals reflect the continued growth occurring in these two counties.

The 1997 estimates distributed the Tri-Cities population as follows: Richland, 36,500; Pasco, 35,300; and Kennewick, 49,090. The combined populations of Benton City, Prosser, and West Richland totaled 13,905 in 1997 (see text box, "Hanford Site Quick Facts:

Hanford Site Quick Facts: Populations (1996 Estimates)	
C	Kennewick: 48,010
C	Richland: 35,990
C	Pasco: 22,370

1 *Populations [1996 Estimates]*). The unincorporated population of Benton County was 34,555. In
2 Franklin County, incorporated areas other than Pasco have a total population of 3,385. The
3 unincorporated population of Franklin County was 15,215 (Neitzel et al. 1998).
4

5 Benton and Franklin counties accounted for 2.4 percent of the population in Washington
6 State (Neitzel et al. 1998). In 1997, the population demographics of Benton and Franklin counties
7 were quite similar to those found within the State of Washington. In 1997, 54.1 percent of the
8 population of Benton and Franklin counties was under the age of 35, compared to 50.3 percent for
9 the State of Washington. In general, the population of Benton and Franklin counties is somewhat
10 younger than that of Washington State. The 0- to 14-year-old age group accounts for 26.5 percent
11 of the total bi-county population as compared to 22.6 percent for Washington State. In 1996, the
12 65-year-old and older age group constituted 9.6 percent of the population of Benton and Franklin
13 counties compared to 11.5 percent for the State of Washington.
14

15 **4.7.1.1 Demographics of Minority Populations.** Demographic information obtained from the
16 U.S. Bureau of Census was used to identify minority populations and low-income communities
17 within an 80-km (50-mi) radius surrounding the Hanford Site. For the evaluation of environmental
18 justice impacts, the area defined by this 80-km (50-mi) radius is considered the zone of potential
19 impact.
20

21 **4.7.1.1.1 Definitions.** The demographic analysis used the following definitions to develop
22 community characteristics:
23

- 24 C Census tract -- An area defined for the purpose of monitoring census data that is
25 usually comprised of between 2,500 and 8,000 persons, with 4,000 persons being
26 ideal. When first delineated, census tracts are designed to be homogeneous with
27 respect to population characteristics, economic status, and living conditions.
28 Census tracts do not cross county boundaries. Spatial census tract size varies
29 widely depending on the density of settlement. Census tract boundaries are
30 delineated with the intention of being maintained over a long period of time so
31 statistical comparisons can be made from census to census.
32
- 33 C Census block group -- An area defined for the purpose of monitoring census data
34 that generally consists of between 250 and 550 housing units.
35
- 36 C Minority populations -- A group of people and/or communities experiencing common
37 conditions of exposures or impact that consists of persons classified by the U.S.
38 Bureau of Census as Negro/Black/African American, Hispanic, Asian and Pacific
39 Islander, American Indian, Eskimo, Aleut, and other non-White persons, based on
40 self-classification by the people according to the race with which they most closely
41 identify. For the purposes of analysis, minority populations are defined as those
42 census tracts within the zone of impact where the percent minority population
43 exceeds the percentage minority population within the entire zone of impact.
44 Census tracts where the percent minority population exceeds 50 percent are also
45 considered minority populations. In the case of migrant or dispersed populations, a
46 minority population consists of a group that is greater than a 50 percent minority.
47
- 48 C Low-income community -- An area where the median household income is
49 80 percent or more below the median household income for the metropolitan
50 statistical area (urban) or county (rural). The 80 percent threshold was used based
51 on definitions used by the U.S. Department of Housing and Urban Development.
52
- 53 C Population base -- Census tracts were included in the analysis if 50 percent of the
54 geographic area of the tract fell within the 80-km (50-mi) radius of the Hanford Site.
55
56

1 **4.7.1.1.2 Minority and Low-Income Populations Near Hanford.** Demographic maps
2 were prepared using 1990 census data resolved to the census group tract level (USBC 1992).
3

4 A total population of approximately 384,000 people reside within an 80-km (50-mi) radius of
5 the Hanford Site. The minority population within the area consists of approximately 95,000 people
6 and represents approximately 25 percent of the population in the assessment area. The ethnic
7 composition of the minority population is primarily Hispanic (approximately 80 percent) and
8 American Indian (8 percent). Census tracts where the percentage of minority persons within the
9 population exceeds 20 percent are located to the southwest and northeast of the Hanford Site and
10 within the City of Pasco, Washington (Neitzel et al. 1998).
11

12 The low-income population within the 80-km (50-mi) area of impact represents
13 approximately 42 percent of the households in the area of impact. Census tracts where the
14 percentage of the population consisting of low-income households exceeds 25 percent are
15 principally located to the southwest and north of the Hanford Site and within the City of Pasco,
16 Washington (Neitzel et al. 1998). Considerable overlap between low-income populations and
17 minority populations exists in the vicinity of the Hanford Site.
18

19 **4.7.1.1.3 Limitations of Demographic Data.** Characterization of minority and low-
20 income populations residing within a geographical area is sensitive to the basic definitions and
21 assumptions used to identify those populations. Consequently, the number of individuals identified
22 as minority and/or low-income individuals within the population around a particular site may vary
23 from analysis to analysis. Several different approaches to identification of minority and low-income
24 populations have been used in recent DOE EISs. The approach presented in this EIS is consistent
25 with the approach used in the *Hanford Site National Environmental Policy Act (NEPA)*
26 *Characterization* (Neitzel et al. 1998). Other demographic studies may use different assumptions
27 and, consequently, report a different total population, minority population, or low-income population
28 depending on the assumptions used to identify each population.
29

30 **4.7.2 Economics**

31
32 This section summarizes pertinent economic activity within the region of interest, including
33 information on the general economy, employment, income, and impact of the Hanford Site.
34 Historically, the primary industries within the region have been related to agriculture — a multitude
35 of crops encompassing many fruits, vegetables, and grains are grown each year.
36

37 **4.7.2.1 Employment in the Tri-Cities.** Three major sectors have been the principal driving
38 forces of the economy in the Tri-Cities since the early 1970s: (1) DOE and Hanford Site
39 contractors; (2) Energy Northwest (formerly known as WPPSS) in its construction and operation of
40 nuclear power plants; and (3) agriculture, including a substantial food-processing industry. With
41 the exception of a minor amount of agricultural commodities sold to local area consumers, the
42 goods and services produced by these sectors are exported from the Tri-Cities. In addition to
43 direct employment and payrolls, these major sectors also support a sizable number of jobs in the
44 local economy through the procurement of equipment, supplies, and business services.
45

46 C **DOE and Hanford Contractors** -- An average of 11,104 employees worked for
47 DOE and its Hanford contractors in 1997. This number is down from over 19,000 in
48 1994 due to downsizing activities, which has reduced employment at Hanford by
49 7,700 through FY 1996 (source: Hanford Site Internet homepage). In addition to
50 downsizing by Hanford contractors in 1996, DOE created a new Project Hanford
51 Team in an effort to produce cleanup results more cost effectively over a shorter
52 time period, and to help diversify and stabilize the Tri-Cities economy. This team is
53 made up of the overall management contractor Fluor Daniel Hanford Company,
54 Fluor's six major subcontractors, and six newly created "enterprise companies."
55 Fluor Daniel Hanford Company is responsible for integrating and directing cleanup
56 tasks. The actual cleanup work is conducted by the six subcontractors. The

1 “enterprise companies” provide services to the six major subcontractors.

2
3 As of December 31, 1997, the official employment count for Hanford was 10,690,
4 which includes Fluor Daniel Hanford Company; Fluor’s six major subcontractors,
5 Pacific Northwest National Laboratory, Bechtel Hanford, Inc., Hanford Environmental
6 Health Foundation, ICF Kaiser; and local DOE employees. The “enterprise
7 companies,” which have a combined employment of just over 2,200, were not
8 included in this count. The Hanford payroll has a widespread impact on the
9 Tri-Cities and state economies, in addition to providing direct employment.

10
11 C **Energy Northwest (formerly known as WPPSS)** – Although activity related to
12 nuclear power plant construction ceased with the completion of the WNP-2 reactor
13 in 1983, Energy Northwest (formerly known as WPPSS) continues to be a major
14 employer in the Tri-Cities area. Headquarters personnel based in Richland oversee
15 the operation of one generating facility and perform a variety of functions related to
16 two mothballed nuclear plants and one generating facility. In 1995 and 1996,
17 downsizing activities at Energy Northwest headquarters decreased employment to
18 about 1,164 workers (down from more than 1,900 in 1994). Energy Northwest
19 activities generated a payroll of approximately \$81 million in the Tri-Cities during
20 1996. Alternate uses or decommissioning of the two mothballed Washington
21 Nuclear Plants (WNP-1 and WNP-4) are expected to begin in the next few years.
22 These activities are expected to reduce the number of employees necessary to
23 maintain these facilities (PNNL 1996a).

24
25 C **Agriculture** -- In 1996, agricultural activities in Benton and Franklin counties were
26 responsible for approximately 10,446 jobs, or 13 percent of the total employment in
27 the area. According to the U.S. Department of Commerce Regional Economic
28 Information System, about 2,317 people were classified as farm proprietors in 1995.
29 Farm proprietors’ income, according to this same source, was estimated to be
30 \$69 million (Neitzel et al. 1998).

31
32 In 1997, the counties of Benton, Franklin, and Walla Walla counties averaged 7,448
33 seasonal farm workers, ranging from 1,809 workers during the winter pruning season to 17,221
34 workers at the peak of harvest. An estimated average of 6,553 seasonal workers were classified
35 as local (ranging from 1,251 to 14,388); an average of 64 were classified as intrastate (ranging
36 from 0 to 355); and an average of 832 were classified as interstate (ranging from 122 to 2,830).
37 Most intrastate workers resided elsewhere in Benton, Franklin, Walla Walla, and Yakima counties,
38 although the peak harvest season saw an influx of workers from around eastern and central
39 Washington.

40
41 Area farms and ranches generate a sizable number of jobs in supporting sectors, such as
42 agricultural services (e.g., application of pesticides and fertilizers or irrigation system development)
43 and sales of farm supplies and equipment. Although formally classified as a manufacturing activity,
44 food processing is a natural extension of the farm sector. More than 20 food processors in Benton
45 and Franklin counties produce items such as potato products, canned fruits and vegetables, wine,
46 and animal feed.

47
48 In addition to the three major employment sectors (Hanford-related, power marketing, and
49 agricultural), five other employers in 1996 were readily identified as contributors to the economic
50 base of the Tri-Cities economy: (1) Iowa Beef Processing Inc., which employed 1,500 workers
51 (this company lies outside of Benton and Franklin counties, but most of the workforce resides in the
52 Tri-Cities); (2) Lamb Weston, which employed 1,700 workers; (3) Siemens Nuclear Power
53 Corporation, which employed 730 workers; (4) Boise Cascade/Paper Group, which employed 511
54 workers (like Iowa Beef Processors, Boise Cascade’s Wallula mill lies outside both Benton and
55 Franklin counties, but most of its workforce resides in the area); and (5) Burlington Northern
56 Santa Fe Railroad, which employed 350 workers. Approximately 4791 workers were employed by

1 these businesses in Benton and Franklin counties in 1997 (Neitzel et al. 1998).

2
3 **4.7.2.1.1 Tourism.** The Tri-Cities Visitors and Convention Bureau reported that
4 approximately 214 conventions were held in the Tri-Cities in 1997, with 66,150 attending visitors
5 spending an estimated \$22 million.

6
7 Overall tourism expenditures in the Tri-Cities were roughly \$184 million in 1995, with
8 travel-generated employment of about 3,220 and an estimated \$34 million in payroll in Benton and
9 Franklin counties.

10
11 **4.7.2.1.2 Retirees.** Although Benton and Franklin counties have a relatively young
12 population (approximately 54 percent under the age of 35), 17,141 people over the age of
13 65 resided in Benton and Franklin counties in 1997. The portion of the total population 65 years and
14 older in Benton and Franklin counties accounts for 9.6 percent of the total population, slightly below
15 that of the State of Washington (11.5 percent). This segment of the population supports the local
16 economy on the basis of income received from government transfer payments and pensions,
17 private pension benefits, and individual savings.

18
19 Although information on private pensions and savings is not available, data is available
20 regarding the magnitude of government transfer payments. The U.S. Department of Commerce
21 Regional Economic Information System has estimated transfer payments by various programs at
22 the county level. A summary of estimated major government pension benefits received by the
23 residents of Benton and Franklin counties in 1995 is shown in Table 4-9.

24
25
26 **Table 4-9. Government Retirement Payments in Benton and**
27 **Franklin Counties in 1995 (\$ million) (Neitzel et al. 1998).**

28

Source	Benton County	Franklin County	Total
Social security (including survivors and disability)	139.3	41.5	180.8
Railroad retirement	4.1	4.6	8.7
Federal civilian retirement	13.4	2.9	16.3
Veterans pension and military retirement	20.8	4.2	25.0
State and local employee retirement	33.2	6.5	39.7
Total	210.8	60.2	269.5

29
30
31
32
33
34

35
36
37 About two-thirds of the social security payments go to retired workers; the remainder of the
38 payments are for disability and other types of payments. The historical importance of government
39 activity in the Tri-Cities area is reflected in the relative magnitude of the government employee
40 pension benefits as compared to total payments (Neitzel et al. 1998).

41
42 **4.7.2.2 Income Sources.** Total personal income is comprised of all forms of income received by
43 the populace, including wages, dividends, and other revenues. Per capita income is roughly
44 equivalent to total personal income divided by the number of people residing in the area. Median
45 household income is the point at which half of the households have an income greater than the
46 median and half of the households have less. The source for total personal income and per capita
47 income was the U.S. Department of Commerce Regional Economic Information System, while
48 median income figures for Washington State were provided by the Office of Financial Management
49 (PNNL 1996a).

1 In 1995, the total personal income for Benton County was \$2,952 million, Franklin County
2 was \$747 million, and the State of Washington was \$129.1 billion. Per capita income in 1995 for
3 Benton County was \$22,072, Franklin County was \$16,356, and Washington State was \$23,709.
4 Median household income in 1995 for Benton County was estimated to be \$43,562, Franklin County
5 was estimated \$31,141, and the State of Washington was estimated at \$39,206 (Neitzel et al.
6 1998).

7
8 **4.7.2.3 Hanford Site Employment.** An average of 11,140 employees worked for DOE and its
9 Hanford contractors in 1997 (Neitzel et al. 1998). Future downsizing in Hanford Site employment is
10 anticipated, although the extent of this downsizing is unknown at this time.

11
12 In 1996, Hanford employment accounted directly for 20 percent of total nonagricultural
13 employment in Benton and Franklin counties and about 0.7 percent of all statewide nonagricultural
14 jobs. In 1997, the Hanford Site total wage payroll was \$537 million and accounted for a significant
15 percentage of the payroll dollars earned in the area (Neitzel et al. 1998) (see text box on next page,
16 "Hanford Site Quick Facts: Economic Multipliers").

17
18 Previous studies have revealed that each
19 Hanford job supports about 1.2 additional jobs in the
20 local service sector of Benton and Franklin counties
21 (about 2.2 total jobs) and about 1.5 additional jobs in
22 the state service sector. Similarly, each dollar of
23 Hanford income supports about 2.1 dollars of total
24 local incomes and about 2.4 dollars of total statewide
25 incomes. Based on these multipliers, Hanford directly
26 or indirectly accounts for more than 40 percent of all
27 jobs in Benton and Franklin counties (Neitzel et al.
28 1998).

<i>Hanford Site Quick Facts: Economic Multipliers</i>
<u>Each Site job supports:</u>
c 1.2 jobs in the local service sector
c 1.5 jobs in the state service sector
<u>Each Site dollar supports:</u>
c 2.1 dollars in total local incomes
c 2.4 dollars in total state incomes

29
30 Based on employee residence records as of December 1997, 93 percent of the direct
31 employment of Hanford is comprised of residents of Benton and Franklin counties. Approximately
32 76 percent of the employment is comprised of residents who reside in one of the Tri-Cities. More
33 than 37 percent of the employment is comprised of Richland residents, 30 percent of Kennewick
34 residents, and 9 percent of Pasco residents. West Richland, Benton City, Prosser, and other
35 areas in Benton and Franklin counties account for 17 percent of total employment. Table 4-10
36 contains the estimated percent of Hanford employees residing in each of the counties within the
37 region of influence.

38
39

Table 4-10. Hanford Employee Residences by County.

County	Percent of Employees in Residence (%)
Adams	0.18
Benton	84.16
Columbia	0.01
Franklin	9.07
Grant	0.25
Walla Walla	0.21
Yakima	5.08
Morrow	0.01
Umatilla	0.01

The DOE and Hanford Site contractors procured nearly \$298 million of goods and services (45.6 percent of total procurements of \$653 million) from Washington firms in 1993. About 18 percent of Hanford Site orders were filled by Tri-Cities firms.

The DOE and Hanford Site contractors paid a total of \$10.9 million in state taxes on operations and purchases during fiscal year 1988 (the most recent year available). Estimates show that Hanford employees paid \$27.0 million in state sales tax, use taxes, and other taxes and fees in fiscal year 1988. In addition, the Hanford Site paid \$0.9 million to local governments in Benton, Franklin, and Yakima counties in local taxes and fees (PNNL 1996a).

4.7.3 Emergency Services

Police protection in Benton and Franklin counties is provided by county sheriff departments, local municipal police departments, and the Washington State Patrol Division, which is headquartered in Kennewick. Table 4-11 shows the number of commissioned officers and patrol cars in each department in April 1997. The Kennewick, Richland, and Pasco municipal departments maintain the largest staffs of commissioned officers with 73, 50, and 44, respectively.

Table 4-11. Police Personnel in the Tri-Cities for 1998 (Neitzel et al. 1998).

Area	Commissioned Officers	Reserve Officers	Patrol Cars
Kennewick Municipal	73	15	45
Pasco Municipal	44	33	15
Richland Municipal	50	13	13
West Richland Municipal	12	10	11
Benton County Sheriff	47	15	55
Franklin County Sheriff	19	17	22

Table 4-12 indicates the number of firefighting personnel, both paid and unpaid, on the staffs of fire districts in the area.

**Table 4-12. Fire Protection in the Tri-Cities for 1998
(Neitzel et al. 1998).**

Station	Firefighting Personnel	Volunteers	Total	Service Area
Kennewick	63	0	63	City of Kennewick
Pasco	30	0	30	City of Pasco
Richland	48	0	48	City of Richland
BCRFD 1	9	94	103	Kennewick Area
BCRFD 2	3	37	40	Benton City
BCRFD 4	5	30	35	West Richland

BCRFD = Benton County Rural Fire Department

The Hanford Fire Department, operated by Hanford Site contractors for DOE, has 93 firefighters who are trained to dispose of hazardous waste and to fight chemical fires, in addition to their regular firefighting duties. During a 24-hour duty period, the 1100 and 300 Areas have seven firefighters; the 200 East and 200 West Areas have eight firefighters; the 100 Areas have five firefighters; and the 400 Area, which includes Energy Northwest (formerly known as WPPSS), has six firefighters (Neitzel et al. 1997). To perform their responsibilities, each station has access to a hazardous material response vehicle that is equipped with chemical fire-extinguishing equipment, an attack truck that carries foam and Purple-K dry chemical, a mobile air truck that provides air for respirators, and a transport tanker that supplies water to six brushfire trucks. The Hanford Fire Department owns five ambulances and maintains contact with local hospitals.

4.7.4 Health Care

The Tri-Cities have three major hospitals, all of which offer general medical services and include a 24-hour emergency room, basic surgical services, intensive care, and neonatal care.

Kadlec Medical Center, located in Richland, has 124 beds and functioned at 54 percent capacity (6,055 admissions) in 1997. Non-Medicare and Medicaid patients accounted for 60 percent of their annual admissions in 1997. An average stay of 4.04 days per admission was reported for 1997.

Kennewick General Hospital maintains a 46.7 percent occupancy rate of its 70 beds with 4,670 admissions in 1995. Non-Medicare and Medicaid patients in 1997 represented 45.6 percent of its total admissions. An average stay of 3.2 days per admission was reported in 1997.

Our Lady of Lourdes Health Center, a 132-bed medical facility located in Pasco, provides acute, sub-acute, skilled nursing and rehabilitation, and alcohol and chemical dependency services. Our Lady of Lourdes also operates the Carondolet Psychiatric Care Center, a 32-bed psychiatric hospital located in Richland, which provides a significant amount of outpatient and home health services. For calendar year 1997, Our Lady of Lourdes had a total of 4,528 admissions, of which 35 percent were non-Medicare and Medicaid admissions. An average acute care length of stay of 3.0 days was reported (Neitzel et al. 1998).

1 **4.7.5 Housing**

2
3 In 1996, 91 percent of all housing (44,488 total units) in the Tri-Cities was occupied.
4 Single-unit housing, which represents nearly 58 percent of the total units, has a 95 percent
5 occupancy rate throughout the Tri-Cities. Multiple-unit housing, defined as housing with two or
6 more units, has an occupancy rate of 85 percent. Pasco had the lowest occupancy rate in all
7 categories of housing with 89 percent, followed by Kennewick with 90 percent, and Richland with
8 92 percent. Mobile homes, which represent 11 percent of the housing-unit types, have the lowest
9 occupancy rate at 84 percent. Table 4-13 shows a detailed listing of total units and occupancy rate
10 by type in the Tri-Cities.
11
12

13 **Table 4-13. Total Units and Occupancy Rates, 1996 Estimates (Neitzel et al. 1998).**

14

City	All Units	Rate (%)	Single Units	Rate (%)	Multiple Units	Rate (%)	Manufactured Homes	Rate (%)
Richland	15,859	92	10,722	96	4,284	84	853	88
Pasco	8,419	89	4,104	95	2,956	85	1,359	83
Kennewick	20,210	90	10,887	95	6,660	85	2,241	84
Total for Tri-Cities	44,488	91	27,213	95	13,900	85	4,875	84

15
16
17
18
19
20

21 Recent Hanford Site downsizing has resulted in occupancy rates lower than in the recent
22 past throughout the Tri-Cities. Statistics from February 1996 indicated that the Tri-Cities apartment
23 occupancy rates are significantly lower: Richland apartment occupancy was 80.2 percent,
24 Kennewick apartment occupancy was 85.4 percent, and Pasco apartment occupancy was
25 83.7 percent (TCH 1996a).
26

27 **4.7.6 Human Services**

28
29 The Tri-Cities offers a broad range of social services. State human service offices in the
30 Tri-Cities include the job services office of the Employment Security Department, food stamp
31 offices, the Division of Developmental Disabilities, financial and medical assistance, Child
32 Protective Services, emergency medical service, a senior companion program, and vocational
33 rehabilitation.
34

35 The Tri-Cities also are served by a large number of private agencies and voluntary human
36 services organizations. The United Way, which is an umbrella fund-raising organization,
37 incorporates 22 participating agencies offering more than 46 programs. These member agencies
38 had a cumulative budget total of \$23 million in 1997. In addition, there were 488 organizations that
39 received funds as part of the United Way-Franklin County donor designation program (Neitzel et al.
40 1998).
41

42 **4.7.7 Educational Services**

43
44 Primary and secondary education are served by the Tri-Cities and Kiona-Benton School
45 Districts. The combined 1997 fall enrollment for all districts was approximately 32,500 students, an
46 increase 1.7 percent from the 1996 total of 31,970 students. The 1997 total includes 8,974 from
47 the Richland School District, 8,066 students from the Pasco School District, 13,745 students from
48 the Kennewick School District, and 1,715 from Kiona-Benton. Private schools total approximately
49 3,000 students. In 1997, Richland was operating over capacity at the elementary level, at capacity
50 at their middle schools, and slightly under capacity at the high school level. A bond issue was
51 recently passed to build a new elementary school, which should open in 1999. Pasco was at
52 capacity for primary education but has room for more students at the secondary level. Pasco also

1 passed an elementary school bond issue, and currently has three buildings under construction.
2 Kennewick and Kiona-Benton schools are operating at capacity (Neitzel et al. 1998).

3
4 Post-secondary education in the Tri-Cities area is provided by a junior college, Columbia
5 Basin College (CBC), and the Tri-Cities branch campus of Washington State University
6 (WSU-TC). WSU-TC offers a variety of upper-division, undergraduate, and graduate degree
7 programs. The 1997 fall/winter enrollment was approximately 6,869 at CBC and 1,334 at
8 WSU-TC. Many of the programs offered by these two institutions are geared toward the vocational
9 and technical needs of the area. Currently, 27 associate degree programs are available at CBC,
10 and WSU-TC offers 10 undergraduate and 16 graduate programs, as well as access to eight
11 additional graduate programs via satellite (Neitzel et al 1998).

12 **4.7.8 Transportation**

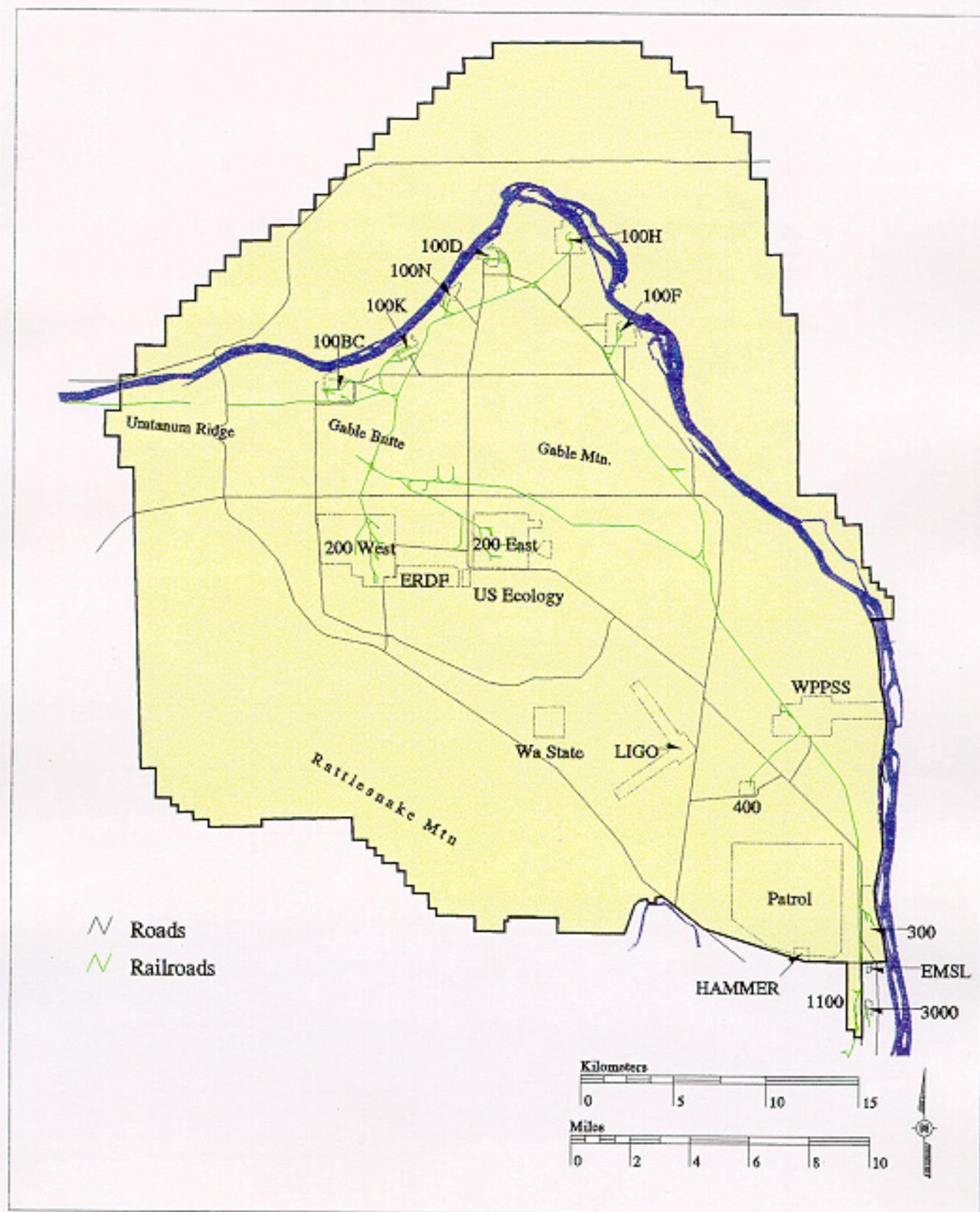
13
14
15 The Tri-Cities serve as a regional transportation and distribution center with major air, land,
16 and river connections (Figure 4-29). The Tri-Cities have direct rail service, provided by Burlington
17 Northern Santa Fe and Union Pacific, which connects the area to more than 35 states. Union
18 Pacific operates the largest fleet of refrigerated rail cars in the United States and is essential to food
19 processors that ship frozen food from this area. Passenger rail service is provided by Amtrak,
20 which has a station in Pasco (Neitzel et al. 1997).

21
22 Docking facilities at the Ports of Benton, Kennewick, and Pasco are important aspects of
23 the regional infrastructure. These facilities are located on the 525-km (325.5-mi)-long commercial
24 waterway, which includes the Snake and Columbia rivers and extends from the Ports of
25 Lewiston-Clarkston in Idaho to the deep-water ports of Portland, Oregon, and Vancouver,
26 Washington. The average shipping time from the Tri-Cities to these deep-water ports by barge is
27 36 hours (PNNL 1996a).

28
29 Daily air passenger and freight services connect the area with most major cities through the
30 Tri-Cities Airport, which is located in Pasco. The airport is currently served by one national and
31 three commuter-regional airlines. There are two runways: a main and minor crosswind. The main
32 runway is equipped for precision instrumentation landings and takeoffs. Each runway can
33 accommodate landings and takeoffs by medium-range commercial aircraft, such as the
34 Boeing 727-200 and Douglas DC-9. The Tri-Cities Airport handled approximately 182,978
35 passengers in 1997, which is up 4.3 percent from 1996. Projections indicate that the terminal can
36 serve nearly 300,000 passengers annually. Two additional airports, located in Richland and
37 Kennewick, are limited to serving private and airfreight aircraft (Neitzel et al. 1998).

38
39 The regional transportation network in the Hanford vicinity (Figure 4-29) includes the areas
40 in Benton and Franklin counties from which most of the commuter traffic associated with the
41 Hanford Site originates. Interstate highways that serve the area are I-82, I-182, I-84, and I-90.
42 Interstate-82 is 8 km (5 mi) south-southwest of the Hanford Site. Interstate-182, a 24-km (15-mi)-
43 long urban connector route, located 8 km (5 mi) south-southeast of the Hanford Site, provides an
44 east-west corridor linking I-82 to the Tri-Cities area. Interstate-90, located north of the Hanford Site,
45 is the major link to Seattle and Spokane and extends to the east coast; I-82 serves as a primary link
46 between Hanford and I-90 and I-84. I-84, located south of the Hanford Site in Oregon, is the major
47 link to Portland and extends eastward. SR 224, south of the Hanford Site, serves as a 16-km
48 (10-mi) link between I-82 and SR 240.

1 **Figure 4-29. Transportation Network on the Hanford Site**
 2 **(DOE-RL 1990a).**
 3
 4
 5



1 SR 24 enters the Hanford Site from the west, continues eastward across the northern-most
2 portion of the Hanford Site, and intersects SR 17 approximately 24 km (15 mi) east of the Hanford
3 Site boundary. SR 17 is a north-south route that links I-90 to the Tri-Cities and joins U.S. Route
4 395, which continues south through the Tri-Cities. SR 14 connects with I-90 at Vantage,
5 Washington, and provides ready access to I-84 at several locations along the Oregon and
6 Washington border. SRs 240 and 24 traverse the Hanford Site and are maintained by Washington
7 State. Other roads within the Hanford Site are maintained by DOE (PNNL 1996a).
8

9 **4.7.9 Utilities**

10
11 The principal source of water in the Tri-Cities and the Hanford Site is the Columbia River.
12 The potable water systems of Richland, Pasco, and Kennewick drew a large portion of the
13 50.6 billion L (13.43 billion gal) used in 1996 from the Columbia River. Each city operates its own
14 supply and treatment system. The Richland water supply system derives about two-thirds of the
15 water used from the Columbia River, while the remainder is split between a well field in North
16 Richland and other groundwater wells. Total usage by the City of Richland in 1997 was
17 26.1 billion L (6.9 billion gal). This usage represents approximately 65 percent of the maximum
18 supply capacity. The City of Pasco system also draws water from the Columbia River. In 1995,
19 Pasco consumed 9.5 billion L (2.6 billion gal). The Kennewick system uses two wells and the
20 Columbia River as a water supply. These wells serve as the sole source of water between
21 November and March and can provide approximately 43 percent of the total maximum supply of
22 30 billion L (8 billion gal). Total 1997 usage in Kennewick was 12.7 billion L (3.36 billion gal).
23 (Neitzel et al. 1998).
24

25 The major incorporated areas of Benton and Franklin counties are served by municipal
26 wastewater treatment systems, whereas the unincorporated areas are served by onsite septic
27 systems. The Richland waste water treatment system is designed to treat a total capacity of
28 45.5 million L/day (12 million gal/day) and processed an average flow of 23.5 million L/day
29 (6.2 million gal/day) in 1997. The Kennewick system similarly has significant excess capacity; with
30 a treatment capability 32.9 million L/day (8.7 million gal/day) and 1997 usage of 19.3 million L/day
31 (5.13 million gal/day). The Pasco waste treatment system processed an average 4.9 million L/day
32 (1.3 million gal/day), while the system is capable of treating 16.3 million L/day (4.3 million gal/day)
33 (Neitzel et al. 1998)
34

35 Natural gas, provided by the Cascade Natural Gas Corporation, serves a small portion of
36 Tri-Cities residents, with 6,182 residential customers in April 1998 (Neitzel et al. 1998).
37

38 In the Tri-Cities, electricity is provided by the Benton County Public Utility District, Benton
39 Rural Electrical Association, Franklin County Public Utility District, and City of Richland Energy
40 Services Department. All of the power provided by these utilities in the local area is purchased
41 from the BPA, a Federal power marketing agency. The average rate for residential customers
42 served by the four local utilities is approximately \$0.049/kWh. Electrical power for the Hanford Site
43 is purchased wholesale from the BPA. Energy requirements for the Hanford Site during fiscal FY
44 1997 exceeded 319 million kWh, for a total cost of nearly \$7.7 million (Neitzel et al. 1998).
45

46 In the Pacific Northwest, hydropower (and to a lesser extent, coal and nuclear power),
47 constitute the regional electrical generation system. The system is capable of delivering
48 approximately 20,300 average megawatts of guaranteed energy; of that amount, approximately
49 62 percent is derived from hydropower, 16 percent from coal, and less than 7 percent from nuclear
50 plants. One commercial nuclear power plant (WNP-2) remains in service in the Pacific Northwest,
51 with an average generating capability of 833 megawatts. The Trojan Nuclear Power Plant in
52 Oregon was permanently shut down on January 4, 1993, and is being buried at Hanford's
53 commercial low-level waste (LLW) facility. |

54
55 The regional electrical power system, more than any other system in the nation, is
56 dominated by hydropower. In a given peak-demand hour, the hydropower system is capable of

1 providing nearly 30,000 megawatts of capacity. Variable precipitation and limited storage
2 capabilities alter system output from 12,300 average megawatts under critical water conditions to
3 20,000 average megawatts in record high-water years. The reliance on hydroelectric power in the
4 Pacific Northwest means that the system is more constrained by seasonal variations in peak
5 demand than in meeting momentary peak demand.
6

7 Additional constraints on hydroelectric production are measures designed to protect and
8 enhance the production of salmon, as many salmon runs have dwindled to the point of being
9 threatened or endangered. These measures, outlined by the Northwest Power Planning Council
10 (NPPC) Columbia River Basin Fish and Wildlife Program, include minimum flow levels and a
11 “water budget,” which refers to water in the Columbia and Snake rivers that is released to speed
12 the migration of young fish to the sea. Generation capacity of the hydroelectric system is
13 decreased with these measures, as less water is available to pass through the turbines.
14

15 Throughout the 1980s, the Pacific Northwest had a surplus of electric power. This surplus
16 has been exhausted, however, and the system only supplies enough power to meet regional
17 electricity needs. In the 1991 Northwest Power Plan, the NPPC set a goal of purchasing more than
18 1,500 megawatts of energy savings by the year 2000 to help the existing system meet the rising
19 electricity demand. The NPPC estimates that the Pacific Northwest will need an additional
20 2,000 megawatts over 1991 consumption by the turn of the century (PNNL 1996a).
21

22 **4.7.10 Site Infrastructure**

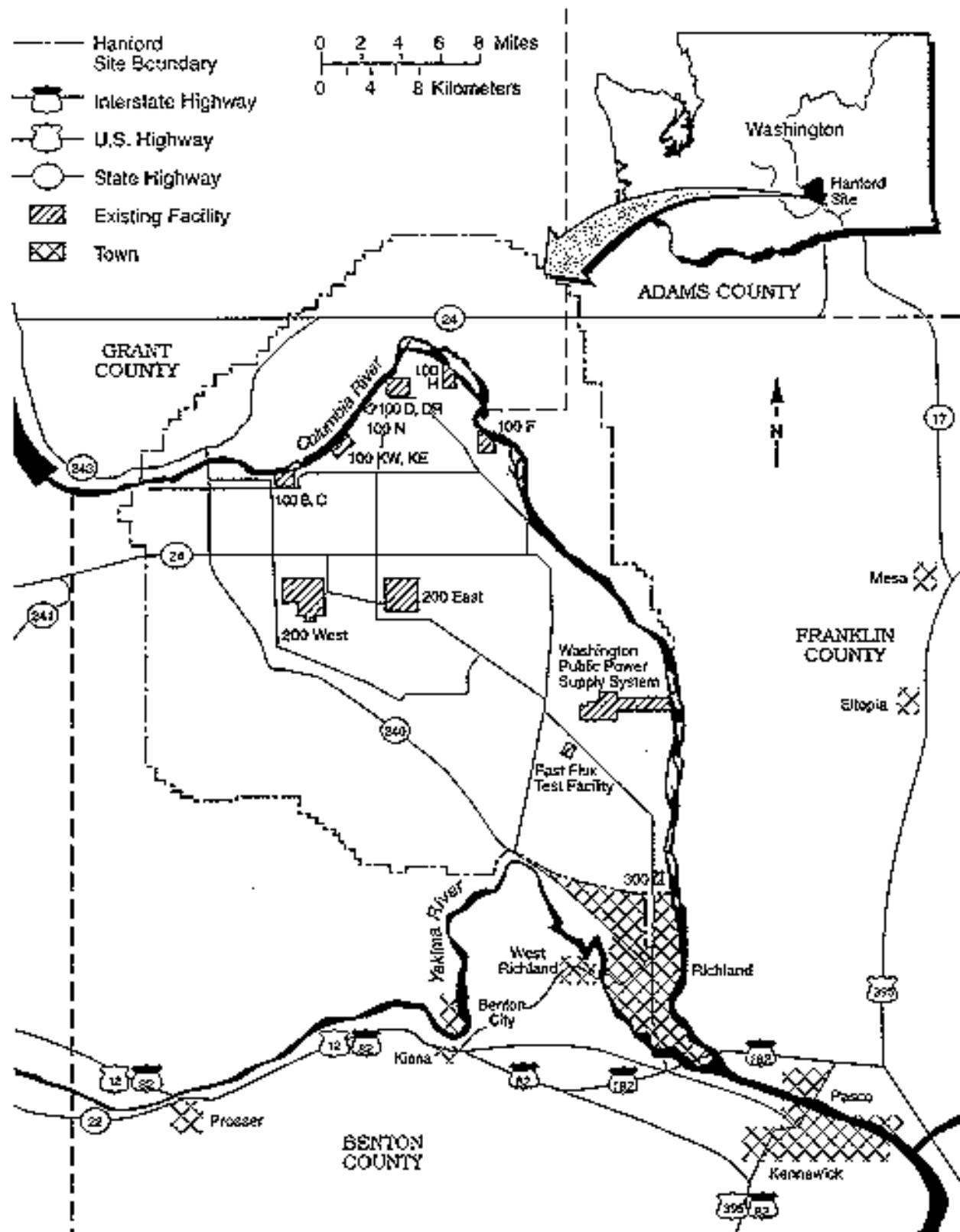
23
24 The Hanford Site infrastructure is a significant resource for furthering industrial development
25 of the region. Key elements of this infrastructure include facilities, road and rail systems, utilities,
26 and support services (DOE-RL 1994a).
27

28 **4.7.10.1 Facilities.** Onsite programmatic (60 percent) and general purpose facilities (40 percent)
29 provide 600,000 m² (6.5 million ft²) of space. General purpose facilities include offices,
30 laboratories, shops, warehouses, and other facilities. The programmatic space supports an
31 evaporator, filter, waste recovery, waste treatment, waste storage, and R&D laboratories. Many of
32 these facilities are over 30 years old; however, upgrades and expansion of some facilities could
33 occur as remediation progresses.
34

35 **4.7.10.2 Road and Rail Systems.** The transportation network is well developed on the
36 Hanford Site with approximately 460 km (approximately 288 mi) of roads onsite (Figure 4-29).
37 SR 24 crosses the Hanford Site primarily on the Wahluke Slope. SR 240 crosses the Hanford Site
38 on the southwest and serves as the boundary between the ALE Reserve and the rest of the Site.
39 A Site access road from SR 240 to the 200 West Area was completed in December 1994.
40 Upgrades are planned for road capacities north of the Wye Barricade in support of remediation
41 activities. Road maintenance will continue on all active roads. The 1100 Area roads were recently
42 upgraded to improve traffic circulation and access.
43

44 There are approximately 204 km (127 mi) of rail line on the Hanford Site (see Figure 4-30).
45 The rail system begins at the Richland Junction (Columbia Center), where it joins the Union Pacific
46 commercial tracks and runs to the abandoned Chicago, Milwaukee, St. Paul, and Pacific
47 right-of-way near the Vernita Bridge, located on the north boundary of the Hanford Site.
48 Approximately 35 km (22 mi) of track are in “out-of-service” condition. The in-service track
49 accommodates 4,000 movements of 1,500 rail cars annually. A railroad spurline from the
50 1100 Area to the City of Richland’s Horn Rapids Industrial Park is planned to serve new industrial
51 development in the Park. The Hanford railroad between the Richland Junction and Horn Rapids
52 Road has been transferred from DOE to the Port of Benton along with the 1100 Area.

Figure 4-30. Transportation Routes in the Vicinity of the Hanford Site.



1
2 **4.7.10.3 Utilities.** The Hanford Site water system includes numerous buildings, pumps, valve
3 houses, reservoirs, wells, and a distribution piping system that delivers water from the Columbia
4 River to all areas of the Hanford Site. The export water system, which is the largest, delivers water
5 to the 100, 200, and parts of the 600 Areas from the Columbia River (Figure 4-31). The 300 Area
6 and Energy Northwest (formerly known as WPPSS) also draw water directly from the Columbia
7 River. Water is purchased from the City of Richland for the 700, 1100, and intermittently provided
8 to the 300 Area, while the 400 Area and part of the 600 Area draw some water from groundwater
9 wells.

10
11 The BPA, a Federal power marketing agency, sells electricity to the Hanford Site and the
12 agencies that serve the Tri-Cities. The BPA provides electrical power to three distinct systems on
13 the Hanford Site (Figure 4-32). The systems are located in the 100, 200, 300, and 400 Areas.
14 Power for the 700 and 1100 Areas is provided by the City of Richland. Major upgrades or
15 replacements of these systems to accommodate Hanford Site remediation are being implemented
16 or planned.

17
18 The DOE has recently replaced the 200 East Area, 200 West Area, and 300 Area
19 centralized steam plants by individual package boilers at specific facilities to supply heat and
20 process steam. The steam in the 200 Areas is produced by oil-fired package boilers, while steam
21 in the 300 Area is produced by natural gas-fired package boilers. A new underground natural gas
22 line was installed from south Richland to the 300 Area to supply natural gas in support of operating
23 the 300 Area package boilers. With these changes, the Hanford railroad is no longer needed to
24 transport coal to the steam plants.

25
26 **4.7.10.4 Support Services.** Other support services on the Hanford Site include sewers, fire
27 stations, telecommunications, landfills, and safeguards and security. Businesses in the City of
28 Richland provide a number of important services such as laundry of radioactively contaminated
29 protective clothing.

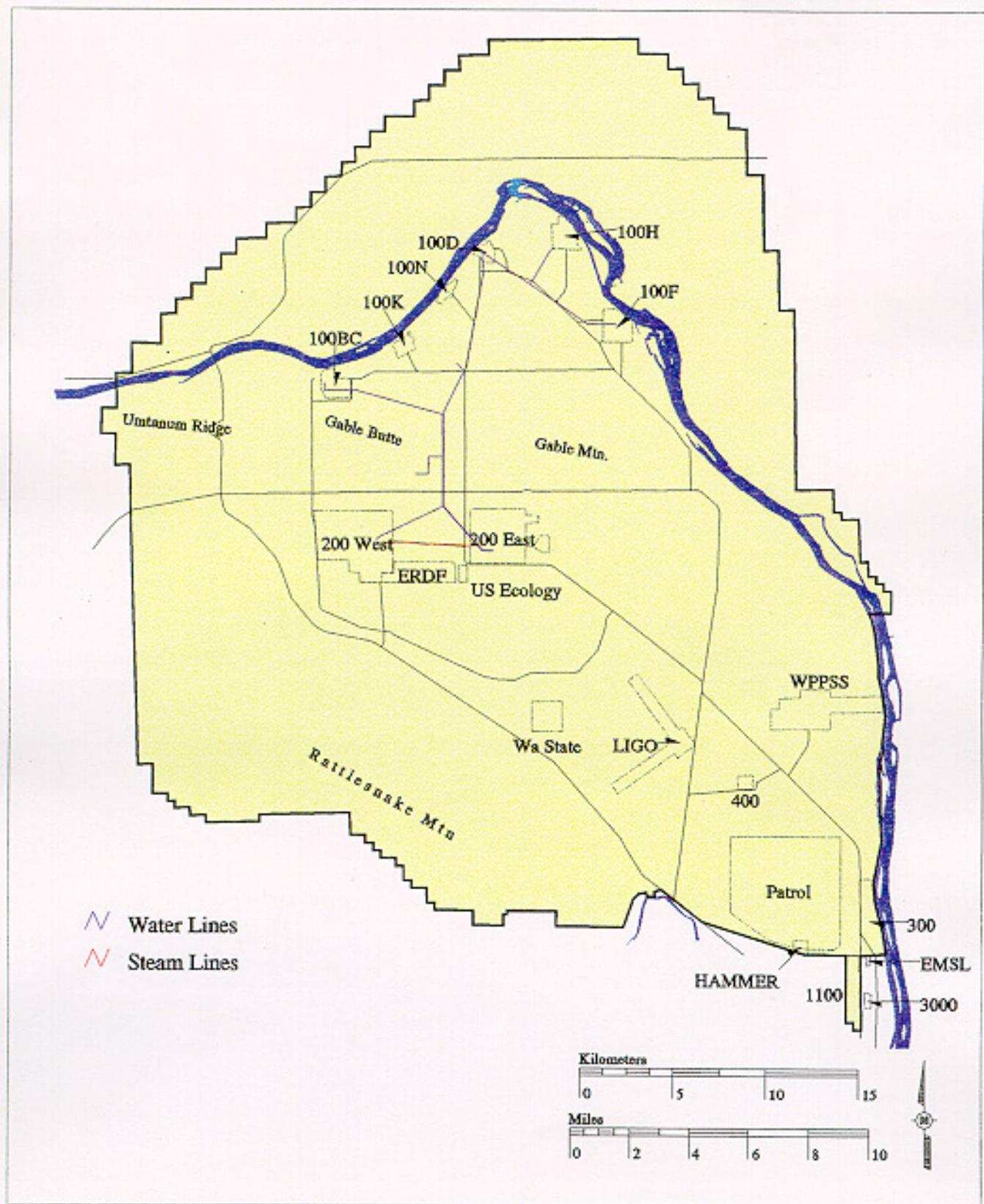
30
31 **4.7.10.4.1 Sewer.** Sanitary wastes in the 200 East and 200 West Areas are currently
32 disposed of through septic tanks and drain fields. A central collection and treatment evaporation
33 plant is being constructed in the 200 East and 200 West Areas to handle the sanitary sewer
34 system. The sewer system in the 300 Area was recently connected to the City of Richland's sewer
35 system. The 400 Area septic tank and drain field were recently closed and sanitary sewer effluent
36 liquid was rerouted to the Energy Northwest (formerly known as WPPSS) sanitary sewer system.

37
38 **4.7.10.4.2 Fire Stations.** Fire stations are located in the 100, 200, and 300 Areas. Water
39 supply, alarm, and sprinkler system upgrades are planned for the 300 Area laboratory and general
40 support buildings. New and upgraded fire protection systems are planned for the 100-K Area
41 facilities currently in use for interim fuel storage.

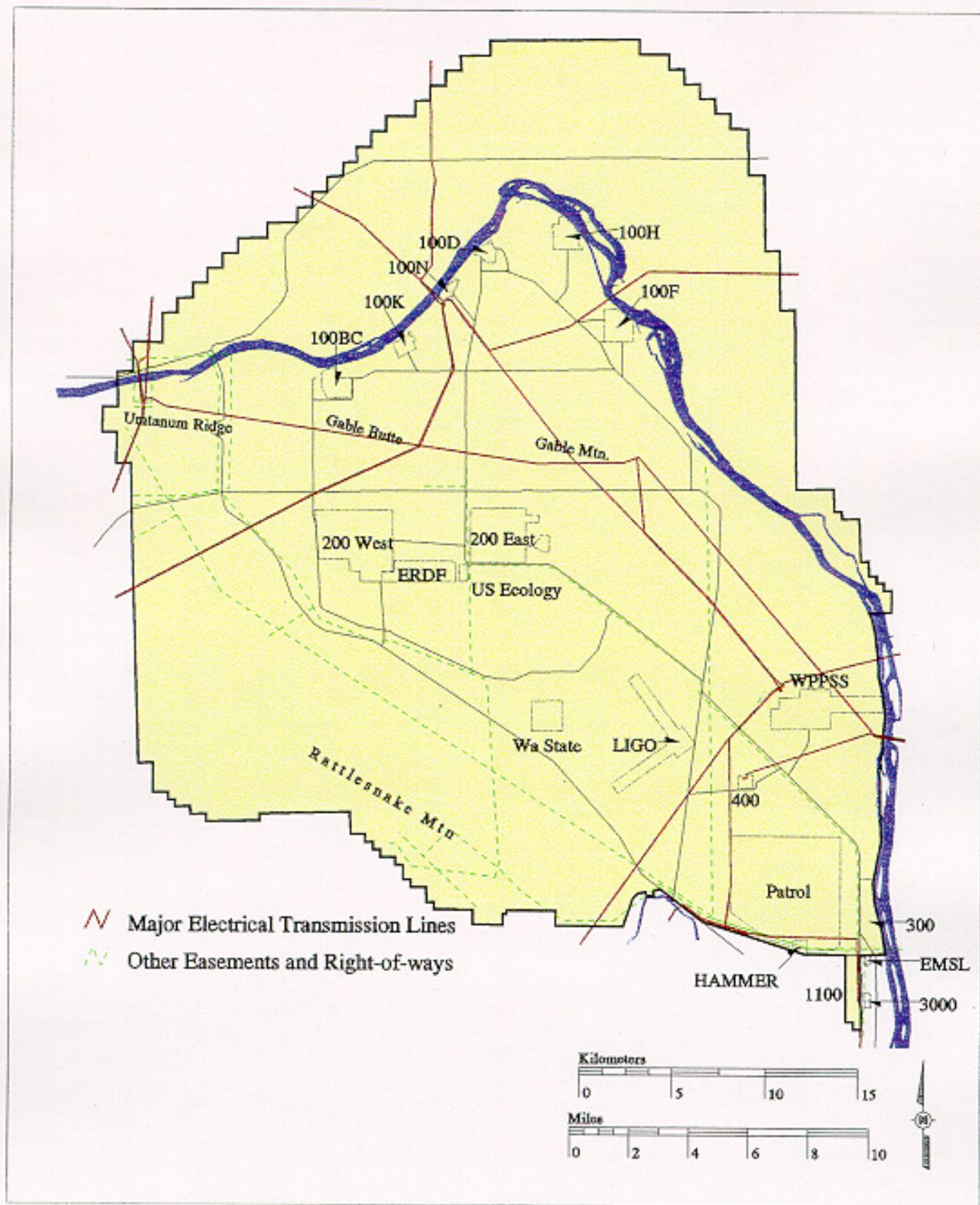
42
43 **4.7.10.4.3 Telecommunications.** A new fiber optic communications network was recently
44 installed on the Hanford Site. This system provides a fully connected internal network of shared
45 computing resources and capabilities to support future voice and data communication
46 requirements.

47
48 **4.7.10.4.4 Environmental Restoration Disposal Facility.** A 65 ha (160 ac) landfill
49 operates directly south of the 200 East and 200 West Areas to address the disposal of radioactive,
50 hazardous, asbestos, polychlorinated biphenyls (PCBs), and mixed wastes resulting from the
51 remediation of operable units on the Hanford Site. The facility can be expanded as needed, to a
52 maximum of 414 ha (1.6 mi²).

1 **Figure 4-31. Export Water System for the Hanford Site**
 2 **(DOE-RL 1990a).**
 3
 4



1 **Figure 4-32. Electrical System for the Hanford Site**
 3 **(DOE-RL 1990b).**



1 **4.7.10.4.5 Safeguards and Security.** A security force is employed onsite and a number of
2 systems are in place to control Hanford Site access, and protect classified and business-sensitive
3 information, property and personnel. The Benton County Sheriff's Office provides traffic
4 enforcement, criminal enforcement, and investigations onsite.
5
6

7 **4.8 Visual and Aesthetic Resources**

8

9 The land in the vicinity of the Hanford Site is generally flat with little relief. Rattlesnake
10 Mountain, rising to 1,060 m (3,477 ft) above mean sea level, forms the southeastern boundary of
11 the Hanford Site. Gable Mountain and Gable Butte are the highest land forms within the Hanford
12 Site (Figure 4-33). The view toward Rattlesnake Mountain is visually pleasing, especially in the
13 springtime when wildflowers are in bloom. Large rolling hills are located to the west and north.
14

15 The Columbia River, flowing across the
16 northern part of the Site and forming the eastern
17 boundary, is generally considered scenic, with its
18 contrasting blue against a background of dark basaltic
19 rocks and desert sagebrush. The White Bluffs, steep
20 whitish-brown bluffs adjacent to the Columbia River,
21 are a striking natural feature of the landscape (see text
22 box, "*Hanford Site Quick Facts: Visual and Aesthetic
23 Resources*").
24

***Hanford Site Quick Facts:
Visual and Aesthetic Resources***

Prominent natural features include the Columbia River, Saddle Mountains, Gable Butte, Rattlesnake Mountain, White Bluffs, and Gable Mountain.

25 SR 24 provides public access through the northern portion of the Hanford Site, primarily on
26 the north side of the Columbia River. Viewsheds along this highway include limited views of the
27 Columbia River when the road drops down into the river valley, crosses the river over the Vernita
28 Bridge, and climbs up out of the valley to a level plateau north of the river. A turnout on the north
29 side of the river offers views of the river and the B and C Reactors, with an interpretive sign located
30 nearby. A rest stop along the road just to the south of the river provides views of the Umtanum
31 Ridge to the west, the Saddle Mountains to the north, and the Columbia River valley to the east and
32 west.
33
34

35 **4.9 Noise**

36

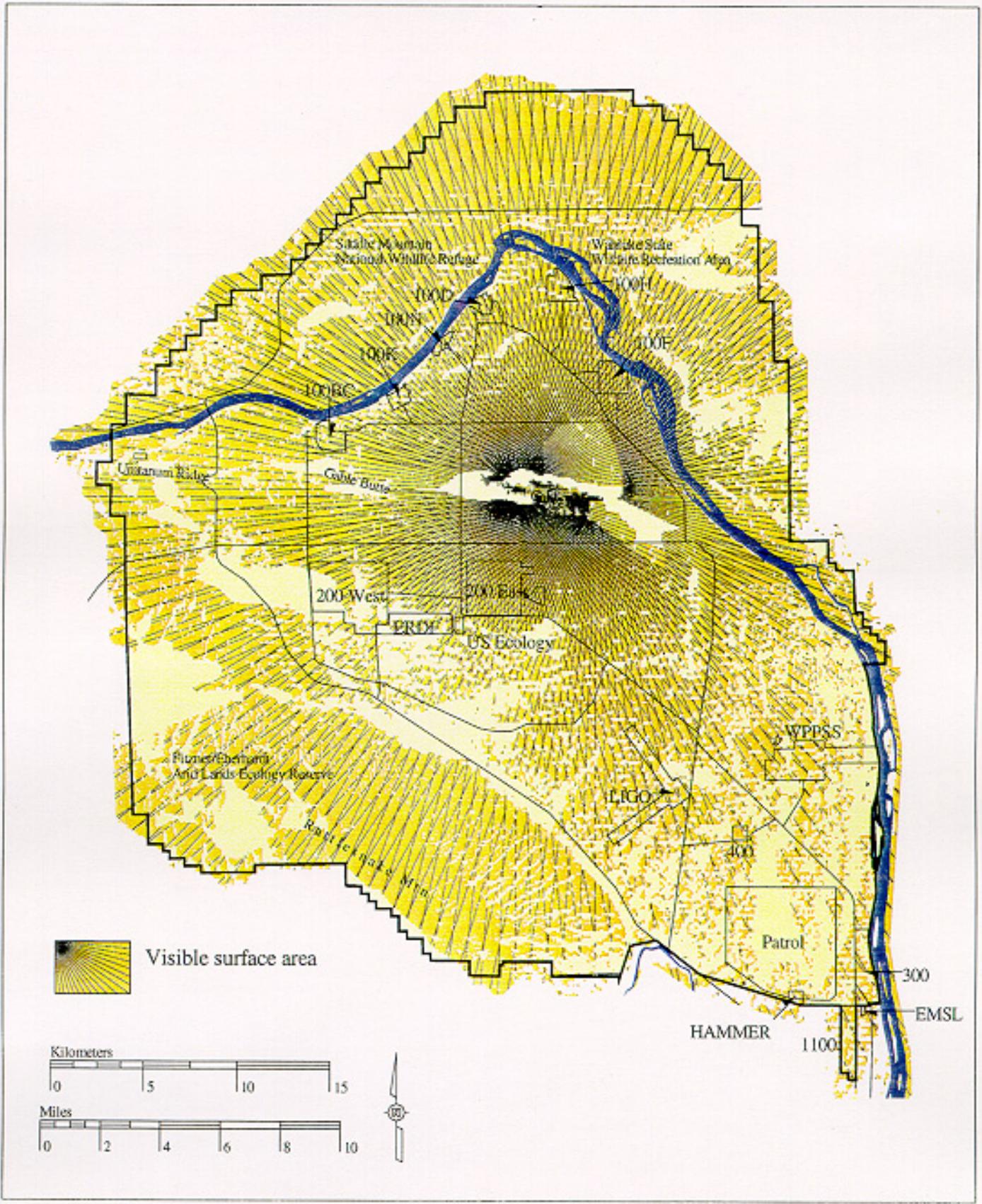
37 This EIS defines noise as "any undesirable or unwanted sound or audible disturbance that
38 interferes with normal activity." Typically, intrusive noise events are those that disrupt normal
39 human activity, especially verbal communication. Under certain circumstances, people are willing
40 to endure noise as a trade-off for accomplishing some meaningful activity or because certain
41 noises represent tangible evidence of progress. In the context of transportation systems, a certain
42 amount of noise also is usually considered tolerable.
43

44 **4.9.1 Public Health Implications**

45

46 Noise impacts on public health usually are analyzed in terms of a dose-response
47 relationship because noise effects are cumulative. Prolonged exposure to loud noises can impair
48 hearing. The impairment can be temporary or permanent, depending on intensity and duration of
49 the noise. Normally, hearing degeneration does not occur if the duration of the event is brief.
50 Off-property noise impacts are the sound-exposure levels that interfere with normal speech, disrupt
51 sleep, or produce secondary effects such as increased levels of stress among community
52 members.
53

Figure 4-33. Viewshed from Gable Mountain.



BHLrpp 03/03/98 clup/viewshed1.aml Database: 03-AUG-1998

1 **4.9.2 Hanford Site Sound Levels**

2
3 Most industrial facilities on the Hanford Site are located far enough away from the Site
4 boundary that noise levels at the boundary are not measurable or are barely distinguishable from
5 background noise levels. Modeling of environmental noises has been performed for commercial
6 reactors and traffic on SR 240 through the Hanford Site. These data are not concerned with
7 background levels of noise and are not reviewed here.

8
9 Two studies of environmental noise were performed at the Hanford Site. One study
10 reported environmental noise measurements taken in 1981 during Site characterization of the
11 Skagit/Hanford Nuclear Power Plant Site (Cushing 1995). The second consisted of a series of
12 Hanford Site characterization studies performed in 1987 that included measurement of background
13 environmental noise levels at five locations on the Hanford Site. Noise can be disruptive to wildlife
14 and studies have been performed to compile noise data in remote areas.

15
16 Recently, the potential impact of traffic noise resulting from Hanford Site activities has been
17 evaluated for a draft environmental impact statement (EIS) addressing the siting of a proposed New
18 Production Reactor (Cushing 1995). While the draft EIS did not include any new baseline
19 measurements, it did address the traffic component of noise and provides modeled “baseline”
20 measurements of traffic noise for the Hanford Site and adjacent communities. Baseline noise
21 estimates were determined for two locations: SR 24, leading from the Hanford Site west to
22 Yakima; and State Highway 240, south of the Site and west of Richland where maximum traffic
23 volume exists. Traffic volumes were predicted based on the presence of both operational and
24 construction work forces. Noise levels were expressed in Leq for one-hour periods in dBA at a
25 receptor located 15 m (49 ft) from the road. Adverse community responses would not be expected
26 at increases of 5 dBA over background noise levels.

27
28 To provide noise data for the Energy Northwest (formerly known as WPPSS) plants,
29 measurements of environmental noise were taken in June 1981 before the construction of the
30 Energy Northwest plants on the Hanford Site. Monitoring was conducted at 15 sites, showing point
31 noise levels reading ranging from 30 to 60.5 dBA. The corresponding values for more isolated
32 areas ranged from 30 to 38.8 dBA. Measurements taken in the vicinity of the sites where Energy
33 Northwest (formerly known as WPPSS) was constructing nuclear power plants ranged from
34 50.6 to 64 dBA, reflecting operation of construction equipment. Measurements taken along the
35 Columbia River near the intake structures for WNP-2 were 47.7 and 52.1 dBA, compared to more
36 remote river noise levels of 45.9 dBA (measured about 4.8 km [3 mi] upstream of the intake
37 structures). Community noise levels from point measurements in North Richland (at Horn Rapids
38 Road and Stevens Road [Route 240]) were 60.5 dBA, which was largely attributed to traffic.

39
40 To support the Basalt Waste Isolation Project, background noise levels were determined at
41 five sites located within the Hanford Site. Noise levels are expressed as equivalent sound levels for
42 24 hours (Leq-24). The average noise level for these five sites was 38.8 dBA on the dates tested.
43 The wind was identified as the primary contributor to background noise levels, with winds
44 exceeding 19 km/hr (12 mi/hr) significantly affecting noise levels. This study concluded that
45 background noise levels in undeveloped areas at the Hanford Site are generally in the range of 24 to
46 36 dBA (Cushing 1992). Periods of high wind, which normally occur in the spring, would elevate
47 background noise levels.

48
49 In addition to the project-driven studies described above, the Hanford Environmental Health
50 Foundation has monitored noise levels resulting from several routine operations performed in the
51 field at the Hanford Site. These included well drilling, pile driving, compressor operations, and
52 water-wagon operation. Occupational sources of noise propagated in the field from outdoor
53 activities ranged from 74.8 to 125 dBA (PNNL 1996a).

4.10 Environmental Monitoring Programs

Environmental surveillance at the Hanford Site consists of monitoring for potential radiological and nonradiological constituents and includes monitoring of external radiation, air, surface water, groundwater, soil, vegetation, wildlife, and regional food and farm products. Monitoring is performed to ensure protection of human health and safety and is conducted in compliance with DOE Order 5400.1, *General Environmental Protection Program* (DOE 1990a), and DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE 1993a). A detailed discussion of the Hanford Site environmental monitoring program is found in the *Hanford Site Environmental Monitoring Plan* (DOE-RL 1991a), and monitoring data are presented in annual reports, such as the *Hanford Site Environmental Report for Calendar Year 1995* (PNNL 1996b).

The Hanford Environmental Health Foundation (HEHF) provides occupational health services to Hanford personnel through health risk management and occupational health monitoring. The HEHF's Health Risk Management Program is used to identify and analyze the hazards that Hanford personnel face in the work environment and bring an awareness to worker health and safety issues at Hanford. HEHF's occupational health services provide occupational medicine and nursing, medical monitoring and surveillance, ergonomics assessment, exercise physiology, case management, psychology and counseling, fitness for duty evaluations, health education, infection control, immediate health care, industrial hygiene, and health, safety, and risk assessments.

4.11 Contamination

Three operating areas of the Hanford Site (the 100, 200, and 300 Areas) are still included on the EPA's National Priorities List (NPL), while the 1100 Area has been fully remediated and removed from the EPA's NPL. Radioactive and hazardous materials have been disposed to the ground throughout the period of active Hanford Site operations, resulting in extensive contamination of the vadose zone and groundwater.

Under the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989), the more than 1,000 inactive waste disposal and unplanned release sites were grouped into groundwater and source operable units, based on geographic proximity or similarity of waste disposal history. In addition, a number of *Resource Conservation and Recovery Act of 1976* (RCRA) treatment, storage, and/or disposal (TSD) units are included in the Tri-Party Agreement, which will be closed or permitted to operate in accordance with the State of Washington's "Dangerous Waste Regulations" (WAC 173-303). Some of these waste sites and TSD units are sources of environmental contamination.

The DOE holds interim status for the operation of hazardous waste management facilities by virtue of having submitted a RCRA Part A application to EPA on November 18, 1980. On November 6, 1985, DOE submitted a RCRA Part B application to Ecology and the EPA Region 10 for the TSD of hazardous wastes at Hanford. Supplemental and revised RCRA applications have been submitted to Ecology in accordance with the schedule established in the Tri-Party Agreement. A final status permit covering several units at the Hanford Site was issued in August 1994. This permit will be amended over a period of years to add additional interim status TSD units.

Hanford surface waste sites, based on data from the Hanford Geographic Information System (HGIS) and Waste Information Data System (WIDS) database, are shown in Figure 4-34. Included is vadose zone contamination, primarily in the 100, 200, and 300 Areas. The vadose zone contamination, while not necessarily occurring from all waste sites, is a result of the disposal of wastes to surface disposal structures such as the following:

- C Tanks and vaults** – Used to store radioactive liquid wastes generated by uranium and plutonium processing activities in the 200 Areas. Tanks include catch tanks,

1 settling tanks, and storage tanks. The catch tanks are generally associated with
2 diversion boxes and other transfer units and were designed to accept overflow and
3 spills; wastes collected in catch tanks were transferred to storage tanks. Settling
4 tanks were used to settle particulates in liquid wastes prior to transfer to cribs.
5 Storage tanks were used to collect and store large quantities of liquid wastes.
6 Storage tanks include single-shell tanks and double-shell tanks.
7

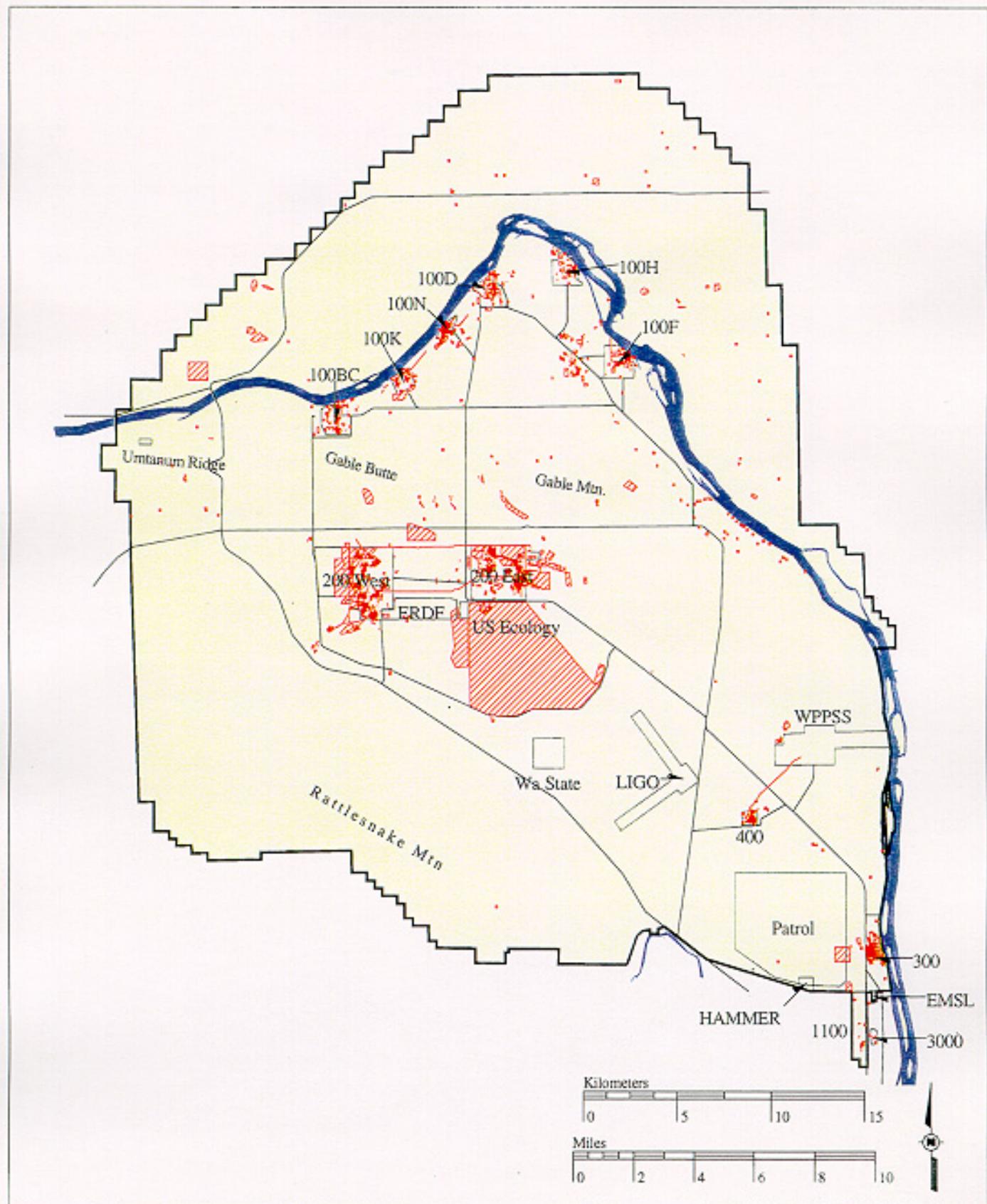
8 **C Vaults** – Typically are deep underground concrete structures that contain tanks as
9 well as associated pumps, valves, and agitators. Vaults do not hold wastes but
10 instead provide containment for other types of storage features and associated
11 plumbing.
12

13 **C Cribs and drains** – Were designed to percolate low-level radioactive process waste
14 into the ground without exposing the waste to the open air. Cribs and drain fields are
15 shallow excavations that were either backfilled with permeable material or held open
16 by wooden structures, both of which are covered with an impermeable layer. Water
17 flows directly into the backfilled material or covered open space and percolates into
18 the soil. French drains generally deliver waste water at a greater depth (up to
19 12.2 m [40 ft]) and are constructed of steel or concrete pipes that are either left open
20 or filled with gravel.
21

22 **C Ponds, ditches, and trenches** – Were designed to percolate high volumes of
23 low-level liquid wastes into the soil. Ditches are long, unlined excavations used to
24 convey wastes to the ponds. Trenches are generally open, unlined, shallow
25 excavations used for disposal of low-liquid discharges, such as sludge, which has a
26 high salt content. Trenches were used for short periods and were deactivated when
27 the discharge rate exceeded the soil infiltration rate.
28

29 **C Burial grounds** – Were used for disposal of solid wastes. Although the burial
30 grounds received a variety of contaminated debris and solid wastes packed in
31 barrels and boxes, there is currently no evidence of vadose zone contamination
32 occurring from the disposal of solid wastes in burial grounds. Vadose contamination
33 typically occurs when there is a driving force for the contamination, such as is found
34 with the disposal of liquids.
35

1 **Figure 4-34. Hanford Surface Waste Sites (Past and Present).**
 2
 3
 4



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1 **4.11.1 Hanford Groundwater Contamination**
2

3 There are a variety of contaminants present in the groundwater of the Hanford Site
4 (Figures 4-35 and 4-36 and Table 4-14). The extent of major radionuclides at levels above the
5 interim drinking water standards (DWSs) is shown in Figure 4-35. Tritium, iodine-129, technetium-
6 99, and strontium-90 were present at levels above EPA or State of Washington interim DWSs.
7 Uranium exceeded EPA's proposed maximum contaminant level (MCL). Minor radiological
8 contamination DWS included carbon-14 (in the 100-K Area), cesium-137, and plutonium (in the 200
9 East Area, near injection well 216-B-5). Derived concentration guide levels (DCGLs) were
10 exceeded for strontium-90 in the 100-K, 100-N, and 200 East Areas (near injection well 216-B-5),
11 and near the former Gable Mountain Pond. The DCGL for uranium was exceeded near U Plant.
12 The DCGL for tritium was exceeded in one well near cribs that received effluent from the
13 Plutonium-Uranium Extraction (PUREX) Plant, and in another well near waste management area
14 TX-TY. The DCGL for plutonium was exceeded in one well in the 200 East Area (near injection well
15 216-B-5). Cobalt-60 levels exceeded the 100 pCi/L interim DWS in recent years but were below
16 the DWS in fiscal year 1998 (PNNL 1998).
17

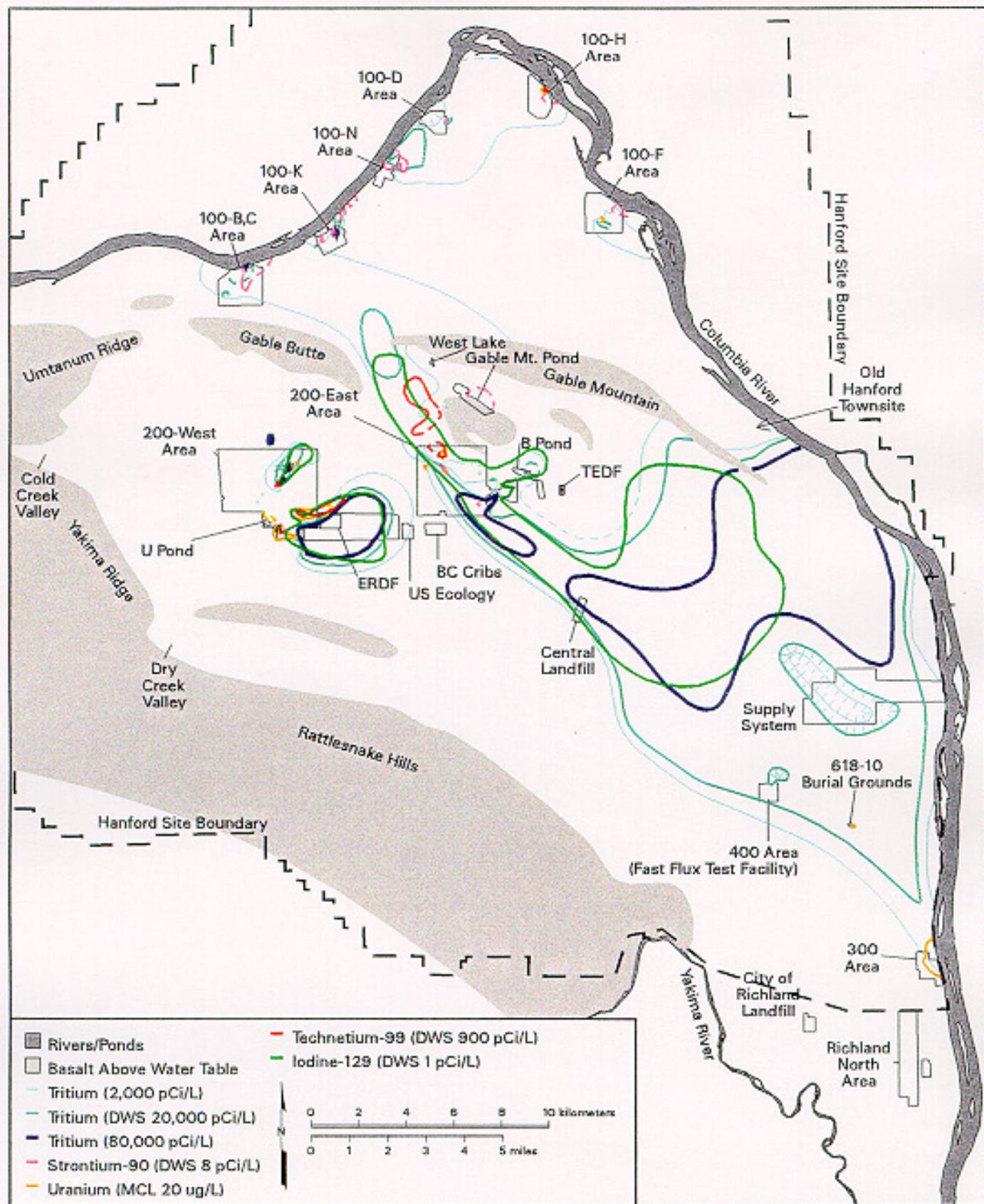
18 The extent of major chemical constituents at levels above the primary MCLs is shown in
19 Figure 4-36. Nitrate, carbon tetrachloride, and trichloroethylene were the most widespread.
20 Chloroform, cis-1,2-dichloroethylene, cyanide, fluoride, chromium, and other metals also were
21 present at levels above their MCLs. Tetrachloroethylene exceeded its 5 µg/L MCL in the 300 Area
22 in fiscal year 1998 for the first time since the 1980s (PNNL 1998).
23

24 The area of Hanford contaminant plumes with concentrations exceeding an MCL or DWS
25 was estimated to be approximately 245 million m² (95 mi²) in fiscal year 1998. This equates to a
26 volume of approximately 1.4 billion m³, which is the same as fiscal year 1997. The volume
27 estimate has a high uncertainty because of a lack of knowledge of the vertical extent of
28 contaminant plumes. Plume thickness is estimated to be 20 m (66 ft), except in the 100 and
29 300 Areas and the North Richland area, where the plume is estimated to be 5 m (16 ft). The
30 porosity of the aquifer is not well-characterized; for the purpose of the calculation, the porosity was
31 assumed to be 30 percent. This estimate does not include water in the vadose zone.
32

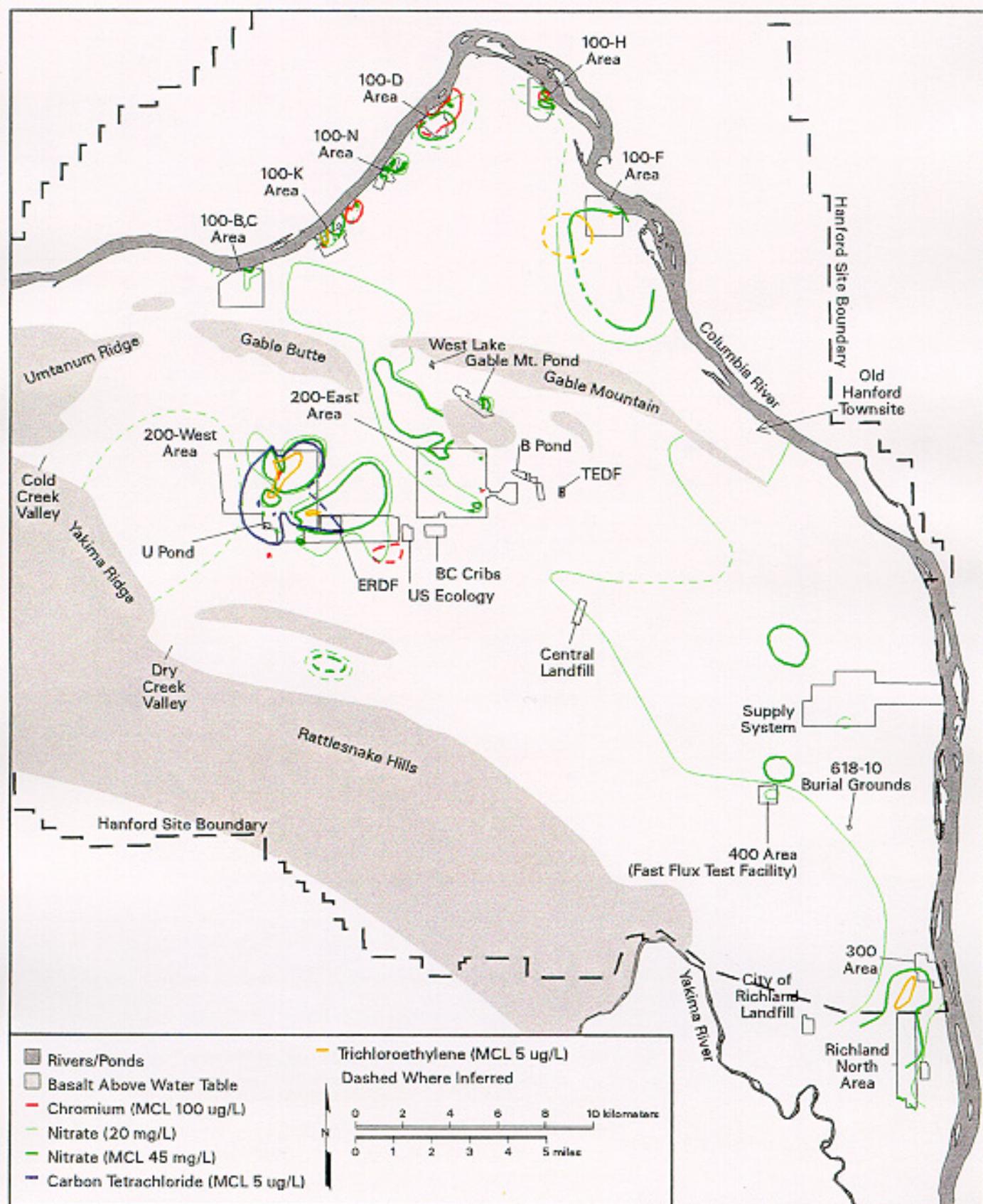
33 Tritium, iodine-129, and nitrate plumes originating in the Central Plateau are quite
34 widespread, reaching the Columbia River to the east. Other contaminants are not as widespread
35 but exist in the groundwater at many different locations. Examples of these contaminants include
36 strontium-90, uranium, technetium-99, and chromium. Contaminant plume migration is affected in
37 part by the degree to which individual contaminants are mobile in groundwater and in part on
38 hydrogeologic conditions. Natural groundwater flow at the Hanford Site has been altered in some
39 areas due to past Hanford Site operations; this alteration is due in large part to groundwater
40 mounds that were created by extensive artificial recharge at some wastewater disposal facilities.
41 Although these groundwater mounds are dissipating, groundwater flow patterns are still affected by
42 past wastewater discharges on the Hanford Site
43

44 **.4.11.1.1 Groundwater Ingestion Dose and Risk Estimates.** Results of groundwater monitoring
45 are compared to the DWSs for individual radiological constituents (see Table 5-14). These interim
46 DWSs use the methodology set out in 40 CFR 141, 40 CFR 142, and 40 CFR 143 to estimate the
47 concentration in water that could result in a potential radiological dose of 4 mrem/yr from
48 consumption of each individual constituent. Similarly, DCGLs provide estimates of activities that
49 could result in a 100 mrem/yr dose, as defined in DOE Order 5400.5. However, the potential dose
50 is actually the sum of the doses from the individual constituents. An estimate of this cumulative
51 dose, which could result from consumption of groundwater from different onsite locations, can be
52 calculated from the extent of contamination.
53

1 **Figure 4-35. Distribution of Radionuclides in Groundwater within the Hanford Site (PNNL 1998).**
 3
 4
 5
 6



1 **Figure 4-36. Distribution of Hazardous Chemicals of**
 2 **Concern in Groundwater within the Hanford Site (PNNL**
 3 **1998).**
 4
 5
 6



**Table 4-14. Detected Concentrations Greater Than Drinking Water Standards:
1995 Groundwater Sampling Rounds (adapted from PNL 1995). (2 pages)**

Area Name	Plume Constituent	Units	Maximum Plume Concentration	EPA DWS	Washington Water Quality Standard
100-B/C	Chromium	ug/L	>50.0	100	50
	Strontium-90	pCi/L	56.7	8	8
	Tritium	pCi/L	28,000	20,000	20,000
100-D/DR	Chromium	ug/L	1,360	100	50
	Nitrate	mg/L	205	45	45
	Strontium-90	pCi/L	44.0	8	8
	Tritium	pCi/L	69,000	20,000	20,000
100-F	Chromium	ug/L	82.4	100	50
	Nitrate	mg/L	110.0	45	45
	Uranium	ug/L	133.0	20	20
	Strontium-90	pCi/L	20.5	8	8
	Tritium	pCi/L	98,300	20,000	20,000
	Trichloroethylene	ug/L	27.0	5	N/A
100-H	Chromium	ug/L	300.0	100	50
	Nitrate	mg/L	730.0	45	45
	Strontium-90	pCi/L	28.0	8	8
100-KE/KW	Chromium	ug/L	210.0	100	50
	Nitrate	mg/L	110.0	45	45
	Strontium-90	pCi/L	803.0	8	8
	Tritium	pCi/L	1,040,000	20,000	20,000
	Trichloroethylene	ug/L	20.0	5	N/A
100-N	Chromium	ug/L	200.0	100	50
	Cobalt-60	pCi/L	732.0	100	N/A
	Nitrate	mg/L	65	45	45
	Strontium-90	pCi/L	4,030	8	8
	Tritium	pCi/L	74,200	20,000	20,000
200 East	Chromium	ug/L	73.0	100	50
	Nitrate	mg/L	120.0	45	45
	Cyanide	ug/L	39.5	200	200
	Strontium-90	pCi/L	9,740	8	8
	Cesium-137	pCi/L	2,310	10	10
	Tritium	pCi/L	3,370,000	20,000	20,000
	Cobalt-60	pCi/L	40.1	100	N/A
	Iodine-129	pCi/L	11.8	1	1
	Plutonium-239/240	pCi/L	2,670	1	N/A
	Technetium-99	pCi/L	3,700	900	900
	Uranium	ug/L	64.3	20	20

Table 4-14. Detected Concentrations Greater Than Drinking Water Standards: 1995 Groundwater Sampling Rounds (adapted from PNL 1995). (2 pages)

Area Name	Plume Constituent	Units	Maximum Plume Concentration	EPA DWS	Washington Water Quality Standard
200 West	Cesium-137	pCi/L	21.8	10	10
	Cobalt-60	pCi/L	13.2	100	N/A
	Cyanide	ug/L	20.0	200	200
	Chromium	ug/L	500.0	100	50
	Nitrate	mg/L	1,700	45	45
	Fluoride	mg/L	5.1	4	4
	Tritium	pCi/L	2,400,000	20,000	20,000
	Iodine-129	pCi/L	86.1	1	1
	Technetium-99	pCi/l	23,700	900	900
	Uranium	ug/L	2,720	20	20
	Carbon tetrachloride	ug/L	5,200	5	0.3
	Chloroform	ug/L	107.0	100	7
	Strontium-90	pCi/L	14.5	8	8
	Trichloroethylene	ug/L	44	5	N/A
300 Area	Chromium	ug/L	<100.0	100	50
	Uranium	ug/L	150	20	20
	Trichloroethylene	ug/L	6.1	5	N/A
600 Area (All Other Areas)	Cyanide	ug/L	110.0	200	200
	Chromium	ug/L	>100.0	100	50
	Nitrate	mg/L	100	45	45
	Strontium-90	pCi/L	994.0	8	8
	Technetium-99	pCi/L	4,310	900	900
	Tritium	pCi/L	257,000	20,000	20,000
	Trichloroethylene	ug/L	25	5	N/A

- 5 DWS = drinking water standard
- 6 EPA = U.S. Environmental Protection Agency
- 7 ug/L = 1 part per billion (ppb) or microgram per liter
- 8 mg/L = 1 part per million (ppm) or milligram per liter
- 9 pCi/L = picocurie per liter
- 10 N/A = not applicable

11
12

13 Figure 4-37 shows the cumulative dose estimates from ingestion of groundwater from the
 14 unconfined aquifer system on the Hanford Site. These estimates were made by summing the
 15 interpolated carbon-14, strontium-90, technetium-99, iodine-129, cesium-137, plutonium, tritium,
 16 and uranium activities in groundwater. The automatic interpolation process sometimes resulted in
 17 peak grid values that were lower than the measured maximum values because it averaged in other
 18 lower values. In these cases, the value at the grid node closest to the measured peak value was
 19 increased to match the measured peak. Factors to convert activities to ingestion dose equivalents
 20 were taken from DOE Order 5400.5. The dose presented in Figure 4-37 represents the cumulative
 21 dose equivalent from all major radionuclides in Hanford Site groundwater.

22
23
24

The dose estimates presented in Figure 4-37 show that areas above the 100 mrem/yr dose standard are restricted to localized parts of the 100-K, 100-N, and 200 Areas. Areas above

1 4 mrem/yr are more restricted than the area above the interim DWS for individual constituents
2 because the dose map used more recent conversion factors than those used in calculating the
3 interim DWSs. Dose estimates for portions of the 100, 200, 300, and 600 Areas exceed
4 4 mrem/yr.

5
6 Figure 4-38 illustrates the estimated lifetime incremental cancer risk that would be
7 experienced by a person drinking water contaminated with chemicals and radionuclides at
8 concentrations that have been measured in groundwater across the Hanford Site. Cancer-risk
9 estimates were made by summing interpolated groundwater concentrations of the radionuclides
10 listed above plus carbon tetrachloride, chloroform, trichloroethylene, cis-1,2-dichloroethylene,
11 nitrate, and hexavalent chromium. The calculation assumes that a person weighing 70 kg (154 lbs)
12 consumes 2 L (0.5 gal) of groundwater every day for 30 years (DOE/RL-91-45, Rev. 3; IRIS 1997).
13 Cancer risks exceeding 0.0001 are present in portions of the 100, 200, 300, and 600 Areas, and
14 this contour closely resembles the cumulative dose map (see Figure 4-37). An additional area of
15 cancer risk >0.0001 is observed in the 200 West Area, a result of the carbon tetrachloride plume.
16

17 Figure 4-39 shows the estimated hazard quotient that would be experienced by an individual
18 drinking water contaminated with chemicals at concentrations that have been measured in
19 groundwater across the Hanford Site. The hazard quotient relates the potential human health
20 hazards associated with exposure to noncarcinogenic substances or carcinogenic substances
21 with systemic toxicities other than cancer (in Hanford Site groundwater, these include nitrate,
22 hexavalent chromium, uranium, and strontium). The calculation assumes that a person weighing
23 70 kg (154 lbs) consumes 2 L (0.5 gal) of groundwater every day for 30 years (DOE/RL-91-45,
24 Rev. 3; IRIS 1997). The only part of the Hanford Site with a >5 hazard quotient is a small portion of
25 the 200 West Area. Hazard quotients >0.3 are present in all of the operational areas and in parts of
26 the 600 Area, primarily those areas with nitrate contamination.
27

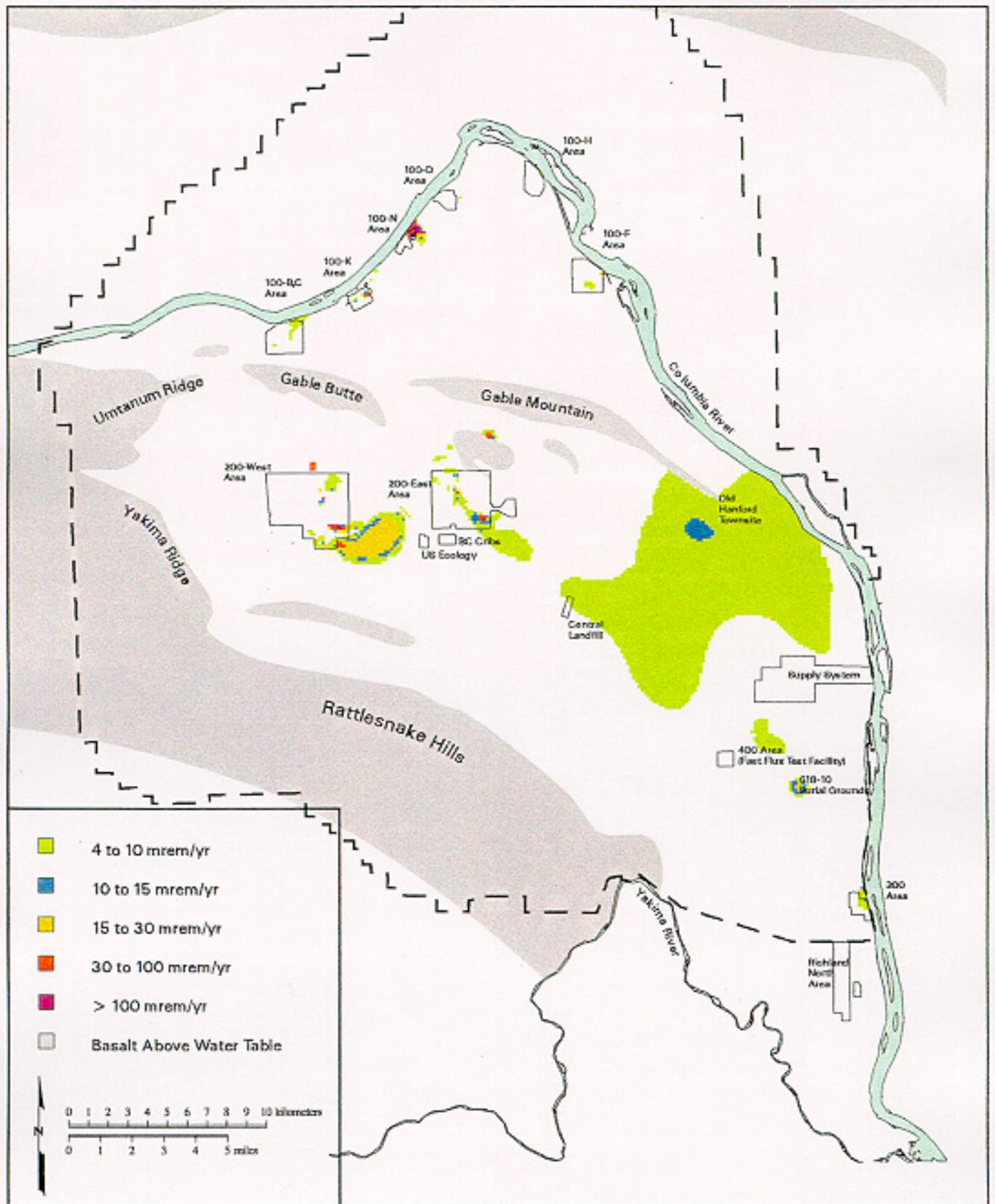
28 **4.11.2 Columbia River Contamination**

29
30 The Columbia River has received radiological and chemical contamination as a result of past
31 operations at the Hanford Site. Columbia River water that was used to cool the Hanford Site
32 nuclear production reactors subsequently was contaminated with chemical and radiological
33 constituents. The contaminated water entered the Columbia River primarily through direct effluent
34 discharge. In addition to direct discharges of contaminated cooling water, the Columbia River
35 received and continues to receive contaminants indirectly through soil column waste disposal units,
36 leaks from pipelines, and possibly leaks from tanks that are carried by the groundwater and
37 discharged through springs and seeps along the shoreline (DOE 1993a).
38

39 Sediments in the Columbia River contain low levels of Hanford radionuclides (i.e., cobalt-60,
40 uranium-238, and europium-154) and metals; and radionuclides from nuclear weapons testing
41 fallout, which collect in slack water habitats. Analyses of sediments showed detectable, though
42 low, levels of metals in Columbia River sediments. Chromium concentrations in sediment along
43 the Hanford Reach appeared to be slightly elevated when compared to upstream samples
44 (PNNL 1996c).
45

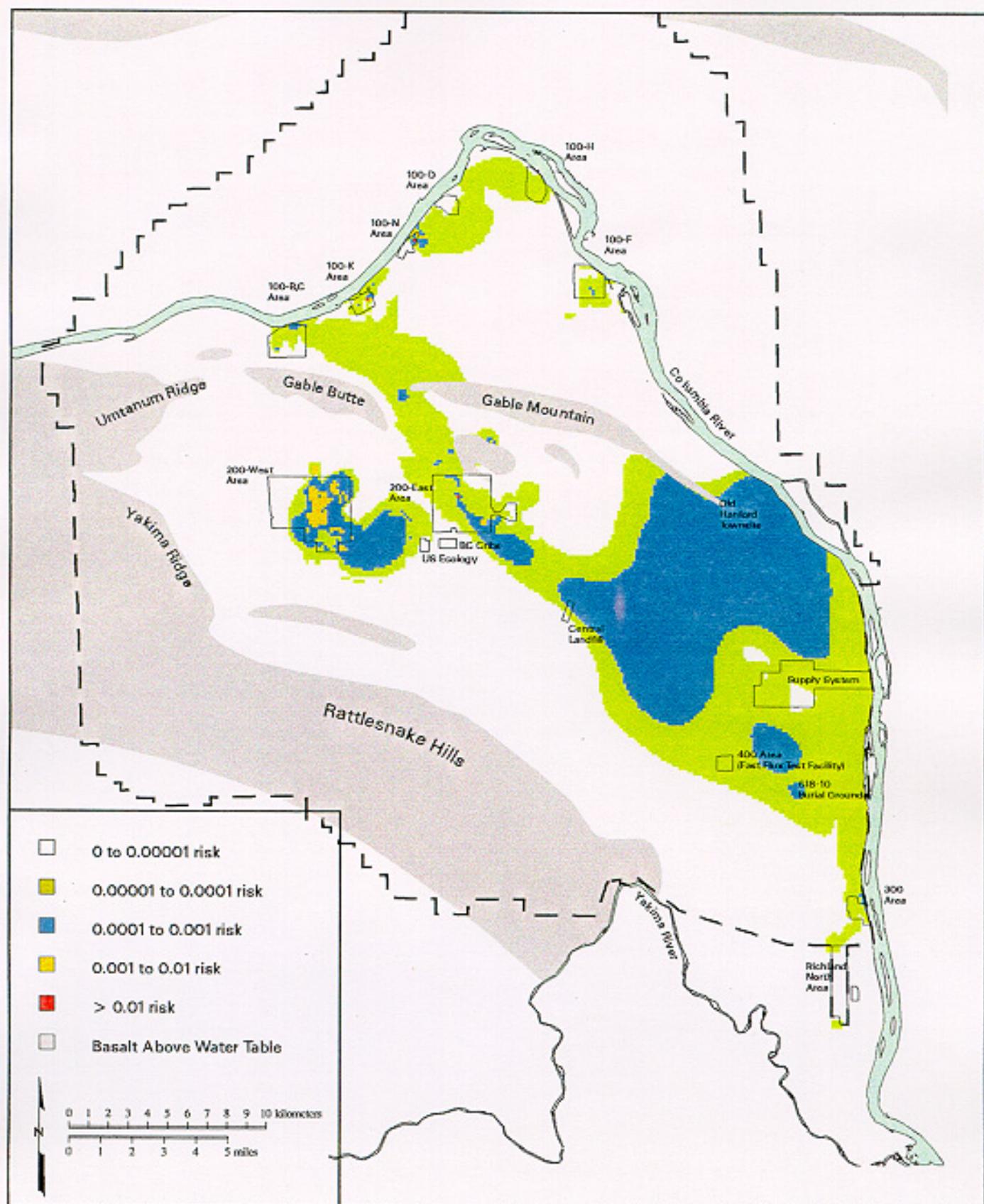
46 Contaminated areas within the Columbia River are generally located in slack water areas,
47 such as sloughs and portions of the islands. These contaminated areas have been identified by
48 aerial gamma-ray surveys. Riverbed sediments and floodplain soils of the Hanford Reach
49 constitute a sink for many of the pollutants released to the environment by past Hanford operations.
50 Shoreline activities that affect the flow of the Columbia River could remobilize contaminants
51 entombed within river sediments.

1 **Figure 4-37. Potential Dose Estimates from Ingestion of**
 2 **Groundwater, Fiscal Year 1998 (PNNL 1998).**
 3
 4



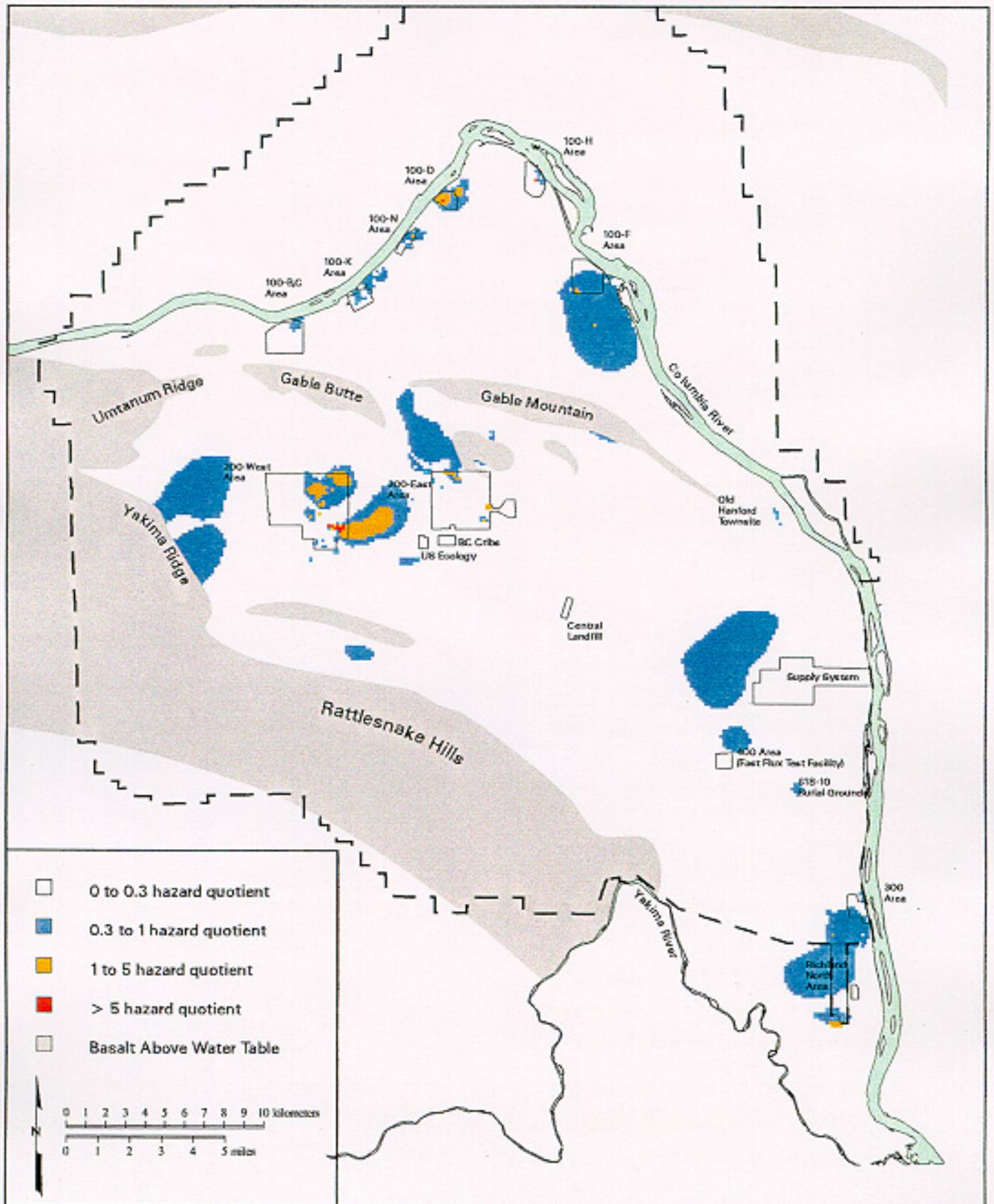
pd99014.eps February 22, 1999

1 **Figure 4-38. Potential Cancer Risk Estimates from Ingestion**
 2 **of Groundwater, Fiscal Year 1998 (PNNL 1998).**
 3
 4
 5



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1 **Figure 4-39. Potential Hazard Quotient Estimates from**
 2 **Ingestion of Groundwater, Fiscal Year 1998 (PNNL 1998).**
 3
 4



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1
2 River water used for cooling flowed through the Hanford reactor to the Columbia River,
3 carrying nuclear fission products and neutron-activated stellites (i.e., cobalt-60 particles). The
4 extent and amount of discrete cobalt-60 particles in the river have never been thoroughly
5 investigated and the actual amount of neutron-activated material transported to the Columbia River
6 is not known. Based on Stokes Law and the physical properties of sand and stellite (Sula 1980;
7 Cooper 1995), cobalt-60 particles (stellite) entrained into the river bedload have preferentially
8 settled in areas dominated by sand-size grains. The sandy areas of the Hanford Reach have never
9 been thoroughly examined for the presence of radionuclides. For example, the sandy portion of
10 D Island has not received a detailed survey for discrete radioactive particles (WDOH 1996).
11 Randomly placed surveys have been conducted, but the deposition of cobalt-60 particles by the
12 Columbia River may not be a random process, and use of a random sampling pattern may actually
13 underestimate the concentration of cobalt-60 particles in the Columbia River shoreline.
14

15 Due to shielding by soil, water, vegetation, and air (as well as the motion of the detector),
16 aerial gamma-ray surveys lack the sensitivity and resolution required to aid in the determination of
17 concentration of cobalt-60 particles. The non-random distribution of the cobalt-60 particles into
18 discrete areas and the presence of water within the detector's "field of view" (Sula 1980) further
19 reduces the utility of aerial gamma-ray surveys in determining the potential for cobalt-60 particles.
20

21 **4.11.3 Soil Contamination**

22
23 The 100 Areas include nine retired plutonium production reactors, effluent lines from each
24 reactor complex, 33 surplus facilities, more than 200 WIDS database past-practice waste sites,
25 and six TSD units. Extensive contamination exists in some areas of surface soils, subsurface
26 soils, and groundwater (EPA 1995a). Strontium-90, tritium, nitrate, and chromium are detected at
27 many of the 100 Area operable units.
28

29 The Central Plateau has been used for fuel reprocessing, waste management, and disposal
30 activities and is the most extensively contaminated area at the Hanford Site. More than 400 WIDS
31 database past-practice waste sites, 13 TSD units, and numerous groundwater contaminant
32 plumes occur in the 200 Areas. This area is the site of the Hanford Central Waste Complex and
33 the Tank Waste Remediation System facilities, which support present and future Hanford waste
34 management activities (EPA 1995a). There have been known releases from the Central Waste
35 Complex to the soil column. Contaminants include extensive groundwater plumes of
36 technetium-99, iodine-129, nitrate, tritium, uranium-238, and chlorinated hydrocarbons (e.g., carbon
37 tetrachloride, chloroform, and trichloroethylene). Carbon tetrachloride in particular poses a
38 complex remediation problem; it is estimated that about 580 to 920 metric tons (640 to 1,014 tons)
39 of carbon tetrachloride have been disposed to the vadose zone where it exists in a vapor phase
40 above the water table, a liquid phase above and below the water table, and as a solute within the
41 water.
42

43 The 600 Area presents a diverse range of existing contamination. Parts of the 600 Area
44 vadose zone are essentially uncontaminated, while nearby operating areas, such as the 300 Area,
45 present significant environmental remediation challenges. Several small, isolated surface waste
46 sites have been remediated as expedited response actions under the *Comprehensive*
47 *Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). Extensive
48 groundwater contamination (i.e., nitrate, tritium, technetium-99, and iodine-129) occurs in the 600
49 Area.
50

51 Although some information on soil contamination is available, DOE recognizes that a
52 comprehensive and integrated vadose zone characterization effort is needed at the Hanford Site to
53 adequately assess risk during waste retrieval and treatment activities, and eventual closure of the
54 200 Area tank farms. Therefore, in April 1996, DOE brought together Hanford's Vadose Zone
55 Expert Panel, comprised on representatives from state government, national laboratories, and the
56 private sector. The Panel was convened primarily to assess how cesium-137 reached depths of

39 m (130 ft) in the vadose zone under the SX tank farm. An integrated vadose zone program plan for the entire Hanford Site is under development (DOE-RL 1998). This project will account for the entire waste inventory on the Hanford Site. Better understanding of vadose zone transport mechanisms may require land-use restrictions where soil contamination is left at depth after remediation.

4.11.4 Hanford Site Protective Safety Buffer Zones

Existing and planned waste disposal sites, waste processing facilities, and hazardous or radiological materials storage facilities are found throughout the Hanford Site. To protect the public from routine or accidental releases of radiological contaminants and/or hazardous materials, protective measures for waste remediation, processing, and disposal facilities are required by DOE Order 420.1 Facility Safety, DOE Order 151.1, *Comprehensive Emergency Management System* (DOE 1996f), and Occupational Safety and Health Administration (OSHA) regulations 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response (Site Safety and Control Plan)," 29 CFR 1910.119, "Process Safety Management (PSM) Rule" the PSM complement, EPA's Risk Management Planning (RMP) under the Clean Air Act, 40 CFR 68.10(a), and WAC 246-247. These buffer zones limit public exposure to radiological and hazardous chemicals from routine operations and accidents. A methodology that used the air dispersion model GXQ with 95-percent meteorological conditions based on the Nuclear Regulatory Commission's Regulatory Guide 1.145 was developed to determine the location, size, shape, and characteristics of the buffer zones needed for the Hanford Site, using existing safety analysis reports, hazard assessments, and emergency planning zone studies. This methodology allows decision makers to restrict potential land uses in areas where hazardous or radioactive material handling could pose an unacceptable risk to human health. Actual DOE facility siting decisions would be made with site-specific wind data at 99.5-percent meteorological conditions.

Buffer zones necessary to protect human health and safety in potential accidents are divided into two main components — an inner exclusive-use zone (EUZ) and an emergency planning zone (EPZ).

- c DOE Orders 420.1 and 5480.23, along with the guidance document DOE-ST-3009, require that a hazard analysis be developed as the basis for a conclusion that off-site personnel are sufficiently protected from accidents at a nuclear facility. That conclusion is to be reached through analysis showing that the estimated individual dose off-site from any design basis accident or evaluation basis accident would be less than some guideline amount. No guideline value has been issued by DOE, but a value of 25 rem committed effective dose equivalent (CEDE) is frequently used by DOE's contractors in the absence of a specified value (DNFSB/TECH-20). The EUZ is an area designated for operation activities associated with a waste site or facility. In DOE O 420.1, Section 4.1.1.2, *Design Requirements*, each DOE nuclear facility is required to "be sited and designed in such a manner that gives adequate protection for the health and safety of the public and for workers, including those at adjacent facilities, from the effects of potential facility accidents involving the release of radioactive materials (DOE Order 420.1)."

Hanford contractors have interpreted this requirement as to maintain a public buffer zone where 25 rem would not be exceeded in the event of an unmitigated low probability accident (10^{-4} to 10^{-6}), where 5 rem would not be exceeded in the event of an unmitigated medium probability accident (10^{-2} to 10^{-4}), or where 0.5 rem would not be exceeded in the event of an unmitigated high probability accident (10^{-2} to 1) (WHC-85M00-JCVK-95008). The EUZ is reserved for DOE or other hazardous operations with severely restricted public access. This zone extends from the facility fence line to a distance at which threats to the public from routine and accidental releases diminish to the point where public access can be routinely allowed while ensuring the intent of DOE O 420.1 is achieved. The EUZ is located inside the EPZ.

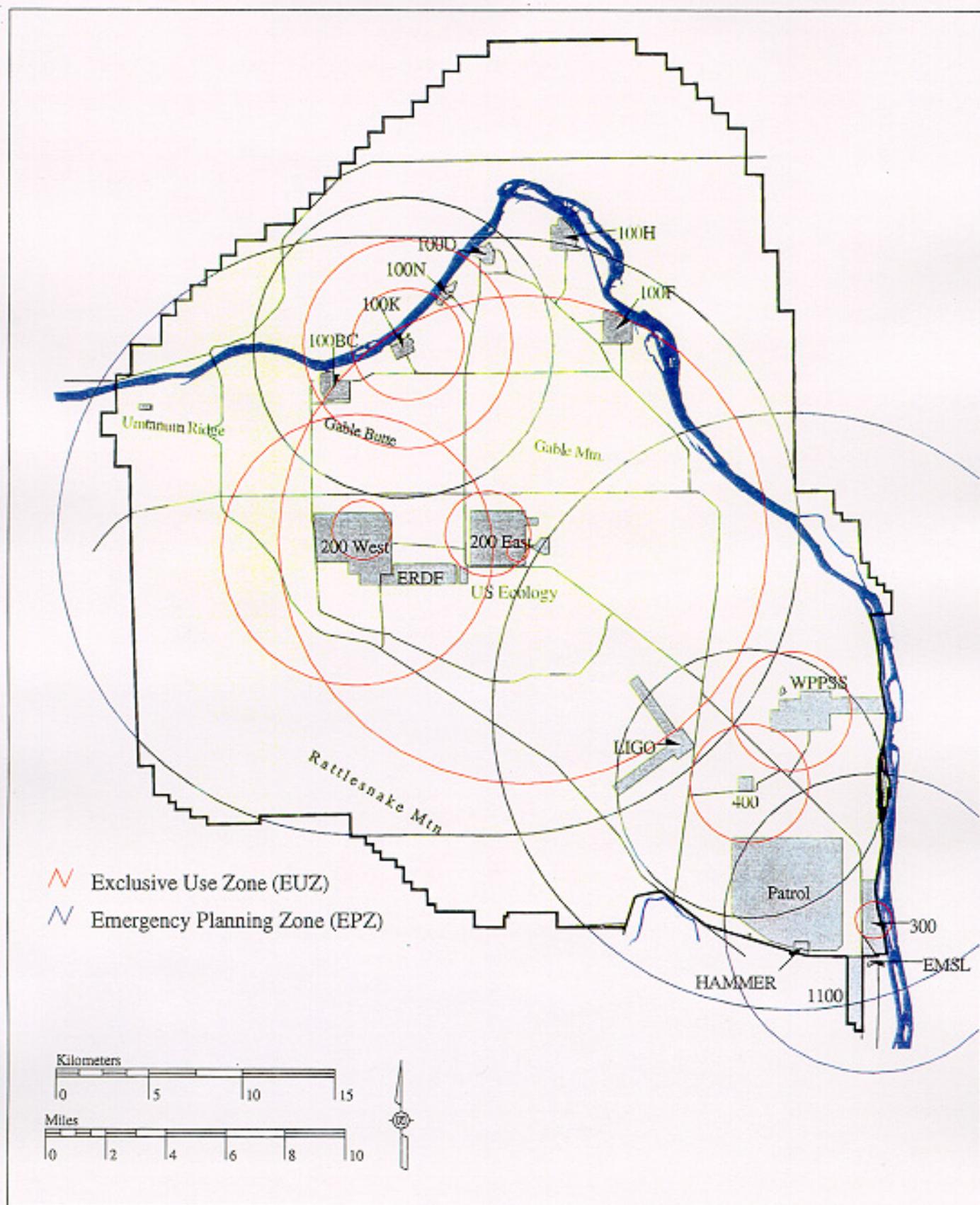
1 C The EPZ is an area surrounding a facility for which emergency planning and preparedness
2 efforts are carried out per DOE's *Comprehensive Emergency Management System*
3 *Order* (DOE Order 151.1) to ensure that prompt and effective actions can be taken to
4 minimize the impact to onsite personnel, public health and safety, and the environment in
5 the event of an operational emergency. The EPZ begins at the boundary of the facility and
6 ends at a distance for which special planning and preparedness efforts are no longer
7 required. Access restrictions are not required within an EPZ; however, DOE would be
8 responsible for ensuring adequate planning and preparedness efforts.
9

10 The protective buffer zones for the Hanford Site (Figure 4-40) were established using
11 boundaries calculated for individual limiting facilities (i.e., facilities with accidents of maximum
12 potential public health impact). Accidents initiated by sabotage are not applicable to EPZs.
13 Information about the limiting facilities, controlling contaminants, and credible accidents is
14 presented in Table 4-15.
15

16
17 In addition to the known risks (e.g., K-Basins could have the fuel elements removed in about
18 six years), RODs for the Hanford Site burial grounds are upcoming. It is very difficult to adequately
19 characterize heterogenous burial grounds created over 40 years ago (e.g., in a surprise to
20 everyone, the 618-4 burial ground had 1500 barrels of uranium fines packed in mineral oil). In the
21 spirit of DOE O 420.1's defense in depth policy, it is prudent for DOE to reserve land for operational
22 safety and/or remediation/stewardship buffer zones until the known risks and the unknown risks are
23 dispositioned. The boundaries provide a conservative buffer zone based on risk and consequence
24 management that is expected to be sufficient to address protective zone needs for the multiple
25 facilities present in each area on the Hanford Site. As the cleanup mission progresses, the extent
26 of these EUZ's is expected to shrink in size and eventually migrate inward to the Central Plateau.
27 This expectation is reflected in section 6.3.1, *Overall Policy*, number 5, *Reduce exclusive use zone*
28 *(EUZ) areas to maximize the amount of land available for alternate uses while still protecting the*
29 *public from inherently hazardous operations.*
30

31 In an effort to consider non-Hanford protective buffer zone requirements that could be
32 affected by Hanford Site public access and land-use decisions, the emergency preparedness
33 needs of Energy Northwest (formerly WPPSS) were considered. Under U.S. Nuclear Regulatory
34 Commission procedures, the Energy Northwest WNP-2 Reactor requires a 16-km (10-mi) EPZ
35 and a 1.9-km (1.2-mi) EUZ.

Figure 4-40. Protective Safety Buffer Zones.



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1 **Table 4-15. Protective Safety Buffer Zones (Exclusive Use Zones and Emergency**
 2 **Planning Zones).**

3	Limiting Facility	Coordinates WASP-X	Coordinates WASP-Y	EUZ Boundary (m)	Credible Accident	Controlling Contaminant	EPZ Boundary (m)	Limiting Accident	Controlling Contaminant
5	100-K Area								
6	K-Basin	569184.3	146717	3,000	Chlorine cylinder valve failure	Cl	8,100	Sabotage	Cl, Pu, Cs-137
7				5,600	Fuel processing for dry storage	Cs-137			Sr-90, Am-241
8	200 West Area								
9	PFP	566474.3	135652.7	7,300	Seismic event with ventilation	Pu	16,100	Waste tank sabotage and PFP seismic accident	Pu, Am-241
10	Tank Farms	566777	136734.1	1,600	Single-shell tank hydrogen deflagration	Cs-137	16,100	Waste tank sabotage and PFP seismic accident	Pu, Am-241
11	200 East Area								
12	B	573504.9	136548.1	2,300	Cross-contamination from K-3 to K-1 filter banks	Sr-90, Cs-137	16,100	Waste tank sabotage	Pu, Am-241
13	Plant/WESF								
14	Tank Farms	575422.2	136203.9	13,150	Double-shell tank filter blowout	Cs-137	16,100	Waste tank sabotage	Pu, Am-241
15	Limiting	575118.1	135636.9	600	Earthquake	Am-241	16,100	Waste tank sabotage	Pu, Am-241
16	Proposed								
17	Facility -								
18	Tank								
19	Waste								
20	Vitrification								
21	Plant								

Table 4-15. Protective Safety Buffer Zones (Exclusive Use Zones and Emergency Planning Zones).

Limiting Facility	Coordinates WASP-X	Coordinates WASP-Y	EUZ Boundary (m)	Credible Accident	Controlling Contaminant	EPZ Boundary (m)	Limiting Accident	Controlling Contaminant
300 Area								
324 Bldg. B-Cell	594247.4	115784.7	1,000	Earthquake 324 Bldg. w/o B-cell upset	Sr-90		(315 Bldg. accident dominates)	
315 Bldg.	594480.3	115761.7		(324 Bldg. accident dominates)		8,100	1,920 lbs. chlorine incident in the 315 Bldg.	Cl
400 Area								
FFTF	587604.9	123117.5	3,200	Sodium Storage Safety Class 2	Sodium hydroxide	7,300	Sodium sabotage	Sodium hydroxide

^{7 a} If K Basin fuel is not stable enough to move to the 200 Area before processing for dry storage, this larger EUZ may be needed.

^{8 b} The 324 B-cell accident dominated the credible ($>10^{-6}$ probability) accident calculations for the 300 Area EUZ; the 315 Building chlorine accident dominated the incredible ($<10^{-6}$ probability) accident calculations for the 300 Area EPZ.

¹⁰ EPZ = emergency planning zone

¹¹ EUZ = exclusive use zone

¹² FFTF = Fast Flux Test Facility

¹³ PFP = Plutonium Finishing Plant

¹⁴ WESF = Waste Encapsulation and Storage Facility

15

16 Within portions of the EUZ, certain types of public access would be restricted, while other
 17 types of public access within that same area might be acceptable. Six different types of public
 18 access have been defined for the EUZ (WHC 85M00-JCVK-95008). These types of access are
 19 presented below:

20

21 C **Very Limited Access** -- Very limited access, such as passing through on transportation
 22 corridors. Special arrangements would be required to leave the designated access
 23 point. The evacuation time for this type of access would be no more than 30 minutes.
 24 The maximum amount of time the maximally exposed individual (MEI)¹ would spend in
 25 this area is estimated to be about 100 hr/yr.

26

27 C **Restricted Routine Access** -- This type of access area would include activities such
 28 as industrial and commercial usage of a specifically designated area. It could also
 29 include short special interest uses, such as short nature trails. All users of the area
 30 must have ready access to transportation to facilitate a rapid evacuation. Evacuation
 31 time for this type of access would be no more than 1 hour. The maximum amount of
 32 time the MEI would spend in this area is estimated to be about 3,000 hr/yr.

33

34 C **Restricted Short-Term Access** -- This type of access may include locations adjacent
 35 to transportation corridors. Public access might involve short stops to view sights or
 36 engage in short duration activities. Access to areas more than 0.4 km (0.25 mi) from a

¹ The maximally exposed individual (MEI) is defined as a hypothetical person who lives near the Hanford Site, who, by virtue of location and living habits, could receive the highest possible dose.

1 designated access point would be prohibited. The evacuation time for this type of
2 access would be no more than 1.5 hours. The maximum amount of time the MEI would
3 spend in this area is estimated to be about 200 hr/yr.
4

5 C **Moderately Restricted Periodic Access** -- This type of access would allow for
6 periodic activities, such as limited agricultural activities. Public access to this area
7 would tend to be more periodic and seasonal. No permanent residences, schools, or
8 hospitals would be allowed. The evacuation time for this type of access would be no
9 more than 2 hours. The maximum amount of time the MEI would spend in this area is
10 estimated to be about 3,000 hr/yr.
11

12 C **Moderately Restricted Occasional Access** -- This type of access area would allow for
13 more diverse activities for a longer, but controlled, periods of time than those defined for
14 the Moderately Restricted Periodic Access areas. For example, overnight stays for
15 short periods would be allowed. The evacuation time for this type of access would be
16 no more than 2.5 hours. The maximum amount of time the MEI would spend in this
17 area is estimated to be about 1,000 hr/yr.
18

19 C **Moderately Restricted Access** -- This type of access requires only minimal access
20 restrictions to ensure timely evacuation. This type of access would consider limited
21 residential-type usage of the area and could accommodate small schools and
22 commercial businesses. The evacuation time for this type of access would be
23 2.5 hours. The maximum amount of time the MEI would spend in this area is estimated
24 to be about 8,700 hr/yr.
25

26 In addition to DOE's desire for land to isolate from the public hazardous processes and |
27 facilities that could produce a 25 rem radiological dose under an accident condition, the current
28 Hanford Site boundary has been used to identify and design safety class systems, structures and
29 components that are required to keep an accident from exceeding 500 mrem at the Site
30 boundary. The current Site boundary is also the point-of-compliance for protection of the public to
31 assure that routine releases from all DOE activities are less than 100 mrem (DOE Order
32 5400.5), and that not more than 10 mrem is from airborne sources (40 CFR 61) or that not more
33 than 4 mrem are from groundwater sources (40 CFR 141). In addition to radiological accident
34 conditions, DOE also uses the current Hanford Site boundary to protect the public from potential
35 hazardous chemical accidents such as a chlorine gas leak. If the CLUP policies and
36 implementing procedures on EUZs are adopted in the ROD, then DOE expects to use DOE's
37 annual review of safety and environmental permitting documentation to be the basis for
38 implementing the EUZ policies (see Chapter 6).
39
40

5.0 Environmental Consequences

This chapter describes the potential environmental consequences associated with the future land-use alternatives (including the No-Action Alternative) discussed in Chapter 3. These analyses focus on the environmental resource categories described in Chapter 4, “Affected Environment.”

5.1 Analysis Approach

The alternatives developed by U.S. Department of Energy (DOE) and the cooperating agencies and consulting Tribal governments would allow a range of uses for Hanford Site lands. These land uses would have impacts to natural and cultural resources and could affect the socioeconomic environment in the region surrounding the Hanford Site. The potential environmental impacts of each land use would depend on the nature of the use, its location with respect to the resources, and the amount of land affected by the land use. Because the location and scale of specific future uses (e.g., a sand and gravel quarry or a metal fabrication plant) cannot be readily predicted, the impacts of these uses on specific resources cannot be accurately quantified. As described in Chapter 6, impacts of specific projects would be analyzed under the *National Environmental Policy Act of 1969* (NEPA); NEPA-integrated *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) and *Resource Conservation and Recovery Act of 1976* (RCRA) documentation; and, where applicable, local *State Environmental Policy Act of 1971* (SEPA) processes as part of the implementation of the Hanford Comprehensive Land-Use Plan (CLUP).

Question #18 of the Council on Environmental Quality’s (CEQ) “40 Most Asked Questions” (46 FR 18026) provides guidance regarding the uncertain effects of future actions (see text box, “*CEQ’s 40 Most Asked Questions: Uncertainties About Future Actions*”). The analysis in this chapter was based on the CEQ guidance and focuses on identifying and describing the impacts of reasonably foreseeable future uses in light of land-use trends in the Hanford region. For some land uses, information was readily available on possible development plans. For example, the Wahluke 2000 Plan provided information on proposed agricultural development of the Wahluke Slope (Wahluke 2000 Committee 1992), and DOE’s 1996 Strategic Plan (DOE-RL 1996b) provided information on proposed DOE development. For other uses, assumptions could be made on the basis of data available for trends in the region (e.g., industrial development in the Tri-Cities).

Although the analysis in this chapter is necessarily more qualitative than quantitative, it has been designed to provide adequate information to support the decisions to be made and to allow for meaningful comparison of the alternatives. The following sections describe the methods used to identify, describe, and compare the impacts of the alternatives.

CEQ’s 40 Most Asked Questions: Uncertainties About Future Actions

18.Q. How should uncertainties about indirect effects of a proposal be addressed, for example, in case of disposal of Federal lands, when the identity or plans of future landowners is unknown?

A. The EIS must identify all the indirect effects that are known and make a good faith effort to explain the effects that are not known but are “reasonably foreseeable” Section 1508.8(b). In the example, if there is total uncertainty about the identity of future land owners or the nature of future land uses, then of course, the agency is not required to engage in speculation or contemplation about their future plans. But, in the ordinary course of business, people do make judgments based upon reasonably foreseeable occurrences. It will often be possible to consider the likely purchasers and the development trends in that area or similar areas in recent years; or the likelihood that the land will be used for an energy project, shopping center, subdivision, farm, or factory. The agency has the responsibility to make an informed judgment, and to estimate future impacts on that basis, especially if trends are ascertainable or potential purchasers have made themselves known. The agency cannot ignore these uncertain but probable effects of its decisions.

5.1.1 Geographic Information System Analysis

A geographic information system (GIS) was used to organize the environmental data and identify and quantify the resources potentially affected under each alternative. The following source documents were used to obtain this data.

- C Draft *Hanford Site Biological Resources Management Plan* (BRMaP) (DOE-RL 1996c) for biological elements including salmonid spawning areas; hawk and eagle nesting, perching, and roosting sites; floodplains; wetlands; and plant communities of concern (BRMaP Levels I, II, III, and IV)
- C Waste Information Data System (WIDS)
- C Hanford Geographic Information System (HGIS)
- C Draft *Hanford Cultural Resources Management Plan* (CRMP) (DOE RL 1999) for cultural resources, including pre-contact and post-contact sites
- C *Site Evaluation Report for Candidate Basalt Quarry Sites* (BHI 1995c) for geologic resources (analysis of basalt outcrops only)
- C *Hanford Site Groundwater Monitoring for Fiscal Year 1997* (PNNL 1997b)
- C *Hanford Site Development Plan* (DOE-RL 1994a) and other area development plans (DOE-RL 1990a, and DOE-RL 1991a) for Site infrastructure, including buildings, roads, and utilities
- C *Hanford Site Environmental Report* (PNNL 1997a).

The GIS system includes spatial data on the distribution of resources, habitats, and infrastructure and allows these elements to be mapped and quantified. The GIS system was also used to quantify the land areas under each land-use designation for each alternative. The land areas, in hectares, acres, square miles, and percent of total acreage, are presented in Table 3-3. By combining the data sets for the resource elements listed above and the land areas for each land-use designation, the amount of each resource element that could potentially be affected under a given land-use designation was quantified. The GIS data tabulated for BRMaP Levels II, III, and IV resources are further discussed in Section 5.2.3.

The GIS analysis has limitations for determining the impacts to a resource from future land uses. For example, although approximately 16,833 hectares (ha) (41,595 acres [ac]) of BRMaP Level III habitat fall under the Conservation (Mining) land-use designation under the Preferred Alternative, it cannot be assumed that all of this habitat would be impacted by mining. Future mining operations under this alternative could impact BRMaP Level III habitat, but the size of the impact area cannot be quantified at this time. What can be determined at this time is (1) those areas designated for Preservation would not be disturbed by mining in the future, and (2) the mineral resources that are there are committed for Preservation.

5.1.2 Identification of Key Resources, Unique Features, and Species and Habitats of Concern

The analysis of the alternatives was focused on resource elements that were identified as important to DOE, the cooperating agencies, affected Tribal governments, and members of the public. These elements were identified through public scoping, comments on the August 1996 *Draft Hanford Remedial Action Environmental Impact Statement and Comprehensive Land Use Plan* (HRA-EIS) (DOE 1996), and discussions with representatives of cooperating agencies and

1 American Indian Tribes. Generally, the resource elements can be categorized as follows:

- 2
- 3 C **Key resources**, including surface water (e.g., the Columbia River), groundwater,
4 economically viable geologic resources, and industrial infrastructure
- 5
- 6 C **Unique features**, including the White Bluffs, basalt outcrops, active and stabilized
7 sand dunes and bergmounds and ripple marks created by the cataclysmic
8 Pleistocene Missoula Floods, viewing locations, viewsheds, archaeological and
9 historic sites, and areas of cultural and religious importance to American Indian Tribes
- 10
- 11 C **Species and habitats of concern**, including plant communities of concern, wildlife
12 and wildlife habitat, aquatic species and habitat, wetlands, and biodiversity.
- 13

14 Plant communities of concern were identified using the classifications from BRMaP.
15 These classifications associate different management actions (i.e., monitoring, impact
16 assessment, mitigation, and preservation) with particular sets of biological resources. The
17 BRMaP classifies Hanford Site biological resources into four levels of management concern
18 (Figure 4-27), which can be summarized as follows:

- 19
- 20 C **Level I** biological resources are resources that require some level of status
21 monitoring because of the recreational, commercial, or ecological role or previous
22 protection status of the resources. Level I includes Washington State "Monitor 3"
23 species (DOE-RL 1996c).
- 24
- 25 C **Level II** biological resources require consideration of potential adverse impacts from
26 planned or unplanned Hanford Site actions for compliance with procedural and
27 substantive laws such as NEPA, CERCLA, and the *Migratory Bird Treaty Act of 1918*.
28 Mitigation of potential impacts by avoidance and/or minimization is appropriate for this
29 level; however, additional mitigation actions are not required. Level II resources
30 include Washington State Monitor 1 and 2 species and early successional habitats.
- 31
- 32 C **Level III** biological resources require mitigation because the resource is listed by the
33 State of Washington; is a candidate for Federal or state listing; is a plant, fish, or
34 wildlife species with unique or significant value; has a special administrative
35 designation (e.g., the Fitzner/Eberhardt Arid Lands Ecology Reserve [ALE Reserve]);
36 or is environmentally sensitive. When avoidance and minimization are not possible, or
37 application of these measures still results in adverse residual impacts above a
38 specified threshold value, mitigation by rectification and/or compensation is required.
39 Maintenance of Level III resource values may prevent more restrictive and costly
40 management prescriptions in the future. Level III resources include Washington State
41 candidate and sensitive species, threatened and endangered species, Federal
42 candidate species, wetlands and deep-water habitats, and late-successional habitats.
- 43
- 44 C **Level IV** biological resources justify preservation as the primary management option
45 because these resources are federally protected or have regional and national
46 significance. The plant communities and habitats that are defined as belonging to this
47 level are of such high quality and/or rarity that damages to these resources cannot be
48 mitigated except through compensatory mitigation by acquiring and protecting in-kind
49 resources. The legally protected species that are included in Level IV cannot be
50 impacted without the concurrence of the U.S. Fish and Wildlife Service (USFWS) or
51 the National Marine Fisheries Service so these types of impacts do not jeopardize the
52 continued existence of the species. Level IV resources include Federal threatened
53 and endangered species and those species proposed for listing, rare habitats such as
54 the White Bluffs, active and stabilized sand dunes, and basalt outcrops.

1 The analysis of impacts to biological resources included an evaluation of effects on
2 BRMaP Levels II, III, and IV plant communities.

3 4 **5.1.3 Description of Impacting Activities**

5
6 The nine land-use designations used to develop the alternatives discussed in Chapter 3
7 are each unique in defining allowable future uses. However, impacts to resources would be
8 similar for several land-use designations. For example, the Industrial, Industrial-Exclusive,
9 Research and Development, and High-Intensity Recreation land-use designations would each
10 involve siting and construction of facilities with surface disturbance, increased traffic, and other
11 similar impacts. Therefore, to simplify the analysis, the possible impacts under the nine land-use
12 designations were organized into five impacting activities, defined as follows:

- 13
14 C **Mining**, including removal of vegetation, surface and subsurface disturbance,
15 changes in groundwater hydrology, and increased dust and noise generation under
16 the Conservation (Mining) and Conservation (Mining and Grazing) land-use
17 designations
- 18
19 C **Livestock grazing**, including changes to vegetation cover and plant species
20 composition under the Conservation (Mining and Grazing) land-use designation
- 21
22 C **Cultivated agriculture**, including removal of vegetation, surface disturbance (e.g.,
23 soil tillage), use of agricultural chemicals, increased water usage, changes to
24 groundwater hydrology, and increased dust and noise generation under the Agriculture
25 land-use designation
- 26
27 C **Development**, including removal of vegetation, surface disturbance, construction and
28 operation of facilities, increased traffic, increased dust and noise generation,
29 increased water usage, and changes in groundwater hydrology under the Industrial,
30 Industrial-Exclusive, Research and Development, and High-Intensity Recreation land-
31 use designations
- 32
33 C **Recreation**, including increased traffic and increased fishing, hunting, boating,
34 bicycling, hiking, and picnicking, under the Low-Intensity Recreation, Conservation
35 (Mining and Grazing), Conservation (Mining), and Preservation land-use designations.
36

37 These five impacting activities were used in the analysis to identify and describe, in
38 general terms, the potential impacts to resource elements under each land-use designation.

39 40 **5.1.4 Consideration of the Comprehensive Land-Use Plan Policies** 41 **and Implementing Procedures**

42
43 With the exception of the No-Action Alternative, impacts to resources from the activities
44 described above likely would be mitigated through the application of the CLUP policies and
45 implementing procedures described in Chapter 6. For example, a Use Request involving a
46 proposed sand and gravel quarry in an area designated for Conservation (Mining) would be
47 subject to review as described in Section 6.4. After completing the review, DOE may deny the
48 request or issue a conditional use permit with project modifications to avoid protected resources
49 or to mitigate damages to those resources. For the purpose of this analysis, the impacts of the
50 alternatives are compared without consideration of the possible mitigating effects of the CLUP
51 policies and implementing procedures discussed in Chapter 6. This approach allows for clearer
52 comparisons of the potential impacts from each alternative and does not take credit for policies
53 and implementing procedures that are actually part of the alternatives (except the No-Action
54 Alternative) and not fully developed or in place. The CLUP policies and implementing procedures

1 are discussed along with other possible mitigation measures under each resource section.

2 3 **5.1.5 Identification of Impacted Resources**

4
5 The potential environmental impacts of proposed land-use designations under each
6 alternative were evaluated by comparing the locations of impacting activities under each
7 alternative to the locations of key resources, unique features, and species and habitats of
8 concern on the Hanford Site. This enabled the generation of tables showing which resource
9 elements would be affected by impacting activities under each alternative. Tables found in
10 Section 5.2 provide an overview of the potential environmental consequences of each alternative
11 and allow for simple comparisons of the alternatives. The identification of the affected resource
12 elements provides a focus for the discussion of impacts under each alternative.
13

14 **5.1.6 Methods and Assumptions for Estimating Socioeconomic Impacts**

15
16 The possible socioeconomic impacts of each alternative were analyzed by focusing on
17 the possible opportunities for economic development posed by each alternative. This approach
18 provides for meaningful comparison of the alternatives without attempting to predict specific
19 impacts, such as changes in demand for housing, schools, or other services. These types of
20 impacts are best assessed on a project-by-project basis, through the appropriate local planning
21 processes.
22

23 The study area for this analysis was limited to Benton, Franklin, and Grant counties,
24 including the cities of Kennewick, Pasco, Richland (the Tri-Cities), and West Richland which are
25 most likely to be affected by land-use changes. The assumptions used for and the general
26 socioeconomic effects of each land-use designation are discussed below.
27

28 **5.1.6.1 Industrial.** The potential socioeconomic impacts of the Industrial land-use designation
29 were evaluated by comparing the amount of land available for industrial use under each
30 alternative to the estimated land needs for future industrial development. The land needs for
31 future private industrial development were estimated by the Benton County Planning Department
32 by correlating industrial land needs with projected population growth (BCPD 1997). For the
33 purpose of this analysis, it was assumed that future industrial land needs would be met using
34 lands on the Hanford Site and not other lands in the study area that are currently zoned for
35 industrial use.
36

37 Assumptions are that annual population growth in the study area would continue at a rate
38 of 2 percent during the 50-year planning period. This growth rate was extrapolated from the
39 Washington State Office of Financial Management “medium series” population projections for
40 Benton County for the period between the years 2010 and 2020. This growth rate corresponds to
41 a population increase of approximately 193,000 for Richland, West Richland, Kennewick, and
42 Pasco. Using a factor of 6 ha (15 ac) per 1,000 population, the Benton County Planning
43 Department estimated that approximately 1,200 ha (3,000 ac) would be needed for industrial
44 development to support the population growth. This estimate was increased to 1,620 ha
45 (4,050 ac) to account for interior roads, railroads, and utility corridors needed to support the
46 industries. The amount of land designated for industrial use under each alternative was
47 compared to the estimated need for 1,620 ha (4,050 ac).
48

49 The amount of land under the Industrial land-use designation for each alternative was
50 correlated with potential employment levels using data on Tri-Cities industrial development
51 compiled by the Benton County Planning Department. Possible levels of employment, expressed
52 as ranges, were determined for each alternative using data on the percentage of lands under
53 industrial zoning designations that are currently developed, and scaling factors similar to those
54 described in Section 5.1.5.4 for the Research and Development land-use designation. The
55 ranges of predicted employment levels used were less than 100 employees, 100 to 1,000

1 employees, and over 1,000 employees.

2
3 Because DOE has a continuing mission at the Hanford Site and because Site lands are
4 under Federal ownership, the potential for future federally sponsored industrial projects also must
5 be considered. These projects may include DOE activities for current or future missions, DOE-
6 sponsored privatization efforts, interagency training facilities such as the Hazardous Materials
7 Management and Emergency Response Facility (HAMMER) Training and Education Center, or
8 projects sponsored by other agencies. Because the land needs for future Federal projects are
9 not currently known, the alternatives cannot be evaluated to determine whether they would meet
10 these needs. Therefore, the alternatives are evaluated and compared based on the amount of
11 land available to support DOE's mission or for other federally sponsored industrial development,
12 over and above the estimated need projected by the Benton County Planning Department for
13 private industrial development.

14
15 **5.1.6.2 Industrial-Exclusive.** The Industrial-Exclusive land-use designation applies to the
16 Central Plateau, where DOE would continue waste management activities. Although all the
17 alternatives being considered would accommodate current waste management activities, the
18 alternatives differ in the amount of acreage available for future waste management activities.
19 The extent to which these differences would affect future development and the resulting
20 economic impacts are discussed.

21
22 **5.1.6.3 Agricultural.** The impacts of the Agricultural land-use designation were evaluated based
23 on the increase in land available for agriculture use, as a percentage of total agricultural land in
24 Benton, Franklin, and Grant counties. The increase in land available was correlated to increased
25 sales of agricultural products. These correlations were made using data from the Census of
26 Agriculture (USDA-NASS 1992), and the Benton County Agricultural Extension Office (Watson
27 et al. 1991), and did not consider impacts on prices due to scales of economy or market share.

28
29 Although it is impossible to predict any commodity market over the next 50 years, the
30 markets for apples, potatoes, and wheat are currently soft. For example, an estimated
31 105 million 42-pound boxes of apples were picked in 1998, whereas in an average year, such as
32 1997, about 78 million boxes were picked. Currently there is a market for only 80 to 90 million
33 boxes, and Washington apple growers are faced with the option of leaving apples unpicked,
34 reducing orchards, or paying for increased marketing in an attempt to gain market share (TCH
35 1998a) (see Table 3-2).

36
37 Three scenarios for agricultural development on the Wahluke Slope were identified, as
38 follows:

- 39
40 C **Scenario 1** -- All lands under the Agricultural land-use designation, except those lands
41 in the Bureau of Reclamation's (BoR's) Red Zone, would be used to produce a mix of
42 crops similar to those currently produced in the three-county study area, and lands in
43 the Red Zone would be used for grazing.
- 44
45 C **Scenario 2** -- All lands under the Agricultural land-use designation, including those
46 lands in the Red Zone, would be used to produce a mix of crops similar to those
47 currently produced in the three-county study area.
- 48
49 C **Scenario 3** -- All lands under the Agricultural land-use designation, except those lands
50 in the Red Zone, would be used to produce specialty crops such as irrigated
51 vegetables and irrigated fruit orchards, and lands in the Red Zone would be used for
52 grazing.

53
54 **5.1.6.4 Research and Development.** The Research and Development land-use designation

1 involves the siting of large-scale facilities in clusters or campus-like developments. Other
2 research and development (R&D) facilities are similar to industrial development, such as the
3 facilities located in the 300 Area. These types of R&D facilities are compatible with industrial land
4 uses and are addressed in the Industrial land-use designation; however, in some cases, R&D
5 facilities may require large safety zones or may require separation from other facilities to
6 minimize noise, dust, or vibrational impacts. For these reasons, development on lands under the
7 Research and Development land-use designation is assumed to occur at a lower density than for
8 the Industrial land-use designation. Because R&D facilities often require large capital
9 investments and provide relatively high salaries compared to other industries, the economic
10 impacts could be significant.

11
12 The Research and Development land-use designation was evaluated by estimating
13 potential employment levels that could be supported by the research and development land base
14 under each alternative. This method, which was developed by the Benton County Planning
15 Department, involved correlating acreage available for research and development uses with
16 employment levels using data from existing research and development projects associated with
17 the Hanford Site. These data include total acreage for each project, total square footage of
18 facilities, and total number of employees (Table 5-1). The average square footage per employee
19 and the average facility area-to-land area ratio shown in Table 5-1 were used to estimate
20 employment levels that would be associated with the research and development land base under
21 each alternative. Because of the uncertainties associated with predicting levels of future use and
22 the wide ranges represented by the data shown in Table 5-1, predicted employment levels for
23 Research and Development were represented as ranges, rather than as point estimates. The
24 predicted employment levels under each alternative were predicted to fall within one of three
25 ranges: up to 100 research and development employees, 100 to 300 research and development
26 employees, and over 300 research and development employees.

27
28 **5.1.6.5 High-Intensity Recreation.** High-Intensity Recreation allows infrastructure development
29 such as potable water systems, septic systems, irrigation systems, paved parking lots, and
30 buildings to support the intended recreational or other seasonal activities. For the purposes of
31 impact analysis, the Benton County Planning Department High-Intensity Recreation assumptions
32 include establishment of the B Reactor Museum, a 27-hole golf course, and a destination resort
33 with a 350-room hotel and conference center and a recreational vehicle/trailer park at Vernita
34 Terrace, which is located near Vernita Bridge (BCPD 1997). The economic impacts of intensive
35 recreational use were estimated using available data for recreational visitor days at Vernita
36 Bridge, regional averages of recreational expenditures per visitor day, and data from golf courses
37 in the study area. These data and their sources are presented in Table 5-2.

38
39 In other alternatives, the High-Intensity Recreation land-use designation may also include
40 developed Tribal fishing sites. In the *Columbia River Treaty Access Fishing Sites Final Phase*
41 *Two Evaluation Report and Finding of No Significant Impact/Environmental Assessment* (USACE
42 1995), in-lieu fishing sites (i.e., in-lieu fishing sites are provided by the Federal government to
43 affected treaty Tribes “in-lieu” of their traditional sites that were covered by the Federal dam
44 reservoirs) ranged from 21.6 ha to 0.36 ha (53.4 ac to 0.9 ac) and included paved or gravel
45 parking lots, boat ramps, restrooms, drinking water, fish cleaning stations, net repair areas and
46 fish drying sheds, and storage sheds.

Table 5-1. Calculation of Ratios for Estimating Employment Under the Research and Development Land-Use Designation.

Facility	Facility Area m ² (ft ²)	No. of Employees	Facility Area per Employee m ² (ft ²)	Total Land Area ha (ac)	Facility Area to Land Area Ratio
Environmental Molecular Sciences Laboratory	17,995 (199,940)	230	78 (870)	8 (20)	1:4
Laser Interferometer Gravitational Wave Observatory	561,519 (6,239,099)	20	28,076 (311,955)	594 (1,486)	1:10
Waste Sampling and Characterization Facility	1,293 (14,375)	65	20 (221)	0.4 (1)	1:3
Fast Flux Test Facility	101,025 (1,122,500)	700	144 (1,604)	3,164 (7,909)	1:307
Superconducting Magnetic Energy Storage Facility ^a	19,602 (217,800)	30	653 (7,260)	19 (207)	1:41
Average			5,794 (64,382)		1:73

^a The Superconducting Magnetic Energy Storage Facility - Engineering Test Model is no longer being proposed for siting at the Hanford Site.

Table 5-2. Data Used to Estimate Recreational Impacts.

Data Category	Datum	Source
<i>Recreational Use on the Columbia River and Wahluke Slope</i>		
Total, Hanford Reach	50,000 visits per year	NPS 1994
Sport fishing	30,800 visits per year	
Other day use	19,200 visits per year	
Persons per vehicle	2.3	
<i>Recreational User Expenditures (per person)</i>		
Sport fishing	\$39.06 per day	DOE et al. 1994
Overnight (used for RV park guests)	\$35.38 per day	
Day use	\$10.19 per day	
<i>Golf Courses</i>		
Number of golfers	150 per day	Phone survey of Tri-Cities golf courses, May 1997
Season	365 days/yr	
Expenditures per golfer	\$25/day	

5.1.6.6 Low-Intensity Recreation. The Low-Intensity Recreation land-use designation would increase opportunities for recreational activities in the study area. The socioeconomic impacts of this land-use designation were evaluated using the data for sport fishing and day-use activities provided in Table 5-2. Low-Intensity Recreation allows little to no infrastructure development to

1 support the intended recreational activities.

2
3 **5.1.6.7 Conservation (Mining and Grazing) and Conservation (Mining).** Although the two
4 Conservation land-use designations are focused on habitat and resource conservation, limited
5 mining and commercial grazing, if permitted by DOE, would be allowed. The economic impact of
6 commercial grazing was evaluated by correlating the increased land available to the increase in
7 the number of cattle that could be supported over the current baseline. Conversion factors of
8 0.17 animal-unit-months (AUMs) per hectare (0.067 AUM/acre) and \$12/AUM (1998 dollars) were
9 used to estimate the economic impacts of grazing.

10
11 The economic effects of limited mining under the two Conservation land-use designations
12 were not quantitatively evaluated because of the speculative nature of developing mineral and
13 natural gas deposits and the lack of data on mining in the study area. The amount and location of
14 lands designated for Conservation uses under each alternative could indirectly affect remediation
15 costs by affecting the costs of obtaining geologic materials for constructing barriers over waste
16 sites. These cost impacts are discussed for each alternative.

17
18 **5.1.6.8 Preservation.** The Preservation land-use designation is reasoned to have little direct
19 impact, although indirect impacts may include improvements in the quality of life, new educational
20 and research opportunities, and benefits associated with ecotourism.

21 22 **5.1.7 Methodology for Evaluating Environmental Justice Impacts**

23
24 Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority*
25 *Populations and Low-Income Populations* (59 FR 7629), directs Federal agencies to consider
26 environmental justice during the NEPA process, and to incorporate environmental justice as part
27 of the agency mission. Federal agencies are specifically directed to identify and address
28 disproportionately high and adverse human health or environmental effects of programs, policies,
29 and activities on minority and low-income populations to the greatest extent practicable and
30 permitted by law.

31
32 **5.1.7.1 Definitions.** The following definitions were used to identify potential environmental
33 justice impacts.

- 34
35 C **Census block group:** An area defined for the purpose of monitoring census data that
36 generally consists of between 250 and 550 housing units.
- 37
38 C **Minority population:** A group of people and/or communities experiencing common
39 conditions of exposure or impact that consists of persons classified by the
40 U.S. Bureau of the Census as Negro/Black/African American, Hispanic, Asian and
41 Pacific Islander, American Indian, Eskimo, Aleut, and other non-White persons, based
42 on self-classification by the people according to the race with which they most closely
43 identify. For purposes of analysis, minority populations are defined as those census
44 tracts within the zone of impact where the percent minority population exceeds the
45 percentage minority population within the entire zone of impact. Census tracts where
46 the percent minority population exceeds 50 percent also are considered minority
47 populations. In the case of migrant or dispersed populations, a minority population
48 consists of a group that is greater than 50 percent minority.
- 49
50 C **Low-income community:** An area where the median household income is at least
51 80 percent or more below the median household income for the metropolitan
52 statistical area (urban) or county (rural). The 80 percent threshold was used based on
53 definitions used by the U.S. Department of Housing and Urban Development.
- 54

- 1 C **Population base:** Census tracts were included in the analysis if 50 percent of the
2 geographic area of the tract fell within the 80-kilometer (km) (50-mile [mi]) radius of
3 the Hanford Site.
4
5 C **Disproportionately high and adverse human health effects:** Adverse health
6 effects are measured in risks and rates that could result in latent cancer fatalities, as
7 well as other fatal or nonfatal impacts to human health. Disproportionately high and
8 adverse human health effects occur when the risk or rate for a minority population or
9 low-income population from exposure to an environmental hazard significantly
10 exceeds the risk or rate to the general population and, where available, to other
11 appropriate comparison groups.
12
13 C **Disproportionately high and adverse environmental impacts:** An adverse
14 environmental impact is an environmental impact determined to be unacceptable or
15 above generally accepted norms. A disproportionately high impact refers to an impact
16 (or risk of an impact) in a low-income or minority community that significantly exceeds
17 the impact on the larger community.
18

19 **5.1.7.2 Demographic Data.** Demographic information obtained from the U.S. Bureau of
20 Census was used to identify minority populations and low-income communities within an 80-km
21 (50-mi) radius surrounding the 200 East Area on the Hanford Site at the census block group level
22 (Neitzel et al. 1997). For the evaluation of environmental justice impacts, the area defined by this
23 80-km (50-mi) radius was considered the zone of potential impact.
24

25 Characterization of minority and low-income populations residing within a geographical
26 area is sensitive to the basic definitions and assumptions used to identify those populations.
27 Federal guidance on environmental justice with regard to the definition of an area that has a
28 minority or low-income population large enough to act as a test for a disproportionate impact has
29 not been developed. Consequently, the number of individuals identified as minority and/or
30 low-income individuals within the population around a particular site may vary from analysis to
31 analysis. Several different approaches to identification of minority and low-income populations
32 have been used in recent DOE environmental impact statements (EISs). The approach
33 presented in this Final HCP EIS is consistent with the approach used in the *Hanford Site National |*
34 *Environmental Policy Act (NEPA) Characterization* (Neitzel et al. 1997). Other demographic
35 studies may use different assumptions and, consequently, report a different total population,
36 minority population, or low-income population, depending on the assumptions used to identify
37 each population.
38
39

40 **5.2 Resource Impacts**

41
42 The CLUP would consist of three parts: land-use maps, policies, and implementing
43 procedures. Because of the mitigating influences of the policies and implementing procedures
44 presented in Chapters 3 and 6, relying solely on the land-use map designation to determine
45 impacts would be misleading. While the policies and implementing procedures in Chapter 6
46 provide a certain level of flexibility in Site development (e.g., Special Use Permits and Plan
47 Amendments), resources would be managed and protected through the application of the policies
48 and implementing procedures ensuring that future development would be orderly and reflective of
49 the policies and implementing procedures limitations.
50

51 **5.2.1 Geologic Resources**

52
53 The Hanford Site includes geologic resources that are unique or have economic value.
54 The unique features include the White Bluffs and basalt outcrops with their talus slopes, such as

1 Gable Mountain and Gable Butte; Missoula Floods features; and active and stabilized sand dunes,
2 which have aesthetic, historic, and ecological value or are valuable for scientific study. Many of
3 these features also have cultural resource value and are discussed in Section 5.2.4. Soils on the
4 Hanford Site can also be considered to have ecological value. Key geologic resources include
5 soil, sand and gravel, pea gravel, basalt, and natural gas deposits, which are needed to support
6 remedial activities or have economic value for future development. Geologic materials required
7 to support remediation at the Hanford Site are discussed further in Appendix D.
8

9 Impacts of the alternatives on unique geologic features on the Hanford Site are described
10 in the following sections and summarized in Table 5-3. Impacts of the alternatives on the
11 availability of key geologic resources are summarized in Table 5-4. The primary impacts to
12 unique geologic features would occur from mining under the Conservation land-use designations.
13 Development under the Industrial, Research and Development, and High-Intensity Recreation
14 land-use designations could also result in destruction of unique features. Grazing is not
15 anticipated to have impacts on these features, although overgrazing could result in increased
16 erosion of some features.
17

18 **5.2.1.1 No-Action Alternative.** Under the No-Action Alternative, unique geologic features could
19 be impacted by mining. Basalt outcrops could be developed as quarry sites for obtaining
20 geologic materials for remediation although the CRMP would require extensive consultation that
21 could result in stopping the proposed use. According to an engineering assessment (Appendix
22 D), Gable Mountain and Gable Butte represent the most economic and technically feasible basalt
23 sources available for remediation. In the absence of a land-use plan, features such as active and
24 stabilized sand dunes and Missoula Floods features could be impacted by commercial sand and
25 gravel operations. These features could also be impacted by industrial development. Soils on
26 the Hanford Site could be impacted by mining, grazing, and cultivated agriculture, which would
27 increase soil compaction and erosion. Industrial development in the southeast portion of the
28 Hanford Site would destroy dune stabilizing vegetation that could result in activation of sand
29 dunes.
30

31 The No-Action Alternative would permit the commercial development of geologic
32 resources on most of the Hanford Site, and would not restrict use of geologic resources needed
33 to support remediation activities. The current administrative designations for the Saddle Mountain
34 National Wildlife Refuge (NWR) and the Wahluke Slope do not preclude mining; in fact, some
35 mining is occurring on those lands. The administrative designation for the ALE Reserve also
36 would not preclude development of existing natural gas claims on the Reserve.
37

38 **5.2.1.2 Preferred Alternative.** Under the Preferred Alternative, unique geologic features,
39 including Gable Mountain and Gable Butte, the White Bluffs, and the active sand dunes would be
40 protected under the Preservation land-use designation. Missoula Floods features could be
41 impacted by sand and gravel operations. Mining could result in soil compaction and increased
42 erosion around quarry sites. Industrial development in the southeast portion of the Hanford Site
43 could destroy dune stabilizing vegetation that could result in activation of the sand dunes.
44

45 The Preferred Alternative would not exclude the commercial development of existing
46 natural gas claims on the ALE Reserve. However, the Preservation land-use designation for the
47 areas of the ALE Reserve surrounding those claims would preclude construction of an access
48 road to the claims, and could make future development costly.

Table 5-3. Potential Adverse Impacts of Land-Use Alternatives on Unique Geologic Features.

Alternative	Impacting Activity	Impacts to Unique Geologic Features (T = impact) ^a				
		Soils	Basalt Outcrops	White Bluffs	Missoula Floods Features	Sand Dunes
No-Action	Mining	T	T		T	T
	Livestock grazing	T				T
	Cultivated agriculture	T		T		
	Development				T	T
	Recreation					
Preferred Alternative	Mining	T			T	T
	Livestock grazing					
	Cultivated agriculture					
	Development					T
	Recreation					
Alternative One	Mining	T				T
	Livestock grazing					
	Cultivated agriculture					
	Development					T
	Recreation					
Alternative Two	Mining					
	Livestock grazing					
	Cultivated agriculture					
	Development					
	Recreation					
Alternative Three	Mining	T			T	T
	Livestock grazing	T				
	Cultivated agriculture	T		T		
	Development				T	T
	Recreation					
Alternative Four	Mining	T				T
	Livestock grazing					
	Cultivated agriculture					
	Development					T
	Recreation					

^a Checkmarks do not represent adverse impacts of comparable significance; refer to accompanying text for significance of impacts.

Table 5-4. Opportunities for Geologic Resource Development Under the Alternatives.

Alternative	Development of Geologic Resources Allowed (T = yes)				
	Soil	Basalt	Pea Gravel	Sand and Gravel	Natural Gas
No-Action	T	T	T	T	T ^a
Preferred Alternative	T ^b	T ^b	T	T ^b	T ^a
Alternative One	T ^b	T ^b		T ^b	T ^a
Alternative Two					T ^a
Alternative Three	T	T	T	T	T ^a
Alternative Four	T ^b	T ^b		T ^b	T ^a

^a Development of existing natural gas claims held by the Big Bend Alberta Mining Company could not be precluded under any alternative.

^b Under this alternative, basalt, sand, and gravel resources could be quarried to support governmental purposes, and could not be commercially developed.

Although basalt quarrying would not be permitted at Gable Mountain or Gable Butte, other viable sources, such as the below-grade ALE Reserve quarry (located along State Highway 240), could be developed to provide geologic materials for remediation and construction supporting future DOE missions and other governmental purposes. However, development of these sources could result in higher remediation costs than quarries at Gable Mountain or Gable Butte (see Appendix D). Geologic resources on approximately 30 percent (44,183 ha [109,179 ac]) of Hanford lands would be available for commercial development under the Preferred Alternative; however, those geologic features that have unique characteristics could be excluded from development by the permitting process.

5.2.1.3 Alternative One. Under Alternative One, unique geologic features, including Gable Mountain and Gable Butte, the White Bluffs, Missoula Floods features, the active sand dunes and most of the stabilized sand dunes, would be protected under the Preservation land-use designation. Mining of geologic materials to support remediation could increase soil compaction and erosion around quarry sites.

Alternative One would allow mining in areas around the Laser Interferometer Gravitational-Wave Observatory (LIGO) and the Fast Flux Test Facility (FFTF), and in other scattered locations in the 100 and 600 Areas. Mining would be allowed in these areas to support Hanford Site remediation activities, future DOE missions, and other uses. As with the Preferred Alternative, Alternative One would allow commercial development of the existing natural gas claims on the ALE Reserve, but Alternative One would not allow any other commercial development of geologic resources.

5.2.1.4 Alternative Two. Under Alternative Two, unique geologic features (including Gable Mountain and Gable Butte, White Bluffs, Missoula Floods features, and active and stabilized sand dunes) would be protected under the Preservation land-use designation. This land-use designation would also minimize soil erosion by maintaining the existing vegetation cover.

As with the Preferred Alternative, Alternative Two would allow commercial development of the existing natural gas claims on the ALE Reserve. Alternative two would preclude the development of any other geologic resources on the Hanford Site. Geologic resources required to support remediation activities would have to be obtained from locations off the Hanford Site, which could increase remediation costs (see Appendix D).

1 **5.2.1.5 Alternative Three.** Under Alternative Three, unique geologic features could be impacted
2 by mining. Basalt outcrops, including Gable Mountain and Gable Butte, could be developed as
3 quarry sites for obtaining geologic materials for remediation, future DOE missions and other
4 uses. Missoula Floods features and active and stabilized sand dunes could be impacted by sand
5 and gravel quarrying. These features could also be impacted by industrial development in the
6 southern and eastern portions of the Hanford Site. Industrial development in the southeast
7 portion of the Hanford Site would destroy dune stabilizing vegetation and may activate the sand
8 dunes. Mining and grazing under Alternative Three could result in soil compaction and increased
9 soil erosion. Cultivated agriculture under Alternative Three would increase soil erosion through
10 removal of the existing vegetation cover and tillage. Soil productivity could also decline with
11 intensive cropping.

12
13 Alternative Three could result in increased landslide activity at White Bluffs by allowing
14 agricultural development on the Wahluke Slope. Previous studies (discussed in the Hanford
15 Reach EIS [NPS 1994]) suggest that irrigation of crops east of the White Bluffs has raised the
16 local water table, saturating the sedimentary materials in the bluffs and increasing the instability of
17 slopes along the Columbia River. Previous landslides at the White Bluffs have resulted in
18 increased sediment loading to the Columbia River. New development of irrigated agriculture on
19 the Wahluke Slope could contribute additional groundwater to the area, increasing slope instability
20 and the potential for additional landslides.

21
22 Alternative Three would allow basalt quarrying, mining of sand and gravel and pea gravel
23 resources, and development of natural gas deposits on the ALE Reserve. The Conservation
24 land-use designation on the ALE Reserve would not preclude construction of an access road to
25 existing natural gas claims. Under Alternative Three, geologic resources on approximately
26 53 percent (195,612 ha [483,368 ac]) of Hanford lands would be available for commercial
27 development; however, those geologic features that have unique characteristics could be
28 excluded from development by the permitting process.

29
30 **5.2.1.6 Alternative Four.** Under Alternative Four, unique geologic features (including basalt
31 outcrops, the White Bluffs, Missoula Floods features, and active and stabilized sand dunes)
32 would be protected under the Preservation land-use designation. This land-use designation
33 would also minimize soil erosion, although some soil compaction and increased soil erosion
34 could occur as a result of mining geological materials for remediation. Industrial development in
35 the southeast portion of the Hanford Site would destroy dune stabilizing vegetation that could
36 result in activation of sand dunes

37
38 As with the Preferred Alternative, Alternative Four would allow commercial development of
39 the existing natural gas claims on the ALE Reserve. Alternative Four would not allow any other
40 commercial development of geologic resources. Mining would be limited to basalt and sand and
41 gravel quarries developed to support remediation activities at the Hanford Site. These quarries
42 would be located in the south-central portion of the Site, in the areas designated as Conservation
43 (Mining). Basalt quarrying would not be permitted at Gable Mountain or Gable Butte under this
44 alternative, but the ALE Reserve quarry located along State Route 240 could be developed to
45 provide geologic materials for remediation.

46
47 **5.2.1.7 Mitigation Measures.** Future development of and access to Hanford Site geologic
48 resources would require review under the CLUP policies and implementing procedures described
49 in Chapter 6. These procedures, which would be implemented under any of the alternatives
50 being considered except the No-Action Alternative, would require avoidance or minimization of the
51 impacts of mining or quarrying. Proposed mining or quarrying activities would be controlled
52 through the issuance of special-use permits to be consistent with the CLUP policies and

1 implementing procedures requiring the protection of natural and cultural resources. Other
2 mitigation measures that could reduce impacts to unique geologic features include the following:

- 3
- 4 C Researchers could be invited to make observations before and during excavation or
5 mining of unique features such as Missoula Floods features so the scientific value of
6 the features would not be lost.
- 7
- 8 C Efficient irrigation methods could be employed to minimize groundwater recharge in
9 the area of the White Bluffs.
- 10
- 11 C Rotational grazing methods could be employed to minimize soil erosion.
- 12
- 13 C Conservation tillage, fallowing, and other techniques could be used to reduce soil
14 erosion from croplands.
- 15
- 16 C Mining operations could be required to remove, stockpile, and replace topsoil.
- 17
- 18 C Soil stabilization techniques would be used around mining and development sites to
19 contain wind erosion.
- 20

21 **5.2.2 Water Resources**

22
23 Key water resources at the Hanford Site include surface water and groundwater. The
24 primary surface water feature is the Columbia River. Other surface water features include
25 springs and seeps. Groundwater is found throughout the subsurface of the Hanford Site at
26 depths ranging from approximately 250 meters (m) (820 feet [ft]) in the central portion of the Site
27 to approximately 15 m (50 ft) near the Columbia River.

28
29 Surface water resources could be impacted by future land uses in several ways. Water
30 quality could be degraded as a result of point source pollution from industrial waste water
31 discharges and non-point source pollution from runoff. Future industrial development and R&D
32 activities could increase waste water discharges to the Columbia River.

33
34 The Columbia River is classified as a “Class A” body of water by the State of Washington,
35 which requires that permitted discharges of waste water from point sources to the river be as
36 clean as, or cleaner, than the water in the river. Consequently, under normal circumstances,
37 industrial discharges to the river would be unlikely to impact water quality in the river.
38 Nevertheless, the potential for water quality impacts from new industrial activities must be
39 considered because of the potential for inadvertent releases and permit violations. Contamination
40 of groundwater from industrial development could also indirectly affect surface water through
41 groundwater discharges to the Columbia River. Industrial development could also increase water
42 withdrawals from the Columbia River.

43
44 Non-point source degradation of surface water could occur as a result of runoff of
45 agricultural chemicals from cultivated fields or a golf course. Surface water could also be
46 degraded through trampling of wetland vegetation by livestock congregating in the vicinity of the
47 water during dry periods. Loss of this vegetation could lead to increased siltation and water
48 quality degradation.

49
50 Impacts to groundwater could occur as a result of consumptive use or contamination.
51 Consumptive use could lead to draw down of aquifers and could change local groundwater flow
52 patterns. Groundwater flow could also be altered by infiltration of water used to irrigate crops
53 under the Agriculture land-use designation. Infiltration from irrigation could also mobilize
54 contaminants in the vadose zone and increase contamination of groundwater. Contamination

1 could occur as a result of infiltration of chemicals from spills. Groundwater contamination could
2 also occur as a result of infiltration of agricultural chemicals applied to crops, landscaped areas,
3 or golf courses.

4
5 Groundwater flow and contaminant transport models are used to simulate future
6 groundwater-flow conditions and predict the migration of contaminants through the groundwater
7 pathway. During the past several years, a Site-wide, three-dimensional, flow and transport model
8 has been under development by Pacific Northwest National Laboratory's (PNNL's) Groundwater
9 Monitoring Project.

10
11 Two-dimensional flow models have been used extensively at the Hanford Site. These
12 models were generally adequate for predicting aquifer head changes and directions of
13 groundwater flow prior to cessation of large wastewater-disposal operations because the
14 groundwater levels were somewhat stable across the Hanford Site. However, in the early 1990s,
15 it was recognized that a three-dimensional model was needed for accurate calculation of future
16 aquifer head changes, directions of groundwater flow, mass transport, and predictions of
17 contaminant concentrations. The three-dimensional model was needed because there is
18 significant vertical heterogeneity in the unconfined aquifer, and the water table is dropping over
19 most of the Hanford Site in response to cessation of large wastewater discharges. The
20 unconfined aquifer system is composed of a series of conductive units that are separated from
21 each other in most places by extensive mud units with relatively low hydraulic conductivities.
22 Accounting for this vertical heterogeneity is particularly important as the water table drops,
23 because the water table is currently near the contact between the Hanford formation and the
24 underlying and much-less-conductive Ringold Formation over a large part of the Hanford Site.
25 Dewatering of the highly permeable Hanford formation sediments in some areas (PNL-10196)
26 may result in aquifer transmissivity changes. These changes would be an order of magnitude or
27 more that would not be properly accounted for by two-dimensional flow and transport models.

28
29 The Site-wide, three-dimensional model was used during fiscal year 1998 to support the
30 composite analysis for low-level waste disposal in the Hanford Site (PNNL-11800). The
31 composite analysis involved simulation of future transport of radioactive contaminants that are
32 expected to exist on the Hanford Site following site closure. Site closure was assumed to occur
33 in the year 2050, followed by a 1,000-year compliance period. Only sources within a designated
34 waste management area on the Central Plateau were considered because other potential
35 sources are assumed to be remediated before site closure to the level that they would not pose a
36 hazard. During the 1,000-year compliance period, potential exposure to radioactive contaminants
37 outside the waste management area must be within regulatory limits and maintained "as low as
38 reasonably achievable" (PNNL-11800). These future groundwater conditions would be potential
39 impacts common to all alternatives and are shown as Figures 5-1 through 5-9, which include the
40 following:

- 41
42 C Figure 5-1 -- Water Table Elevations Predicted for 2350 Compared to the Inferred
43 1944 Water Table
- 44
45 C Figure 5-2 -- Predicted Tritium Plume from the 200 Areas for 2050
- 46
47 C Figure 5-3 -- Predicted Iodine-129 Plume from the 200 Areas for 2049
- 48
49 C Figure 5-4 -- Predicted Technetium-99 Plume from the 200 Areas for 2049
- 50
51 C Figure 5-5 -- Predicted Uranium Plume from the 200 Areas for 2049
- 52
53 C Figure 5-6 -- Predicted Strontium-90 Plume from the 200 Areas for 2049
- 54

1 C Figure 5-7 -- Predicted Strontium-90 Plume from the 200 Areas for 2049

2
3 C Figure 5-8 -- Predicted Chlorine-36 Plume from the 200 Areas for 2049

4
5 C Figure 5-9 -- Predicted Selenium-79 Plume from the 200 Areas for 2049.

6
7 The potential for impacts to groundwater under each alternative is identified in Table 5-5,
8 and the potential for impacts to surface water is identified in Table 5-6.

9
10 **5.2.2.1 No-Action Alternative.** Under the No-Action Alternative, mining operations could be
11 undertaken within the All Other Areas geographic area and could occur in the vicinity of the
12 Columbia River. Runoff from mining operations located close to the Columbia River could lead to
13 water quality degradation because of erosion and release of silt to the river. Also, potential fuel or
14 chemical spills on quarry sites could contaminate groundwater or surface water if the sites are
15 located close to the Columbia River. Mining operations could also require water for material
16 washing and dust control. Water use by mining operations would be minor compared to
17 agricultural or industrial uses, and would be less likely to result in changes to groundwater
18 hydrology. Quarry sites could collect surface water runoff, and provide a favorable infiltration
19 surface thereby increasing recharge and mobilizing contaminants in the vadose zone below the
20 quarry sites.

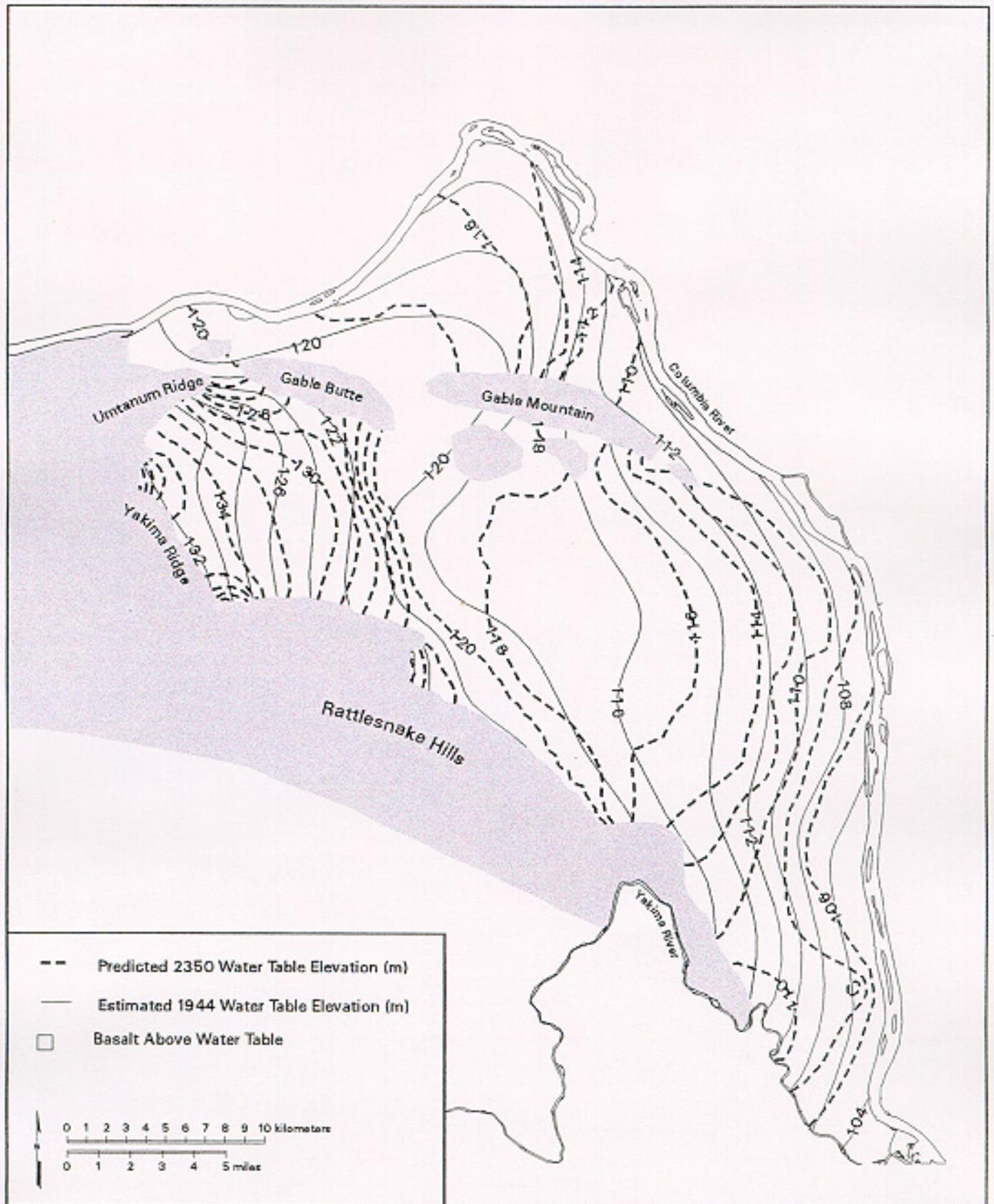
21
22 Grazing under the No-Action Alternative could occur in the vicinity of the Columbia River
23 and could reduce riparian vegetation cover. Reduced cover could destabilize the river banks and
24 increase sediment loading to the river. Grazing use under the No-Action Alternative would also
25 require development of water sources. However, water consumption for grazing would be
26 relatively small compared to other uses, such as agriculture or industrial development.

27
28 The No-Action Alternative could allow conversion of lands to cultivated agriculture in the All
29 Other Areas geographic area. Agricultural development would most likely occur near the
30 Columbia River, which would provide a clean source of irrigation water. Irrigation water could
31 also be provided by groundwater wells, which would alter groundwater flow patterns through
32 aquifer drawdown. Irrigation of crops could leach agricultural chemicals and residual Hanford
33 Site contaminants from the vadose zone to the groundwater. Runoff from agricultural land could
34 also degrade water quality in the Columbia River through release of agricultural chemicals and
35 increased siltation.

36
37 The No-Action Alternative would allow industrial development throughout the All Other
38 Areas geographic area. Future development would most likely occur in the South 600 Area
39 because supporting infrastructure is available in this area. Water to support development could
40 be obtained from on-site groundwater wells, as is the case in the 400 Area, provided by the City
41 of Richland (as it is in the 300 Area), or withdrawn from the Columbia River. Consumptive use of
42 groundwater to support development could lead to changes in groundwater flow patterns as a
43 result of aquifer drawdown. Water quality degradation from new industrial point sources would be
44 minimal because discharges (e.g., septic systems) to groundwater would require state or county
45 permits, and because Federal permit discharges to the Columbia River must be as clean or
46 cleaner than water in the river. However, water quality could be affected by accidental releases to
47 the soil column or the Columbia River or Yakima River from industrial sites.

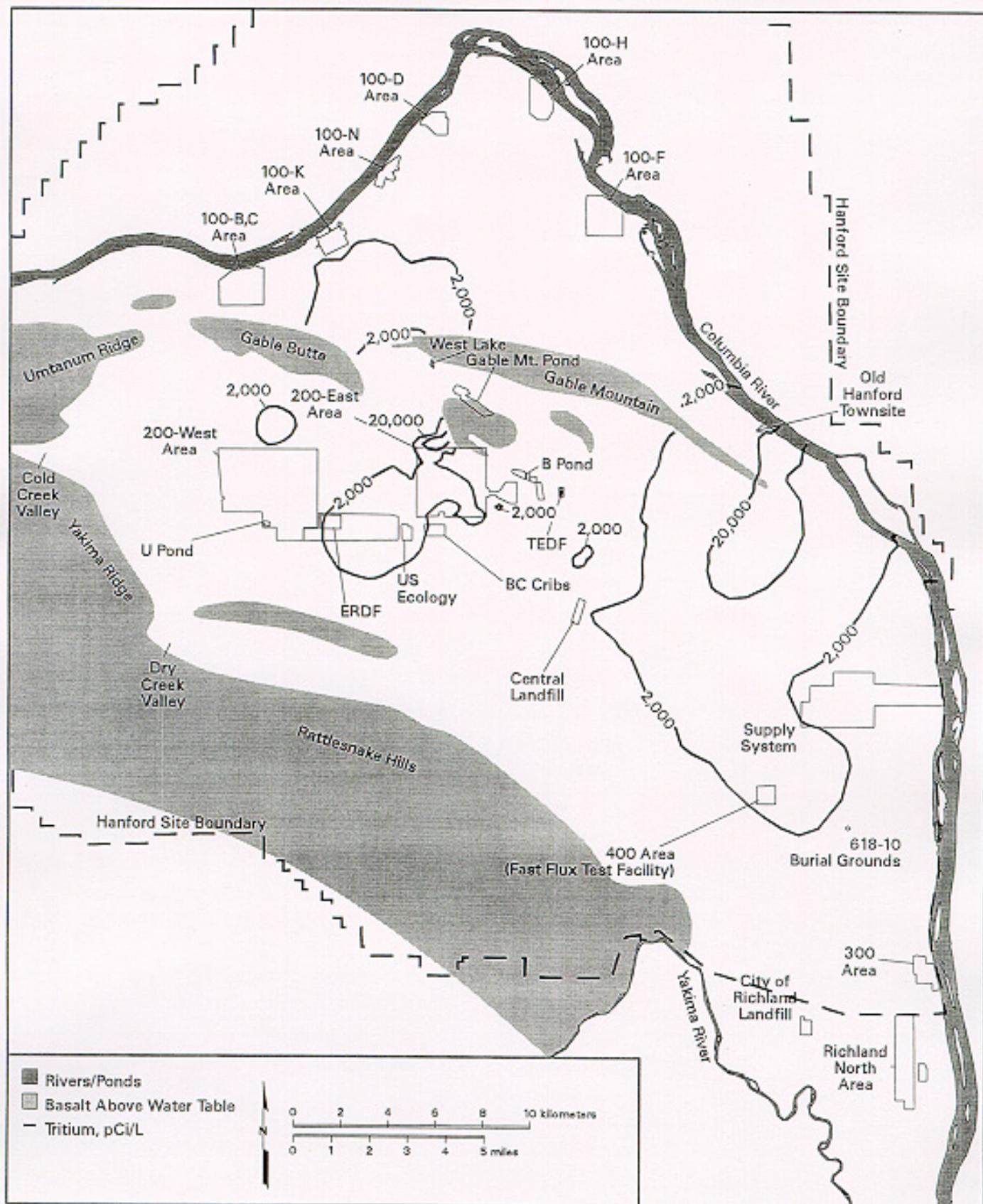
48
49 The No-Action Alternative would not increase recreational access to the Columbia River
50 over existing conditions and, therefore, is unlikely to result in increased impacts to water quality
51 from recreational activities.

1 **Figure 5-1. Water Table Elevations Predicted for 2350**
 2 **Compared to the Inferred 1944 Water Table.**
 3
 4
 5



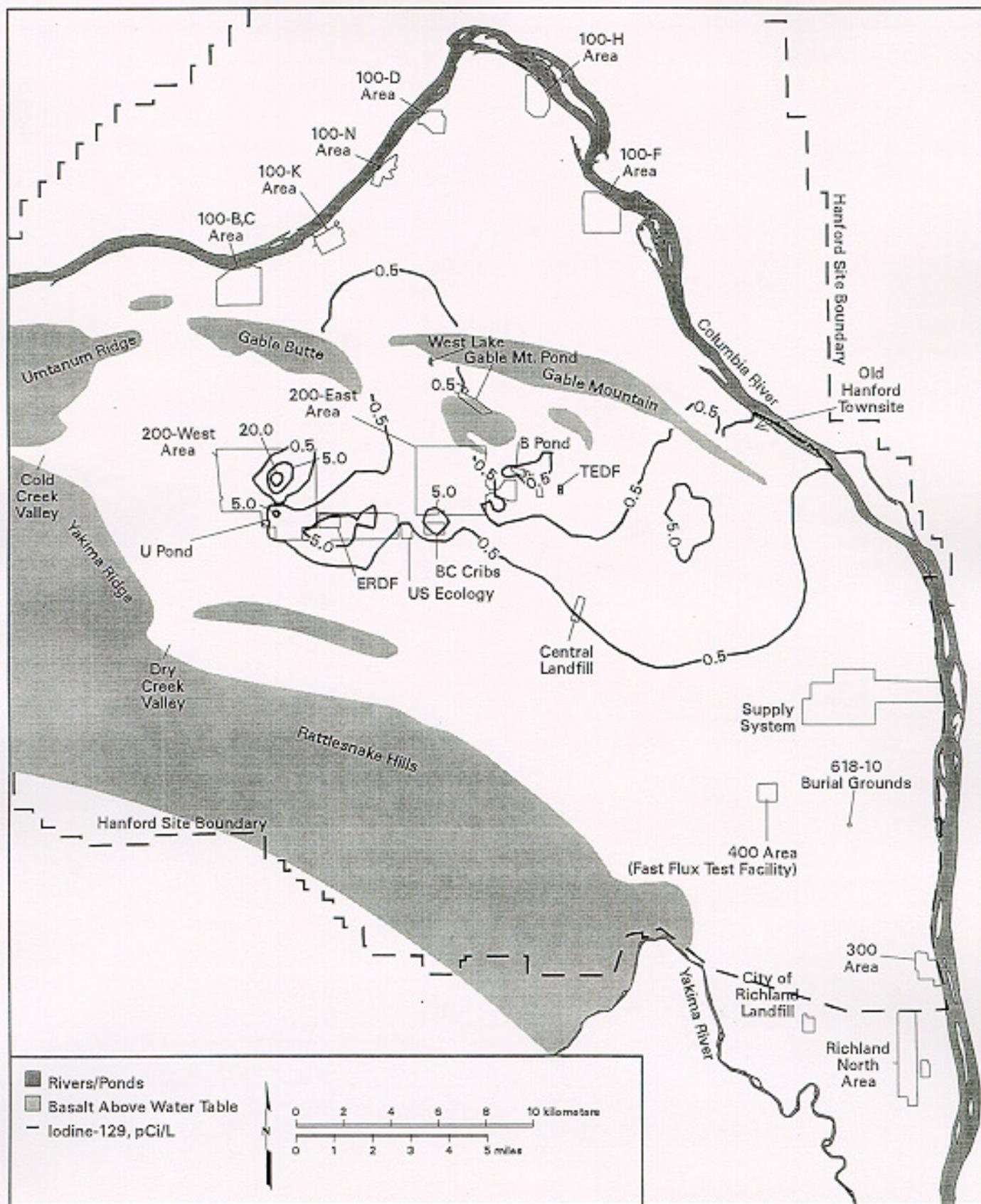
pdt99013.eps

1
2
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4
5
Figure 5-2. Predicted Tritium Plume from the 200 Areas for 2050.

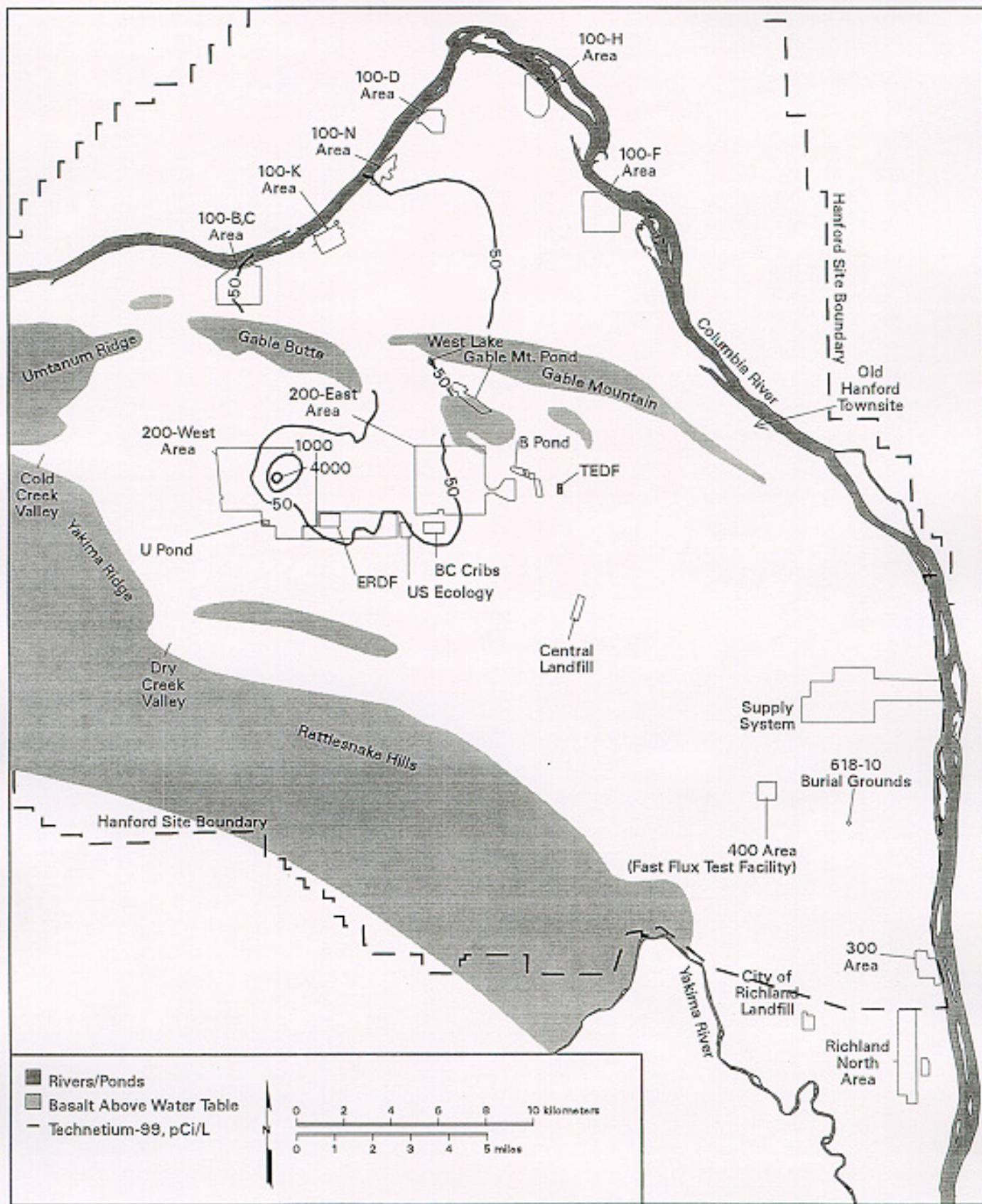


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1
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3
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5
6
Figure 5-3. Predicted Iodine-129 Plume from the 200 Areas for 2049.

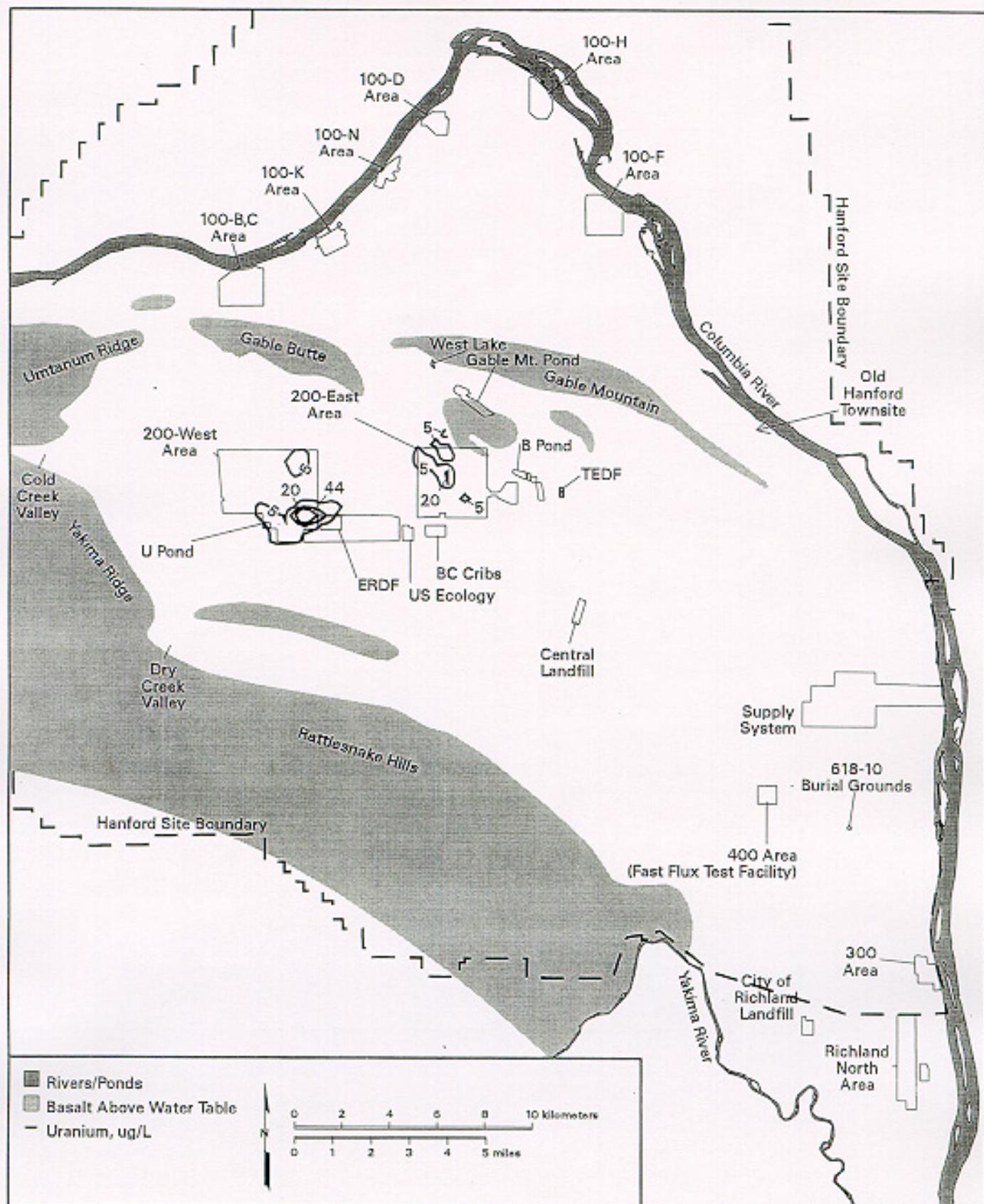


1 **Figure 5-4. Predicted Technetium-99 Plume from**
 2 **the 200 Areas for 2049.**
 3
 4
 5
 6



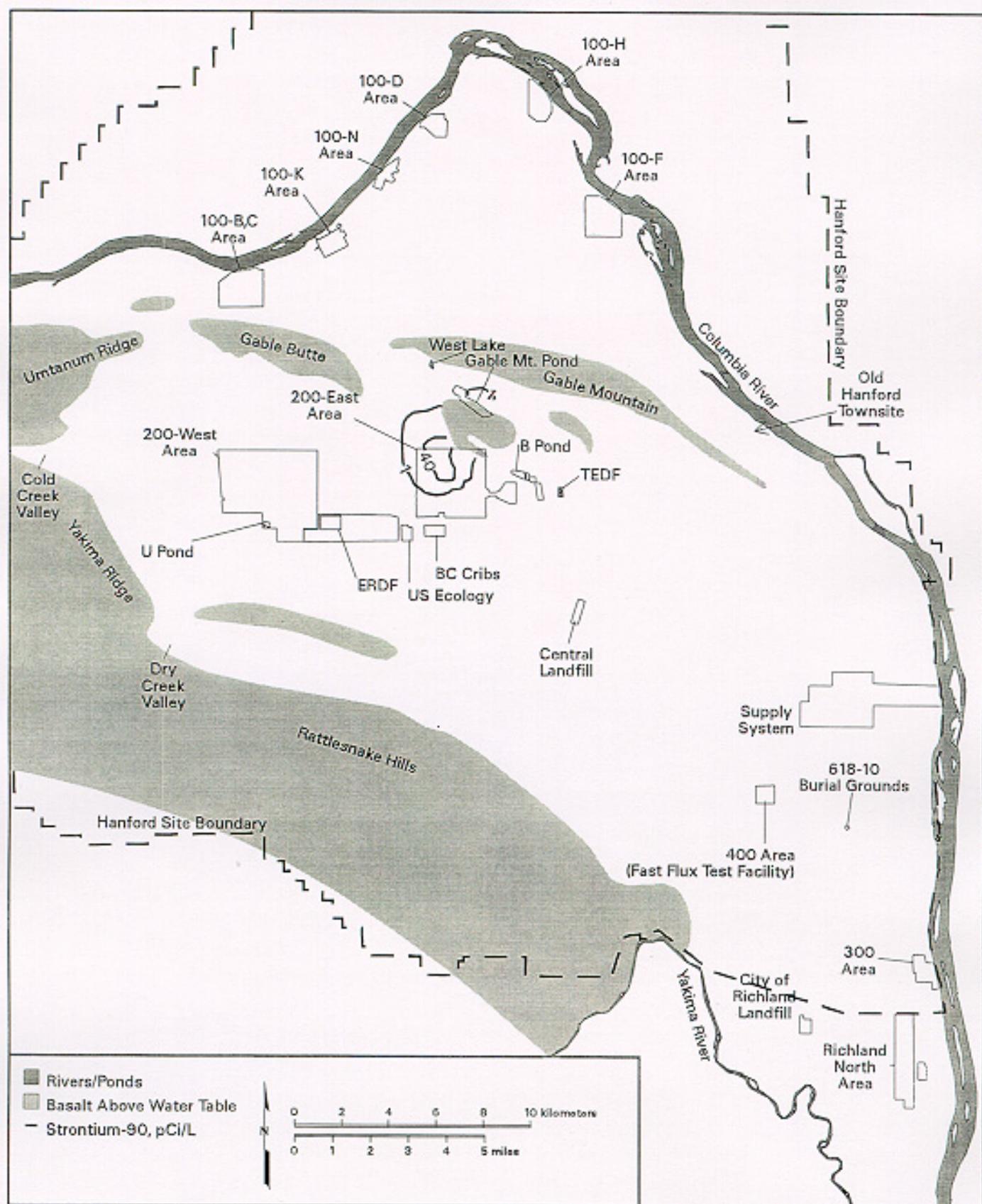
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6
Figure 5-5. Predicted Uranium Plume from the 200 Areas for 2049.

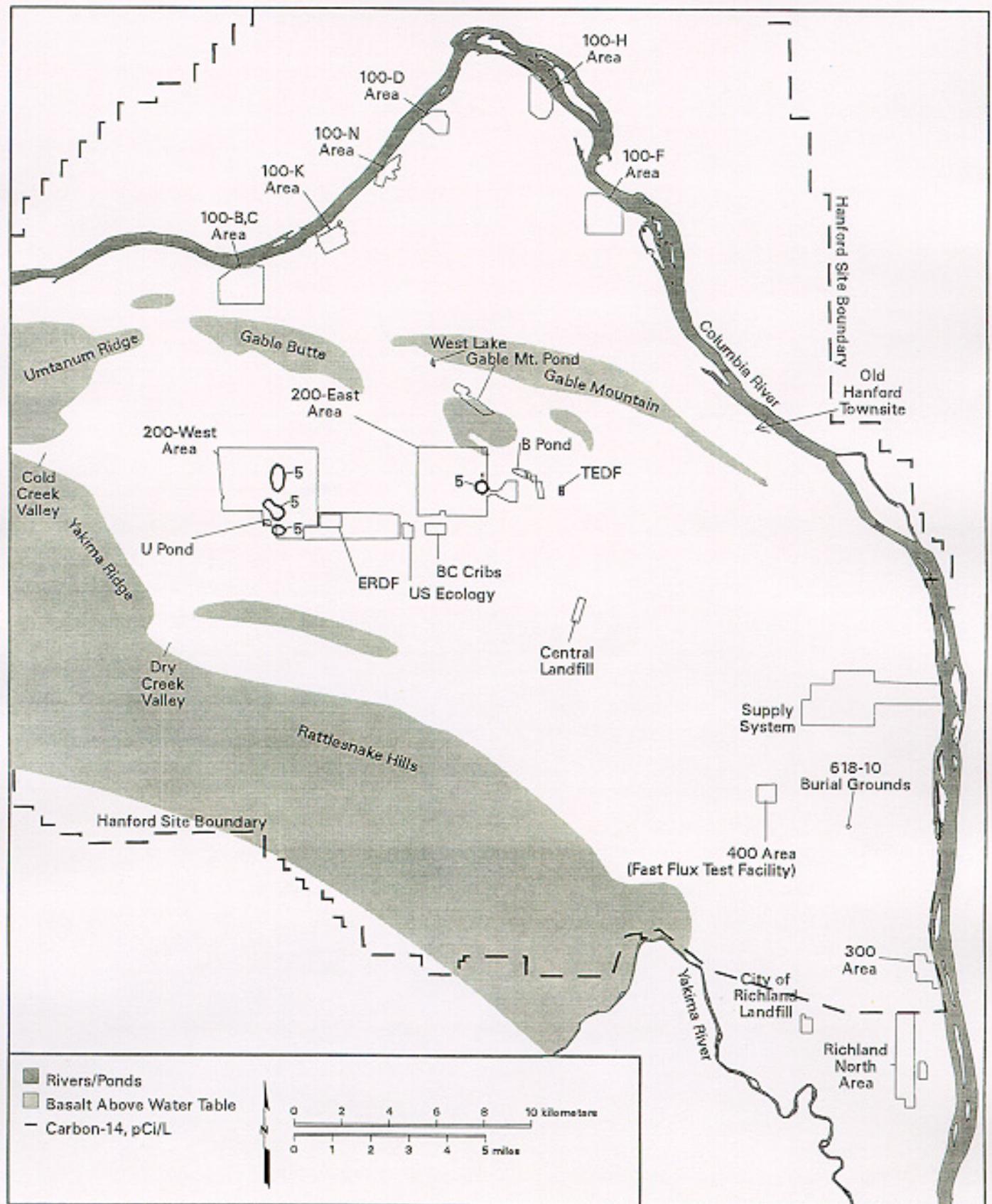


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2
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Figure 5-6. Predicted Strontium-90 Plume from the 200 Areas for 2049.

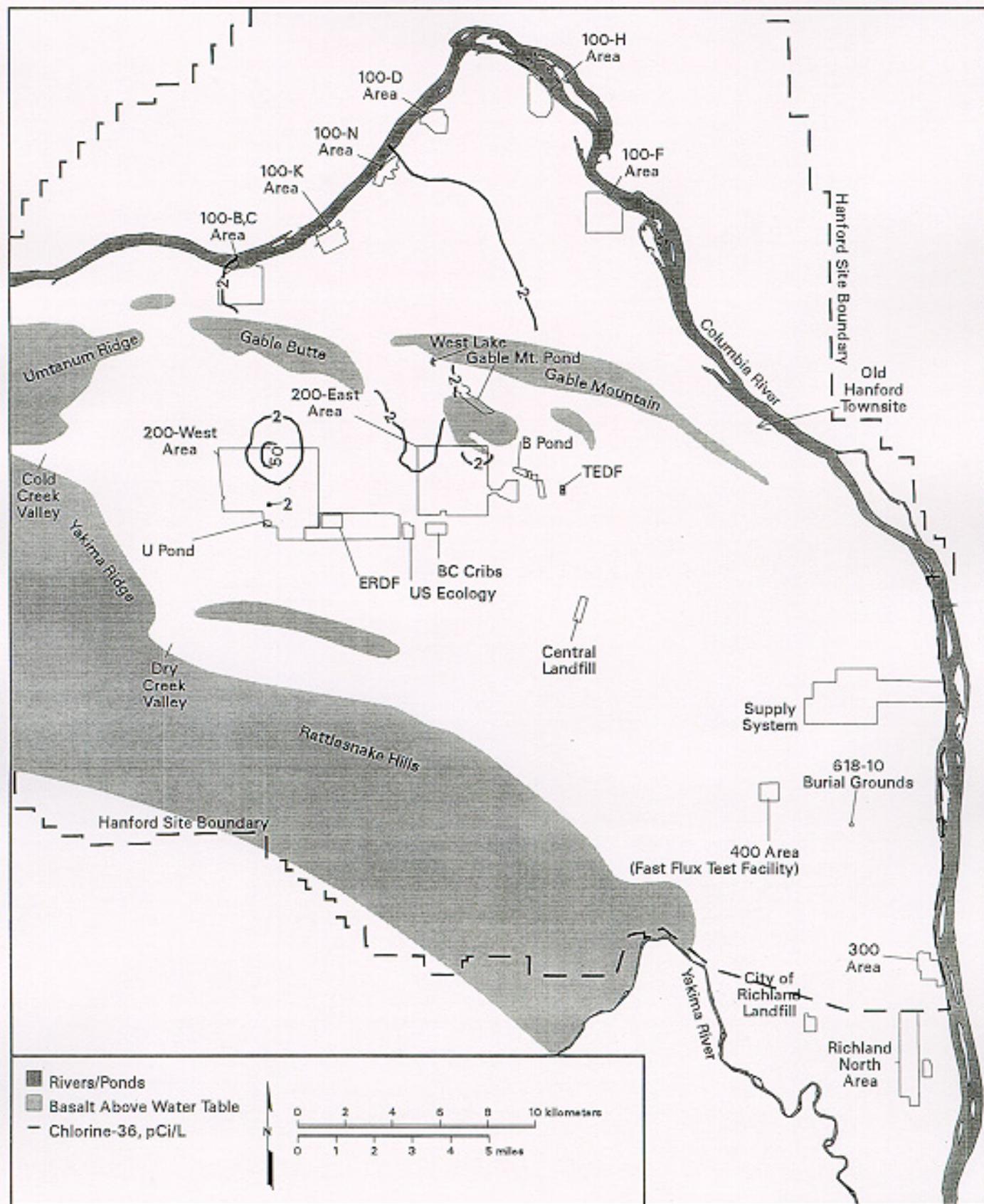


1 **Figure 5-7. Predicted Carbon-14 Plume from**
 2 **the 200 Areas for 2049.**
 3
 4
 5
 6



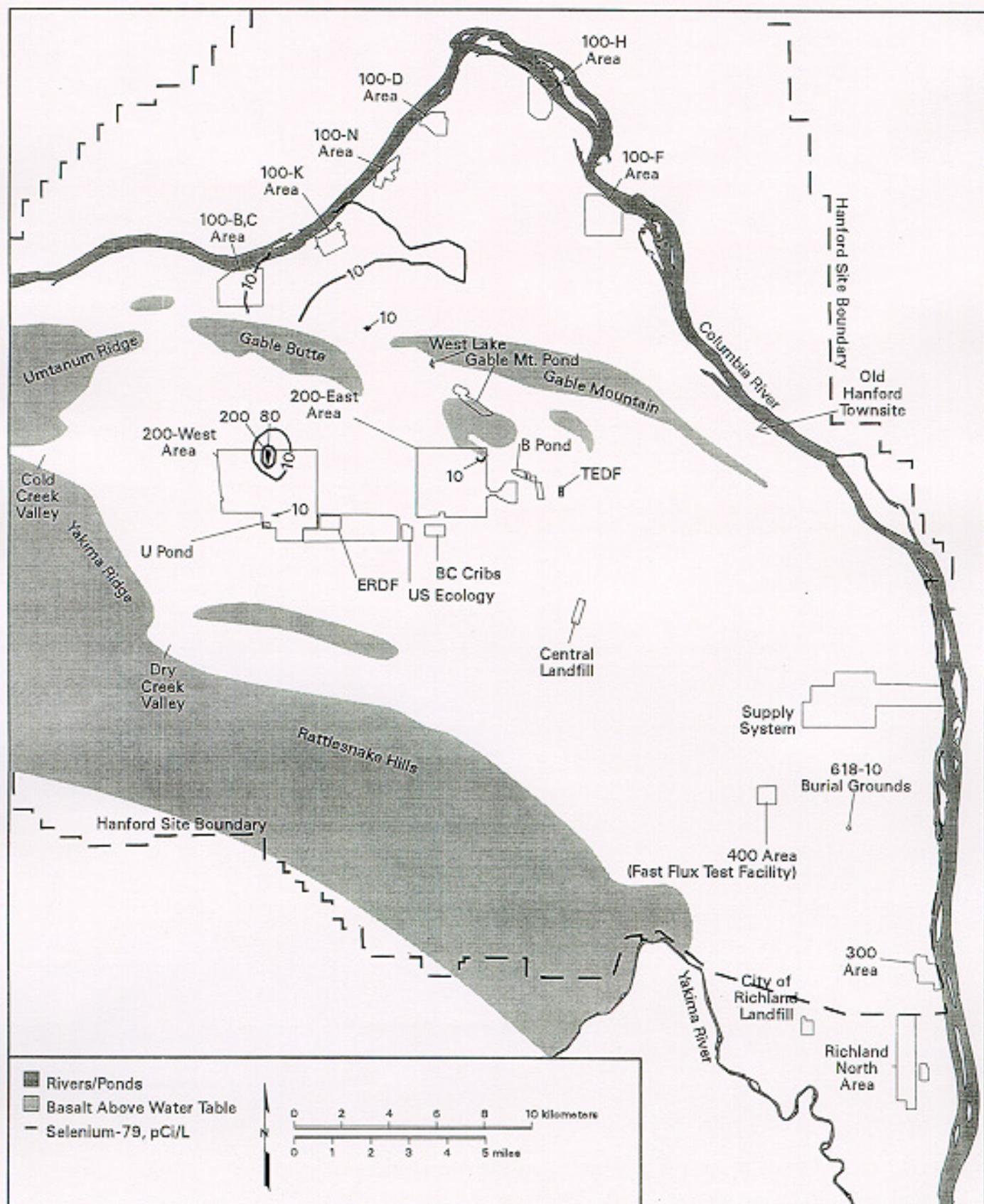
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Figure 5-8. Predicted Chlorine-36 Plume from the 200 Areas for 2049.



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Figure 5-9. Predicted Selenium-79 Plume from the 200 Areas for 2049.



pdf99008 February 13, 1999 1:01 PM

1 **Table 5-5. Potential Impacts of Alternatives on the Vadose Zone and Groundwater.**

2	Plan Map	Impacting Activity	Impacts to Vadose Zone and Groundwater (T = impact) ^a				
			Consumptive Use	Contamination (Spills)	Contamination (Agricultural Chemicals)	Mobilization of Contaminants	Changes to Hydrology
3 4	No-Action Alternative	Mining	T	T		T	T
		Livestock grazing					
		Cultivated agriculture	T	T	T	T	T
		Development	T	T		T	T
		Recreation					
5 6	Preferred Alternative	Mining	T	T		T	T
		Livestock grazing					
		Cultivated agriculture					
		Development	T	T		T	T
		Recreation					
7 8	Alternative One	Mining	T	T		T	T
		Livestock grazing					
		Cultivated agriculture					
		Development	T	T		T	T
		Recreation					
9 10	Alternative Two	Mining					
		Livestock grazing					
		Cultivated agriculture					
		Development	T	T			
		Recreation					
11 12	Alternative Three	Mining	T	T		T	T
		Livestock grazing	T				
		Cultivated Agriculture	T	T	T	T	T
		Development	T	T		T	T
		Recreation					
13 14	Alternative Four	Mining	T	T		T	T
		Livestock Grazing					
		Cultivated Agriculture					
		Development	T	T		T	T
		Recreation					

15 ^a Checkmarks do not represent adverse impacts of comparable significance; refer to accompanying text for significance of
 16 impacts.
 17

1 **Table 5-6. Potential Impacts of the Alternatives on Surface Water.**

2	Plan Map	Impacting Activity	Impacts to Surface Water (T = impact) ^a			
			Consumptive Use	Degradation by Point Sources	Degradation by Non-Point Sources	Degradation by Sediment Loading
3 4	No-Action Alternative	Mining			T	T
		Grazing	T			T
		Agriculture	T		T	T
		Development	T	T	T	T
		Recreation				
5 6	Preferred Alternative	Mining	T		T	T
		Grazing				
		Agriculture				
		Development	T	T	T	
		Recreation				
7 8	Alternative One	Mining				
		Grazing				
		Agriculture				
		Development	T	T		
		Recreation				
9 10	Alternative Two	Mining				
		Grazing				
		Agriculture				
		Development		T	T	
		Recreation				
11 12	Alternative Three	Mining				
		Grazing	T			T
		Agriculture	T		T	T
		Development	T	T	T	
		Recreation				
13 14	Alternative Four	Mining				
		Grazing				
		Agriculture				
		Development	T	T	T	
		Recreation				

15 ^a Checkmarks do not represent adverse impacts of comparable significance; refer to accompanying text for significance of
16 impacts.

17
18
19 **5.2.2.2 Preferred Alternative.** Under the Preferred Alternative, mining operations could occur
20 throughout much of the All Other Areas geographic area and on a portion of the ALE Reserve.
21 Potential impacts to water resources as a result of mining operations would be similar to the
22 potential impacts described for the No-Action Alternative.

23
24 The Preferred Alternative would allow industrial development in the eastern and southern

1 portions of the Hanford Site. As with the No-Action Alternative, industrial development under this
2 alternative could alter groundwater flows through increased withdrawals. Industrial discharges to
3 the soils column could mobilize contaminants in the vadose zone and accidental releases from
4 industrial sites could contaminate the groundwater or the Columbia or Yakima Rivers. The
5 potential for immediate contamination of the Columbia River is limited, however, as the 300 Area
6 is the only Industrial land-use designation adjacent to the river under this alternative.
7

8 Recreational access to the Columbia River would be increased under the Preferred
9 Alternative through adding new boat ramps and upgrading existing boat ramps. The Preferred
10 Alternative would add three new access points to the Hanford Reach of the Columbia River, and
11 would allow development of tribal fishing villages with supporting facilities. Increased access
12 could increase boating activity on the river, which could increase shoreline erosion from wakes
13 generated by motorized water craft. Increased boating activity could also generate additional
14 pollutants (e.g., oil, gas, and engine exhaust).
15

16 **5.2.2.3 Alternative One.** Under Alternative One, mining would be limited to upland areas away
17 from the Columbia River, and would have minimal affects on water quality.
18

19 Industrial development under Alternative One would be restricted to areas that have
20 already been developed, the City of Richland urban growth area (UGA), and an area between the
21 Energy Northwest (formerly known as the Washington Public Power Supply System, or WPPSS)
22 site and the City of Richland UGA. Industrial development in these areas could have impacts
23 such as those described for the Preferred Alternative, including changes in groundwater flows
24 through drawdowns and groundwater contamination through accidental releases. However,
25 these impacts are less likely to occur under Alternative One, as less land would be available for
26 industrial development. Contamination of surface water from new point sources would be
27 minimal under this alternative, as most areas designated for Industrial land use are located away
28 from the Columbia and Yakima Rivers.
29

30 Alternative One would increase recreational access to the Columbia River by adding one
31 new access point to the river at Vernita Bridge and maintaining an existing unimproved boat ramp
32 at White Bluffs. The increased access could have impacts to water quality such as those
33 described for the Preferred Alternative, although impacts under Alternative One may be less
34 extensive because it would not provide access to as many areas.
35

36 **5.2.2.4 Alternative Two.** Under Alternative Two, mining, commercial grazing, and agriculture
37 would not be allowed, and no impacts to water resources would occur as a result of these
38 activities.
39

40 Areas proposed for industrial development under this alternative include the City of
41 Richland UGA and areas that have already been developed. The potential for new impacts to
42 water resources under this alternative is minimal; however, Alternative Two would allow
43 experimental aqua-culture in the K Reactor area, and discharge of waste water from fish farming
44 activities could add to the nutrient load in the Columbia River.
45

46 Alternative Two would not increase recreational access to the Columbia River and is
47 unlikely to result in increased impacts to water quality from recreational uses.
48

49 **5.2.2.5 Alternative Three.** Alternative Three would allow mining activities in the All Other Areas
50 geographic area and on the ALE Reserve, with impacts to groundwater similar to those described
51 for the No-Action Alternative and the Preferred Alternative. Mining would not be permitted within
52 400 m (0.25 mi) of the Columbia River, and would be unlikely to affect river water quality.
53

54 Grazing under Alternative Three would be permitted in some areas on the Wahluke Slope,
55 including wetland areas associated with irrigation water return flows. Grazing could reduce
56 vegetation cover in wetlands and increase siltation in flows entering the Columbia River.

1 However, grazing under this alternative would not be allowed directly adjacent to the bank of the
2 Columbia River.

3
4 Alternative Three would allow cultivated agriculture on much of the Wahluke Slope but
5 would not allow agriculture within a corridor along the Columbia River. This buffer zone would
6 minimize the potential for non-point source runoff of agricultural chemicals and eroded soils into
7 the Columbia River. However, infiltration of agricultural chemicals could contaminate
8 groundwater underlying cropland, and agriculture on the Wahluke Slope could also alter
9 groundwater flow patterns. Increased groundwater recharge from irrigation would increase
10 slumping along the White Bluffs, reducing their scientific, aesthetic, and cultural value. Increased
11 slumping would add large quantities of sediment to the Columbia River, which could bury
12 salmonid spawning areas and would alter flow patterns in the river and could mobilize
13 contaminants, causing erosion of banks and islands.

14
15 Water resource impacts due to industrial development under Alternative Three would be
16 similar to those described for the Preferred Alternative and could include changes in groundwater
17 flow, mobilization of vadose zone contaminants, and possible groundwater and surface water
18 contamination through accidental releases.

19
20 Recreational development under this alternative could include a golf course and
21 destination resort on the Vernita Terrace. Runoff from parking lots and runoff or infiltration of
22 agricultural chemicals from the golf course could impact water resources. However,
23 development would not be permitted within 400 m (0.25 mi) of the Columbia River, which would
24 minimize the potential effects of runoff on river water quality. The recreational development
25 would involve consumption of large amounts of groundwater for culinary and sanitary uses at the
26 resort and for irrigation of the golf course. Groundwater wells at the destination resort could
27 result in changes in groundwater flows from aquifer drawdown, as well as possible groundwater
28 mounding under sewage treatment facilities.

29
30 Alternative Three would increase recreational access to the Columbia River, with potential
31 impacts from increased boating activity such as those described for the Preferred Alternative.
32 However, Alternative Three would concentrate the increased recreational activity on the upper
33 end of the Hanford Reach and at a location near the Yakima River. This could result in water
34 quality impacts with higher intensity in these areas, but lower intensity in the lower portion of the
35 Hanford Reach.

36
37 **5.2.2.6 Alternative Four.** As with Alternative One, Alternative Four would limit mining to upland
38 areas away from the Columbia River and would result in minimal impacts to water quality from
39 mining.

40
41 Water resource impacts due to industrial development under Alternative Four would be
42 similar to those described for the Preferred Alternative and could include changes to groundwater
43 flow from drawdown, mobilization of vadose zone contaminants, and possible contamination
44 from accidental releases. However, these impacts may be less likely to occur, as less land
45 would be available for industrial development.

46
47 Alternative Four would increase recreational access to the Columbia River by adding two
48 new access points to the river at White Bluffs and Vernita Bridge, which would be associated with
49 tribal fishing villages and support facilities. The increased access could have impacts to water
50 quality such as those described for the Preferred Alternative, although impacts under Alternative
51 Four may be less extensive because it would not provide access to as many areas.

1
2 **5.2.2.7 Mitigation Measures.** With the exception of the No-Action Alternative, the CLUP policies
3 and implementing procedures described in Chapter 6 would be used to screen development
4 proposals for Hanford Site lands. Some activities with the potential to impact water resources
5 would not be permitted by DOE and others would be required to incorporate mitigation measures
6 to reduce impacts. Mitigation measures that could reduce impacts to water resources include
7 the following activities.
8

- 9 C Minimizing the use of groundwater so that water withdrawal would not alter
10 groundwater flow and influence existing contamination plumes.
- 11
- 12 C Restricting irrigated agriculture on the Wahluke Slope, requiring hydrogeologic studies,
13 or requiring efficient irrigation methods to minimize the potential for increased
14 slumping of the White Bluffs.
- 15
- 16 C Designating “no wake” zones along the Columbia River in areas where the riverbank
17 is subject to erosion.
- 18
- 19 C Employing agricultural practices that minimize the use of pesticides, fertilizers, and
20 herbicides, thereby minimizing the potential for infiltration or runoff of these chemicals
21 to groundwater or surface water.
- 22
- 23 C Requiring a demonstration of no adverse affect on vadose zone contaminants or
24 contaminated groundwater plumes prior to allowing irrigation or industrial discharges
25 to the soil column.
- 26
- 27 C Employing agricultural practices that minimize soil erosion.
- 28
- 29 C Using silt fences around development sites to contain soil erosion around those sites
30 and minimize the potential for release of silt to surface water.
- 31
- 32 C Using soil stabilizing techniques around mining and development sites to contain wind
33 erosion.
- 34
- 35 C Implementing water conservation measures wherever possible to minimize water use.
- 36
- 37 C Implementing spill control and cleanup measures to minimize the risk of
38 contaminating water resources from accidental releases.
- 39
- 40 C Managing commercial grazing activities to minimize livestock access to wetlands and
41 riverbanks (e.g., development of off-stream water sources).
- 42
- 43 C Requiring a demonstration of no adverse impact on groundwater due to increased
44 infiltration and transportation of vadose zone contamination resulting from
45 development.
- 46

47 **5.2.3 Impacts to Biological Resources**

48
49 Sensitive biological resources are present on the Hanford Site in association with the
50 Columbia River, basalt outcrops with their talus slopes such as Gable Butte and Gable Mountain,
51 sand dunes, low elevation deep soils, and other unique features. Biological resources
52 considered for each alternative in this analysis include terrestrial vegetation and habitat,
53 especially habitats identified through consideration of plant communities of concern; wildlife and
54 wildlife habitat; aquatic species and habitat; wetlands; and biodiversity. The potential impacts of
55 activities allowed under the alternatives on these biological resources are identified in Table 5-7.

Table 5-7. Potential Impacts of the Alternatives on Sensitive Biological Resources.

Alternative	Impacting Activity	Impacts to Biological Resources (T = impact)				
		Terrestrial Vegetation and Habitat	Wildlife and Wildlife Habitat	Aquatic Species and Habitat ^a	Wetlands	Biodiversity
No-Action	Mining	T	T	T	T	
	Livestock grazing	T	T	T	T	T
	Cultivated agriculture	T	T	T	T	T
	Development	T	T	T		T
	Recreation					
Preferred Alternative	Mining	T	T	T	T	
	Livestock grazing					
	Cultivated agriculture					
	Development	T	T			T
	Recreation			T		
Alternative One	Mining	T	T			
	Livestock grazing					
	Cultivated agriculture					
	Development	T	T			
	Recreation			T		
Alternative Two	Mining					
	Livestock grazing					
	Cultivated agriculture					
	Development	T	T			
	Recreation					
Alternative Three	Mining	T	T			
	Livestock grazing	T	T	T	T	T
	Cultivated agriculture	T	T	T	T	T
	Development	T	T			T
	Recreation			T		
Alternative Four	Mining	T	T			
	Livestock grazing					
	Cultivated agriculture					
	Development	T	T			T
	Recreation			T		

^a Aquatic species and habitats includes creeks, springs, riparian, and riverine (deep water) habitat. Checkmarks do not represent adverse impacts of comparable significance; refer to accompany text for significance of impacts.

Biological resources at the Hanford Site are also classified by level of concern under BRMaP (DOE-RL 1996c). This analysis is focused on resources classified as BRMaP Levels II, III, and IV, defined as follows:

- 1 c Level II resources include Washington State Monitor 1 and 2 species and early
2 successional habitats.
- 3
- 4 c Level III resources include Washington State candidate, sensitive, threatened, and
5 endangered species, Federal candidate species, wetlands and deep-water habitats,
6 and late-successional habitats.
- 7
- 8 c Level IV resources include Federal threatened and endangered species and those
9 species proposed for listing, and rare habitats such as the White Bluffs, active and
10 stabilized sand dunes, and basalt outcrops.
- 11

12 Table 5-8 presents the potential impacts on biological resources that have been defined in
13 BRMaP as Levels II, III, and IV from activities allowed under the alternatives. The amount of
14 acreage of each BRMaP level under each land-use designation is tabulated from GIS spatial data
15 in Table 5-9.

16

17 **5.2.3.1 No-Action Alternative.** The No-Action Alternative would allow continued
18 development of the All Other Areas geographic area on a project-by-project basis. Without a
19 land-use plan in place, it is less likely that facility siting would be coordinated to share utility
20 corridors and conserve space. Biological resources would be damaged in localized areas where
21 future development occurred. Construction of new facilities would require surface clearing and
22 grading, which would eliminate vegetation and wildlife habitat present on the construction site and
23 allow weed species to become established. New utility corridors could fragment habitats.
24 Scattered development under the No-Action Alternative could also increase the risk of wildfire,
25 which could result in large-scale losses of habitat. Future industrial development under the
26 No-Action Alternative could affect biological resources associated with BRMaP Levels II, III,
27 and IV, as shown in Table 5-9.

28

29 The No-Action Alternative would not preclude development of quarries on basalt outcrops
30 such as the Umtanum Ridge, Gable Mountain, and Gable Butte, which could damage sensitive
31 habitats in these locations. This alternative would also allow sand and gravel quarrying in most of
32 the All Other Areas geographic area, and could affect BRMaP Levels II, III, and IV resources.
33 Because basalt and sand and gravel quarries are typically limited in size, it is unlikely that habitat
34 losses would be large enough to affect biodiversity. Conversely, mining of topsoil for covering
35 and reclaiming remediation sites could disturb large areas and could affect biodiversity. Under
36 the No-Action Alternative, the McGee Ranch could be developed as a quarry site for remediation.
37 Large-scale soil mining at McGee Ranch could affect the connection between the large tracts of
38 shrub-steppe habitat on the Hanford Site and those on the Yakima Training Center to the west.
39 Mining at McGee Ranch could eliminate the wildlife movement corridor between these areas and
40 increase habitat fragmentation. Isolating these two habitat remnants could reduce the genetic
41 diversity of plant and animal species associated with shrub-steppe habitat and reduce regional
42 biodiversity in the long term.

43

44 Although the No-Action Alternative does not designate lands for cultivated agriculture, this
45 alternative would not preclude future agricultural development of Hanford Site lands. Assuming
46 that cultivated agriculture would be established near the Columbia River to facilitate irrigation, the
47 conversion to cropland could displace rare plants, riparian plant communities, and other BRMaP
48 Level III and IV resources associated with the free flowing Hanford Reach. Cultivated agriculture
49 adjacent to the Columbia River would increase sediment loading to the river, potentially affecting
50 salmonid spawning areas. Agricultural chemicals in runoff from croplands could damage
51 sensitive wetland and aquatic habitats.

52

Table 5-8. Potential Impacts to Biological Resources as Defined by BRMaP.

Alternative	Activity	Impact to BRMaP Resource Level of Concern (T = impact) ^a		
		II	III	IV
No-Action	Mining	T	T	T
	Livestock grazing	T	T	T
	Cultivated agriculture	T	T	T
	Development	T	T	T
	Recreation			
Preferred Alternative	Mining	T	T	T
	Livestock grazing			
	Cultivated agriculture			
	Development	T	T	
	Recreation		T	T
Alternative One	Mining			T
	Livestock grazing			
	Cultivated agriculture			
	Development	T	T	
	Recreation			
Alternative Two	Mining			
	Livestock grazing			
	Cultivated agriculture			
	Development	T	T	
	Recreation			
Alternative Three	Mining	T	T	T
	Livestock grazing	T	T	T
	Cultivated agriculture	T	T	T
	Development	T	T	
	Recreation	T	T	T
Alternative Four	Mining	T	T	T
	Livestock grazing			
	Cultivated agriculture			
	Development	T	T	
	Recreation		T	T

^a Checkmarks do not represent adverse impacts of comparable significance; refer to accompany text for significance of impacts.

10
11
12

Table 5-9. Distribution of BRMaP Level II, III, and IV Resources Under the Nine Land-Use Designations for the Alternatives. (2 pages)

Land-Use Designation	No-Action Alternative	Preferred Alternative	Alternative One	Alternative Two	Alternative Three	Alternative Four
BRMaP II						
Hectares (35,909 total)						
Preservation	1,113	3,297	24,414	34,427	381	13,664
Conservation (Mining)	0	15,940	10,806	0	14,309	13,462
Conservation (Mining & Grazing)	15,807	0	0	0	93	0
Industrial	18,840	11,590	538	744	12,495	4,610
Industrial-Exclusive	146	146	134	134	146	146
Research and Development	0	4,885	11	599	7,885	4,022
Low-Intensity Recreation	3	6	3	3	105	3
High-Intensity Recreation	0	45	2	0	355	1
Agriculture	0	0	0	0	139	0
BRMaP III						
Hectares (66,744 total)						
Preservation	26,857	44,096	61,306	61,539	3,548	56,842
Conservation (Mining)	0	16,833	209	0	37,096	4,166
Conservation (Mining & Grazing)	33,396	0	0	0	3,578	0
Industrial	1,108	385	75	260	706	310
Industrial-Exclusive	3,115	3,115	2,672	2,672	3,115	3,115
Research and Development	0	<1	194	4	13	<1
Low-Intensity Recreation	2,268	2,295	2,287	0	2,379	6
High-Intensity Recreation	0	19	<1	1	56	37
Agriculture	0	0	0	0	16,251	0
BRMaP IV						
Hectares (9,260 total)						
Preservation	7,180	7,895	7,905	9,260 ^a	1,178	9,260 ^a
Conservation (Mining)	0	0	0	0	6,450	0
Conservation (Mining & Grazing)	721	0	0	0	65	0
Industrial	4	0	0	0	0	0
Industrial-Exclusive	0	0	0	0	0	0
Research and Development	0	0	0	0	0	0
Low-Intensity Recreation	1,355 ^a	1,355 ^a	1,355 ^a	0	1,355 ^a	0
High-Intensity Recreation	0	<1	0	0	<1	0
Agriculture	0	0	0	0	211	0

^a Area includes Columbia River surface area.

1
2
3 Although the No-Action Alternative would not preclude cultivated agriculture, mining, or
4 industrial development adjacent to the Columbia River, such developments would have to be
5 reviewed by the National Park Service for compatibility with the proposed Wild and Scenic River
6 designation for the Columbia River. This review may prevent the siting of impacting activities near
7 the river, and effectively provide protection of biological resources in the Columbia River Corridor
8 under any of the alternatives being considered.
9

10 Grazing of livestock on the Wahluke Slope under the No-Action Alternative could alter
11 terrestrial vegetation communities by eliminating or reducing the cover of some species,
12 encouraging the growth of grazing-tolerant species, and providing opportunities for weed species
13 to become established. These changes could adversely affect associated wildlife species.
14 Cessation of grazing could increase the fire danger by providing flash and step fuel biomass such
15 as cheatgrass that carries a range fire between brushy areas. Wetland and riparian plant
16 communities could be damaged where livestock congregate near water sources.
17

18 Although the No-Action Alternative would continue to allow recreational use of the Hanford
19 Reach, no new boat ramps or other recreational development would be planned. The No-Action
20 Alternative is not likely to result in increased recreational impacts to biological resources
21 associated with the Columbia River.
22

23 **5.2.3.2 Preferred Alternative.** Industrial development under the Preferred Alternative could
24 disturb previously undisturbed land areas, including areas containing BRMaP Level II and III
25 resources in the southern portion of the All Other Areas geographic area. Construction of new
26 facilities would require surface clearing and grading, which would eliminate vegetation and wildlife
27 habitat present on the construction site and provide opportunities for weed species to become
28 established. Industrial development in the southeast portion of the Hanford Site would destroy
29 dune stabilizing vegetation and encourage dune activation. The Preferred Alternative, through
30 implementation of the CLUP's policies and implementing procedures (see Chapter 6), would
31 mitigate the disturbance, encouraging the clustering of future developments and sharing of utility
32 corridors, conserving space and minimizing disturbance. Industrial development under the
33 Preferred Alternative would be less likely to fragment habitats or affect biodiversity than under the
34 No-Action Alternative.
35

36 The Preferred Alternative would designate much of the All Other Areas geographic area for
37 Conservation (Mining). In addition, a small portion of the ALE Reserve, which has been identified
38 as an alternative basalt source, would be designated for Conservation (Mining). Biological
39 resources located at quarry sites would be damaged or destroyed. The area in the ALE Reserve
40 where mining would be permitted contains BRMaP Level I and II resources.
41

42 The Preferred Alternative would increase recreational access to the Columbia River by
43 allowing additional boat launch facilities to be constructed. Increased boating activity on the river
44 could adversely affect salmonid spawning areas, aquatic plant communities and other BRMaP
45 Level III and IV resources. Development of biking and hiking trails and other recreational facilities
46 could also damage plant communities of concern, and disturb bald eagle roosts and great blue
47 heron rookeries along the Hanford Reach. With increased access, there would also be an
48 increase in the probability of a wildfire occurring.
49

50 The Preferred Alternative would assign the Preservation land-use designation to
51 approximately 53 percent (78,127 ha [193,056 ac]) of the Hanford Site, including the Wahluke |
52 Slope, most of the ALE Reserve, the basalt outcrops, the McGee Ranch area, the shoreline of the |
53 Columbia River, river islands, and the active sand dunes. The Preservation land-use designation |
54 would protect approximately 66 percent (44,096 ha [108,964 ac]) of BRMaP Level III and |
55 85 percent (7,895 ha [19,509]) of BRMaP Level IV resources on the Hanford Site. |
56

1 **5.2.3.3 Alternative One.** Industrial development under Alternative One would be allowed in areas
2 where development has already impacted sensitive habitats and in an area south of the Energy
3 Northwest (formerly known as WPPSS) site where cheatgrass dominates the vegetation cover.
4 These areas consist mainly of BRMaP Level I and II resources. Industrial development under
5 Alternative One would result in destruction of habitat, but the impacts would be less extensive and
6 to lower quality habitat than under the Preferred Alternative or the No-Action Alternative because of
7 the limited areas available for development.
8

9 Alternative One would minimize the area designated for Industrial-Exclusive use to
10 preserve the maximum amount of high-quality, late-successional shrub-steppe habitat located
11 west of the 200 West Area. An additional 443 ha (1,108 ac) of BRMaP Level III resources would
12 be protected under the Preservation land-use designation in this area, as compared to the
13 Preferred Alternative and the No-Action Alternative.
14

15 Under Alternative One, the Conservation (Mining) land-use designation would be assigned
16 to areas around LIGO and FFTF, and in other scattered locations in the 100 and 600 Areas.
17 Biological resources at many of these locations have been previously impacted and are classified
18 as BRMaP Level I and II. Other areas contain BRMaP Level III and IV resources that could be
19 damaged by basalt and sand and gravel quarrying. Impacts to these resources are less likely than
20 under the Preferred Alternative or No-Action Alternative, however, because mining under
21 Alternative One would be limited to supporting remediation activities.
22

23 Alternative One would increase recreational access to the Columbia River by allowing an
24 additional boat launch facility to be constructed. Increased boating activity on the river could
25 adversely affect biological resources associated with the Hanford Reach. Impacts would be less
26 extensive than under the Preferred Alternative because access would not be provided to as many
27 locations.
28

29 Alternative One would assign the Preservation land-use designation to approximately
30 84 percent (124,517 ha [307,688 ac]) of Hanford Site, including most of the ALE Reserve, the
31 basalt outcrops, the McGee Ranch area, the Saddle Mountain NWR, the entire Columbia River
32 Corridor, and the active and most stabilized sand dunes. The Preservation land-use designation
33 would protect approximately 92 percent (61,306 ha [151,490 ac]) of BRMaP Level III and
34 85 percent (7,905 ha [19,534 ac]) of BRMaP Level IV resources.
35

36 **5.2.3.4 Alternative Two.** Under Alternative Two, lands designated for industrial development are
37 mostly occupied by existing facilities, although some BRMaP Level II and Level III resources are
38 included under the Industrial and Research and Development land-use designations. Industrial
39 development under Alternative Two could result in destruction of habitat, but the impacts would be
40 less extensive than under any of the other alternatives being considered because of the limited
41 areas available for development. By limiting the amount of area to be developed, Alternative Two
42 (by land-use designation rather than by CLUP policies and implementing procedures), advocates
43 the clustering of future development.
44

45 Alternative Two, like Alternative One, would minimize the area designated for Industrial-
46 Exclusive use in order to preserve the maximum amount of high-quality, late-successional shrub-
47 steppe habitat located west of the 200 West Area. An additional 443 ha (1,108 ac) of BRMaP
48 Level III resources would be protected under the Preservation land-use designation in this area, as
49 compared to the Preferred Alternative and the No-Action Alternative.
50

51 Alternative Two would not increase recreational access to the Columbia River, and would
52 be unlikely to result in increased impacts to biological resources associated with the river.
53

54 Alternative Two would assign the Preservation land-use designation to approximately
55 95 percent (140,767 ha [347,843 ac]) of Hanford Site, including the ALE Reserve, Wahluke Slope,
56 Columbia River Corridor, and much of the All Other Areas geographic area. The Preservation

1 land-use designation would protect approximately 92 percent (61,539 ha [152,066 ac]) of the
2 BRMaP Level III and 100 percent (9,260 ha [22,882 ac]) of the BRMaP Level IV resources.

3
4 **5.2.3.5 Alternative Three.** Under Alternative Three, the Industrial and Research and
5 Development land-use designations would be larger than under any of the other alternatives, but
6 would mainly consist of BRMaP Level I and II resources. Impacts to biological resources from
7 industrial development under Alternative Three would be similar to those described for the
8 Preferred Alternative.

9
10 Alternative Three would designate the ALE Reserve and much of the All Other Areas
11 geographic area as Conservation (Mining). Basalt and sand and gravel quarries developed in
12 these areas could impact rare plants and sensitive plant communities, depending on their relative
13 locations, but CLUP policies and implementing procedures would mitigate against such impacts.
14 Basalt and sand and gravel quarrying could affect BRMaP Level II, III, and IV resources. Because
15 basalt and sand and gravel quarries are typically limited in size, it is unlikely that habitat losses
16 would be large enough to affect biodiversity.

17
18 Under Alternative Three, lands in the Wahluke Slope could be converted to agriculture,
19 which would involve conversion of native plant communities to cropland, pasture land, and
20 orchards. Habitats of concern, including BRMaP Level II, III, and IV resources, would be damaged
21 or destroyed. Conversion of native plant communities to cropland would reduce biodiversity by
22 replacing complex plant communities with monocultures and allowing invasion of non-native
23 species. Biodiversity also could be affected on portions of the Wahluke Slope designated for
24 Conservation (Mining and Grazing), where livestock grazing could alter native plant communities.
25 Converting the Wahluke Slope to irrigated agriculture could accelerate the collapse of the White
26 Bluffs and destroy salmon spawning areas by siltation of the spawning gravels in the Columbia
27 River.

28
29 Alternative Three would allow High-Intensity Recreational development of the Vernita
30 Terrace, and Low-Intensity Recreational use of a large portion of the 100 Areas near the Columbia
31 River. Development of a destination resort at Vernita Terrace would impact mostly BRMaP Level I
32 resources, as this area consists of cheatgrass and abandoned fields. Construction of Low-
33 Intensity Recreational facilities, such as the proposed recreational trail along the river, could result
34 in habitat losses, including BRMaP Level II, III, and IV resources. However, such trails and other
35 facilities would be sited according to the CLUP policies and implementing procedures to minimize
36 impacts to BRMaP Level II, III, and IV resources. Increased recreational access to the Columbia
37 River under this alternative would increase boating activity and could result in impacts to salmonid
38 spawning areas, bald eagle roosts, great blue heron rookeries, and aquatic plant communities.
39 Increased access could also result in the increased probability of wildfire. Recreational facilities
40 would be located at least one-quarter mile from the river with Low-Intensity access points.

41
42 Alternative Three would assign the Preservation land-use designation to approximately
43 6 percent (9,002 ha [22,244 ac]) of Hanford Site lands, primarily along the Columbia River corridor. |
44 The Preservation land-use designation would protect approximately 5 percent (3,548 ha [8,767 |
45 ac]) of BRMaP Level III and 13 percent (1,178 ha [2,911 ac]) of BRMaP Level IV resources on the |
46 Hanford Site. As with the other alternatives being considered, Alternative Three would also protect
47 sensitive biological resources through the Conservation (Mining) land-use designation with mining
48 only by DOE's special-use permit, as described in Chapter 6 policies and implementing
49 procedures. Under Alternative Three, the Conservation (Mining) land-use designation includes
50 56 percent (37,096 ha [91,666 ac]) of BRMaP Level III and 70 percent (6,450 ha [15,938 ac]) of |
51 BRMaP Level IV resources on the Hanford Site.

52
53 **5.2.3.6 Alternative Four.** Alternative Four would allow industrial development in the City of
54 Richland UGA, in previously developed sites, such as Energy Northwest (formerly known as
55 WPPSS), FTF, 300 Area, and undisturbed areas north of the City of Richland UGA, which
56 contain mainly BRMaP Level I and II resources. Construction of new industrial or R&D facilities

1 would require surface clearing and grading, which would eliminate vegetation and wildlife habitat
2 present on the construction site and provide opportunities for weed species to become
3 established. Industrial development in the southeast portion of the Hanford Site would destroy
4 dune stabilizing vegetation. Industrial development under Alternative Four would be less likely to
5 fragment habitats and affect biodiversity than the Preferred Alternative or Alternative Three,
6 because the areas available for development would be smaller, of lesser quality, and closer to
7 existing infrastructure.
8

9 Under Alternative Four, a portion of the All Other Areas geographic area and a small portion
10 of the ALE Reserve would be managed under the Conservation (Mining) land-use designation.
11 Lands within the ALE Reserve under this land-use designation are classified as BRMaP Levels I
12 and II. The portion of the All Other Areas geographic area available for mining includes BRMaP
13 Levels II and III resources. Basalt and sand and gravel quarries developed in these areas could
14 impact rare plants and sensitive plant communities, depending on their location. Because basalt
15 and sand and gravel quarries are typically limited in size and would be permitted by DOE, it is
16 unlikely that habitat losses would be large enough to affect biodiversity.
17

18 Alternative Four would increase recreational access to the Columbia River by adding two
19 new access points to the river at White Bluffs and Vernita Bridge, which would be associated with
20 tribal fishing villages and support facilities. The increased access could have impacts to biological
21 resources such as those described for the Preferred Alternative, although impacts under
22 Alternative Four may be less extensive because it would not provide access to as many areas.
23

24 Alternative Four would assign the Preservation land-use designation to approximately
25 76 percent (112,321 ha [277,551 ac]) of Hanford Site, including the Wahluke Slope, the Columbia
26 River Corridor, most of the ALE Reserve, the basalt outcrops and active sand dunes, and other
27 portions of the All Other Areas geographic area. The Preservation land-use designation would
28 protect approximately 85 percent (56,842 ha [140,460 ac]) of BRMaP Level III and 100 percent
29 (9,260 ha [22,882 ac]) of BRMaP Level IV resources on the Hanford Site.
30

31 **5.2.3.7 Mitigation Measures.** With the exception of the No-Action Alternative, the CLUP policies
32 and implementing procedures described in Chapter 6 would be used to screen development
33 proposals for Hanford Site lands. All proposals, including the No-Action Alternative, potentially
34 affecting sensitive biological resources would be required to comply with applicable statutes, such
35 as the *Endangered Species Act of 1973*, the *Bald and Golden Eagle Protection Act of 1972*, the
36 *Migratory Bird Treaty Act of 1918*, and other statutes, Executive Orders, and policies discussed in
37 Chapter 7. Some activities with the potential to impact habitats of concern would not be permitted
38 by DOE and others would be modified or required by CLUP policies and implementing procedures
39 to incorporate mitigation measures to reduce impacts. Mitigation measures that could reduce
40 impacts to biological resources include the following:
41

- 42 C Minimize disturbance of wetlands and replace disturbed wetlands through purchase,
43 construction, or restoration of wetlands.
44
- 45 C Mitigation for remedial actions should occur near the site of the disturbance as a first
46 priority or, if that is not feasible, be performed as compensatory mitigation on areas
47 designated for Conservation or Preservation.
48
- 49 C Revegetate disturbed areas using native vegetation.
50
- 51 C Schedule activities to avoid critical nesting, roosting, leking, breeding, and fawning
52 times.
53

54 **5.2.4 Cultural Resources** 55

56 Impacts to cultural resources may include damage or destruction of archaeological and

1 historic sites and artifacts, as well as disruption of religious and traditional uses of the Hanford Site
2 by American Indians. Impacts of the alternatives on Hanford Site cultural resources are
3 summarized in Table 5-10.
4

5 **5.2.4.1 No-Action Alternative.** The No-Action Alternative would allow quarrying from basalt
6 outcrops that have traditional, cultural, and religious importance to American Indians. The
7 No-Action Alternative also would allow sand and gravel mining and industrial development in most
8 of the All Other Areas geographic area, which would alter the viewsheds associated with religious
9 sites. These activities and cultivated agriculture (which could be allowed under the No-Action
10 Alternative) could also displace natural resources traditionally gathered by American Indians and
11 disturb archaeological and historic sites. Ground-disturbing activities adjacent to the Columbia
12 River could also increase sediment loading to the Columbia River, which could damage salmonid
13 spawning areas and potentially affect American Indian fishing as a cultural activity. Although the
14 No-Action Alternative would not increase recreational access to the Columbia River,
15 archaeological sites would remain at risk to unauthorized artifact collection and riverbank erosion
16 from boat wakes.
17

18 **5.2.4.2 Preferred Alternative.** Although the Preferred Alternative would preclude quarrying of
19 basalt outcrops such as Gable Mountain and Gable Butte, mining of other areas could damage or
20 destroy archaeological and historic sites and displace natural resources traditionally gathered by
21 American Indians. Mining and industrial development could also affect viewsheds associated with
22 American Indian religious sites.
23

24 The Preferred Alternative would allow industrial development in the Central Plateau and in
25 the southeastern portion of the Hanford Site. Although these areas already include developed
26 sites (e.g., 200 Areas, Energy Northwest [formerly known as WPPSS], FFTF, and 300 Area), large
27 land areas remain that have not been disturbed. Development of these areas could result in
28 damage to or destruction of archaeological and historic sites and displacement of natural
29 resources traditionally gathered by American Indians.
30

31 The Preferred Alternative would increase recreational access to the Columbia River by
32 allowing additional boat launch facilities to be constructed. The Low-Intensity Recreation land-use
33 designation would also allow increased recreational use of the Vernita Terrace. Increased
34 recreational uses along the Columbia River could result in damage to natural resources
35 traditionally gathered by American Indians and impacts to archaeological and historic sites from
36 unauthorized artifact collection, vandalism, and erosion of riverbanks from boat wakes.

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Table 5-10. Potential Impacts of Land-use Alternatives on Cultural Resources.

Alternative	Impacting Activity	Impacts to Key Cultural Resource Areas (T = impact) ^a				
		Religious Sites	Viewsheds	Natural Resource Gathering Areas	Archaeological and Burial Sites	Historic Sites
No-Action	Mining	T	T	T	T	T
	Livestock grazing	T		T	T	
	Cultivated agriculture		T	T	T	T
	Development		T	T	T	T
	Recreation				T	
Preferred Alternative	Mining		T	T	T	T
	Livestock grazing					
	Cultivated agriculture					
	Development		T	T	T	T
	Recreation			T	T	T
Alternative One	Mining		T	T	T	T
	Livestock grazing					
	Cultivated agriculture					
	Development				T	T
	Recreation			T	T	T
Alternative Two	Mining					
	Livestock grazing					
	Cultivated agriculture					
	Development				T	T
	Recreation					
Alternative Three	Mining	T	T	T	T	T
	Livestock grazing	T		T	T	
	Cultivated agriculture		T	T	T	T
	Development		T	T	T	T
	Recreation			T	T	T
Alternative Four	Mining		T	T	T	T
	Livestock grazing					
	Cultivated agriculture					
	Development			T	T	T
	Recreation				T	T

^a Checkmarks do not represent adverse impacts of comparable significance; refer to accompany text for significance of impacts.

1 **5.2.4.3 Alternative One.** Under Alternative One, mining to support remediation would be allowed
2 in scattered locations in the All Other Areas geographic area. Although some archaeological sites
3 in these areas were previously disturbed by pre-Hanford farming or by construction of Hanford Site
4 facilities, cultural artifacts may remain that could be impacted by mining. Mining in these areas
5 could affect native plant communities and animals of importance to American Indians. However,
6 this impact is less likely to occur under Alternative One than under the Preferred Alternative,
7 because less land would be available for mining and much of it has been previously disturbed.
8

9 Alternative One would limit the Industrial and Research and Development land-use
10 designations to the Central Plateau, Energy Northwest (formerly known as WPPSS) site,
11 300 Area, and the City of Richland UGA, where some archaeological and historic sites have
12 already been identified and mitigated. The Industrial land-use designation also includes an area
13 located south of the Energy Northwest (formerly known as WPPSS) site where cheatgrass
14 dominates the vegetation cover. Future industrial development in this area could disturb
15 archaeological or historic sites. Archaeological sites could also be disturbed by future
16 development under the Industrial-Exclusive land-use designation on the Central Plateau, although
17 Alternative One would protect more of these resources in the Central Plateau than would the
18 Preferred Alternative.
19

20 Alternative One would increase recreational access to the Columbia River by allowing an
21 additional boat launch facility to be constructed. Increased recreational uses along the Columbia
22 River could result in damage to natural resources traditionally gathered by American Indians and
23 impacts to archaeological and historic sites from unauthorized artifact collection, vandalism, and
24 riverbank erosion from boat wakes. These impacts would be less extensive under Alternative One
25 than under the Preferred Alternative, which would allow higher levels of recreational use.
26

27 **5.2.4.4 Alternative Two.** Industrial development under Alternative Two would be limited to the
28 Central Plateau, Energy Northwest (formerly known as WPPSS) site, 300 Area, and areas
29 adjacent to the City of Richland. Archaeological and historic resources in most of these areas
30 have already been identified and mitigated. New development in areas of the Central Plateau
31 could disturb additional sites, although Alternative Two would protect more of these resources in
32 the Central Plateau than would the Preferred Alternative. Alternative Two would designate most of
33 the Hanford Site for Preservation, which would minimize future impacts to cultural resources.
34

35 **5.2.4.5 Alternative Three.** Under Alternative Three, areas with known cultural resources,
36 including the ALE Reserve, could be affected by mining if permitted by CLUP policies and
37 implementing procedures. However, this alternative would not allow mining or other development
38 within 400 m (0.25 mi) of the Columbia River Corridor, where cultural resources are concentrated.
39 Mining, cultivated agriculture, and industrial development under this alternative could alter
40 viewsheds associated with religious sites used by American Indians.
41

42 Alternative Three would allow industrial and R&D in the Central Plateau and in the eastern
43 and southern portions of the Hanford Site. Although these areas already include developed sites,
44 such as the 200 Areas, Energy Northwest site, FFTF, and 300 Area, there remain large land areas
45 that have not been disturbed. Development of these areas could result in damage to or
46 destruction of archaeological and historic sites and displacement of natural resources traditionally
47 gathered by American Indians.
48

49 Alternative Three would allow conversion of much of the Wahluke Slope to croplands under
50 the Agricultural land-use designation. Conversion to croplands would involve removal of native
51 vegetation important to American Indians. Tillage of croplands would damage or destroy
52 archaeological and historic sites. Irrigated agriculture would increase slumping of the White
53 Bluffs, which have cultural significance to American Indians. Increased slumping could also

1 impact American Indian cultural fishing and other fishing and could alter the river channel, causing
2 losses of cultural resources to riverbank and island erosion.

3
4 Agricultural development and commercial grazing on the Wahluke Slope would also alter
5 native plant communities and displace animals of importance to American Indians. Archaeological
6 and burial sites could be damaged where livestock gather, such as at water sources.

7
8 Alternative Three would increase recreational access to the Columbia River by designating
9 a large portion of the 100 Areas for Low-Intensity Recreation, as well as designating the Vernita
10 Terrace and the B Reactor area for High-Intensity Recreation. Development of recreational
11 facilities could damage archaeological and historic sites in these areas. Increased recreational
12 uses along the Columbia River could also result in damage to natural resources traditionally
13 gathered by American Indians and impacts to archaeological and historic sites from unauthorized
14 artifact collection, vandalism, and riverbank erosion from boat wakes. An area near Horn Rapids
15 on the Yakima River designated for High-Intensity Recreation could have similar impacts to
16 cultural resources and the culturally important viewshed.

17
18 **5.2.4.6 Alternative Four.** Alternative Four would allow mining that followed the CLUP's policies
19 and implementing procedures in support of remediation in the southern portion of the All Other
20 Areas geographic area. Mining in this area could alter viewsheds associated with religious sites
21 used by American Indians.

22
23 Alternative Four would designate southeastern portions of the Hanford Site for Industrial
24 and Research and Development uses. Although these areas already include developed sites
25 (e.g., Energy Northwest [formerly known as WPPSS], FFTF, and the 300 Area), other areas under
26 these designations have not previously been disturbed. Development of these areas could result
27 in damage to or destruction of archaeological and historic sites and displacement of natural
28 resources traditionally gathered by American Indians. These impacts would be less extensive
29 under this alternative than under the Preferred Alternative or Alternative Three because less land
30 would be available for development.

31
32 Alternative Four would increase recreational access to the Columbia River by allowing
33 additional boat launch facilities to be constructed. Increased recreational uses along the Columbia
34 River could result in impacts to archaeological and historic sites from unauthorized artifact
35 collection, vandalism, and riverbank erosion from boat wakes. These impacts may be less
36 extensive under Alternative Four than under the Preferred Alternative because this alternative
37 would not provide access to as many areas.

38
39 **5.2.4.7 Mitigation Measures.** With the exception of the No-Action Alternative, the CLUP policies
40 and implementing procedures described in Chapter 6 would be used by DOE to screen
41 development proposals for Hanford Site lands. Impacts of specific proposed projects would be
42 evaluated through the NEPA process including potential impacts on tribal member's treaty rights
43 and known archaeological and historic sites. Some projects may not be permitted and others may
44 be required to incorporate mitigation measures to reduce the impacts. Mitigation measures that
45 could reduce impacts to cultural resources include the following:

- 46
47 C Restrict irrigated agriculture on the Wahluke Slope, requiring hydrogeologic studies, or
48 requiring efficient irrigation methods to minimize the potential for increased slumping of
49 the White Bluffs.
50
51 C Continue to conduct cultural resource surveys of proposed project locations in
52 accordance with Neitzel et al. 1997.
53

- 1 C Continue to schedule activities to avoid conflicts with American Indian traditional and
2 religious uses.
- 3
- 4 C Continue to conduct consultations with the RL Cultural Resources Program Manager,
5 the State Historic Preservation Office, affected Tribal governments, and Wanapum
6 Band representatives to identify additional mitigation measures or project alternatives.
7

8 **5.2.5 Aesthetic Resources**

9

10 In this document, key aesthetic resources include viewing locations, viewsheds, visibility
11 (ambient air quality), odors, and ambient noise levels. Adoption of any particular alternative would
12 not directly impact aesthetic resources; however, activities allowed under the various alternatives
13 could have different affects on these resources.
14

15 Impacts of the alternatives on aesthetic resources are described in the following sections
16 and are summarized in Table 5-11. The primary impacts to aesthetic resources would occur as a
17 result of altering viewsheds through mining or development, visibility or odor impacts from release
18 of atmospheric pollutants from industrial activities, visibility impacts from releases of fugitive dust
19 from construction sites and seasonally from agricultural activities, and new noise impacts as a
20 result of development, mining, or recreation in areas that are typically quiet.
21

22 Under all alternatives, new development projects would be subject to a New Source
23 Review in accordance with the requirements of *Washington Administrative Code (WAC) 173-400*.
24 The New Source Review would identify probable air emissions and air emission control
25 technology would be required, if necessary, to comply with Washington State air-quality
26 thresholds.
27

28 **5.2.5.1 No-Action Alternative.** Under the No-Action Alternative, a quarry operation could be
29 developed on Gable Mountain or Gable Butte, affecting access to these viewing locations. Mining
30 and industrial development activities under this alternative could alter the viewsheds associated
31 with the basalt outcrops. These activities could be widely dispersed under the No-Action
32 Alternative and would stand out against the relatively undisturbed surrounding terrain.
33

34 Potential impacts to visibility under this alternative would occur as a result of temporary
35 releases of fugitive dust from construction sites, seasonal releases of fugitive dust from
36 agricultural fields, releases of fugitive dust during mining or quarrying operations, and from
37 releases of pollutants from developed sites.
38

39 Potential noise impacts under the No-Action Alternative would include blasting associated
40 with quarry operations, noise generated seasonally by agricultural machinery, and industrial noise
41 around new industrial sites. Depending on the location of the activities, these noise impacts could
42 detract from the recreation experience of recreationists on the Wahluke Slope and along the
43 Columbia River.
44

45 Commercial grazing by domestic animals could destroy wetland vegetation, create mud
46 holes, create obnoxious odors, create noise, and be a source of weed and insect pests. Grazing
47 could detract from the recreation experience of recreationists, including hikers, hunters, fishers,
48 and wildlife watchers using areas designated for Low-Intensity Recreation, Conservation, and
49 Preservation; and could disrupt wildlife.

Table 5-11. Potential Impacts of Land-Use Alternatives on Aesthetic Resources.

Plan Map	Impacting Activity	Impacts to Aesthetic Resources (T = impact)		
		Viewsheds	Ambient Visibility	Ambient Noise Levels
No-Action Alternative	Mining	T	T	T
	Livestock grazing			
	Cultivated agriculture	T	T	T
	Development	T	T	T
	Recreation			T
Preferred Alternative	Mining	T	T	T
	Livestock grazing			
	Cultivated agriculture			
	Development	T	T	T
	Recreation			T
Alternative One	Mining	T	T	T
	Livestock grazing			
	Cultivated agriculture			
	Development		T	T
	Recreation			T
Alternative Two	Mining			
	Livestock grazing			
	Cultivated agriculture			
	Development		T	
	Recreation			
Alternative Three	Mining	T	T	T
	Livestock grazing			
	Cultivated agriculture	T	T	T
	Development	T	T	T
	Recreation	T		T
Alternative Four	Mining	T	T	T
	Livestock grazing			
	Cultivated agriculture			
	Development	T	T	T
	Recreation			T

Checkmarks do not represent adverse impacts of comparable significance; refer to accompany text for significance of impacts.

5.2.5.2 Preferred Alternative. Under the Preferred Alternative, viewing locations associated with basalt outcrops and the ALE Reserve would not be disturbed. Viewing locations associated with the Columbia River could be disrupted through development of a mining operation outside a quarter mile from the river. Mining operations would also be permitted within the viewsheds of basalt outcrops. An area designated for Industrial use is within the viewshed of Gable Mountain. Impacts to visibility could include releases of fugitive dust from construction sites and pollutants from new industrial sites.

Noise impacts under the Preferred Alternative could include blasting during quarry operation, increased noise in the vicinity of new industrial sites, and noise from increased motorized watercraft use on the Columbia River. The increased noise levels from these activities could detract from the recreation experience of recreationists, including hikers, hunters, fishers,

1 and wildlife watchers using areas designated for Low-Intensity Recreation, Conservation, and
2 Preservation; and could disrupt wildlife.

3
4 **5.2.5.3 Alternative One.** Under Alternative One, viewing locations associated with basalt
5 outcrops, the Columbia River, and the ALE Reserve would be protected. Mining operations would
6 be permitted within the viewshed of Gable Mountain, but with the exception of the 200 Areas, only
7 limited industrial development would be permitted within the viewshed. Visibility impacts could
8 include emissions of fugitive dust from mining operations and construction sites, along with
9 potential emissions of pollutants from industrial activities.

10
11 Noise impacts under Alternative One could include blasting during quarry operation,
12 increased noise in the vicinity of new industrial sites, and noise from increased motorized
13 watercraft use on the Columbia River. Because areas designated for development are in close
14 proximity to previously developed areas, new noise sources are not likely to affect previously quiet
15 areas. Noise from blasting and from recreational activities along the Columbia River could affect
16 some areas that are presently quiet, detracting from the recreation experience of recreationists
17 and potentially disrupting wildlife.

18
19 **5.2.5.4 Alternative Two.** Alternative Two would allow minimal new development on the Hanford
20 Site, protecting existing viewing locations and viewsheds. New industrial development could occur
21 in the City of Richland UGA, but would have minimal visibility and noise impacts to recreationists.

22
23 **5.2.5.5 Alternative Three.** Alternative Three would allow quarrying operations on basalt outcrops
24 and mining on the ALE Reserve, which could affect access to viewing locations. Viewing
25 locations associated with the Columbia River would remain unaffected. The viewshed from the
26 basalt outcrops and from points along the Columbia River could be altered by development of
27 agriculture on the Wahluke Slope and mining and industrial development on other portions of the
28 Hanford Site. Agricultural development of the Wahluke Slope would replace natural vegetation
29 mosaics with ordered rectangular, linear, and circular patterns associated with irrigated cropland
30 and orchards.

31
32 Visibility impacts could include fugitive dust from mining and quarrying operations,
33 seasonal releases of particulates from farming activities, releases of fugitive dust from
34 construction sites, and releases of pollutants from new industrial sites.

35
36 Noise impacts associated with this alternative could include blasting in support of quarry
37 operations, noise from agricultural machinery, industrial noise in developed areas, and increased
38 noise associated with motorized watercraft on the Columbia River. The new noise sources could
39 affect some areas that are presently quiet, detracting from the recreation experience of
40 recreationists and potentially disrupting wildlife.

41
42 Commercial grazing by domestic animals could destroy wetland vegetation, create mud
43 holes, create obnoxious odors, create noise, and be a source of weed and insect pests. Grazing
44 could detract from the recreation experience of recreationists, including hikers, hunters, fishers,
45 and wildlife watchers using areas designated for Low-Intensity Recreation, Conservation, and
46 Preservation; and could disrupt wildlife.

47
48 **5.2.5.6 Alternative Four.** Alternative Four would protect viewing locations at basalt outcrops, on
49 the ALE Reserve, and along the Columbia River. Mining activities in the south-central portion of
50 the Hanford Site could alter viewsheds associated with basalt outcrops. Impacts to visibility could
51 include releases of fugitive dust from construction sites and pollutants from new industrial sites.

52
53 Noise impacts under Alternative Four could include blasting during quarry operation,
54 increased noise in the vicinity of new industrial sites, and noise from increased motorized

1 watercraft use on the Columbia River. The increased noise levels from these activities could
2 detract from the recreation experience of recreationists and could disrupt wildlife.

3
4 **5.2.5.7 Mitigation Measures.** With the exception of the No-Action Alternative, the CLUP policies
5 and implementing procedures described in Chapter 6 would be used to screen development
6 proposals for Hanford Site lands. Proposed projects would be planned to be consistent with the
7 CLUP policies requiring protection of natural and cultural resources. This planning effort would
8 include consideration of aesthetic resources. Potential mitigation measures for aesthetic
9 resources include:

- 10 C Implementing dust control measures, such as spraying water or other dust
11 suppressants, on construction, excavation, and quarry sites to reduce emissions of
12 fugitive dust.
- 13
14 C Covering loads when hauling materials away from construction or excavation sites.
- 15
16 C Siting development or mining activities in areas with the least impact on the viewshed
17 from basalt outcrops with their talus slopes, such as Gable Butte and Gable Mountain.
- 18
19 C Minimizing noise impacts to wildlife by restricting activities that generate noise to
20 seasons when sensitive wildlife would be disrupted the least.
- 21
22
23 C Limiting grazing timing, grazing rotation, and grazing areas to protect aesthetic
24 resources.
- 25
26

27 **5.3 Socioeconomic**

28 29 **5.3.1 Socioeconomic Impacts**

30
31 The study area used for the purpose of socioeconomic analysis includes Benton,
32 Franklin, and Grant counties.

33
34 **5.3.1.1 No-Action Alternative.** Under the No-Action Alternative, a land-use plan would not be
35 implemented, and facility planning and siting would continue on a project-by-project basis.
36 Because a land-use plan would not guide development, the potential socioeconomic impacts of
37 the No-Action Alternative cannot be readily predicted. The lack of a land-use plan that provides a
38 framework for DOE and local governments to work cooperatively may discourage multiple use
39 and transfer of Hanford lands. In the absence of a land-use plan, it is also unlikely that new
40 recreational opportunities would be developed that would generate economic benefits. However, it
41 can be assumed that this alternative would allow industrial development and R&D activities to
42 occur. Industrial development under the No-Action Alternative is likely to generate more
43 employment than Alternatives One or Two, but probably less employment than would the
44 Preferred Alternative or Alternative Three.

45
46 Under the No-Action Alternative, it is less likely facility siting would be coordinated to share
47 utility corridors and conserve space. The lack of a land-use plan could result in inefficient use of
48 existing infrastructure, with new infrastructure added on a project-by-project basis. In the absence
49 of a land-use plan, prioritization of infrastructure maintenance and improvements would be more
50 difficult and could result in higher costs to DOE and local governmental entities responsible for
51 infrastructure.

52
53 **5.3.1.2 Preferred Alternative.** Implementation of the Preferred Alternative would allow industrial
54 development, R&D initiatives, limited mining, and increased recreational uses on Hanford Site

1 lands. A total of 15,335 ha (37,894 ac) would become available for industrial development, which |
2 would meet the estimated need forecasted by the Benton County Planning Department (1,639 ha |
3 [4,050 ac]), and would provide an additional 13,696 ha (33,844 ac) to support possible future DOE |
4 missions. This amount of land would allow the siting of several manufacturing facilities, with a
5 total employment of 1,000 or more. Lands under the Research and Development land-use
6 designation would total approximately 4,912 ha (12,138 ac), which could support at least
7 527,482 m² (5.9 million ft²) of facility space (including buildings, parking lots, and support facilities)
8 and total employment of up to 100 employees.
9

10 Future industrial development on Hanford Site lands would require additional support
11 infrastructure, such as roads and utilities. The City of Richland, in its Comprehensive Plan (COR
12 1997), anticipates industrial development in its UGA¹, which includes Hanford's 300 Area, and a
13 portion of the Hanford Site north of the city limits. The Comprehensive Plan was prepared with the
14 assumption that all industrial development within the 20-year planning period would be
15 accommodated by land already available within the UGA. The Comprehensive Plan describes the
16 city's plans for addressing additional infrastructure needs anticipated in the UGA during the
17 planning period.
18

19 The City of Richland's Comprehensive Plan (pp. 3-17, and 3-19 through 3-22) (COR 1997)
20 indicates that growth exceeding the City's projections could result in reduced levels of service in
21 the city's infrastructure, including the transportation system, waste water facilities, water supply,
22 solid waste management, and electrical power supply. If industrial development under the
23 Preferred Alternative expanded beyond the UGA, the development could exceed the City's capacity
24 to provide supporting infrastructure. Existing Hanford Site infrastructure could meet at least some
25 of the increased demand. Improvements to the existing infrastructure may have to be financed
26 through other governmental or public entities, such as Benton County or the Port of Benton, to
27 encourage industrial development on Hanford Site lands.
28

29 The Preferred Alternative would make some of the Hanford Site available for mining under
30 the Conservation (Mining) land-use designation. The Preferred Alternative would allow the
31 development of the existing natural gas claim held by the Big Bend Alberta Mining Company and
32 the filing of new claims for sand and gravel and natural gas development. However, the
33 Preservation land-use designation for the areas of the ALE Reserve surrounding those claims
34 would preclude construction of an access road to the claims, and could make future development
35 economically unfeasible. Mineral development on other areas of the Hanford Site would depend
36 on the release of Hanford Site lands withdrawn from the public domain by DOE, the Bureau of
37 Land Management (BLM), and the BoR. The BoR-held lands on the Wahluke Slope are not
38 subject to mineral claims without the specific agreement of the BoR. The BoR does not anticipate
39 giving permission for extraction of building materials such as sand and gravel from its lands on the
40 Wahluke Slope. Because the restrictions placed on mineral development at the Hanford Site are
41 likely to discourage investment in mining claims, future mineral development is unlikely to have
42 impacts to the regional economy.
43

44 The Preferred Alternative would preclude basalt quarrying from basalt outcrops and soil
45 mining from the McGee Ranch. These locations have been identified as the most cost-effective
46 and technically feasible sources of geologic materials for remediation (see Appendix D). The
47 Conservation (Mining) land-use designation under the Preferred Alternative designates an area in
48 the ALE Reserve as an alternative basalt source. Alternative soil mining sites are also available
49 under the Conservation (Mining) land-use designation. Increased haul distances from quarries to
50 remediation sites would increase remediation costs under the Preferred Alternative, as compared
51 to the No-Action Alternative and Alternative Three.

¹ An urban growth area (UGA) is defined as an area designated by the county or city for the expansion of urban development and municipal jurisdiction.

1 Low-Intensity Recreation associated with the Vernita Terrace, and High-Intensity
2 Recreation use associated with boat launches and the B Reactor Museum, along with limited
3 recreational opportunities under the Conservation and Preservation land-use designations, could
4 have impacts on the economy in the study area. Because current access to the Columbia River
5 Corridor is effectively limited to the Wahluke Wildlife Recreation Area, increased access under the
6 Preferred Alternative could greatly increase use for sport fishing, recreational boating, and other
7 day uses. Assuming that increased access to the Columbia River Corridor would double the
8 amount of day use over levels at the Wahluke Wildlife Recreation Area, an additional \$1.4 million
9 per year could be generated for the local economy in recreational tourism dollars. Increased
10 recreational use could increase employment in retail sporting goods, boat dealers, recreational
11 vehicle (RV) dealers, and hotels and motels in the study area. These service industry jobs
12 typically benefit the economically disadvantaged worker by providing more job opportunities.
13

14 **5.3.1.3 Alternative One.** Implementation of Alternative One would expand the existing Saddle
15 Mountain NWR. According to the Washington Department of Fish and Wildlife (WDFW), wildlife
16 viewing is big business in Washington State. More than a third of the state's population
17 participates in wildlife viewing and those wildlife watchers spent nearly \$1.7 billion on the pursuit in
18 Washington in 1996. A report issued by the WDFW entitled, *The Economic Benefits of Wildlife-*
19 *Watching Activities in Washington*, found that wildlife watchers spent \$1.1 billion on equipment
20 purchases; \$509 million on trip-related expenses including food and lodging; \$106 million for land-
21 use fees and rentals; and \$59 million for items such as magazines, books, membership dues, and
22 other items. Nationwide, Americans spent \$29.2 billion on wildlife in 1996 and if wildlife-watching
23 were a company, nationally it would have ranked 23rd among Fortune 500 corporations. In
24 Washington alone, wildlife-viewing activities in 1996 translated to nearly 8,000 jobs, sales tax of
25 \$56.9 million, and destination tourism drawing about 270,000 out-of-state visitors who spent nearly
26 6 million visitor-days. How much income the expanded refuge would bring to the Hanford area is
27 unknown at this time.
28

29 Alternative One would allow continued industrial development and limited recreational uses
30 on Hanford Site lands. A total of 2,542ha (6,281 ac) would become available for industrial
31 development, which would meet the estimated need forecasted by the Benton County Planning
32 Department (1,639 ha [4,050 ac]), and would provide an additional area to support possible future
33 DOE missions. This amount of land would allow the siting of several manufacturing facilities, with
34 a total employment of 100 to 1,000. Research and Development land uses would be limited to the
35 300 Area and 400 Area, which are already developed. The economic impact of Research and
36 Development land use under Alternative One would depend on possible future uses for the
37 300 and 400 Areas facilities.
38

39 Alternative One would allow efficient use of existing infrastructure located in the 300 Area
40 and in the City of Richland UGA, but could require new infrastructure to develop the rectangular
41 area located south of the Energy Northwest (formerly known as WPPSS) site designated for
42 industrial use. This area is an "island" surrounded by lands designated Preservation, which could
43 make extension of utilities to the area difficult. Construction of utility corridors through
44 Preservation lands would require more project reviews and justification, resulting in increased
45 costs and extended schedules. Because Alternative One would convert other areas containing
46 existing infrastructure to the Preservation land-use designation, the existing infrastructure would
47 not be maintained and would lose its remaining economic value.
48

49 Alternative One would expand an existing Federal wildlife refuge. Because a wildlife refuge
50 would be expected to maintain high ecological values, there are various legal requirements
51 attached by the Federal and state governments that could have socioeconomic impacts. A
52 summary of possible socioeconomic impact drivers by resource area follows.
53

- 1 C **Air** -- For visibility protection, the *Clean Air Act of 1977* specifies that Federal wildlife
2 refuges over 10,000 acres can only be designated as Federal Class I or Federal Class
3 II air shed (CAA Section 162 and WAC 173-400).
4
- 5 C **Land** -- Any Dangerous Waste Management Unit boundary must be sited at least one-
6 quarter mile from state or federally designated wildlife refuges (WAC 173-303-282);
7 and, incinerator ash disposal facilities shall not be located in a state or federally
8 designated wildlife refuge (WAC 173-306-350).
9
- 10 C **Surface water** -- No degradation of existing sediment quality shall be allowed of waters
11 constituting an outstanding national resource, such as water of a wildlife refuge
12 (WAC 173-204-120).
13
- 14 C **Groundwater** -- Degradation shall not be allowed of high quality ground waters
15 constituting an outstanding national or state resource such as waters of a wildlife
16 refuge (WAC 173- 200-030)
17

18 Alternative One would reduce the amount of land designated Industrial-Exclusive as
19 compared to the No-Action Alternative, the Preferred Alternative, and Alternatives Three and Four.
20 This could limit future development of lands under this designation for future DOE missions, and
21 could have impacts on the future economic contribution of DOE activities. However, GIS data
22 indicate that only 38 percent of lands under this designation are currently developed. Also, none of
23 the reasonably foreseeable actions identified for the 200 Areas would require lands that would not
24 be available under Alternative One, indicating that sufficient lands would remain available under the
25 Industrial-Exclusive land-use designation to support future development without adverse
26 socioeconomic impacts.
27

28 Alternative One would allow the development of the existing natural gas claim held by the
29 Big Bend Alberta Mining Company, but would not allow the filing of new claims for sand and gravel
30 and natural gas development. Mining on the Hanford Site would be limited to obtaining geologic
31 materials to support remediation and maintaining existing sand and gravel quarries. These mining
32 activities are unlikely to have economic impacts in the study area.
33

34 Alternative One would allow High-Intensity Recreational uses at the B Reactor and Vernita
35 Bridge, where a new boat ramp would be constructed. Another unimproved boat ramp and other
36 Low-Intensity Recreational uses would also be allowed. Recreation under this alternative is likely
37 to have the greatest economic impact directly from ecotourism as a result of the expansion of the
38 existing Saddle Mountain NWR.
39

40 **5.3.1.4 Alternative Two.** Implementation of Alternative Two would allow limited industrial
41 development and limited recreational uses on Hanford Site lands. This alternative would have the
42 least economic potential of the alternatives being considered. A total of 1,830 ha (4,522 ac) would
43 become available for industrial development, which is 191 ha (472 ac) more than the estimated
44 need forecasted by the Benton County Planning Department (1,639 ha [4,050 ac]). However,
45 much of this land (which includes the Energy Northwest [formerly WPPSS], FFTF, and lands
46 adjacent to the city of Richland), is already developed. According to the GIS database, 673 ha
47 (1,662 ac) or 32 percent of the Industrial land-use designation under Alternative Two is already
48 developed. Therefore, this alternative would not have sufficient vacant land to meet the estimated
49 future need or provide for possible future DOE missions.
50

51 The relatively small amount of vacant land designated for Industrial development under this
52 alternative would probably limit new industrial employment to less than 100. Research and
53 Development land uses under this alternative would be limited to existing uses at LIGO (theoretical
54 physics research), and the K Reactor Basins (aqua-culture). The number of employees that
55 could be supported would depend on possible future uses of these facilities. As was described

1 under Alternative One, Alternative Two would reduce the area available for development under the
2 Industrial-Exclusive land-use designation but is unlikely to have adverse socioeconomic impacts.
3

4 As with the Preferred Alternative, Alternative Two would allow commercial development of
5 the existing natural gas claim on the ALE Reserve, but the Preservation land-use designation
6 would limit access. This alternative would preclude the development of any other geologic
7 resources on the Hanford Site. Geologic resources required to support remediation activities
8 would have to be obtained from locations off the Hanford Site, which could increase remediation
9 costs (see Appendix D).
10

11 Alternative Two would allow High-Intensity Recreation associated with the B Reactor
12 Museum, but would not increase recreational access to the river. Day use of the B Reactor area
13 would generate some economic benefits, but they would be substantially less than those
14 estimated for the recreational uses under the other alternatives.
15

16 As in Alternative One, an additional economic benefit may be realized from the
17 Preservation land-use designation, which could increase interest in the Hanford Site in the
18 ecotourism market. Interest in ecotourism, which focuses on pristine habitats and rare species, is
19 increasing. The preserved habitats and associated species at the Hanford Site could draw
20 additional visitors to the Site, and generate additional revenues. However, access would be limited
21 under Alternative Two and the Preservation areas would lack the additional legal protection of
22 being a NWR.
23

24 **5.3.1.5 Alternative Three.** Under Alternative Three, a total of 17,860 ha (44,133 ac) would
25 become available for industrial development, which would meet the estimated need forecasted by
26 the Benton County Planning Department (1,639 ha [4,050 ac]), and would provide an additional
27 16,221 ha (40,083 ac) to support possible future DOE missions. This amount of land would allow
28 the siting of several manufacturing facilities, with a total employment of 1,000 or more. Industrial
29 development on the Hanford Site could increase infrastructure demand, as described under the
30 Preferred Alternative.
31

32 Lands under the Research and Development land-use designation would total
33 approximately 8,177 ha (20,206 ac), of which approximately 20 percent would be occupied by
34 infrastructure, such as roads and utility corridors. The remaining land base would support at least
35 878,000 m² (9.7 million ft²) of facility space and total employment of 100 to 300 employees.
36

37 As with the Preferred Alternative, Alternative Three would allow the efficient use of existing
38 infrastructure on the Hanford Site, but could generate increased demand that could exceed the
39 capacity of the City of Richland. Improvements to the existing infrastructure may have to be
40 financed through other governmental or public entities, such as Benton County or the Port of
41 Benton, to encourage industrial development on Hanford Site lands.
42

43 Alternative Three would allow the development of the existing natural gas claim held by the
44 Big Bend Alberta Mining Company, and the filing of new claims for sand and gravel and natural gas
45 development. The Conservation (Mining) land-use designation on the ALE Reserve would allow
46 access to develop the existing natural gas claim, pending review and issuance of a special-use
47 permit, as described in Chapter 6. Alternative Three is more likely to result in development of the
48 existing natural gas claim than would the other alternatives being considered, and could
49 encourage further development of natural gas resources on and near the Hanford Site. Mineral
50 development on other areas of the Hanford Site would depend on the release of Hanford Site lands
51 withdrawn from the Public Domain, as described under the Preferred Alternative.
52

53 Alternative Three would not preclude basalt quarrying, if permitted by DOE, from basalt
54 outcrops such as Gable Mountain and Gable Butte, and soil mining from the McGee Ranch.

1 These locations have been identified as the most cost-effective and technically feasible sources of
2 geologic materials for remediation (see Appendix D). Alternative Three could reduce remediation
3 costs compared to the Preferred Alternative and Alternatives One, Two, and Four.
4

5 Alternative Three would allow cultivated agriculture, industrial development, R&D initiatives,
6 limited commercial grazing and mining, and High-Intensity Recreational uses within designated
7 areas of the Hanford Site. This alternative would have the highest potential for economic
8 development of the alternatives being considered. Under this alternative, lands on the Wahluke
9 Slope could be developed for growing irrigated crops, including small grains, potatoes, hay, fruits,
10 and vegetables, as well as livestock production. The economic impact of agricultural development
11 on former Hanford Site lands would depend on how much land is converted to farmland, how
12 much is irrigated, and what crops are grown. Table 5-12 summarizes the potential economic
13 impacts of agricultural development under several scenarios. Under these scenarios, the total
14 market value of agricultural products in the three counties could increase from 1.7 to 9.4 percent,
15 corresponding to a range of \$16 million to \$88 million (using 1992 prices) in additional revenues.
16 This potential increase does not take into account the affect of increasing production on the
17 market for agricultural commodities. Alternative Three would allow livestock grazing on 6,476 ha
18 (16,003 ac) of the Wahluke Slope, increasing the total pasture land base in the three counties by
19 2.5 percent. This acreage could support approximately 1,059 AUM, with a value of approximately
20 \$12,700.
21

22 High-Intensity Recreational development of the Vernita Terrace under Alternative Three
23 may include a destination resort with golf course, a boat launch, Tribal fishing facilities, interpretive
24 exhibits, and the B Reactor Museum. A destination resort and conference center featuring a
25 350-unit hotel, RV parking, and a golf course could employ 200 to 400 persons. By comparison,
26 hotels and motels in the study area employed approximately 900 persons with a total payroll of
27 approximately \$9.4 million in 1995. A large destination resort located at Vernita Terrace could
28 generate an additional \$2 million to \$4 million in payroll, in addition to other revenues. However,
29 these possible benefits could have negative impacts on other hotels, motels, and resorts in the
30 area. In addition, a destination resort development at Vernita Terrace could also require additional
31 investment in infrastructure in the northwestern portion of the Hanford Site.
32

33 If future recreational developments under Alternative Three do not include a destination
34 resort, other developments could contribute to the economy. An RV park containing 100 spaces
35 and operating at 80 percent capacity for 200 days per year could generate approximately
36 \$1.3 million annually. A golf course serving 150 golfers per day and operating year-round could
37 generate approximately \$1.4 million annually. Increased access to the Columbia River Corridor
38 under this alternative could also generate revenues from sport fishing and other day uses that
39 would be similar to those estimated for the Preferred Alternative.
40

41 **5.3.1.6 Alternative Four.** Implementation of Alternative Four would allow continued industrial
42 development, R&D initiatives, limited mining, and recreational uses on former Hanford Site lands.
43 Alternative Four would increase the land base available for industrial and Research and
44 Development land uses in Benton County. A total of 6,881 ha (17,003 ac) would become available
45 for industrial development, which would meet the estimated need forecasted by the Benton County
46 Planning Department (1,639 ha [4,050 ac]) and would provide an additional 5,242 ha (12,953 ac) to
47 support possible future DOE missions. This amount of land would allow the siting of several
48 manufacturing facilities, with a total employment of 100 to 1,000. Lands under the Research and
49 Development land-use designation would total 4,388 ha (10,843 ac), which could support at least
50 522,000 m² (5.8 million ft²) of facility space and total employment of up to 100 employees.
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Table 5-12. Potential Economic Impacts of Agricultural Development.

Agricultural Economic Indicators for the Three-County Study Area	Scenario 1: Crop Mix with Grazing in Red Zone ^a	Scenario 2: Crop Mix Without Red Zone	Scenario 3: Specialty Crop Production with Grazing in Red Zone
	Percent Increase over Existing Conditions		
Agricultural land	2.5%	2.5%	2.5%
Cropland	2.1%	3.7%	2.1%
Irrigated land	4.5%	8.0%	4.5%
Land in vegetable crops	4.5%	8.0%	24%
Land in fruit orchards	4.5%	8.0%	24%
Pastureland	4.1%	0%	4.1%
Total market value of agricultural products	1.7%	3.0%	9.4%
Total market value of crops	2.1%	3.7%	12%
Total market value of livestock	4.1%	0%	4.1%
Total market value of specialty crops	4.5%	8.0%	24%

a Red Zone refers to areas on the Wahluke Slope that may contribute to sloughing of the White Bluffs if used for agricultural purposes.

As with the Preferred Alternative, Alternative Four would allow the efficient use of existing infrastructure on the Hanford Site, but could generate increased demand that could exceed the capacity of the City of Richland. Improvements to the existing infrastructure may have to be financed through other governmental or public entities, such as Benton County or the Port of Benton, to encourage industrial development on Hanford Site lands.

Alternative Four would allow the development of the existing natural gas claim held by the Big Bend Alberta Mining Company, but would not allow the filing of new claims for sand and gravel and natural gas development. As with the Preferred Alternative, Alternative Four would limit access to the existing natural gas claim on the ALE Reserve. Mining elsewhere on the Hanford Site would be limited to obtaining geologic materials to support remediation. These mining activities are unlikely to have economic impacts in the study area.

Alternative Four would provide increased boating access to the Columbia River by adding two new access points to the river at White Bluffs and Vernita Bridge. Recreation under this alternative is likely to have economic impacts such as increased revenues and employment, but these impacts would probably be less than those described for the Preferred Alternative.

5.4 Environmental Justice

The following discussion addresses environmental justice as related to the land-use alternatives being considered for the Hanford Site. Minority and low-income populations in the vicinity of the Hanford Site are identified, followed by a discussion of the impacts that the alternatives might have on these populations. Analysis of environmental justice concerns was based on a qualitative assessment of the impacts reported in other sections of Chapter 5. The analysis was performed to identify any disproportionately high and adverse human health or environmental impacts on minority or low-income populations within the zone of potential impact, and for tribal members that are beyond the 80 km (50 mi) radius from the 200 East Area but have reserved treaty rights on the Hanford Site. The evaluation considered potential impacts arising

1 under each of the major impact categories evaluated in this EIS, including socioeconomics, water
2 resources, air resources, ecology, health and safety, and cultural resources.

3 4 **5.4.1 Demographic Analysis**

5
6 Demographic information obtained from the U.S. Bureau of Census was used to identify
7 minority populations and low-income communities within an 80-km (50-mi) radius surrounding the
8 200 East Area on the Hanford Site at the census block group level (Neitzel et al. 1997). For the
9 evaluation of environmental justice impacts, the area defined by this 80-km (50-mi) radius was
10 considered the zone of potential impact.

11
12 A total population of approximately 384,000 people reside within an 80-km (50-mi) radius of
13 the Hanford Site. The minority population within the area of impact consists of approximately
14 95,000 people and represents approximately 25 percent of the population in the assessment area.
15 The ethnic composition of the minority population is primarily Hispanic (approximately 80 percent)
16 and American Indian (8 percent). Census block groups where the percentage of minority persons
17 within the population exceeds 25 percent are primarily located to the southwest and northeast of
18 the Hanford Site and within the City of Pasco, Washington (Neitzel et al. 1997). However, several
19 large census block groups (i.e., areas with low population density) with populations consisting of
20 between 25 and 50 percent minority persons border the Hanford Site on the west, north, and east.

21
22 The low-income population within the 80-km (50-mi) area of impact represents
23 approximately 42 percent of households in the area of impact. Census block groups where the
24 percentage of the population below the poverty level exceeds 20 percent are principally located to
25 the southwest and north of the Hanford Site and within the City of Pasco, Washington
26 (Neitzel et al. 1997).

27 28 **5.4.2 American Indian Populations Near the Hanford Site**

29
30 Substantial American Indian populations are located within the 80-km (50-mi) assessment
31 area. Census block groups within the assessment area and composed primarily of American
32 Indian populations are primarily located on the Yakama Indian Reservation in Yakima County,
33 Washington. However, other American Indian populations located outside of the assessment area
34 also have an interest in the Hanford Site based on treaty rights (see Appendix A). Treaty reserved
35 Tribal fishing rights have been recognized as effective within the Hanford Reach. The Tribes also
36 have an interest in renewing traditional uses, such as gathering of foods and medicines, hunting,
37 and pasturing horses and cattle on Hanford Site lands (Yakama Nation, June 1, 1998, DOE
38 CCN 059113).

39
40 Future opportunities of the tribal members to exercise reserved treaty rights are dependent |
41 upon the health of the ecosystems. The Tribes assert that a treaty right to hunt, fish, or gather
42 plants is diminished (if not voided) if the fish, wildlife, or plants have vanished or are contaminated
43 to the extent that they threaten human health. These resources, particularly the resources with
44 cultural and religious connotations, do not have equivalent value for the general population. |

45 46 **5.4.3 Human Health Impacts**

47
48 Although adoption of a land-use plan for the Hanford Site would not have any direct impacts
49 on human health, each of the alternatives could indirectly affect human health, depending on the
50 land uses that are implemented. The contamination left at depth poses a potential hazard to
51 development.
52

1 Even facilities associated with Low-Intensity Recreation may increase human health risk
2 by increasing infiltration of natural precipitation above the expected parameters used in the
3 CERCLA risk estimation. Where vegetation is suppressed and ground covers are used (i.e.,
4 campgrounds), infiltration of precipitation could occur at a higher rate driving contaminants toward
5 groundwater, unless the increase in activities also increases soil compaction. Soil compaction
6 caused by camping activities could actually reduce the rate of infiltration in some areas by
7 reducing the number and size of water infiltration pathways in the soil.

8
9 The recently completed *Screening Assessment and Requirements for a Comprehensive*
10 *Assessment, Columbia River Comprehensive Impact Assessment (CRCIA)* (DOE 1998a)
11 evaluated both chemical and radiological health risk potential for a variety of Hanford Site use
12 scenarios. This assessment focused on the Columbia River and riparian zone and included
13 several Native American subsistence scenarios (e.g., subsistence resident, upland hunter, river-
14 focused hunter and fisher, gatherer of plant materials, and Columbia River island users). These
15 Native American scenarios were developed by a Native American representative on the CRCIA
16 team specifically for the CRCIA effort¹. Environmental measurements used for the CRCIA
17 analysis were based on data collected under DOE's environmental monitoring program from 1990
18 through 1996 and, as a consequence, would not necessarily reflect the future condition of the
19 Hanford Site, as these scenarios do not assume cleanup.

20
21 Even these current monitoring program data do not indicate that adverse health risks
22 would be associated with consumption of fish and game. The radiation dose received by a person
23 who subsisted on wild game and fish would be higher than the 2.2×10^{-3} mrem reported as the
24 "Sportsman Dose" in the *Hanford Site Annual Environmental Report* by Pacific Northwest National
25 Laboratory (PNNL). However, this incremental dose to natural background of approximately
26 300 mrem would be unlikely to be sufficiently high to cause adverse health effects.

27
28 In the CRCIA Native American scenarios, people were assumed to live along the Columbia
29 River, to eat substantial quantities of food grown in the riparian zone, to eat fish and wildlife from
30 the river, and to drink seep water. These people who live a subsistence lifestyle linked to a
31 specific location would have a much larger potential exposure and, thus, estimated health risk than
32 other people who are more mobile and can trade for other food sources. Lifetime health risks
33 greater than 1×10^{-4} [1 in 10,000] were found for many sections of the river for potential exposure
34 to chromium, copper, strontium-90, uranium-238, lead, and tritium. However, the source of the
35 nonradioactive heavy metals (particularly copper and lead) may be from historic mining operations
36 upstream of Hanford (e.g., copper, silver, and gold mining in Idaho's Clearwater River drainage).
37 According to these analyses, potentially increased health risk is possible if people were to move
38 onto the Hanford Site and derive a large percentage of their daily food intake from crops and
39 animals grown or taken in the river's riparian zone. In most cases, this higher risk is limited in
40 extent to a few regions of highest contamination. Although many cultural differences exist in the
41 relative percentages of food types between the general population and Native American
42 populations, the common pathways of food and water consumption would affect both groups.

43
44 Land-use designations such as Preservation, Conservation, Low-Intensity Recreation,
45 Industrial, and Research and Development are unlikely to contribute to increased health risk from
46 residual contamination because the current CERCLA RODs are written to either industrial or
47 residential exposure times and pathways. However, increased human health risk could be
48 associated with Agriculture and High-Intensity Recreation uses if the CLUP policies and
49 implementing procedures are not implemented with the land use designations.

1 These scenarios are not the same as scenarios commonly used for determining health impacts at Hanford.

1 Adoption of a land-use plan for the Hanford Site could have direct impacts on human health
2 depending on the land uses that are implemented because of the associated changes in types
3 and durations of activities associated with a land-use designation (Table 5-13). For example,
4 currently the Hanford Site is used for Federal industrial activities. The Hanford Site has an
5 average annual fatality rate of 2.8 per 100,000 workers. The national average annual fatality rate
6 for private industry is 5.1 per 100,000 workers. The transfer jobs from the government to the
7 private sector statistically doubles the fatality risk for the average worker. By race, white workers
8 average annually 4.6 fatalities per 100,000 workers, black workers average annually 4.5 fatalities
9 per 100,000 workers and hispanic workers average annually 5.3 fatalities per 100,000 workers
10 (Table 5-13).

11 **5.4.4 No-Action Alternative**

12 Access restrictions would remain in effect under the No-Action Alternative and the potential
13 for health risks would be comparable to existing risk. Use of the Columbia River for recreation
14 would continue at levels comparable to current use. Minority or low-income individuals may be
15 more prone to use this resource for subsistence than might members of the general population.
16 Current uses of the Columbia River are not known to cause disproportionately high and adverse
17 human health impacts in any population and no such impacts would be expected to occur as a
18 result of the No-Action Alternative.
19

20
21
22 Development of Hanford Site lands would not be restricted by land-use designations under
23 the No-Action Alternative. Cultural resources of importance to American Indians located on the
24 Hanford Site, including Gable Butte and Gable Mountain, could be developed under this alternative.
25 The availability of these resources for development represents a potential environmental justice
26 impact to American Indians.
27

28 Prohibiting development of agriculture on the Wahluke Slope would also potentially impact
29 low-income and minority populations located to the north of the Hanford Site by limiting the
30 potential for new jobs in those areas. In general, lands on the Wahluke Slope are not presently
31 available for agricultural development and many jobs associated with agricultural practices are not
32 high wage opportunities. Consequently, the current management of the Wahluke Slope would be
33 unlikely to result in disproportionately high and adverse impacts to low-income or minority
34 populations.
35

36 **5.4.5 Preferred Alternative**

37
38 The Preferred Alternative would allow for increased access to Hanford Site lands and to
39 the Columbia River for Tribal members by allowing a High-Intensity Recreation Tribal fishing camp
40 at the White Bluffs boat launch on the Franklin County side (north) of the river and by allowing a
41 High-Intensity Recreation Tribal fishing camp near B Reactor on the Grant County side (north) of
42 the river. Private fishing, hunting and trapping activities have one of the highest fatal accident rates
43 at 137.7 fatalities per 100,000 workers (Table 5-13).
44

45 As described in CRCIA (DOE 1998a), increased use and access to the Hanford Site would
46 potentially increase exposure time to contaminated plants, air, soil, and water; and, therefore,
47 could also potentially increase health risk. This access would also provide increased opportunity
48 for subsistence consumption of fish taken from the Columbia River which could, in turn, increase

Table 5-13. Annual Occupational Fatality Rates for Selected Occupations (1996).
(3 pages)

Number, percent, and rate of potential fatal occupational injuries by selected worker characteristics, industry, and occupation, 1996.

Characteristic	Fatalities		Employed ¹ (thousands)	Fatalities per 100,000 workers ²	Relative Standard error ³ (percent)
	Number	Percent			
TOTAL	6,112	100	127,997	4.8	.2
Employee Status					
Wage and salary workers	4,905	80	117,329	4.2	.2
Self-employed	1,207	20	10,668	11.1	1.1
Gender					
Men	5,605	92	69,329	8.1	.3
Women	507	8	58,668	0.9	.4
Age					
Under 16 years	27	--	--	--	--
16 to 17 years	43	1	2,648	1.6	2.2
18 to 19 years	124	2	3,941	3.1	1.8
20 to 24 years	440	7	12,532	3.5	1.0
25 to 34 years	1,336	22	32,579	4.1	.6
35 to 44 years	1,563	26	35,319	4.4	.5
45 to 54 years	1,226	20	25,550	4.8	.6
55 to 64 years	847	14	11,741	7.2	1.0
65 years and over	492	8	3,690	13.3	1.8
Not reported	14	--	--	--	--
Race					
White	5,047	83	108,805	4.6	.2
Black	617	10	13,789	4.5	.9
American Indian, Eskimo, and Aleut	35	1	--	--	--
Asian and Pacific Islander	163	3	--	--	--
Other	91	1	--	--	--
Not reported	159	3	--	--	--
Hispanic origin					
Hispanic	626	10	11,725	5.3	1.0
Industry					
PRIVATE INDUSTRY	5,521	90	108,472	5.1	.2
Agriculture, forestry, and fishing	798	13	3,505	22.2	1.9
Agricultural production, crops	335	5	1,025	31.3	3.5
Agricultural production, livestock	154	3	1,214	12.2	3.2
Agricultural services	171	3	1,189	14.3	3.2
Fishing, hunting and trapping	73	1	53	137.7	15.4
Mining	152	2	567	26.8	4.7
Coal mining	39	1	98	39.8	11.3
Oil and gas extraction	82	1	302	27.2	6.5
Construction	1,039	17	7,464	13.9	1.3
Manufacturing	715	12	20,434	3.5	.7
Food and kindred products	70	1	1,706	4.1	2.7
Lumber and wood products	203	3	794	25.6	4.0
Transportation and public utilities	947	15	7,248	13.1	1.3
Local and interurban passenger transit	78	1	503	15.5	5.0
Trucking and warehousing	511	8	2,451	20.8	2.3
Transportation by air	113	2	778	14.5	4.0
Electric, gas, and sanitary services	88	1	1,066	8.3	3.4

Table 5-13. Annual Occupational Fatality Rates for Selected Occupations (1996).
(3 pages)

Number, percent, and rate of potential fatal occupational injuries by selected worker characteristics, industry, and occupation, 1996.

Characteristic	Fatalities		Employed ¹ (thousands)	Fatalities per 100,000 workers ²	Relative Standard error ³ (percent)
	Number	Percent			
Wholesale trade	267	4	4,942	5.4	1.6
Retail trade	672	11	21,443	3.1	.7
Food stores	173	3	3,507	4.9	1.9
Automotive dealers and service stations	98	2	2,165	4.5	2.4
Eating and drinking places	166	3	6,483	2.6	1.4
Finance, insurance, and real estate	114	2	7,862	1.5	1.2
Services	767	13	35,008	2.2	.5
Business services	168	3	5,680	3.0	1.5
Auto repair, services, and parking	103	2	1,618	6.4	2.8
Not reported	50	1	--	--	--
GOVERNMENT	591	10	19,525	3.0	.8
Federal	178	3	4,583	3.9	1.6
State	127	2	5,150	2.5	1.5
Local	284	5	9,791	2.9	1.1
Managerial and professional specialty occupations	711	12	36,497	1.9	.5
Executive, administrative, and managerial occupations	437	7	17,746	2.5	.8
Managers, food serving and lodging establishments	75	1	1,383	5.4	3.0
Professional specialty	274	4	18,752	1.5	.8
Technical, sales, and administrative support occupations	761	12	37,683	2.0	.5
Technicians and related support occupations	163	3	3,926	4.2	1.8
Airplane pilots and navigators	100	2	114	87.7	10.5
Sales occupations	503	8	15,404	3.3	.9
Supervisors and proprietors, sales occupations	225	4	4,501	5.0	1.7
Cashiers	94	2	2,856	3.3	2.1
Administrative support occupations, including clerical	95	2	18,353	0.5	.8
Messengers	8	--	175	4.6	8.5
Service occupations	492	8	17,177	2.9	.8
Protective service occupations	248	4	2,187	11.3	2.4
Fire fighting and fire prevention occupations ⁴	37	1	270	13.7	6.8
Police and detectives	114	2	1,057	10.8	3.4
Guards	97	2	859	11.3	3.8
Farming, forestry, and fishing occupations	883	14	3,566	24.2	1.9
Farm occupations	569	9	2,212	24.8	2.4
Groundskeepers and gardeners, except farm	90	1	875	10.3	3.8
Forestry and logging occupations	134	2	108	124.1	10.8
Timber cutting and logging occupations	118	2	75	157.3	13.0
Fishers, hunters, and trappers	72	1	49	146.9	16.0
Fishers ⁵	72	1	47	153.2	16.4
Precision production, craft, and repair occupations	1,072	18	13,587	7.9	.9
Mechanics and repairers	282	5	4,521	6.2	1.6
Automobile mechanics and apprentices	35	1	889	3.9	3.8
Heavy equipment mechanics	38	1	156	24.4	9.0
Construction trades	592	10	5,108	11.6	1.5
Carpenters and apprentices	87	1	1,220	7.1	3.2
Electricians and apprentices	98	2	763	12.8	4.1
Electrical power installers and repairers	38	1	126	30.2	10.0
Painters, construction and maintenance	45	1	504	8.9	5.0

Table 5-13. Annual Occupational Fatality Rates for Selected Occupations (1996).
(3 pages)

Number, percent, and rate of potential fatal occupational injuries by selected worker characteristics, industry, and occupation, 1996.

Characteristic	Fatalities		Employed ¹ (thousands)	Fatalities per 100,000 workers ²	Relative Standard error ³ (percent)
	Number	Percent			
Plumbers, pipefitters, steamfitters, and apprentices	32	1	555	5.8	4.8
Roofers	61	1	197	31.0	8.0
Structural metal workers	52	1	61	85.2	14.4
Extractive occupations	87	1	130	66.9	9.8
Drillers, oil wells	22	--	22	100.0	23.9
Mining machine operators	28	--	39	71.8	18.0
Operators, fabricators, and laborers	2,006	33	18,197	11.0	.8
Machine operators, assemblers, and inspectors	218	4	7,874	2.8	1.2
Welders and cutters	62	1	605	10.2	4.6
Transportation and material moving occupations	1,154	19	5,302	21.8	1.5
Motor vehicle operators	913	15	4,025	22.7	1.7
Truck drivers	785	13	3,019	26.0	2.0
Drivers-sales workers	35	1	156	22.4	9.0
Taxicab drivers and chauffeurs	65	1	203	32.0	7.9
Water transportation occupations	42	1	69	60.9	13.5
Sailors and deckhands	33	1	25	132.0	22.5
Material moving equipment operators	177	3	1,093	16.2	3.4
Operating engineers	38	1	245	15.5	7.2
Excavating and loading machine operators	26	--	92	28.3	11.7
Industrial truck and tractor equipment operators	46	1	512	9.0	5.0
Handlers, equipment cleaners, helpers, and laborers	634	10	5,021	12.6	1.6
Construction laborers	291	5	809	35.7	3.9
Garbage collectors	21	--	43	48.8	17.1
Laborers, except construction	213	3	1,334	15.9	3.1
Military	123	2	1,289	9.5	--
Not reported	64	1	--	--	--

¹ The employment figures, except for military, are annual average estimates of employed civilians 16 years of age and older, from the Current Population Survey (CPS 1996). The resident military figure, derived from resident and civilian population data from the Bureau of the Census, was added to the CPS employment total.

² The rate represents the number of fatal occupational injuries per 100,000 employed workers and was calculated as follows: $(N/W) \times 100,000$, where N = the number of fatal work injuries, and W = the number of employed workers, as described in the previous footnote. There were 27 fatally injured workers under the age of 16 years that were not included in the rate calculations to maintain consistency with the CPS employment.

³ The relative standard errors of the CPS employment estimates can be used to approximate confidence ranges for the fatality rates. For example, a confidence range for the roofers rate can be approximated as follows: $31.0 \times .08 \times 1.6 = 4.0$, where 31.0 = the rate, .08 = the relative standard error (8.0 percent), and 1.6 = the factor for a 90 percent confidence level. The confidence range for this rate is 27.0 to 35.0 (31.0 plus or minus 4.0).

⁴ Includes supervisors.

⁵ Includes captains and other officers.

NOTE: The rates are experimental measures using CPS employment. Selected rate categories had 20 or more reported work injury fatalities in 1996 and 20,000 or more employed workers. Dashes indicate data not available or less than .5 percent. Totals for major categories may include subcategories not shown separately. Figures may not add to totals because of rounding.

SOURCE: U.S. Department of Labor, Bureau of Labor Statistics, Census of Fatal Occupational Injuries, 1996.

the potential for adverse health effects from fish that have resided in contaminated water. As a percentage of their population, minority or low-income individuals may be more prone to adopt a subsistence lifestyle than might members of the general population and therefore any health impact would be disproportionate to the minority population. Avid sportsmen among the general population also could have an increased risk of health effects from increased exposure but would represent a smaller percentage of their population. Environmental measurements used for the CRCIA analysis were based on data collected from 1990 through 1996 and, as a consequence,

1 would not necessarily reflect the future condition of the Hanford Site, as these scenarios do not
2 assume cleanup. Therefore, although the CRCIA analyses used an increased access to and use
3 of the Hanford Site as a basis for estimating health effects, the increased access due to this
4 alternative is not expected to result in disproportionately high and adverse health effects in minority
5 or low-income populations because of the institutional protections provided by the CLUP policies
6 and implementing procedures.
7

8 The Preferred Alternative would designate Gable Mountain, Gable Butte, and other areas of
9 cultural value to American Indians for Preservation. This designation would eliminate the potential
10 for disproportionately high and adverse impacts due to development of culturally significant areas.
11 The Preferred Alternative would allow development within the viewscape of these high
12 promontories. Alteration of these viewscales would represent a potential environmental justice
13 impact to American Indians.
14

15 The Preferred Alternative would allow economic development of Hanford Site lands.
16 Low-income populations in the vicinity of the Hanford Site would benefit from increased economic
17 activity and growth in community services that could occur as a result of development. However,
18 economic development could increase the demand for housing and tend to decrease the
19 availability of low-income housing. In spite of these conflicting impacts, low-income populations in
20 communities that are influenced by development at the Hanford Site would probably benefit from
21 the development. Low-income communities located to the north and west of the Hanford Site
22 historically have not been strongly influenced by Hanford Site activities and the affects of future
23 development would probably be neutral in these communities.
24

25 Prohibiting development of agriculture on the Wahluke Slope would also potentially impact
26 low-income and minority populations located to the north of the Hanford Site by limiting the
27 potential for new jobs in those areas. In general, lands on the Wahluke Slope are not presently
28 available for agricultural development and many jobs associated with agricultural practices are not
29 high wage opportunities and have a higher average annual fatality rate of 31.3 fatalities per 100,000
30 workers (Table 5-13). Additionally, increased access to the Columbia River would allow more
31 fishing which has a high average annual fatality rate of 153 fatalities annually per 100,000 workers. |
32 The Preferred Alternative would be unlikely to result in disproportionately high and adverse
33 socioeconomic impacts to low-income or minority populations.
34

35 **5.4.6 Alternative One**

36
37 With the expansion of the existing Saddle Mountain NWR, more restrictions could be
38 placed on the consumptive use of natural resources. These restrictions placed to preserve the
39 natural resources could impact the exercise of treaty reserved rights that by their nature (e.g.,
40 hunting, fishing, pasturing of livestock etc.) consume the natural resources. Private fishing,
41 hunting and trapping activities have one of the highest fatal accident rates at 137.7 fatalities per
42 100,000 workers (Table 5-13).
43

44 Alternative One would allow increased access to Hanford Site lands and to the Columbia
45 River. As described in CRCIA (DOE 1998a), increased use and access to the Hanford Site would
46 potentially increase exposure time to contaminated plants, air, soil, and water; and, therefore,
47 could also potentially increase health risk. This access would also provide increased opportunity
48 for subsistence consumption of fish taken from the Columbia River which could, in turn, increase
49 the potential for adverse health effects from fish that have resided in contaminated water. As a
50 percentage of their population, minority or low-income individuals may be more prone to adopt a
51 subsistence lifestyle than might members of the general population and, therefore, any health
52 impact would be disproportionate to the minority population. Avid sportsmen among the general
53 population also could have an increased risk of health effects from increased exposure but would
54 represent a smaller percentage of their population. Environmental measurements used for the
55 CRCIA analysis were based on data collected from 1990 through 1996 and, as a consequence,
56 would not necessarily reflect the future condition of the Hanford Site, as these scenarios do not

1 assume cleanup. Therefore, although the CRCIA analyses used an increased access to and use
2 of the Hanford Site as a basis for estimating health effects, the increased access due to this
3 alternative is not expected to result in disproportionately high and adverse health effects in minority
4 or low-income populations because of the institutional protections provided by the CLUP policies
5 and implementing procedures.
6

7 Alternative One would limit development primarily to previously disturbed areas and to
8 areas of low habitat quality (BRMaP Levels I and II). This limitation to development could constrain
9 economic development in the vicinity of the Site, which would potentially affect low-income
10 individuals and communities to a greater degree than it would potentially affect the general
11 population. These impacts could include declining community services or increased taxes which
12 could place an greater burden on low-income households and communities than on the population
13 in general. This burden represents a potential disproportionately high socioeconomic impact;
14 however, most low-income communities within the analysis area are not greatly influenced by
15 development activities at the Site.
16

17 Prohibiting development of agriculture on the Wahluke Slope would also potentially impact
18 low-income and minority populations located to the north of the Hanford Site by limiting the
19 potential for new jobs in those areas. In general, lands on the Wahluke Slope are not presently
20 available for agricultural development and many jobs associated with agricultural practices are not
21 high wage opportunities. Consequently, Alternative One would be unlikely to result in
22 disproportionately high and adverse impacts to low-income or minority populations.
23

24 **5.4.7 Alternative Two**

25
26 Alternative Two would designate the majority of the Hanford Site for Preservation, and
27 would allow development in previously developed areas and in an area immediately north of the
28 city of Richland. The major difference between Alternative Two and Alternative One is that
29 Alternative Two would lack the Federal designation of wildlife refuge and therefore those natural
30 resources would not be considered “taken” because they had Federal protection greater than
31 normally found on Public Domain lands. Alternative Two would ensure that tribal treaty rights
32 could be enjoyed under the limits of the Preservation designation. Alternative Two would protect
33 cultural resources from Mining, and utilization of geologic resources on the Hanford Site would not
34 be allowed under this alternative. Economic development of Hanford Site land and resources
35 would be held to a minimum under this alternative.
36

37 Alternative Two would allow increased access to Hanford Site lands and to the Columbia
38 River. As described in CRCIA (DOE 1998), increased use and access to the Hanford Site would
39 potentially increase exposure time to contaminated plants, air, soil, and water; and, therefore,
40 could also potentially increase health risk. This access would also provide increased opportunity
41 for subsistence consumption of fish taken from the Columbia River which could, in turn, increase
42 the potential for adverse health effects from fish that have resided in contaminated water. As a
43 percentage of their population, minority or low-income individuals may be more prone to adopt a
44 subsistence lifestyle than might members of the general population and, therefore, any health
45 impact would be disproportionate to the minority population. Avid sportsmen among the general
46 population also could have an increased risk of health effects from increased exposure but would
47 represent a smaller percentage of their population. Environmental measurements used for the
48 CRCIA analysis were based on data collected from 1990 through 1996 and, as a consequence,
49 would not necessarily reflect the future condition of the Hanford Site, as these scenarios do not
50 assume cleanup. Therefore, although the CRCIA analyses used an increased access to and use
51 of the Hanford Site as a basis for estimating health effects, the increased access due to this
52 alternative is not expected to result in disproportionately high and adverse health effects in minority
53 or low-income populations because of the institutional protections provided by the CLUP policies
54 and implementing procedures.
55

1 Alternative Two would also minimize access to the Hanford Site through the Preservation
2 designation. This limited access would minimize the potential for environmental justice impacts to
3 American Indians that could occur as a result of potential damage to cultural and biological
4 resources under other alternatives.
5

6 Limitations to economic development under this alternative would potentially impact low-
7 income populations in the vicinity of the Hanford Site. These impacts could include declining
8 community services or increased taxes, which could in turn place an greater burden on low-
9 income households and communities than on the population in general. This burden represents a
10 potential disproportionately high socioeconomic impact; however, most low-income communities
11 within the analysis area are not greatly influenced by development activities at the Site.
12

13 Prohibiting development of agriculture on the Wahluke Slope would also potentially impact
14 low-income and minority populations located to the north of the Hanford Site by limiting the
15 potential for new jobs in those areas. In general, lands on the Wahluke Slope are not presently
16 available for agricultural development and many jobs associated with agricultural practices are not
17 high wage opportunities. Consequently, the Preservation designation for the Wahluke Slope would
18 be unlikely to result in disproportionately high and adverse impacts to low-income or minority
19 populations.
20

21 **5.4.8 Alternative Three**

22

23 Alternative Three would allow increased access to Hanford Site lands and to the Columbia
24 River. As described in CRCIA (DOE 1998), increased use and access to the Hanford Site would
25 potentially increase exposure time to contaminated plants, air, soil, and water; and, therefore,
26 could also potentially increase health risk. This access would also provide increased opportunity
27 for subsistence consumption of fish taken from the Columbia River which could, in turn, increase
28 the potential for adverse health effects from fish that have resided in contaminated water. As a
29 percentage of their population, minority or low-income individuals may be more prone to adopt a
30 subsistence lifestyle than might members of the general population and, therefore, any health
31 impact would be disproportionate to the minority population. Avid sportsmen among the general
32 population also could have an increased risk of health effects from increased exposure but would
33 represent a smaller percentage of their population. Environmental measurements used for the
34 CRCIA analysis were based on data collected from 1990 through 1996 and, as a consequence,
35 would not necessarily reflect the future condition of the Hanford Site, as these scenarios do not
36 assume cleanup. Therefore, although the CRCIA analyses used an increased access to and use
37 of the Hanford Site as a basis for estimating health effects, the increased access due to this
38 alternative is not expected to result in disproportionately high and adverse health effects in minority
39 or low-income populations because of the institutional protections provided by the CLUP policies
40 and implementing procedures. Independent of risk due to residual contamination, private fishing,
41 hunting and trapping activities have one of the highest fatal accident rates at 137.7 fatalities per
42 100,000 workers (Table 5-13).
43

44 Activities associated with Alternative Three, such as agriculture, could result in damage to
45 cultural and biological resources of value to American Indian Tribes. Furthermore, if permitted by
46 DOE, Gable Butte and Gable Mountain could be available for development of quarries and mining
47 activities could be undertaken within the viewsheds of these high promontories. Disturbance of
48 the promontories or their viewsheds would be a disproportionately high and adverse environmental
49 impact to American Indians.
50

51 Alternative Three would allow for the maximum potential for economic development of
52 Hanford Site lands. Low-income populations in the vicinity of the Hanford Site would benefit from
53 increased economic activity and growth in community services that could occur as a result of
54 development. However, economic development could increase the demand for housing and tend
55 to decrease the availability of low-income housing. In spite of these conflicting impacts, low-

1 income populations in communities that are influenced by development at the Hanford Site would
2 probably benefit from the development.
3

4 Allowing agriculture on the Wahluke Slope would potentially provide a benefit to low-income
5 and minority populations located to the north of the Hanford Site by providing the potential for new
6 jobs in those areas. Many jobs associated with current agricultural practices are not high wage
7 opportunities and relatively dangerous with an average annual fatality rate of 31.3 fatalities per
8 100,000 workers (Table 5-13), but increases in economic opportunities could be expected to
9 benefit local communities, including low-income and minority populations by increasing access to
10 health care and educational opportunities. Infrastructure costs would increase in proportion to the
11 number of low-wage jobs created and filled from outside the area. Disproportionately high and
12 adverse socioeconomic impacts to low-income or minority populations would be unlikely under
13 Alternative Three.
14

15 **5.4.9 Alternative Four**

16
17 Alternative Four would allow for increased access to Hanford Site lands and to the
18 Columbia River for Tribal members by allowing a High-Intensity Recreation Tribal fishing camp at
19 the White Bluffs boat launch on the Benton County side (south) of the river.
20

21 As described in CRCIA (DOE 1998), increased use and access to the Hanford Site would
22 potentially increase exposure time to contaminated plants, air, soil, and water; and, therefore,
23 could also potentially increase health risk. This access would also provide increased opportunity
24 for subsistence consumption of fish taken from the Columbia River which could, in turn, increase
25 the potential for adverse health effects from fish that have resided in contaminated water. As a
26 percentage of their population, minority or low-income individuals may be more prone to adopt a
27 subsistence lifestyle than might members of the general population and, therefore, any health
28 impact would be disproportionate to the minority population. Avid sportsmen among the general
29 population also could have an increased risk of health effects from increased exposure but would
30 represent a smaller percentage of their population. Environmental measurements used for the
31 CRCIA analysis were based on data collected from 1990 through 1996 and, as a consequence,
32 would not necessarily reflect the future condition of the Hanford Site, as these scenarios do not
33 assume cleanup. Therefore, although the CRCIA analyses used an increased access to and use
34 of the Hanford Site as a basis for estimating health effects, the increased access due to this
35 alternative is not expected to result in disproportionately high and adverse health effects in minority
36 or low-income populations because of the institutional protections provided by the CLUP policies
37 and implementing procedures. Independent of risk due to residual contamination, private fishing,
38 hunting and trapping activities have one of the highest fatal accident rates at 137.7 fatalities per
39 100,000 workers (Table 5-13).
40

41 Alternative Four would designate most of the Hanford Site for Preservation and this
42 designation would serve to protect cultural and biological resources of importance to American
43 Indian Tribes. Alternative Four would also designate presently undisturbed lands to the north
44 within the watershed of Gable Butte and Gable Mountain for Preservation, leaving only the center
45 portion of the Hanford Site with potential to cause disproportionate adverse impacts to American
46 Indians.
47

48 Alternative Four would designate most of the Hanford Site for Preservation but would allow
49 for Mining, Research and Development, and Industrial uses. Sufficient area is available to
50 accommodate anticipated future development. Low-income populations in the vicinity of the
51 Hanford Site would benefit from increased economic activity and growth in community services
52 that could occur as a result of development. However, economic development could increase the
53 demand for housing and tend to decrease the availability of low-income housing. In spite of these
54 conflicting impacts, low-income populations in communities that are influenced by development at
55 the Hanford Site would probably benefit from the development. Low-income communities located

1 to the north and west of the Hanford Site historically have not been strongly influenced by Hanford
2 Site activities and the effects of future development would probably be neutral in these
3 communities.
4

5 Designating the Wahluke Slope for Preservation would potentially impact low-income and
6 minority populations located to the north of the Hanford Site by limiting the potential for new jobs in
7 those areas. In general, lands on the Wahluke Slope are not presently available for agricultural
8 development and many jobs associated with agricultural practices are relatively dangerous and
9 not high wage opportunities. Consequently, the Preservation designation for the Wahluke Slope
10 would be unlikely to result in disproportionately high and adverse impacts to low-income or
11 minority populations.
12
13

14 **5.5 Human Health Risk**

15
16 The alternatives being considered in this EIS were developed with the assumption that
17 human health risk associated with contamination at the Hanford Site will continue to be addressed
18 through the RCRA and CERCLA processes. These processes are expected to reduce human
19 health risk to acceptable levels through remedial actions and administrative controls, such as
20 deed restrictions, which are imposed by CERCLA Records of Decision (RODs). The DOE has
21 also assumed that future land uses would not be allowed until remediation has reduced human
22 health risk to levels acceptable for the intended land use.
23

24 Even though ongoing remedial actions at the Hanford Site are expected to reduce human
25 health risks to acceptable levels, health risk from residual contamination could affect future land
26 users at the Hanford Site. Continued migration of contaminant plumes in groundwater could
27 increase future risk levels in down-gradient areas that had previously been remediated to
28 acceptable risk levels. The Draft HRA-EIS (DOE 1996) addressed human health risk to future
29 populations by evaluating four exposure scenarios: residential, agricultural, industrial, and
30 recreational. The risk assessment evaluated the No-Action unrestricted-use alternative, which
31 involved cleanup to annual risk levels less than 1 in 1,000,000 (10^{-6}), two restricted-use
32 alternatives, and the exclusive-use alternative, which involved reducing annual risk levels to less
33 than 1 in 10,000 (10^{-4}).
34

35 The Hanford Site has an average annual accident fatality rate that has ranged from 4.9
36 (1994) to 2.8 (1997) per 100,000 workers. The national average annual accident fatality rate for
37 private industry in 1996 was 5.1 per 100,000 workers (Table 5-13) and Hanford was 4.3 per
38 100,000 workers. The transfer jobs from the government to the private sector statistically doubles
39 the annual accident fatality risk for the average worker in 1997. Some comparisons can be made
40 regarding occupational health risks among the land-use designations using statistics from the U.S.
41 Bureau of Labor Statistics (Table 5-13). The data in Table 5-13 indicate that the riskiest
42 occupation is logging with an annual fatality rate of 157.3 per 100,000 workers (equivalent to a 10^{-3}
43 risk). Industrial activities associated with Industrial, Industrial Exclusive, and Research and
44 Development have fatal accident annual rates that vary from administrative support operations at
45 0.5 fatalities per 100,000 workers to, 4.1 fatalities per 100,000 workers for food manufacturing
46 workers, to 20.8 fatalities per 100,000 workers for trucking and warehousing workers. The land-
47 use designations of Preservation, Conservation (Mining), Conservation (Mining and Grazing), Low-
48 Intensity Recreation, High-Intensity Recreation have a different set of occupational hazards
49 associated with recreational activities. Fishing, hunting and trapping are very risky occupations
50 (second to logging) with an annual fatality rate of 137.7 fatalities per 100,000 workers. For sand
51 and gravel mining operations, excavating and loading machine operators annually have 28.3
52 fatalities per 100,000 workers. The Agriculture land-use designation would expose workers to
53 occupational fatality annual rates of 31.3 fatalities per 100,000 workers for crop production, 12.2
54 fatalities per 100,000 workers for livestock production and 14.3 fatalities per 100,000 workers for
55 agricultural services (Table 5-13).

1
2 Increased recreational opportunities associated with the Preferred Alternative and
3 Alternatives One, Three, and Four could increase accident risks associated with outdoor
4 recreation activities. These would include risks from boating and swimming accidents, hunting
5 and target shooting accidents, and bicycling accidents. Alternative Three would introduce the
6 relatively risky occupation of agriculture onto the Hanford Site. The DOE Preferred Alternative and
7 Alternative Three would best support the selection of some of the occupationally safer uses of the
8 Hanford Site such as manufacturing, managerial and administrative support functions.
9

10 11 **5.6 Cumulative Impacts**

12
13 This section summarizes potential cumulative impacts associated with Hanford Site land-
14 use designations for each alternative identified in Chapter 3. Cumulative impacts result

15
16 *... from the incremental impact of the action when added to other past, present,*
17 *and reasonably foreseeable future actions regardless of what agency (Federal or*
18 *non-Federal) or person undertakes such actions. Cumulative impacts can result*
19 *from individually minor but collectively significant actions taking place over a*
20 *period of time (40 CFR 1508.7).*

21
22 Reasonably foreseeable actions are identified and the relationship between these actions and
23 the proposed land-use designations is discussed. The description of potential cumulative
24 impacts couples impacts of each alternative with impacts from past and existing operations at
25 the Hanford Site and impacts that may be associated with anticipated future actions.
26 Section 5.6.1 discusses potential cumulative impacts to land use associated with present and
27 reasonably foreseeable actions; Section 5.6.2 discusses potential cumulative impacts to trustee
28 resources; and Sections 5.6.3 and 5.6.4 discuss potential cumulative socioeconomic impacts
29 and cumulative human health risk, respectively.
30

31 **5.6.1 Cumulative Impacts to Land Use**

32
33 The alternatives analyzed in this document would establish acceptable uses for Hanford
34 Site lands for at least the next 50 years. The alternative identified and selected for
35 implementation in the ROD would allocate lands for use under the defined land-use
36 designations. Other present and reasonably foreseeable actions at the Hanford Site that involve
37 siting new facilities or using Site resources also would, in effect, allocate lands for certain uses.
38 Those present and reasonably foreseeable actions that involve land uses that are compatible
39 with the proposed land-use designations under all the alternatives would not have cumulative
40 impacts for land use; these actions are listed in Table 5-14 and described further in Appendix E.
41 However, those present and reasonably foreseeable actions that do not conform with the
42 proposed land-use designations would change the land-use allocations and, in this sense, could
43 be considered to have potential cumulative impacts. Those present and reasonably foreseeable
44 actions involving nonconforming uses are listed in Table 5-15.
45

46
47 The five actions listed in Table 5-15 could involve land uses that conflict with land-use
48 designations under some alternatives. The USFWS is initiating a Comprehensive Conservation
49 Plan (CCP) for the ALE Reserve. Assuming that the USFWS management plan would call for
50 maintaining the ALE Reserve in its present, Preservation and Conservation type of
51 management, the management plan would not conflict with any of the proposed land-use
52 designations. If the USFWS plan only addresses preservation, then the proposed mining
53 alternative on ALE, in lieu of the McGee Ranch mining area, would be in conflict with alternatives,
Preferred, Four and Three.

1 A similar situation exists with the alternative selected in the ROD for the Hanford Reach
2 (NPS 1996), which calls for designating the Wahluke Slope as an overlay wildlife refuge and |
3 designating the Columbia River Corridor on the Hanford Site (i.e., the Hanford Reach) as a Wild
4 and Scenic Recreational River. These designations could result in the management of the
5 Wahluke Slope

Table 5-14. Present or Reasonably Foreseeable Future Actions Compatible with Land-Use Designations under All Alternatives.

Present or Reasonably Foreseeable Future Action	Location	Land Use
Wild and Scenic River Designation for Hanford Reach	Hanford Reach	Preservation
Decommissioning of Eight Surplus Production Reactors	200 Areas (disposal)	Industrial-Exclusive
Deactivation of the N Reactor	200 Areas (disposal)	Industrial-Exclusive
Safe Interim Storage of Hanford Tank Wastes	200 Areas	Industrial-Exclusive
Tank Waste Remediation System	200 Areas	Industrial-Exclusive
Plutonium Finishing Plant Stabilization	200 Areas	Industrial-Exclusive
Decommissioning of Building 232-Z and Building 233-S	200 Areas	Industrial-Exclusive
Environmental Restoration Disposal Facility Expansion	200 Areas	Industrial-Exclusive
Spent Nuclear Fuel Management (current and projected)	200 Areas	Industrial-Exclusive
200 Area Effluent Treatment Facility	200 Areas	Industrial-Exclusive
Operation of 200 Areas LLW Burial Grounds	200 Areas	Industrial-Exclusive
Operation of U.S. Ecology Commercial LLW Burial Ground	200 Areas	Industrial-Exclusive
Solid Waste Retrieval Complex, Enhanced Radioactive and Mixed Waste Storage Facility, and Central Waste Support Complex	200 Areas	Industrial-Exclusive
Tank 241-C-106 Sluicing and Waste Removal	200 Areas	Industrial-Exclusive
Special Case Waste Storage Facility	200 Areas	Industrial-Exclusive
Disposal of Decommissioned Naval Reactor Plants	200 Areas	Industrial-Exclusive
Environmental Molecular Sciences Laboratory	300 Area	Industrial, Research & Development (R&D)
Disposition of Sodium Test Loops	200 Areas, 300 Area	Industrial-Exclusive, Industrial, R&D
Fast Flux Test Facility	400 Area	Industrial, R&D
Disposal of S3G and D1G Prototype Reactor Plants	200 Areas	Industrial-Exclusive
Hanford Solid Waste EIS	200 Areas	Industrial-Exclusive
Offsite Thermal Treatment of Low-Level Mixed Waste	200 Areas, City of Richland	Industrial-Exclusive, Industrial, R&D
200 Area Emergency Facilities Campus	200 Areas	Industrial-Exclusive
300 Area Steam Replacement	300 Area	Industrial, R&D
Lead Test Assembly Irradiation and Analysis	200 Areas, 300 Area	Industrial-Exclusive, Industrial, R&D
Management of Hanford Site Non-Defense Production Reactor Spent Nuclear Fuel	200 Areas	Industrial-Exclusive
Relocation and Storage of Sealed Isotopic Heat Sources	200 Areas	Industrial-Exclusive
Trench 33 and 36 Widening in 218-W-5 LLW Burial Ground	200 Areas	Industrial-Exclusive
<i>Idaho High Level Waste and Facility Disposition Environmental Impact Statement (DOE/EIS-0287)</i>	200 Areas	Industrial-Exclusive
Implementation of Final Waste Management Programmatic EIS (DOE/EIS-0200) RODs	200 Areas	Industrial-Exclusive
Expansion of the Energy Northwest (formerly known as WPPSS) area industrial facilities (natural gas fired electric generator turbine or aluminum smelter)	600 Area	Industrial, R&D

Table 5-15. Present or Reasonably Foreseeable Future Actions with Nonconforming Land Uses.

Present or Reasonably Foreseeable Future Action	Nonconforming Land-Use Designations T = nonconforming					
	No-Action	Preferred Alternative	Alternative One	Alternative Two	Alternative Three	Alternative Four
Development of a Comprehensive Conservation Plan for the ALE Reserve by the USFWS (Preservation)	N/A	T Conservation (Mining)			T Conservation (Mining)	T Conservation (Mining)
Designation of the Wahluke Slope as a National Wildlife Refuge (Preservation)	N/A				T Agriculture	
Operation of the Laser Interferometer Gravitational Wave Observatory (Research and Development)	N/A	T Conservation (Mining)	T Conservation (Mining)		T Conservation (Mining)	T Conservation (Mining)
Inert/Demolition Waste Landfill (Pit 9) (Industrial)	N/A		T Preservation	T Preservation		T Preservation
B-Reactor Museum (High-Intensity Recreation)	N/A					T Preservation

and the Columbia River Corridor as Preservation, Conservation or Agriculture depending on the USFWS's CCP and intent for establishing the refuge. The management of the Wahluke Slope as an overlay wildlife refuge could conflict with the Agriculture land-use designation under Alternative Three unless a purpose of establishing the refuge as defined in the USFWS's CCP included sharecropping for wildlife. The need to link agriculture to furthering the purposes of wildlife is the reason agriculture appears as a conflict in Table 5-15. Of the 181 NWRs with farming programs in 1989, 612 km² (233 mi²) of the 129 refuges were farmed by permittees who retained a share of the crop in return for costs incurred to farm the land. On the remaining refuges, Service personnel conducted farming operations with government equipment.

The remaining nonconforming uses listed in Table 5-15 involve present or upcoming actions that would conflict with land-use designations. The operation of LIGO would be considered a pre-existing, nonconforming use under Alternative One and Alternative Four, which could require that the LIGO site be restored to the designated use at the end of the facility's life. Operation of LIGO conflicts with Conservation mining designations because of the facility's sensitivity to vibrations. The Inert/Demolition Waste Landfill proposed for Pit 9 involves using an existing gravel pit located north of the 300 Area for disposal of inert and demolition wastes from the 300 Area. This would be classified as an Industrial land use, and would be considered a pre-existing, nonconforming use under Alternative One, Alternative Two, and Alternative Four. The proposed salvage and demolition of the 300 Area Steam Plant calls for obtaining fill from Pit 9 for filling voids and constructing the final cover. The use of Pit 9 for quarrying materials would be a pre-existing, nonconforming use under Alternative One, Alternative Two, and Alternative Four. The B-Reactor Museum would be in conflict with the Preservation designation of Alternative Four. Management and mitigation of these nonconforming land uses would be accomplished through the CLUP policies and implementing procedures as explained in Chapter 6.

5.6.2 Cumulative Impacts by Trustee Resource

5.6.2.1 Geologic Resources.

Geologic resources on the Hanford Site include unique features that have been preserved while similar features in the region have been damaged or destroyed by development. Mining of geologic materials would be allowed under all alternatives being considered, except Alternative Two, and could damage or destroy unique geologic features, such as Missoula Floods features and sand dunes. Mining under the No-Action Alternative and

1 Alternative Three, if permitted by DOE, could also impact basalt outcrops, such as Umtanum
2 Ridge, Gable Mountain, and Gable Butte. Because these features are rare and susceptible to
3 development elsewhere in the region, damage or destruction of these features on the Hanford
4 Site would increase their aesthetic and ecological value offsite, and decrease their availability for
5 scientific study.
6

7 Alternative Three would allow development of cultivated agriculture on the Wahluke
8 Slope. Increasing irrigated lands in the vicinity of the White Bluffs would cumulatively increase
9 groundwater recharge in the area and also could result in additional slumping of the White Bluffs.
10 Additional slumping of the White Bluffs would further reduce their aesthetic, historic, and
11 ecological value; would cumulatively increase sedimentation of the Columbia River; and could
12 accelerate riverbank and island erosion. The No-Action Alternative would also allow the
13 WDFW's current management practice of growing crops for wildlife management purposes on
14 the Wahluke Slope as long as the practice is compatible with the USFS's CCP.
15

16 **5.6.2.2 Water Resources.** Water resources on the Hanford Site, including groundwater and
17 surface water, have been impacted by past waste disposal practices at Hanford. Remediation
18 strategies for cleaning up past contamination are designed for current and predicted future
19 hydrologic conditions. Additional development on the Hanford Site could alter hydrologic
20 conditions, disrupt CERCLA ROD conditions, and increase impacts to water quality from
21 contamination.
22

23 Industrial development would be allowed under all alternatives being considered and
24 would increase groundwater consumption and alter groundwater hydrology. Changes to
25 groundwater hydrology as a result of aquifer drawdown and discharges to the soil column could
26 alter the rate of the movement of contaminants toward the Columbia River or in any other
27 direction. Groundwater recharge from industrial waste water discharges and collection and
28 infiltration of runoff in quarries could mobilize contaminants in the vadose zone and cumulatively
29 increase contaminant levels in groundwater.
30

31 The Preferred Alternative and Alternatives One, Three, and Four would increase
32 recreational use of the Columbia River over existing levels, which would cumulatively increase
33 levels of oil, gas, and engine exhaust discharged to the river; and increase riverbank and island
34 erosion from boat wakes. Unregulated non-point sources associated with industrial
35 development and mining could add to pollutants discharged to the river from upstream sources,
36 resulting in further water quality degradation. Mining and grazing along the Columbia River
37 Corridor, which would be allowed under the No-Action Alternative, would increase sedimentation
38 in the river, with possible cumulative impacts on spawning areas in the Columbia River.
39

40 **5.6.2.3 Biological Resources.** Because the Hanford Site contains much of remaining
41 undisturbed Columbia Basin shrub-steppe habitat, proposed developments of undisturbed areas
42 would result in cumulative impacts to rare plants and animals, unique plant communities, and
43 terrestrial and aquatic ecosystems. In addition, the Hanford Site contains the last unimpounded,
44 nontidal segment of the Columbia River, and further development along the Reach could result
45 in cumulative losses to species and habitats associated with the Hanford Reach. In some
46 cases (e.g., Upper Columbia River spring run chinook salmon (Endangered listed -3/99), Middle
47 Columbia River steelhead (Threatened listed -3/99) and Upper Columbia River steelhead
48 [Endangered listed -8/97]), further losses of habitat could endanger remaining populations.
49

50 The Industrial, Research and Development, and Industrial-Exclusive land-use
51 designations would allow industrial development to displace native plant communities and
52 wildlife habitats where the habitats still exist. In addition, ongoing remediation activities, such as
53 the decommissioning of surplus production reactors, would result in further habitat losses.
54 Many of the actions listed in Table 5-14 for the 200 Areas would involve small losses of habitat,
55 but expansion of the Environmental Restoration and Disposal Facility (ERDF) and other future
56 actions in the 200 Areas could involve larger losses, with potential cumulative impacts to shrub-

1 steppe habitat. Alternatives One and Two would limit potential cumulative impacts in the
2 200 Areas by reducing the size of the Industrial-Exclusive land-use designation.
3

4 The Conservation land-use designations could result in cumulative impacts by allowing
5 commercial livestock grazing and mining. Cumulative impacts from grazing are most likely
6 under the No-Action Alternative, which would allow grazing over the largest area and could result
7 in further losses of regional biodiversity.
8

9 Although basalt and sand and gravel quarries are unlikely to have cumulative impacts
10 because they would disturb relatively small areas, large-scale soil mining to support remediation
11 could result in large habitat losses. If permitted by DOE, the potential for cumulative effects from
12 mining are greatest under the No-Action Alternative and Alternative Three, which would allow
13 development of quarry sites at the McGee Ranch. Losses of shrub-steppe habitat in this area
14 could eliminate the remaining segments of the wildlife movement corridor between the Hanford
15 Site and the Yakima Training Center; which are among the last remaining large tracts of shrub-
16 steppe habitat in the region. Mining in the McGee Ranch area would add to habitat fragmentation
17 that has previously taken place in the region as a result of agricultural, residential, and industrial
18 development; and could further reduce regional biodiversity.
19

20 Increased recreational use associated with the Wild and Scenic River designation and
21 High- or Low-Intensity Recreation land-use designations under the Preferred Alternative and
22 Alternatives One, Three, and Four could result in cumulative impacts to wildlife and habitats that
23 are not currently accessible by the public under the No-Action Alternative. Recreation
24 designations would increase impacts from boating as well as foot traffic on sensitive plant
25 communities and habitats.
26

27 The potential for cumulative impacts to biological resources may best be evaluated by
28 determining the amount of BRMaP Level III and IV resources that could be affected. The BRMaP
29 Level III and IV designations identify the resources that could be most adversely affected by
30 further habitat losses. Alternative Three has the greatest potential to impact Level III and IV
31 resources, primarily because it would allow conversion of native plant communities on the
32 Wahluke Slope to cultivated agriculture. The Preferred Alternative and the No-Action Alternative
33 would have less potential for impacts to BRMaP Level III and IV resources, but are more likely to
34 impact those resources than Alternatives One, Two, or Four. Alternative Two is least likely to
35 have cumulative effects on biological resources, based on the amounts of BRMaP Level III and
36 IV resources that could be impacted by development.
37

38 **5.6.2.4 Cultural Resources.** Regionally, agricultural, industrial, and residential development
39 have damaged or destroyed cultural resources. In addition, construction of dams along the
40 Columbia River has inundated many cultural resources and sites of significance to American
41 Indian Tribes. Cultural resources on the Hanford Site have been preserved by access
42 restrictions for the past 55 years. Preservation of the Hanford Reach as the last free-flowing
43 stretch of Columbia River would also preserve cultural resources associated with the river.
44 Loss of these sites through development of Hanford Site lands could lead to potentially
45 significant impacts on the remaining cultural resources in the region.
46

47 The biological resources on the Hanford Site are also important to American Indian
48 Tribes for traditional subsistence uses. In addition, the Hanford Site includes religious sites
49 important to American Indians. American Indian Tribes with ties to the Hanford Site have long
50 advocated the protection of these resources in their efforts to maintain their cultures and
51 traditional life ways. Further losses of these resources could impact American Indian cultures
52 associated with the Hanford Site.
53

54 Potential cumulative impacts to cultural resources are most likely to occur along the
55 Columbia River, where cultural resources and traditional American Indian uses are
56 concentrated. The No-Action Alternative has the greatest potential to affect these resources by

1 allowing mining, grazing, or industrial development in the Columbia River Corridor. The
2 Preferred Alternative and Alternatives One, Three, and Four would increase recreational access
3 to the corridor, which could result in impacts to cultural resources from unauthorized artifact
4 collection, vandalism, and losses to riverbank and island erosion from boat wakes.
5

6 Industrial development under any of the alternatives has the potential to disturb
7 archaeological and historic sites. Alternatives One and Two are least likely to result in
8 cumulative impacts because these alternatives would minimize the amount of land designated
9 for Industrial, Research and Development, and Industrial-Exclusive land uses. Ongoing
10 remediation activities and some of the proposed projects listed in Table 5-15 could also have
11 cumulative effects on cultural resources.
12

13 Other potential cumulative impacts to American Indian cultures could occur under the
14 No-Action Alternative and Alternative Three which, if permitted by DOE, would allow quarrying on
15 basalt outcrops that are important religious and cultural sites. Alternative Two would designate
16 most of the Hanford Site for Preservation to protect cultural resources and would be least likely
17 to have cumulative impacts.
18

19 **5.6.2.5 Aesthetic Resources.** The large, undeveloped portions of the Hanford Site and
20 features such as the basalt outcrops, Rattlesnake Mountain, the White Bluffs, and the Columbia
21 River Corridor have aesthetic values that are unique to the region. Industrial development
22 associated with past Hanford operations has altered some viewsheds. Future development of
23 Hanford Site lands could further alter viewsheds and reduce the aesthetic value by increasing
24 airborne particulate, odors, or other pollutants.
25

26 The potential for cumulative impacts to viewsheds would be greatest under the No-Action
27 Alternative, which would allow development of Hanford Site lands on a project-by-project basis.
28 This alternative is more likely to result in the siting and construction of industrial developments in
29 previously undisturbed viewsheds. Alternative Three could also have cumulative impacts to
30 viewsheds by allowing, if permitted by DOE, quarrying on basalt outcrops, the conversion of
31 native plant communities on the Wahluke Slope to crop land and orchards, and development of
32 High-Intensity Recreational facilities adjacent to the Columbia River Corridor. Future industrial
33 development under the Industrial-Exclusive land-use designation, along with proposed and
34 planned actions listed in Table 5-14, would have cumulative effects on viewsheds that would be
35 similar under the alternatives being considered.
36

37 Alternative Three also has the greatest potential for cumulative impacts on visibility
38 associated with air quality. The conversion of much of the Wahluke Slope to agriculture would
39 create a significant new source of fugitive dust from cultivated fields. Industrial development
40 under this alternative as well as all other alternatives being considered could also result in new
41 sources of industrial pollutants, which could further diminish visibility.
42

43 Future development could also increase ambient noise levels, which would detract from
44 the recreational experience associated with the Columbia River Corridor and other natural areas
45 on the Hanford Site. Cumulative increases in noise are most likely occur under the No-Action
46 Alternative, which could allow industrial development along the Columbia River. Mining along the
47 river corridor, which could occur under the No-Action Alternative, could also increase noise
48 impacts. Increases in High-Intensity Recreational land-use activities such as Alternative Three's
49 proposed destination resort and RV camps or the Preferred Alternative's and Alternative Four's
50 proposed Tribal fishing camps, could also increase the noise along the river and distract from
51 the aesthetic experience.
52

1 **5.6.3 Cumulative Socioeconomic Impacts**
2

3 The economy of the area has in the past been strongly influenced by Hanford Site
4 activities. Changes in the Site mission and reductions in Site activities have had negative
5 impacts in the past. Recently, the area economy has become more diversified and less
6 dependent on the Hanford Site. Future development of Hanford Site lands under multiple uses
7 could accelerate the transition to a diversified economy. On the other hand, economic growth
8 associated with future uses of the Hanford Site could cumulatively increase demand for
9 infrastructure and services.

10
11 Alternative Three has the greatest potential to have cumulative impacts, both positive and
12 negative, on socioeconomic conditions. On the positive side, Alternative Three would provide
13 the most opportunities to develop alternate uses of Hanford Site lands, maximizing the economic
14 return. Alternative Three could have negative impacts on socioeconomic conditions by
15 increasing the demand for services, including schools, law enforcement, and health and human
16 services. Alternative Two has the least potential to have cumulative socioeconomic impacts
17 because it would minimize future Hanford Site development.

18
19 As was discussed in Section 5.3.1, future industrial development on Hanford Site lands
20 could place increased demand on infrastructure beyond the City of Richland's capacity. This
21 potentially cumulative impact could occur under the Preferred Alternative and Alternatives Three
22 and Four because they have Industrial land-use designations larger than the City of Richland
23 UGA. However, the impact would be the most under the No-Action Alternative, because no land-
24 use plan would be available to assist government entities in anticipating and addressing
25 increased demand.

26
27 **5.6.4 Cumulative Human Health Risk**
28

29 Risks due to exposure to residual contamination remaining after completion of CERCLA
30 activities would be dependent on the level of access to any particular area where residual
31 contamination remained. New wastes could be imported for disposal as specified in the RODs
32 for the *Waste Management Programmatic Environmental Impact Statement (DOE/EIS-0200,*
33 *May 1997)*. Health risks from the new wastes would be principally to workers and could include
34 physical hazards and latent cancer fatalities from waste management activities over the 20-year
35 period of waste movements analyzed. Collective worker health risk estimates for the potential
36 new wastes are one fatality for Low-Level Mixed Waste, three fatalities for High-Level Waste,
37 and up to four fatalities for Low-Level Waste, depending on whether Hanford is selected as a
38 Low-Level Waste disposal site. Less than one latent cancer fatality is estimated among the
39 offsite population. These proposed waste management activities could greatly increase waste
40 shipments entering or leaving the site.

41
42 Consequently, the cumulative health risk to humans would be expected to be greatest
43 under Alternative Three because it would provide greater access to more areas and would
44 provide more opportunities for development of Hanford Site lands than would the other
45 alternatives. Conversely, Alternative Two would have the least potential for cumulative human
46 health risks, because it would provide the least access to Hanford Site lands.

47
48 Significant occupational risk to workers could occur under some industrial uses, under
49 both the Industrial-Exclusive and Industrial land-use designations. Agriculture is also traditionally
50 a high risk occupation (Table 5-13). Cumulative occupational risk would likely be the greatest
51 under Alternative Three because of the large area designated for Agriculture and the higher level
52 of use associated with the entire Hanford Site. Conversely, occupational risk would be lowest

1 for Alternative Two because industrial risk would be limited to workers in the 200 Areas (similar
2 under all alternatives) and Alternative Two designates the smallest area for Industrial
3 development.
4
5

6 **5.7 Other NEPA Considerations**

7
8 NEPA is used by the Executive Branch through Executive Orders to further the
9 administration's goals in several policy areas. NEPA integration requires the presentation of
10 many diverse subject areas to ensure that the Federal decision maker is fully informed.
11

12 **5.7.1 Unavoidable Adverse Impacts**

13
14 The potential unavoidable adverse impacts associated with implementation of future land
15 uses on the Hanford Site are described in the following section. Unavoidable adverse impacts
16 are impacts that would occur after implementation of all feasible mitigation measures. Although
17 these impacts would not occur as a result of adoption of any particular land-use plan,
18 unavoidable adverse impacts would occur as a result of development of undisturbed land for
19 other uses. The greatest potential for unavoidable adverse impacts is associated with more
20 intensive land uses and the areal extent of those uses in each alternative. These impacts would
21 be associated with the degree of disturbance of sensitive habitats and loss of cultural resources.
22

23 Land-use designations with the greatest potential for unavoidable adverse impacts are
24 Agriculture, Industrial, Industrial-Exclusive, and High-Intensity Recreation. Designations with
25 less potential for unavoidable impacts (but that would likely include some unavoidable adverse
26 effects on resources) include Research and Development, Low-Intensity Recreation,
27 Conservation (Mining and Grazing), and Conservation (Mining). Unavoidable adverse impacts
28 would be minimal or nonexistent under the Preservation designation.
29

30 The Hanford Site has an abundance of significant cultural resources and conversion of
31 land from the relatively undisturbed condition could result in the loss of significant resources.
32 These resources are considered irreplaceable. The extent of damage to these resources would
33 depend on the extent of the land area converted to intensive uses and the distribution of the
34 resources relative to the location of the disturbance. Some resource locations are more
35 significant than others, and each location must be assessed individually. Mitigation measures,
36 such as data collection, would be implemented but unavoidable adverse impacts associated
37 with destruction of the actual location of resources would occur as a result of some land-use
38 designations.
39

40 The Hanford Site also represents one of the last remaining large tracts of the shrub-
41 steppe habitat that previously covered extensive areas in eastern Washington State. Intensive
42 use of these lands could result in the loss of significant amounts of this habitat and could
43 potentially lead to listing (as threatened or endangered) species that are dependent upon this
44 habitat. Although lands converted to other uses potentially could revert to the original state, this
45 reversion is unlikely to occur because the land would remain in the developed condition and
46 reversion would require many years.
47

48 Physical impacts on terrestrial resources and sensitive habitats (e.g. aquatic habitat,
49 wetlands, shrub-steppe habitat) would be unavoidable under some land-use designations.
50 Permanent loss of habitat for some species of concern could occur and could result in
51 population declines. Habitat loss within the 200 Areas would likely be unavoidable, but these
52 losses are anticipated to be similar under all alternatives. The magnitude of potential physical

1 impacts across other areas on the Hanford Site depends upon the land-use designations
2 associated with particular alternatives.

3
4 The Agriculture land-use designation has the greatest potential for unavoidable adverse
5 impacts. Destruction of cultural resource sites, both on the land converted to this use (and,
6 potentially, as a result of increased slumping of the White Bluffs if uncontrolled irrigated
7 agriculture occurs on the Wahluke Slope), would be unavoidable under this designation. Shrub-
8 steppe habitat in areas converted to agricultural use would be lost. Depending on the area of
9 land converted to agriculture, mitigation of habitat loss would not be feasible.

10
11 Industrial, Research and Development, and High-Intensity Recreation land-use
12 designations could result in unavoidable adverse impacts to cultural resources and sensitive
13 habitats. The degree of impact would depend on the extent of development. Siting of specific
14 industrial facilities could be modified to minimize impacts. Nevertheless, if large portions of
15 areas designated for Industrial use are ultimately used, cultural and biological resources within
16 the areas would be lost. Similarly, development of High-Intensity Recreational facilities (e.g., golf
17 courses) or R&D facilities could involve loss of or damage to resources.

18
19 Other potential unavoidable adverse impacts would be associated with grazing of
20 livestock (resulting in damage to habitats that are sensitive to grazing or physical damage of
21 cultural resources), inadvertent or deliberate damage to cultural resources due to increased
22 exposure of resources to humans, and localized damage to resources due to mining activities.

23
24 Implementation of Alternative Three would involve the greatest potential for unavoidable
25 adverse impacts. These impacts would be associated with loss of cultural and biological
26 resources due to conversion of extensive areas on the Wahluke Slope to agriculture and with the
27 area designated for Industrial use, and Research and Development. Alternative Three also
28 includes the greatest extent of land designated for Recreational uses.

29
30 The Preferred Alternative also could potentially lead to unavoidable adverse impacts
31 associated with lands designated for Industrial Use, Research and Development, and
32 Conservation (Mining). Although impacts associated with other land-use designations could
33 potentially be mitigated, Industrial and Research and Development uses would likely lead to
34 unavoidable adverse impacts to some cultural and biological resources.

35
36 Implementation of Alternative Two would have the least potential for unavoidable adverse
37 impacts. This alternative designates virtually the entire Hanford Site for Preservation. Areas
38 designated for other uses occur largely in previously disturbed areas. Unavoidable adverse
39 impacts under this alternative would be minimal and would be associated with Industrial-
40 Exclusive use of the 200 Areas (similar under all alternatives) and with Industrial use in the UGA
41 north of the City of Richland, which is smaller than the area designated for Industrial use under
42 all other alternatives.

43
44 Alternatives One and Four represent intermediate conditions between Alternative Two
45 and the Preferred Alternative. Potential unavoidable adverse impacts under the No-Action
46 Alternative could involve development of any portion of the Hanford Site in the future, with the
47 exception that this alternative assumes that management on the Wahluke Slope and ALE
48 Reserve would continue to be similar to current management.

49 **5.7.2 Irreversible and Irrecoverable Commitments of Resources**

50
51 The identification of irreversible and irretrievable (I&I) commitments of resources
52 associated with actions proposed by Federal agencies is required by NEPA. On land-use
53 projects, I&I commitments are related to the use of nonrenewable resources and the effects that
54 consumption of those resources could have on future generations. For example, irreversible
55

1 effects occur as a result of use or destruction of a resource (i.e., energy and minerals) that
2 cannot be replaced within a reasonable time, while irretrievable resource commitments involve
3 the loss in value of an affected resource that cannot be restored (i.e., extinction of a species or
4 disturbance of a cultural site).

5
6 The Final HCP EIS does not I&I commit resources to any specific project of the Hanford
7 Site, but does I&I commit natural resources to the land-use designations as allocated by
8 Table 3-1. After incorporating by reference the previous 1975 ERDA 1538 irreversible and
9 irretrievable (I&I) commitments and other documented commitments into this EIS (see Section
10 1.3), future individual project land-use requirements would be I&I committed through the
11 appropriate NEPA and CERCLA/RCRA/NEPA integrated processes, as described in Chapter 6.
12 Table 3-3 summarizes the commitment of Hanford Site lands, by land-use designation, for each
13 alternative.

14 15 **5.7.3 Conflicts with Land-Use Plans of Other Federal, Regional, State, Local, and Tribal** 16 **Agencies**

17
18 The Draft HRA-EIS CLUP (DOE 1996) identified one vision for the future use of Hanford
19 Site lands. Numerous comments were received by DOE from other agencies, Tribal
20 governments, and stakeholders indicating that a land-use plan for the Hanford Site needed to be
21 developed. These comments indicated that alternative land-use plans needed to be analyzed
22 and compared to the plan presented in the Draft HRA-EIS CLUP, and that DOE needed to
23 identify a Preferred Alternative for future land use at the Hanford Site. As a result of these
24 comments and concerns regarding different visions for the future of Hanford Site lands, DOE
25 initiated a process of coordination and consultation with other Federal, state, and local
26 government agencies, and Tribal governments to develop and analyze potential impacts
27 associated with alternative land-use scenarios for the Hanford Site. The DOE revised the
28 August 1996 Draft HRA-EIS to reflect these concerns and is presenting the impact analysis in
29 this Final HCP EIS.

30
31 Existing plans of other Federal, state, and local agencies, and Tribes have been
32 incorporated as alternatives in the Final HCP EIS if those agencies or Tribes elected to provide
33 DOE with a land-use map depicting a vision for the future of Hanford Site lands. The DOE
34 cannot speculate with regard to land-use patterns that might be preferred by agencies or Tribes
35 that did not provide a specific vision for the future of land use at the Hanford Site. Therefore,
36 DOE knows of no existing land-use plans in conflict with the alternatives presented in this Final
37 HCP EIS.

38
39 The DOE recognizes the interest of the BoR and the BLM in lands withdrawn from them
40 at the Hanford Site, and acknowledges the U.S. Atomic Energy Commission's agreement to
41 return lands no longer needed for safeguards and security purposes in the Wahluke Slope to the
42 BoR for development as part of the Columbia Basin Project. The DOE also recognizes, as a
43 co-preparing agency, the alternative selected in the ROD for the Hanford Reach EIS (NPS
44 1994). This alternative would designate the land within the Wahluke Slope as a NWR. The
45 DOE and BLM have discussed consolidation of BLM lands within a specific area of the Hanford
46 Site (Figure 4-3), or exchanging Hanford Public Domain lands for lands elsewhere with natural
47 resources values. The BLM may consider selling land to private entities to allow Industrial,
48 Research and Development, or High-Intensity Recreation uses to occur on BLM's scattered
49 tracts of land if the economic return would fund appropriate environmental mitigation elsewhere.
50 Public comment such as the anti-grazing response received on this EIS will help determine the
51 path forward.

52
53 The BLM completes approximately 65 land exchanges per year, acquiring nearly
54 60,703 ha (150,000 ac) valued over \$60,000,000. Current law restricts exchanges to lands
55 located within the same state. In general, the lands must be of equal value, although limited

1 cash equalization adjustments are allowed. Certain low value exchanges may proceed on the
2 basis of "approximately equal" value.

3
4 The exchange of land is authorized under the *Federal Land Policy and Management Act*
5 *of 1976*, (FLPMA), as amended, and the *Federal Land Exchange Facilitation Act of 1988*
6 (FLEFA). The BLM's final rulemaking implementing FLEFA was published jointly with the
7 U.S. Forest Service in 1993. A final Land Exchange Handbook was completed in 1997 replacing
8 a draft that was in use for over two years.

9
10 Land exchange has been identified as a high priority within the DOI as well as BLM.
11 Exchanges provide the opportunity for BLM to acquire lands with high recreational, wildlife
12 habitat, scenic, and cultural resource values. They are also used to consolidate BLM lands into
13 more manageable units and to meet community expansion needs.

14
15 Recent accomplishments in this program include the following:

- 16
17 C **Lake Tahoe, Zephyr Cove, Nevada** -- The Federal government acquired 14 ha
18 (35 ac) along Lake Tahoe. The property has nearly 1.6 km (1 mi) of sandy beach,
19 spectacular scenic views, and an opportunity to protect sensitive plant and animal
20 species. The BLM traded approximately 546 ha (1,350 ac) of lands in the Las Vegas
21 Valley for the property. The lands acquired will be managed by the U.S. Forest
22 Service.
- 23
24 C **Lake Fork of the Gunnison River, Colorado** -- The BLM acquired 1,376 ha
25 (3,400 ac) of Smock Ranch (formerly Gateview Ranch) along the Lake Fork of the
26 Gunnison River. The BLM plans to acquire approximately 809 ha (2,000 ac) of the
27 adjacent Thomas Ranch in a second phase. The exchange provides valuable
28 fisheries and recreational resources, and reduces the BLM's management costs by
29 placing 33 small isolated parcels into private ownership.
- 30
31 C **Santa Ana Pueblo, New Mexico** -- Approximately 6,070 ha (15,000 ac) of Federal
32 and state lands were transferred to the Santa Ana Pueblo, resolving a 20-year
33 commitment to eliminate the "checkerboard" land ownership pattern within the
34 Pueblo's boundary. The BLM will receive state lands located in wilderness study
35 areas and other special management areas throughout the state.
- 36
37 C **Clearwater - Phase II, Washington** -- The BLM acquired 364 ha (900 ac) of land
38 including 3.2 km (2 mi) of river frontage adjacent to the Grande Ronde National Wild
39 and Scenic River. The lands have important values for fish and wildlife as well as
40 high recreational value for fishing, hunting, white water boating, hiking, and
41 sightseeing.

42 43 **5.7.4 Relationship Between Near-Term Use and Long-Term Productivity** 44 **of the Environment**

45
46 For the purposes of this Final HCP EIS, near-term use is defined to encompass the
47 50-year planning period associated with this EIS. Long-term productivity is defined to
48 encompass the period following this planning window.

49
50 The DOE anticipates that considerable activity related to ongoing remedial actions will
51 occur at the Hanford Site for the near-term. This activity would likely influence allowable land
52 uses in the near-term. New near-term uses would be consistent with land-use designations
53 adopted in the ROD for this Final HCP EIS, and remedial activities would be anticipated to
54 support those uses and designations.

1 Although the land-use alternatives analyzed in this Final HCP EIS represent varied |
2 viewpoints of the best use of Hanford Site lands within the near-term, the objective of these
3 plans is establishment of a framework for balancing overlapping long-term needs to meet the
4 requirements of DOE missions, community development, recreational opportunities, and
5 resource preservation. Long-term productivity can be enhanced through this process because
6 conflicting viewpoints regarding the best use of Hanford Site land can be objectively analyzed,
7 and the uses to satisfy the various real and perceived needs can be incorporated into long-term
8 planning. Through this planning process, long-term productivity of Hanford Site lands can be
9 enhanced by establishing areas that would be devoted in the short- and long-term for uses
10 ranging from intensive development to preservation.
11

1 **6.0 Implementation of the Comprehensive Land-Use Plan**
2
3

4 This chapter provides an overview of the polices and implementing procedures that
5 would be used by DOE, the cooperating agencies and the consulting Tribal governments to
6 implement the Hanford Comprehensive Land-Use Plan (CLUP) following the Record of Decision
7 (ROD) for the *Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP
8 EIS).
9

10 The DOE is expected to use this land-use plan in its decision-making process to
11 establish what is the “highest and best use”¹ of the land (41 CFR 101-47, “Federal Property
12 Management Regulations”). The final selection of a land-use map, land-use policies and
13 implementing procedures, would create the working CLUP when they are adopted through the
14 ROD for this EIS.
15

16 Once adopted, the CLUP would provide the framework within which future use of the
17 Hanford Site’s lands and resources occurs. In developing the CLUP DOE will have considered
18 the visions, goals, and objectives articulated by participants in the land-use planning process.
19 This framework consists of four basic elements:
20

- 21 1. A final ***Hanford CLUP Land-Use Map***, depicting land uses for the Site (see
22 Chapter 3). The ROD for this EIS would select one of the alternative land-use maps
23 presented in Chapter 3 or would select a land-use map such as the new Preferred
24 Alternative that combines features of several alternatives.
25
- 26 2. ***Hanford CLUP Land-Use Definitions***, describing the purpose, intent, and principal
27 use(s) of each of the land-use designations on the adopted CLUP map (see
28 Chapter 3, Table 3-1, and Section 6.1 below).
29
- 30 3. ***Hanford CLUP Policies***, directing land-use actions. These policies will help to
31 ensure that individual actions of successive managers collectively advance the
32 adopted CLUP map, goals, and objectives over time (see policies in Section 6.3).
33
- 34 4. ***Hanford CLUP Implementing Procedures***, including:
35
 - 36 C Administrative procedures for reviewing and approving Use Requests for
37 consistency with the CLUP
38
 - 39 C A Site Planning Advisory Board (SPAB) consisting of representatives from DOE,
40 the cooperating agencies and the affected Tribal governments
41
 - 42 C Actions which, after plan adoption, shall be undertaken to align and coordinate
43 existing and new “area” and “resource” management plans for the Site (e.g., The
44 Comprehensive Conservation Plan for the Fitzner/Eberhardt Arid Lands Ecology
45 Reserve [ALE Reserve]; fire; cultural and historical resources; and species
46 management), with the policies and designations of the CLUP.
47

1 Section 101-47.4909 of the *Federal Property Management Regulations* defines the “highest and best use” as that use to which a property can be put that produces the highest monetary return from the property, promotes its maximum value, or serves a public or institutional purpose. The “highest and best use” determination must be based upon the property’s economic potential, qualitative values inherent in the property, and utilization factors affecting land use such as zoning, physical characteristics, other private and public uses in the vicinity, neighboring improvements, utility services, access, roads, location, and environmental and historical considerations.

For all proposals and projects, the above procedures and actions would be integrated with existing DOE land-use review procedures (e.g., biological, cultural, and the *National Environmental Policy Act of 1969* [NEPA]), while DOE maintains control of the land. The DOE has the final determination and approval of all land-use decisions taking place on the Hanford Site land under DOE authority.

6.1 Definitions and Descriptions of Land-Use Map Designations

The land-use designations of each land-use map depict the categories of land use that would occur within specific geographic locations of the Site. Ideally, the designated use is suitable, based on a broad range of factors including natural and biological resources; existing uses; infrastructure; proximity to other development; economic objectives; and historical, prehistorical, and aesthetic resources and values.

The definitions of the various land-use designations are provided in Table 6-1. These land-use designations and their definitions were developed by the cooperating agencies and are discussed in greater detail in Chapter 3 of this Final HCP EIS.

Table 6-1. Hanford Site Land-Use Designations.

Land-Use Designation	Definition
Industrial-Exclusive	An area suitable and desirable for treatment, storage, and disposal of hazardous, dangerous, radioactive, and nonradioactive wastes. Includes related activities consistent with Industrial-Exclusive uses.
Industrial	An area suitable and desirable for activities, such as reactor operations, rail, barge transport facilities, mining, manufacturing, food processing, assembly, warehouse, and distribution operations. Includes related activities consistent with Industrial uses.
Agricultural	An area designated for the tilling of soil, raising of crops and livestock, and horticulture for commercial purposes along with all those activities normally and routinely involved in horticulture and the production of crops and livestock. Includes related activities consistent with Agricultural uses.
Research and Development	An area designated for conducting basic or applied research that requires the use of a large-scale or isolated facility or smaller scale time-limited research conducted in the field or in facilities that consume limited resources. Includes scientific, engineering, technology development, technology transfer, and technology deployment activities to meet regional and national needs. Includes related activities consistent with Research and Development.
High-Intensity Recreation	An area allocated for high-intensity, visitor-serving activities and facilities (commercial and governmental), such as golf courses, recreational vehicle parks, boat launching facilities, Tribal fishing facilities, destination resorts, cultural centers, and museums. Includes related activities consistent with High-Intensity Recreation.
Low-Intensity Recreation	An area allocated for low-intensity, visitor-serving activities and facilities, such as improved recreational trails, primitive boat launching facilities, and permitted campgrounds. Includes related activities consistent with Low-Intensity Recreation.
Conservation (Mining and Grazing)	An area reserved for the management and protection of archeological, cultural, ecological, and natural resources. Limited and managed mining (e.g., quarrying for sand, gravel, basalt, and topsoil for governmental purposes only) and grazing could occur as a special use (i.e., a permit would be required) within appropriate areas. Limited public access would be consistent with resource conservation. Includes activities related to Conservation (Mining and Grazing), consistent with the protection of archeological, cultural, ecological, and natural resources.
Conservation (Mining)	An area reserved for the management and protection of archeological, cultural, ecological, and natural resources. Limited and managed mining (e.g., quarrying for sand, gravel, basalt, and topsoil for governmental purposes only) could occur as a special use (i.e., a permit would be required) within appropriate areas. Limited public access would be consistent with resource conservation. Includes activities related to Conservation (Mining), consistent with the protection of archeological, cultural, ecological, and natural resources.
Preservation	An area managed for the preservation of archeological, cultural, ecological, and natural resources. No new consumptive uses (i.e., mining or extraction of non-renewable resources) would be allowed within this area. Limited public access would be consistent with resource preservation. Includes activities related to Preservation uses.

1
2
3 **6.2 Definitions for Terms Relating to Plan Implementation**
4

5 The following three definitions – Allowable Use, Special Use, and Amendments – relate
6 the land-use policies to the land-use maps:
7

- 8 • **Allowable Use** -- Any reservation of land for a physical development or land-use
9 activity that is consistent with the land-use designation and policies of the land-use
10 map and CLUP, or a specifically identified part of an approved area management
11 plan (AMP), except for “Amendments” or uses that are identified as “Special Use.”
12 Any new remediation project or support activity that is categorically excluded under
13 DOE’s NEPA regulations (10 CFR 1021) is an allowable use, except projects
14 proposed in the Preservation designation. |
15
- 16 • **Special Use** -- Activities requiring further review and approval prior to being allowed.
17 The following are special uses.
18
- 19 1. Any physical development or land-use activity in the Preservation designation
 - 20
 - 21 2. Any physical development or land-use activity in the Conservation designation |
22 that is not categorically excluded under DOE’s NEPA regulations (10 CFR 1021) |
23
 - 24 3. AMPs outside of the 200, 300, and 400 Areas |
 - 25
 - 26 4. Any proposed new development that is inconsistent with the land-use designation
27 of the adopted local counties’ or cities’ comprehensive plans for the Hanford Site
28
 - 29 5. Mining or grazing activities within areas designated for Conservation
 - 30
 - 31 6. Any proposed new project that is located within an area that has a deed or
32 covenant restriction as a result of the remediation process (e.g., institutional |
33 controls) |
 - 34
 - 35 7. Additions to or enlargements of pre-existing, nonconforming uses
 - 36
 - 37 8. Any proposed new project that establishes an exclusive use zone (EUZ) over
38 lands not currently under an EUZ (see Section 4.11.4). |
 - 39
- 40 c **Amendments** -- Amendments are required for the following:
41
- 42 1. Any change to the map land-use designation of an area
 - 43
 - 44 2. Any change to CLUP policy
 - 45
 - 46 3. Any change in the use of land or an existing facility to a use that is inconsistent
47 with the land-use designation.
48

49 Additionally, definitions are used to define the terms of the land-use policies. These
50 definitions include the following:
51

- 52 c **Area management plans (AMPs)** – Management plans for specific geographic
53 areas, which may include specific resource management plans, mitigation
54 strategies, and various uses and facilities. An AMP shall be consistent with the
55 CLUP’s land-use designations and policies.
56

- 1 C **Use Request** -- A Use Request is a proposal to use land or a facility for an activity
2 different from what is currently occurring. Use Requests can include site
3 preparations, leasing, granting right-of-ways, or any other land-use related activities.
4
- 5 C **Policy** -- Policies are statements of intent which direct decisions toward the
6 accomplishment of adopted goals and objectives. Policies are applied on a
7 continuous basis and applied consistently over time.
8
- 9 C **Pre-existing, Nonconforming Use** -- Any existing lawfully established use that is
10 neither allowed nor conditionally permitted within a land-use designation, but exists
11 therein, having been established prior to the CLUP land-use designation.
12
- 13 C **Resource management plan (RMP)** – A RMP contains adopted management
14 standards and strategies for a specific resource. Generally, resources subject to
15 RMPs are not confined to geographically discrete areas and they are not static
16 (i.e., their characteristics and conditions often vary in time and/or location across the
17 Site). Examples of resources which have RMPs are biological resources (Draft
18 *Biological Resources Management Plan* [BRMaP] [DOE-RL 1996c]), cultural
19 resources (Draft *Cultural Resources Management Plan* [CRMP] [DOE-RL 1999]),
20 and the *Bald Eagle Management Plan* (DOE-RL 1994b). The provisions of each
21 RMP apply wherever its subject resource occurs on the Site, except for areas
22 specifically exempted within the RMP itself.
23
- 24 Several RMPs may apply within an AMP. A single RMP may extend across several
25 AMPs. Where an RMP exists within an AMP, the provisions of both must be
26 integrated toward achieving their common objectives, consistent with land-use
27 designations within which they occur.
28
- 29 C **RL Manager** -- The RL Manager is the Manager of DOE’s Richland Operations
30 Office (RL).
31
- 32 C **RL Site Management Board (SMB)** – The SMB is chaired by the Site Deputy
33 Manager and comprises selected members of RL senior management staff.
34
- 35 C **Real Estate Officer (REO)** – The REO, from the RL Site Services Division (SSD), is
36 the single point of contact for reviewing, processing, and coordinating land-use
37 activities on the Hanford Site.
38
- 39 C **Shall** -- For the purpose of Chapter 6 of this EIS, “shall” refers to activities that would
40 be mandatory if adopted by the ROD.
41
- 42 C **Should** -- For the purpose of Chapter 6 of this EIS, “should” refers to activities that
43 would be discretionary if adopted by the ROD.
44
- 45 C **Site Planning Advisory Board (SPAB)** – The SPAB is an advisory board to land-
46 use matters on the Hanford Site. The SPAB consists of representatives from
47 cooperating agencies with land-use authority, and affected Tribal governments. The
48 SPAB reviews Use Requests that are not “allowable uses” and makes
49 recommendations to DOE.
50

6.3 Hanford CLUP Policies

The Hanford CLUP policies connect all the CLUP elements. It is expected that the ROD for this EIS would set forth the following policies:

- C Establish land-use mitigation procedures
- C Establish hierarchies, priorities, and standards relating to land use, resource use, and values
- C Integrate competing land and resource goals and objectives
- C Provide reference points for addressing unanticipated circumstances and making actual Amendments to the CLUP when necessary
- C Identify which RMPs or AMPs shall be considered for development or revision as part of the CLUP implementation.

Land-use and resource-related decisions, actions, and programs should neither conflict with, nor be inconsistent with the adopted CLUP map and policies. Actions related to policies should be feasible and practical, and policies should be consistently applied on a continuous basis.

The Hanford CLUP policies are described below. They are a synthesis of stated values and objectives from DOE, Future Site Uses Working Group, Hanford Advisory Board, August 1996 Draft HRA-EIS, April 1999 Revised Draft HRA-EIS written comments, public hearings and public meetings, cooperating agencies, consulting Tribal governments, and those associated with municipal and county land-use planning principles.

6.3.1 Overall Policy

The CLUP policy would accomplish the following for the Hanford Site:

1. Protect the Columbia River and associated natural and cultural resources and water quality.
2. Wherever possible, locate new development, including cleanup and remediation-related projects, in previously disturbed areas.
3. Protect and preserve the natural and cultural resources of the Site for the enjoyment, education, study, and use of future generations.
4. Honor treaties with American Indian Tribes as they relate to land uses and resource uses.
5. Reduce exclusive use zone (EUZ) areas to maximize the amount of land available for alternate uses while still protecting the public from inherently hazardous operations (see Section 4.11.4).
6. Allow access for other uses (e.g., recreation) outside of active waste management areas, consistent with the land-use designation.
7. Ensure that a public involvement process is used for amending the CLUP and land-use designations to respond to changing conditions.

8. As feasible and practical, remove pre-existing, nonconforming uses.
9. Facilitate cleanup and Waste Management.

6.3.2 *Protection of Environmental Resources*

The CLUP policy would accomplish the following for the Site:

1. Implement DOE's *Land- and Facility-Use Policy* (DOE P 430.1), which is to protect and sustain native species and their habitats on the Site. The Conservation and Preservation land-use designations are the primary land-use controls to accomplish this policy. Within the Conservation and Preservation designations, land uses shall be consistent with the purpose of the designation and significant impacts shall be mitigated. Implementation mechanisms such as the BRMaP (DOE-RL 1996c), the Draft *Hanford Site Biological Resources Mitigation Strategy Plan* (BRMiS) (DOE-RL 1996), the *Hanford Site Ground-Water Protection Management Plan* (DOE-RL 1995a) and cultural management plans augment these designations for development review and approval Site-wide. Developments for public access and recreation should be according to adopted AMPs depicting management of use, and siting of support facilities.
2. Within land-use designations other than Conservation and Preservation, mitigate significant unavoidable (residual) impacts at locations by enhancing habitats within the Conservation or Preservation designations. To accomplish this, undertake the following actions:
 - a. Modify the BRMaP (DOE-RL 1996c) and BRMiS (DOE-RL 1996) to be consistent with this policy and with implementing procedures.
 - b. Review habitat management plans to redirect their mitigation actions and strategies, where necessary and possible, to the established Conservation and Preservation areas.
 - c. Consider provisions for the protection of "vulnerable aggregations," as defined by the Washington Department of Fish and Wildlife, for non-game species wherever they occur on the Site.
3. Require that projects have reasonable setbacks from the Preservation and Conservation features of importance.
 - a. Within all land-use designations, require that land not be cleared until a specific project has been approved consistent with DOE's NEPA regulations (10 CFR 1021).

6.3.3 *Protection of Cultural Resources*

The CLUP policy would accomplish the following for the Site:

1. Implement DOE's *Land- and Facility-Use Policy* (DOE P 430.1), which is to protect and sustain cultural resources on the Site. The Conservation and Preservation land-use designations are the primary land-use controls to accomplish this policy. The CRMP addresses those actions where land-use controls are not the appropriate mitigation (i.e., if a cultural resource is found in an Industrial designation, provisions of the CRMP would be applied to mitigate impacts to the resource). Within the Conservation and Preservation designations, land uses shall be consistent with the

1 purpose of the designation and significant impacts mitigated. Implementation
2 mechanisms such as the CRMP (DOE-RL 1999), and habitat management plans
3 augment these designations for Site-wide reviewing and approving proposed
4 development. Developments for public access and recreation should be according
5 to adopted AMPs depicting management of use, and siting of support facilities.
6

- 7 2. Proposed developments within all areas should be reviewed consistent with the
8 BRMaP (DOE-RL 1996c) and the CRMP (DOE-RL 1999), and reflected in the
9 applicable AMP.

10 **6.3.4 Siting New Development**

11 The CLUP policy would accomplish the following for the Site:

- 12
- 13 1. Locate and approve new developments in areas consistent with the adopted Hanford
14 CLUP.
 - 15 2. Locate proposed projects, as feasible and practical, in those areas of the Hanford
16 Site where the adopted CLUP and the local cities' and counties' land-use maps are
17 consistent.
 - 18 3. Within all land-use designations, previously disturbed areas (as identified by the
19 BRMaP and CRMP) should be developed first, followed by the acreage with the least
20 sensitive biological and cultural resources. Within the Hanford Site's plan of any
21 proposed new development, the acreage with the most sensitive biological and
22 cultural resources should be worked into natural open space for landscaping, buffers,
23 natural drainage areas, etc.
 - 24 4. Focus on using existing infrastructure and developed areas for new projects within a
25 land-use designation.
 - 26 a. Locate new development in close proximity to existing infrastructure unless a
27 project requires an isolated site away from incompatible uses.
 - 28 b. Concentrate development on or adjacent to existing infrastructure. Where
29 extensions of infrastructure are necessary, minimize the extension of
30 infrastructure into undeveloped areas.
 - 31 c. Site, plan, and design development to avoid significant impacts on resources.
32 Mitigate unavoidable impacts through design to minimize impacts and mitigation
33 costs associated with biological, cultural, air and groundwater resources.

34 **6.3.5 Utility and Transportation Corridors**

35 The CLUP policy would accomplish the following for the Site:

- 36
- 37 1. With to-be-identified exception(s), existing utility and transportation corridor right-of-
38 ways are the preferred routes for expanded capacity and new infrastructure.
 - 39 2. Existing utility corridors that are in actual service, clearly delineated, and of defined
40 width, are not considered "nonconforming" uses in any land-use designation.
 - 41 3. Utility corridors and systems without the characteristics of number 2 (above) are
42 considered to be nonconforming uses and shall be identified in the applicable RMP or
43 AMP.

- 4 Avoid the establishment of new utility corridors within the Conservation and Preservation designations unless the use of an existing corridor(s) is infeasible or impractical.
- 5 Avoid the location of new above-ground utility corridors and systems in the immediate viewshed of an American Indian sacred site. Prioritize for removal, as funding is available, existing nonconforming utility corridors and systems in such areas.

6.3.6 Economic Development

CLUP policy would promote the following for the Site:

1. Multiple land uses for both the private and public sector.
2. Protection and maintenance of existing functional infrastructure and utilities for use in economic development and Site transition.
3. Future Federal missions and programs, consistent with the provisions of the CLUP.
4. Protection of natural, historic, and cultural resources to assure continued biodiversity and cultural values as essential elements of a recreation and tourism economy.
5. Reduction or elimination of existing conditions which are impediments to the realization of the land-use designations (e.g., scattered withdrawn Public Domain land, contamination, and nonconforming and abandoned developments).

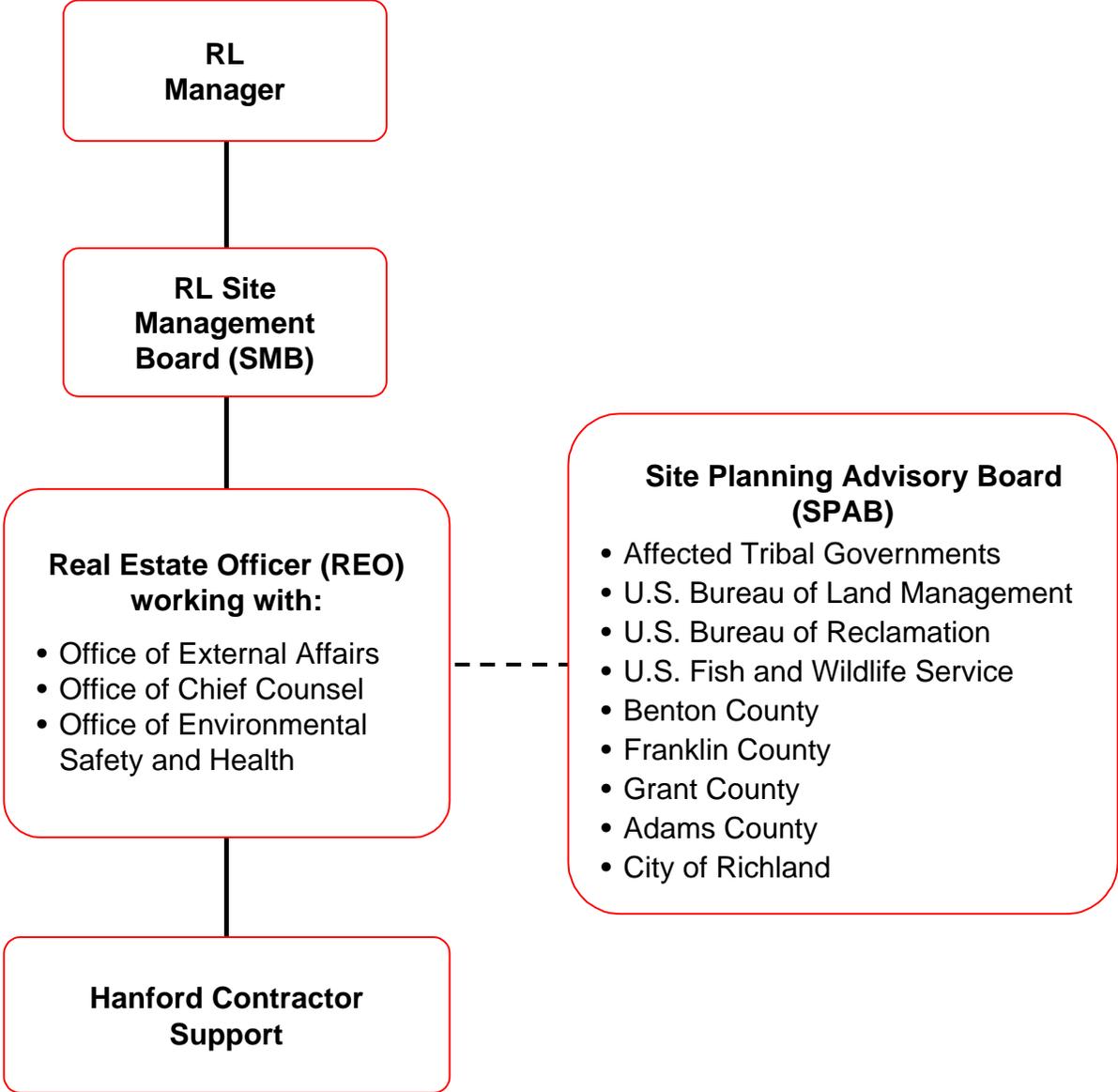
6.4 Organizational Structure and Procedure for Review and Approval of Use Requests

The existing organizational structure within RL would implement the Hanford CLUP, augmented with a SPAB consisting of representatives from the cooperating agencies and affected Tribal governments. The organizational structure for implementation of the Hanford CLUP is shown in Figure 6-1.

The REO receives notice (e.g., NEPA checklist, SEPA checklist, CERCLA RI/FS review request, CERCLA review request, RCRA permit request, etc.) from a proposed project or activity and initiates, with the NEPA Compliance Officer (NCO), a coordinated project review (Figure 6-2). As an initial step in the review process, the REO determines whether the project is an "Allowable Use," "Special Use," or "Amendment" to the CLUP. For projects that require Special Use Permits or Plan Amendments, the REO obtains comments and recommendations from the SPAB on the suitability of the proposed "Use" with respect to the existing CLUP map, land-use policies and implementing procedures. For CLUP Amendments, review includes a final RL Site Management Board (SMB) affirmation, or the SMB can refer a proposed Plan Amendment back to the REO for further review. Figure 6-2 depicts the route of review for proposed projects.

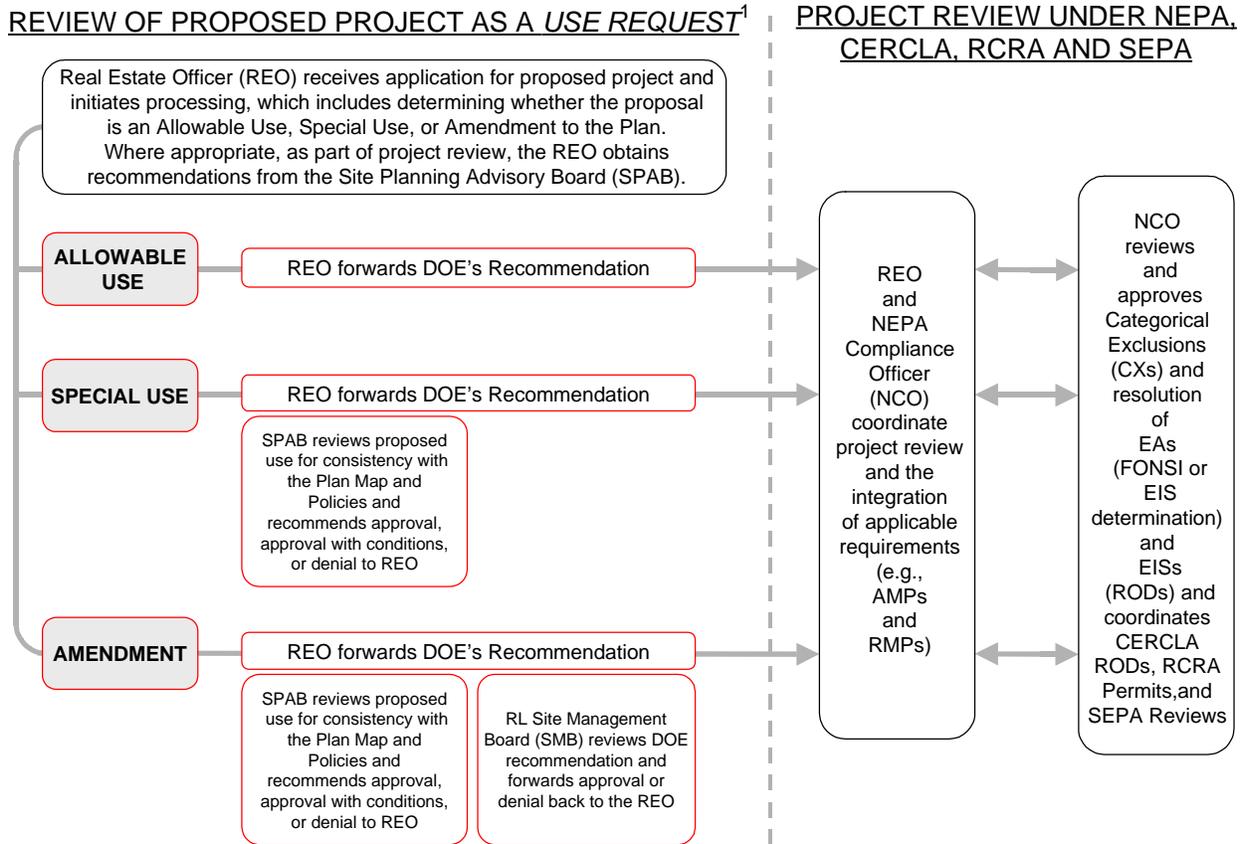
1
2
3
4

Figure 6-1. Organizational Structure for CLUP Implementation.



1
2
3
4

Figure 6-2. Review Process for Use Requests.



¹The proposed land or facility use, and location are reviewed for consistency with the Plan Map and Policies.

- 5 AMP = area management plan
- 6 CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
- 7 CX = categorical exclusion
- 8 EA = environmental assessment
- 9 FONSI = finding of no significant impact
- 10 EIS = environmental impact statement
- 11 NEPA = *National Environmental Policy Act of 1969*
- 12 RCRA = *Resource Conservation and Recovery Act of 1976*
- 13 ROD = Record of Decision
- 14 SEPA = *State Environmental Policy Act of 1971*
- 15
- 16

1 **6.4.1 Relationship Between the Site Planning Advisory Board and Real Estate Officer**
2

3 The SPAB has been recommended by the cooperating agencies and consulting Tribal
4 governments as an essential function, and by DOE as a desirable function, for the successful
5 implementation of the CLUP. The SPAB would directly interface with the REO to advise DOE
6 on land use and resource management issues. The SPAB would consist of representatives
7 from the cooperating agencies with land-use authority, and affected Tribal governments.

8
9 The SPAB would support the REO by reviewing and providing advice for “area” and
10 “resource” management plans, providing policy advice to RL in areas involving coordination of
11 land and resource management, and advising during consideration of nonconforming proposals
12 within the boundaries of the Hanford Site. The SPAB advice shall be provided in a timely manner
13 to support the decision process.
14
15

16 **6.5 Use Requests for Non-Federal Projects**
17

18 Proponents and entities of non-Federal projects shall follow the approval process for Use
19 Requests onsite (Section 6.4). The county, city or private entity would be invited to cooperate
20 early in the Use Request and in the NEPA review process (Figure 6-2). Use Requests for
21 non-Federal projects involving new construction shall be required to comply with applicable local
22 county and/or city review and permitting requirements such as compliance with the Uniform
23 Building Code (UBC), health district requirements, shoreline permits, and local air authority
24 standards.
25
26

27 **6.6 Plan Implementation Requirements**
28

29 After the HCP EIS ROD is approved, the actions presented in this section would be
30 undertaken to ensure that the plan is implemented. The objectives of these actions are as
31 follows:
32

- 33 C To streamline and integrate procedures for project review, including ensuring project
34 consistency with the plan, pre-planning for large areas, siting new developments,
35 providing and using infrastructure and utilities, managing resources, notifying the
36 public, and conducting environmental review.
37
- 38 C To make decisions on the use of lands and resources on the Site within the frame-
39 work of existing DOE legal and administrative procedures, with an implementation
40 process that parallels, and efficiently coordinates with local land-use regulatory
41 processes, and provides similar accountability and tracking.
42
- 43 C To make adjustments in existing DOE administrative structures as necessary to
44 efficiently implement the CLUP.
45

46 Achieving these objectives is essential to accomplishing DOE missions and working with
47 Federal agencies, Tribes, and local cities and counties to jointly accomplish planning goals,
48 economic transition, institutional controls, long-term Site stewardship, and multiple uses of the
49 Site.
50

51 **6.6.1 DOE Equivalent to a Municipal or County Planning Approach**
52

53 Given the mutual objectives of RL and local governments to coordinate on privatization
54 and transition, the management of uses of real estate at the Hanford Site would be done with

1 procedures that are similar to, or compatible with, the administration of land use in the adjacent
 2 municipality or counties. Currently, there are similarities which are amenable to closer
 3 alignment. Table 6-2 shows the similarities between geographic segmentation (e.g., a city in the
 4 county is similar to an area on the Hanford Site). Table 6-3 shows the similarities between local
 5 land-use regulatory procedures and implementation processes on the Hanford Site which, if
 6 aligned and coordinated, would improve management of resources.
 7
 8

9 **Table 6-2. Administration Parallels of RL and Local Jurisdictions.**

Municipal and County-Land Use	.	DOE Equivalent
Region	.	Region
County	.	Hanford Site
City	.	Area (i.e., 100, 200, 300, and 400)
Neighborhood or Industrial Park	.	Complex (e.g., ORP)
Site, Lot, and Parcel	.	Site, Lot, and Parcel
Facility, Utility, and Infrastructure	.	Facility, Utility, and Infrastructure

17
18
19 **Table 6-3. Example of Local Government Processes and RL Counterparts.**

Existing Municipal or County Process	.	DOE Counterpart
<u>Administrator: Planning Department Director</u> C Reviews for consistency with Comprehensive Plan C Coordinates land-use review (e.g., Planning Commission, Board of Adjustment, and Board of County Commissioners) C Administrative/discretionary approval C Initiates <i>State Environmental Policy Act</i> (SEPA)	.	<u>Administrator: Real Estate Officer (REO)</u> C Reviews for consistency with CLUP C Coordinates review of Use Requests for real estate (e.g., Site Planning Advisory Board, Site Management Board, and Site Manager) C Not applicable C Initiates NEPA <u>NEPA Compliance Officer (NCO)</u> C Administers NEPA
<u>Administrator: Planning Department Director</u> C Administers SEPA	.	<u>Comprehensive Plan</u> C Map C Policies
<u>Regulatory Review</u> C Protocols for coordination of Department and agency review	.	<u>CLUP</u> C Map C Policies <u>CLUP RL Implementing Procedures</u> C Protocols for coordination of program and agency review
<u>Official Controls</u> C Zoning ordinances C Subdivision ordinances C Critical Resources Protection Ordinances C Shoreline management plan C SEPA C Uniform Building Codes C Approval of building permits C Occupancy permits by Building Department C Other controls	.	<u>Implementation Controls</u> C Design standards C Location and development requirements C Resource management plans C Area management plans C NEPA C Uniform Building Codes C Approval of Use Requests C Occupancy permit by Fire Marshal C Other controls

6.6.2 CLUP Implementation Procedures and Implementation Controls

The CLUP implementation procedures and implementation controls should be made consistent and integrated with the CLUP, so that project activities are consistent with and carry out the CLUP over time. This would be instituted through a RL Implementing Directive for the CLUP, which would provide the mandatory requirements and procedures for RL and its contractors to follow. Integrated implementation procedures would be accomplished within 24 months of the issuance of the HCP EIS ROD, funding permitting, under the coordination of the RL Assistant Manager responsible for the Site Services Division.

Table 6-4 shows the implementing controls (RMPs and AMPs) required for implementation of the CLUP. These controls are tools to ensure that land-use actions are consistent with the CLUP. Prior to the adoption of the controls, each RMP and AMP would be reviewed for consistency and alignment with the CLUP, in accordance with the list of tasks that follows Table 6-4. Task One through Task Seven would be performed sequentially. Completion of these tasks would integrate the various RMPs, AMPs, and project-review activities currently in use on the Site with the CLUP implementation procedures.

Table 6-4. Current Status of CLUP Implementing Controls (RMPs and AMPs).

Resource Management Plans (RMPs)	To Be Prepared	Current Draft	Current Final	Revision Planned
Hanford Cultural Resources Management Plan		U		U
Hanford Biological Resources Management Plan		U		U
Hanford Bald Eagle Management Plan			U	U
Fire Management Plan			U	U
Noxious Weed Management Plan			U	U
Chinook Salmon - Upper Columbia River Spring run Hanford Management Plan	U			
Steelhead - Middle Columbia River run Hanford Management Plan	U			
Steelhead Upper Columbia River run Hanford Management Plan		U		
Aesthetic and Visual Resources Management Plan	U			
Facility and Infrastructure Assessment and Strategy		U		
Mineral Resources Management Plan (i.e., soils, sand, gravel, and basalt)	U			
Hanford Site Watershed Management Plan	U			
Hanford Site Ground-Water Protection Management Plan			U	
Groundwater Vadose Zone Integration Project Summary Description			U	
Hanford Institutional Control Plan (i.e., long-term stewardship plan)	U			
Area Management Plans (AMPs)	To Be Prepared	Current Draft	Current Final	Revision Planned
ALE Reserve Comprehensive Conservation Plan			U	U
Wahluke Slope Comprehensive Conservation Plan	U			
Columbia River Corridor Area Management Plan	U			
South 600 Area Management Plan (includes 300 Area)	U			

- 1
- 2 1. Identify all similar documents, policies, and procedures.
- 3
- 4 2. Review documents and associated policies and implementing procedures for
- 5 consistency with the CLUP map and policies and implementing procedures.
- 6
- 7 3. Identify changes necessary to align documents and associated policies and
- 8 implementing procedures with the provisions of the CLUP.
- 9
- 10 4. Prepare recommendations to amend existing documents and associated policies
- 11 and implementing procedures so they are consistent with and carry out the CLUP.
- 12
- 13 5. Prepare new RMPs and AMPs.
- 14
- 15 6. Submit CLUP Amendments and new RMPs and AMPs to the REO for review as
- 16 Special Use Requests so these changes may be integrated with the CLUP
- 17 implementation procedures as standards for project review (see Figures 6-1 and
- 18 6-2).
- 19
- 20 7. Integrate the prescribed and coordinated process for applying the provisions of the
- 21 documents into the RL Implementing Directive for the CLUP (Table 6-4).
- 22

23 **6.6.3 Mission-Related Program and Contractor Integration**

24
25 The CLUP map and policies would be integrated with and addressed at the threshold
26 decision points of all authorizations, operational plans (e.g., the current Hanford Strategic Plan), |
27 and actions considered in RCRA, CERCLA, NEPA and SEPA reviews. This includes contracts
28 and budget proposals that directly or indirectly affect land use on the Site.
29

30 **6.6.4 Establishment of Site Planning Advisory Board**

31
32 The establishment and seating of the SPAB (see Figures 6-1 and 6-2) shall be
33 accomplished within two months from the issuance of the HCP EIS ROD. Prescribed SPAB |
34 charter and guidelines would need to be developed by this board and DOE.
35

36 **6.6.5 Amendments to the Comprehensive Land-Use Plan**

37
38 The CLUP is a living document designed to hold a chosen course over an extended
39 period of development and management of resources, yet the plan is flexible enough to
40 accommodate a wide spectrum of both anticipated and unforeseen mission conditions. A
41 fundamentally good plan can do this for a relatively short period of time (five years), during which
42 monitoring, data gathering, and analysis for the purposes of “fine tuning” and improving the plan
43 by Amendment should be an ongoing program. It is recommended that a reassessment of the
44 CLUP should occur every 5 years, in the form of a NEPA Supplemental Analysis per |
45 10 CFR 1021.
46
47

7.0 Consultations, Laws, and Requirements

This chapter summarizes the major laws, regulations, Executive Orders, and U.S. Department of Energy (DOE) regulations, orders, and agreements that might apply to Hanford Site land uses. The Federal, Tribal, state, and local agencies that were consulted by DOE during the preparation of the HRA-EIS are also identified.

7.1 Federal Laws

Relevant laws of the United States that might apply to the implementation of the land-use alternatives at the Hanford Site are discussed in the sections that follow.

7.1.1 Treaties of the United States with American Indian Tribes of the Hanford Region

In May and June of 1855, at Wai-i-lat-pu (near present-day Walla Walla, Washington), leaders of various Columbia Plateau American Indian Tribes and Bands negotiated treaties with representatives of the United States. The negotiations resulted in 3 treaties, one with the 14 Tribes and bands of what would become the Confederated Tribes and Bands of the Yakama Nation, one with the 3 Tribes that would become the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and one with the Nez Perce Tribe. The treaties were ratified by the U.S. Senate in 1859. The negotiated treaties are as follows:

- c *Treaty with the Walla Walla, Cayuse, etc.* (June 9, 1855; 12 Stat. 945)
- c *Treaty with the Yakama* (June 9, 1855; 12 Stat. 951)
- c *Treaty with the Nez Perce* (June 11, 1855; 12 Stat. 957).

The terms of all three treaties are essentially the same. Each of the three Tribal organizations agreed to cede large blocks of land to the United States. The Tribes retained certain lands for their exclusive use (the three reservations) and also retained the rights to continue traditional activities outside the reservations. These reserved rights include the right to fish (and erect fish-curing facilities) at usual and accustomed places. These rights also include rights to hunt, gather foods and medicines, and pasture livestock on open and unclaimed lands.

The act of treaty-making between the United States and an Indian Tribe has many legal consequences for both entities. The United States recognizes the existence of the Tribe as a sovereign and initiates a government-to-government relationship with the Tribe. At the same time, the Tribe loses some aspects of its sovereignty, such as the right to negotiate (independently of the United States) with other foreign powers. In return, the United States and the Tribe enter into a trust relationship, whereby the United States assumes the responsibility to preserve the rights and resources of the Tribe from incursions by private entities, states, or the Federal government itself. One aspect of this trust duty is the need to consult with the Tribes concerning decisions made by the Federal government that could affect Tribal rights or resources. In addition to these general legal consequences of treaty-making, the individual treaty itself defines particular new roles and responsibilities of the two governments, within the terms of the new legal relationship created by the treaty.

Every Federal agency that makes decisions potentially affecting the rights or resources of federally recognized American Indian Tribes shares in the trust responsibility duties of the Federal government. This trust responsibility includes the duty to consult with those Tribes concerning the potential impacts of agency decisions. As a result, DOE regularly consults with the CTUIR, the Confederated Tribes and Bands of the Yakama Nation, and the Nez Perce Tribe

1 concerning decisions being made by DOE on the Hanford Site that might affect Tribal rights or
2 resources. Land-use planning decisions are within the realm of such decisions. DOE invited all
3 affected Tribes to participate in the drafting of the HRA-EIS. The U.S. Department of Energy,
4 Richland Operations Office (RL) will continue to consult with these Tribes during the further
5 development and implementation of this environmental impact statement (EIS). Copies of the
6 Treaties are presented in Appendix A.
7

8 **7.1.2 International Treaties of the United States**

9
10 **7.1.2.1 Migratory Bird Treaty Act of 1918.** The *Migratory Bird Treaty Act of 1918*, as
11 amended, is intended to protect birds that have common migration patterns between the United
12 States and Canada, Mexico, Japan, and Russia. The law regulates the harvest of migratory
13 birds by specifying factors such as the mode of harvest, hunting seasons, and bag limits. This
14 Act stipulates that, except as permitted by regulations, it is unlawful at any time, by any means,
15 or in any manner to “kill . . . any migratory bird.” The DOE is required to consult with the U.S.
16 Fish and Wildlife Service (USFWS) regarding impacts to migratory birds and to evaluate ways to
17 avoid or minimize impacts in accordance with the USFWS migration policy.
18

19 **7.1.2.2 Pacific Salmon Treaty Act of 1985.** The *Pacific Salmon Treaty Act of 1985* ratified a
20 treaty between the United States and Canada concerning Pacific salmon. The law is intended to
21 protect and maintain Pacific salmon fisheries by regulating the fishing season. The law
22 establishes panels with jurisdiction over certain areas. Associated regulations close the panel
23 area to sockeye and pink salmon fishing unless opened by panel regulations or by in season
24 orders of the Secretary of Commerce that give the effect to panel orders.
25

26 **7.1.3 Federal Natural Resource Management, Pollution Control, and Cultural Resource** 27 **Laws**

28
29 **7.1.3.1 National Environmental Policy Act of 1969.** The *National Environmental Policy Act*
30 *of 1969* (NEPA), as amended, establishes a national policy that encourages awareness of the
31 environmental consequences of human activities and promotes consideration of those
32 environmental consequences during the planning and implementing stages of a project. Under
33 NEPA, Federal agencies are required to prepare detailed statements to address the
34 environmental effects of proposed major Federal actions that might significantly affect the quality
35 of the human environment. The HRA-EIS has been prepared in accordance with NEPA
36 requirements and policies, and presents reasonable alternatives and the potential environmental
37 consequences of those alternatives.
38

39 **7.1.3.2 Clean Air Act of 1970.** The *Clean Air Act of 1970* (CAA), as amended, is intended to
40 “protect and enhance the quality of the Nation’s air resources so as to promote the public health
41 and welfare and the productive capacity of its population.” Section 118 of the CAA requires each
42 Federal agency, with jurisdiction over properties or facilities engaged in any activity that might
43 result in the discharge of air pollutants, to comply with all Federal, state, interstate, and local
44 requirements with regard to the control and abatement of air pollution.
45

46 Under Section 109 of the CAA, the U.S. Environmental Protection Agency (EPA) is
47 required to establish national ambient air quality standards (NAAQS) that protect public health
48 from known or anticipated adverse effects of a regulated pollutant. Section 111 of the CAA
49 requires establishment of national performance standards for new or modified stationary
50 sources of atmospheric pollutants. Specific emission increases must be evaluated in order to
51 prevent significant deterioration of air quality. Hazardous air pollutants, including radionuclides,
52 are regulated separately. Emissions of air pollutants are regulated by the EPA in 40 CFR 50-99.
53 Radionuclide emissions and hazardous air pollutants are regulated under the National
54 Emissions Standards for Hazardous Air Pollutants Program (40 CFR 61 and 40 CFR 63).
55

1 **7.1.3.3 Safe Drinking Water Act of 1974.** The primary objective of the *Safe Drinking Water*
2 *Act of 1974* (SDWA), as amended, is to protect the quality of the public water supply and
3 sources of drinking water. In the State of Washington, the EPA has the authority to implement
4 regulations to establish standards applicable to public water systems. These regulations further
5 establish the maximum contaminant levels, including maximum levels of radioactivity, that are
6 allowed in public drinking water systems. The EPA has promulgated the SDWA requirements in
7 40 CFR 140-149. Current regulations (40 CFR 141) specify that the average annual
8 concentration of beta particle and photon radioactivity from man-made radionuclides in drinking
9 water shall not produce an annual dose equivalent to the total body or any internal organ greater
10 than 4 mrem/yr. Revisions to the limits regulating radionuclides have been proposed by the
11 EPA.

12
13 Other programs established by the SDWA include the Sole Source Aquifer Program, the
14 Wellhead Protection Program, and the Underground Injection Control Program.

15
16 **7.1.3.4 Clean Water Act of 1977.** The *Clean Water Act of 1977* (CWA), as amended, was
17 enacted to “restore and maintain the chemical, physical and biological integrity of the Nation’s
18 water.” The CWA prohibits “discharge of toxic pollutants in toxic amounts” to navigable waters
19 of the United States. Section 313 of the CWA requires all branches of the Federal government
20 with jurisdiction over properties or facilities engaged in any activity that might result in a
21 discharge or runoff of pollutants to surface waters, to comply with Federal, state, interstate, and
22 local requirements.

23
24 In addition to setting water quality standards for waterways, the CWA provides guidelines
25 and limitations for effluent discharges from point sources and gives authority for the EPA to
26 implement the National Pollutant Discharge Elimination System (NPDES) Permitting Program.
27 The NPDES Program is administered by the Water Management Division of the EPA
28 (40 CFR 122).

29
30 In 1987, the CWA was amended and EPA was required to establish regulations for
31 issuing permits for stormwater discharges associated with industrial activity. Stormwater
32 discharges are permitted through the NPDES Program, and general permit requirements are
33 published in 40 CFR 122.

34
35 **7.1.3.5 Resource Conservation and Recovery Act of 1976.** Treatment, storage, and/or
36 disposal of hazardous and nonhazardous waste is regulated under the *Solid Waste Disposal*
37 *Act of 1965*, which was amended by the *Resource Conservation and Recovery Act of 1976*
38 (RCRA), and the *Hazardous and Solid Waste Amendments of 1984*. Any state that seeks to
39 administer and enforce a hazardous waste program pursuant to RCRA may apply for EPA
40 authorization of the state program. The Washington State Department of Ecology (Ecology) has
41 been delegated the authority for implementing the Federal RCRA program in the State of
42 Washington. The EPA regulations implementing RCRA define hazardous wastes and specify
43 the transportation, handling, and waste management requirements of these wastes
44 (40 CFR 260-280).

45
46 The *Federal Facilities Compliance Act of 1992* (FFCA) amends RCRA and waives
47 sovereign immunity for fines and penalties for RCRA violations at Federal facilities. A provision
48 of the FFCA postpones fines and penalties for three years for mixed waste storage prohibition
49 violations at DOE sites and requires DOE to prepare plans for developing the required treatment
50 capacity for mixed waste stored or generated at each facility. Each plan must be approved by
51 the host state or the EPA, after consultation with other affected states, and a consent order
52 requiring compliance with the plan must be issued by the regulator. The FFCA also states that
53 DOE will not be subject to fines and penalties for land disposal restriction storage prohibition
54 violations for mixed waste as long as DOE is in compliance with an approved plan and consent
55 order and meets all other applicable regulations.

1 **7.1.3.6 Comprehensive Environmental Response, Compensation, and Liability Act of**
2 **1980.** The *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
3 (CERCLA) provides a statutory framework for the remediation of waste sites containing
4 hazardous substances and, as amended by the *Superfund Amendments and Reauthorization*
5 *Act of 1986* (SARA), an emergency response program in the event a release (or threat of a
6 release) of a hazardous substance to the environment occurs. Using a hazard ranking system,
7 Federal and private contaminated sites are ranked and may be included on the National Priorities
8 List. CERCLA requires Federal facilities with contaminated sites to undertake investigations,
9 remediation, and natural resource restoration, as necessary.

10
11 **7.1.3.7 Emergency Planning and Community Right-to-Know Act of 1986.** Under Subtitle A
12 of the *Emergency Planning and Community Right-to-Know Act of 1986*, also known as the
13 *Superfund Amendments and Reauthorization Act of 1986* (SARA Title III), Federal facilities are
14 required to provide information regarding the inventories of chemicals used or stored at a site
15 and releases from that site to the State Emergency Response Commission and the Local
16 Emergency Planning Committee. This requirement ensures that emergency plans are sufficient
17 to respond to unplanned releases of hazardous substances. Implementation of provisions in the
18 *Emergency Planning and Community Right-to-Know Act of 1986* began voluntarily in 1987;
19 inventory and emissions reporting began in 1988 based on 1987 activities and information. The
20 requirements of the *Emergency Planning and Community Right-to-Know Act of 1986* are
21 promulgated by the EPA in 40 CFR 350-372. The DOE requires compliance with SARA Title III.

22
23 **7.1.3.8 Toxic Substances Control Act of 1976.** The *Toxic Substances Control Act of 1976*
24 (TSCA) provides the EPA with the authority to require testing of chemical substances (both new
25 and old) entering the environment and, where necessary, to regulate those chemicals. The law
26 complements and expands other toxic substance laws such as Section 112 of the CAA and
27 Section 307 of the CWA. The TSCA was enacted because there were no Federal regulations
28 requiring evaluation of potential environmental or health effects from the thousands of chemicals
29 being developed and released to the public or commerce annually. The TSCA also regulates the
30 treatment, storage, and disposal of certain toxic substances (e.g., polychlorinated biphenyls,
31 chlorofluorocarbons, asbestos, dioxins, certain metal-working fluids, and hexavalent chromium).

32
33 **7.1.3.9 Pollution Prevention Act of 1990.** The *Pollution Prevention Act of 1990* establishes a
34 national policy for waste management and pollution control. This Act focuses first on source
35 reduction, followed sequentially by environmentally safe recycling and treatment and, as a last
36 resort, disposal or other release into the environment. The DOE has committed to participation
37 in Section 313 of SARA, the EPA 33/50 Pollution Prevention Program. The goal for facilities
38 involved in Section 313 compliance is a 33 percent reduction in releases of 17 priority chemicals
39 by 1997 (based on a 1993 baseline). On August 3, 1993, Executive Order 12856 was issued.
40 This Executive Order expands the 33/50 Pollution Prevention Program and requires DOE to
41 reduce total releases of all toxic chemicals by 50 percent by December 31, 1999. Each DOE
42 site is, therefore, establishing site-specific goals to reduce generation of all waste types.

43
44 **7.1.3.10 National Historic Preservation Act of 1966.** The *National Historic Preservation Act*
45 *of 1966*, as amended, requires nomination for placement of sites with significant national historic
46 value on the National Register of Historic Places (NPS 1988). Permits and certifications are not
47 required under this Act; however, consultation with the Advisory Council on Historic Preservation
48 is required if a Federal undertaking might impact a historic property resource. This consultation
49 generally results in a Memorandum of Agreement (MOA) that includes stipulations to minimize
50 adverse impacts to the historic resource. Coordination with the State Historic Preservation
51 Office is undertaken to ensure that potentially significant sites are properly identified and
52 appropriate mitigation measures are implemented.

53
54 **7.1.3.11 Archaeological Resources Protection Act of 1979.** The *Archaeological Resources*
55 *Protection Act of 1979*, as amended, requires a permit for any excavation or removal of

1 archaeological resources from Federal or Indian lands. Excavations must be undertaken for the
2 purpose of furthering archaeological knowledge in the public interest, and resources removed
3 are to remain the property of the United States. Consent must be obtained from the Indian Tribe
4 or the Federal agency having authority over the land on which a resource is located before
5 issuance of a permit; the permit must contain terms and conditions requested by the Tribe or
6 Federal agency.
7

8 **7.1.3.12 Native American Graves Protection and Repatriation Act of 1990.** The *Native*
9 *American Graves Protection and Repatriation Act of 1990* directs the Secretary of the Interior to
10 guide Federal agencies in the repatriation of Federal archaeological collections and collections
11 affiliated culturally to American Indian Tribes, which are currently held by museums receiving
12 Federal funding. This Act established statutory provisions for the treatment of inadvertent
13 discoveries of American Indians' remains and cultural objects. Specifically, when discoveries
14 are made during ground disturbing activities, the following must take place: (1) activity in the
15 area of the discovery must cease immediately, (2) reasonable efforts must be made to protect
16 the items discovered, (3) notice of discovery must be given to the agency head (DOE) and the
17 appropriate Tribes, and (4) a period of 30 days must be set aside following notification for
18 negotiations regarding the appropriate disposition of these items.
19

20 **7.1.3.13 American Indian Religious Freedom Act of 1978.** The *American Indian Religious*
21 *Freedom Act of 1978* reaffirms American Indians' religious freedom under the First Amendment
22 and sets United States policy to protect and preserve the inherent and constitutional right of
23 American Indian Tribes to believe, express, and exercise traditional religions. This Act also
24 requires that Federal agencies avoid interfering with access to sacred locations and traditional
25 resources that are integral to the practice of religion.
26

27 **7.1.3.14 Endangered Species Act of 1973.** The *Endangered Species Act of 1973*, as
28 amended, is intended to prevent further decline of endangered and threatened species and to
29 restore those species and their habitats. This Act is jointly administered by the Departments of
30 Commerce and Interior. Section 7 of this Act requires agencies to consult with the USFWS or
31 the National Marine Fisheries Service. This consultation determines whether endangered and
32 threatened species or critical habitats are known to be in the vicinity of a proposed action, and
33 whether an action will adversely affect listed species or designated critical habitats.
34

35 **7.1.3.15 Bald and Golden Eagle Protection Act of 1972.** The *Bald and Golden Eagle*
36 *Protection Act of 1972*, as amended, makes it unlawful to take, pursue, molest, or disturb bald
37 and golden eagles, their nests, or their eggs anywhere in the United States. A permit must be
38 obtained from the U.S. Department of the Interior (DOI) to relocate a nest that interferes with
39 resource development or recovery operations.
40

41 **7.1.3.16 Wild and Scenic Rivers Act of 1968.** The *Wild and Scenic Rivers Act of 1968*, as
42 amended, protects selected national rivers possessing outstanding scenic, recreational,
43 geological, fish and wildlife, historical, cultural, or other similar values. These rivers are to be
44 preserved in a free-flowing condition to protect water quality and for other vital national
45 conservation purposes. This Act also instituted a National Wild and Scenic Rivers system,
46 designated the initial rivers within the system, and developed standards for the addition of new
47 rivers in the future.
48

49 **7.1.3.17 Nuclear Waste Policy Act of 1982.** The *Nuclear Waste Policy Act of 1982*, as
50 amended, authorizes Federal agencies to develop a geologic repository for the permanent
51 disposal of spent nuclear fuel and high-level radioactive waste. This Act specifies the process
52 for selecting a repository site and constructing, operating, closing, and decommissioning the
53 repository, and also establishes programmatic guidance for these activities.
54

55 **7.1.3.18 Atomic Energy Act of 1954.** The *Atomic Energy Act of 1954* (AEA), as amended,

1 authorizes DOE to establish standards to protect health or minimize dangers to life or property
2 with respect to activities under DOE jurisdiction. The DOE has used a series of departmental
3 orders to establish an extensive system of standards and requirements to ensure safe operation
4 of DOE facilities.
5

6 The AEA and related statutes give EPA the responsibility and authority for developing
7 applicable environmental standards for protection of the general environment from radioactive
8 materials. The EPA has promulgated several regulations under this authority.
9

10 **7.1.3.19 Occupational Safety and Health Act of 1970.** The *Occupational Safety and Health*
11 *Act of 1970*, as amended, establishes standards to enhance safe and healthy working
12 conditions in places of employment throughout the United States. The *Occupational Safety and*
13 *Health Act of 1970* is administered and enforced by the Occupational Safety and Health
14 Administration (OSHA), a U.S. Department of Labor agency. Although the OSHA and the EPA
15 both have a mandate to limit exposures to toxic substances, the jurisdiction of the OSHA is
16 limited to safety and health conditions in the workplace. In general, each employer is required to
17 furnish a place of employment free of recognized hazards likely to cause death or serious
18 physical harm to all employees. The OSHA regulations establish specific standards telling
19 employers what must be done to achieve a safe and healthy working environment. Employees
20 have a duty to comply with these standards and with all rules, regulations, and orders issued by
21 OSHA.
22

23 The DOE places emphasis on compliance with OSHA regulations at DOE facilities.
24 Through DOE orders, DOE prescribes that contractors shall meet OSHA standards applicable
25 to work at government-owned, contractor-operated facilities. The DOE maintains and makes
26 available the various records of minor illnesses, injuries, and work-related deaths, as required by
27 OSHA regulations.
28

29 **7.1.3.20 Comprehensive Conservation Study of the Hanford Reach of the Columbia**
30 **River, Public Law 100-605.** Public Law 100-605, passed by Congress on November 4, 1988,
31 authorizes a comprehensive study of the Hanford Reach of the Columbia River to identify the
32 outstanding features of the Hanford Reach and its immediate environment (including fish and
33 wildlife, geologic, scenic, recreational, natural, historical, and cultural values), and to examine
34 alternatives for their preservation. The Secretary of the Interior has affirmed the addition of the
35 Hanford Reach to the National Wild and Scenic Rivers System and is waiting for Congressional
36 action to implement the decision.
37

38 The Secretary of the Interior is charged with reviewing proposed actions within the study
39 corridor to determine if there will be a direct and adverse effect on the values for which the
40 Hanford Reach is under study and, if so, to provide recommendations for mitigation. In 1996,
41 Public Law 104-333, *Omnibus Parks and Public Lands Management Act of 1996*, was enacted.
42 Section 404 of this Act amended Public Law 100-605 to extend the Secretary's environmental
43 review responsibility indefinitely and permanently prohibited any damming, dredging, or
44 navigation project within the Hanford Reach.
45

46 **7.1.3.21 Mining Law of 1872, as amended.** The *Mining Law of 1872*, as amended, permits
47 prospecting and mining on the unappropriated public domain for hardrock minerals (the Hanford
48 Site is not considered unappropriated public domain). Congress declared that it is the
49 continuing policy of the Federal government to foster and encourage private enterprise in (1) the
50 development of economically sound and stable domestic mining, minerals, metals and mineral
51 reclamation industries; (2) the economic development of domestic mineral resources, reserves,
52 and reclamation of metals and minerals; (3) mining, mineral, and metallurgical research,
53 including the use and recycling of scrap to promote the efficient use of natural and reclaimable
54 resources; and (4) the study and development of methods for the disposal, control, and
55 reclamation of mineral waste products and the reclamation of mined land, to lessen the adverse

1 impact of mineral extraction and processing on the physical environment.

2
3 **7.1.3.22 Archeological and Historic Preservation Act of 1974.** The *Archeological and*
4 *Historic Preservation Act of 1974*, as amended, protects sites that have historic and prehistoric
5 importance.

6
7 **7.1.3.23 Fish and Wildlife Conservation Act of 1980.** The *Fish and Wildlife Conservation Act*
8 *of 1980*, as amended, encourages all Federal entities (in cooperation with the public) to protect
9 and conserve the nation's fish and wildlife.

10
11 **7.1.3.24 Fish and Wildlife Coordination Act of 1934.** The *Fish and Wildlife Coordination Act*
12 *of 1934*, as amended, promotes more effectual planning and cooperation between Federal,
13 state, public, and private agencies for the conservation and rehabilitation of the nation's fish and
14 wildlife and authorizes the DOI to provide assistance.

15
16 **7.1.3.25 National Wildlife Refuge System Administration Act of 1966 (as amended by the**
17 **National Wildlife Refuge System Improvement Act of 1997, Public Law 105-57).** The
18 *National Wildlife Refuge System Administration Act of 1966*, as amended, provides guidelines
19 and directives for the administration and management of all lands within the system, including
20 "wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened
21 with extinction, wildlife ranges, game ranges, wildlife management areas, or waterfowl
22 production areas." The Secretary of the Interior is authorized to permit by regulations the use of
23 any area within the system provided "such uses are compatible with the major purposes for
24 which such areas were established."

25
26 **7.1.3.26 Noise Control Act of 1972.** The *Noise Control Act of 1972*, as amended, directs all
27 Federal agencies to carry out, to the fullest extent within agency authority, programs within
28 agency jurisdiction in a manner that furthers a national policy of promoting an environment free
29 from noise that jeopardizes health and welfare.

30
31 **7.1.3.27 American Antiquities Preservation Act of 1906.** The *American Antiquities*
32 *Preservation Act of 1906*, as amended, protects historic and prehistoric ruins, monuments, and
33 antiquities, including paleontological resources, on federally controlled lands.

34
35 **7.1.3.28 Federal Insecticide, Fungicide, and Rodenticide Act of 1972.** The *Federal*
36 *Insecticide, Fungicide, and Rodenticide Act of 1972*, as amended, governs the storage, use, and
37 disposal of pesticides through product labeling, registration, and user certification.

38
39 **7.1.3.29 Federal Land Policy and Management Act of 1976.** The *Federal Land Policy and*
40 *Management Act of 1976*, as amended, governs the use of Federal lands which may be
41 overseen by several agencies and establishes the procedure for applying to the U.S. Bureau of
42 Land Management (BLM) for land withdrawals and right-of-ways.

43
44 **7.1.3.30 Federal Water Pollution Control Act Amendments of 1972.** The *Federal Water*
45 *Pollution Control Act Amendments of 1972* is the predecessor Federal statute to the *Clean*
46 *Water Act of 1977*.

47
48 **7.1.3.31 Historic Sites, Buildings, and Antiquities Act of 1965.** The *Historic Sites,*
49 *Buildings, and Antiquities Act of 1965* sets national policy to preserve historic sites, buildings,
50 and antiquities for the inspiration and benefit of the people of the United States.

51
52 **7.1.3.32 Materials Act of 1947.** The *Materials Act of 1947* provides for the management of
53 minerals, timber, and other construction resource materials on public lands.

54
55 **7.1.3.33 Federal Urban Land-Use Act of 1949.** The *Federal Urban Land-Use Act of 1949* was

1 enacted to promote harmonious intergovernmental relations. The Act also encourages sound
2 planning, zoning, and land-use practices by prescribing uniform policies and implementing
3 procedures in order that land transactions entered into for the General Services Administration
4 or on behalf of other Federal agencies be consistent with zoning and land-use practices and be
5 made in accordance with planning and development objectives of local governments and local
6 planning agencies concerned.
7

8 **7.1.3.34 National Defense Authorization Act, Public Law 104-201.** Section 3153 of the
9 National Defense Authorization Act requires DOE to develop a future-use plan for defense
10 nuclear facilities, including the Hanford Site. The future-use plans required under this section
11 must address a planning period of at least the next 50 years. The DOE prepared an overview
12 report, *Planning for the Future, An Overview of Future Use Plans at Department of Energy Sites*,
13 which provided a summary of the future land-use planning processes at the Hanford Site, the
14 Idaho National Engineering and Environmental Laboratory, the Rocky Flats Environmental
15 Technology Site, and the Savannah River Site. This overview report was delivered to Congress
16 on October 7, 1998. In addition, DOE submitted the current future-use plans for three of the
17 above four sites, excluding Hanford. Hanford's CLUP will be delivered to members of Congress
18 with the distribution of this Final HCP EIS.
19
20

21 **7.2 State Laws**

22
23 State and local statutes also apply to activities at the Hanford Site when Federal law
24 delegates enforcement or implementation authority to state or local agencies. In general, state
25 laws do not apply to the Federal government based on the National Supremacy Clause that
26 reads, "This constitution, and the laws of the United States which shall be made in pursuance
27 thereof; and all treaties made, or which shall be made, under the authority of the United States,
28 shall be the supreme law of the land; and the judges in every state shall be bound thereby, any
29 thing in the constitution or laws of any state to the contrary notwithstanding" (Article 4, U.S.
30 Constitution).
31

32 **7.2.1 State Environmental Policy Act of 1971**

33
34 The Washington State legislature enacted the *State Environmental Policy Act of 1971*
35 (SEPA). The statute was amended in 1983, and new implementing regulations (the SEPA rules)
36 were adopted and codified by Ecology in 1984 as *Washington Administrative Code*
37 (WAC) 197-11. The purpose and policy sections of the statute are extremely broad, including
38 recognition by the legislature that "each person has a fundamental and inalienable right to a
39 healthful environment. . . ." SEPA contains a substantive mandate that "policies, regulations,
40 and laws of the State of Washington shall be interpreted and administered in accordance with
41 the policies set forth in [SEPA]."
42

43 SEPA applies to all branches of state government, including state agencies, municipal
44 and public corporations, and counties. It requires each agency to develop procedures
45 implementing and supplementing SEPA requirements and rules. Although the SEPA does not
46 apply directly to Federal actions, the term "government action" with respect to state agencies is
47 defined to include the issuance of licenses, permits, and approvals. Thus, as in NEPA,
48 proposals (Federal, state, or private) are evaluated, and may be conditioned or denied through
49 the permit process, based on environmental considerations. SEPA does not create an
50 independent permit requirement, but overlays all existing agency permitting activities.
51

52 **7.2.2 Hazardous Waste Management Act of 1976**

53
54 The Federal RCRA program allows state enforcement if the state program is consistent

1 with the Federal program and is at least as stringent. Through the *Hazardous Waste*
2 *Management Act of 1976*, Ecology has enacted hazardous waste regulations that are consistent
3 with and as stringent as (or more stringent than) the Federal program. Washington has been
4 delegated authority to implement RCRA and *Hazardous and Solid Waste Amendments of 1984*
5 programs. Regulated parties must comply with the requirements of both the Federal program,
6 pursuant to regulations in 40 CFR 260-280, and the state program, pursuant to the requirements
7 of the *Hazardous Waste Management Act of 1976* and WAC 173-303, “Dangerous Waste
8 Regulations.”
9

10 **7.2.3 Model Toxics Control Act of 1989**

11
12 The State of Washington has adopted a statutory “Superfund” scheme for identifying and
13 responding to releases of hazardous substances. Known as the *Model Toxics Control Act of*
14 *1989* (MTCA), the State of Washington law supplements CERCLA. Under this Act, Ecology
15 must investigate and prioritize hazardous waste release sites, provide technical assistance to
16 “potentially liable parties” desiring to perform cleanups, set cleanup standards for hazardous
17 substances, undertake cleanups where appropriate, require and assist in or perform cleanups,
18 provide opportunities for public involvement, establish a scientific advisory board, and regularly
19 report to the legislature. The statute empowers Ecology to gain access to property, enter into
20 settlements (either through administrative orders or consent decrees), file actions or issue
21 orders to compel cleanups, and impose civil penalties and seek recovery of state cleanup costs.
22

23 **7.2.4 Water Pollution Control Act of 1945**

24
25 The *Water Pollution Control Act of 1945*, as amended, establishes a permit system to
26 license and control the discharge of pollutants into waters of the state. Under the permit system,
27 dischargers must reduce releases to a level determined to be technologically and economically
28 achievable, regardless of the condition of the receiving water. Dischargers also must maintain
29 or improve the condition of the receiving water. The state has a general policy prohibiting
30 degradation of existing water quality, and a variety of approaches are used to address the
31 problem of toxic pollutants. Permits are required for both point-source and nonpoint-source
32 discharges.
33

34 **7.2.5 Growth Management Act of 1989**

35
36 Most planning by local governments falls under the *State of Washington Growth*
37 *Management Act* (GMA), which established a state-wide planning framework and created roles
38 and responsibilities for planning at the local, regional, and state levels. The GMA required the
39 largest and fastest growing counties (counties with more than 50,000 people or with a population
40 growth of more than 20 percent in the past 10 years) and cities within those counties to develop
41 new comprehensive plans. Counties not required to plan may elect to do so. Benton, Franklin,
42 and Grant counties, along with the City of Richland, have elected to plan under the GMA
43 requirements. Jurisdictions under GMA must prepare comprehensive plans that project growth
44 for a minimum of 20 years.
45

46 **7.2.6 Air Quality Regulations**

47
48 Most of the provisions of the *Washington Clean Air Act of 1991* (WCAA) mirror the
49 requirements of the *Federal Clean Air Act Amendments of 1990* (Federal CAAA). The
50 Federal CAAA establishes a minimum or “floor” for Washington air quality programs. The
51 WCAA authorizes Ecology and local air pollution control authorities to implement programs
52 consistent with the Federal CAAA. For example, the WCAA authorizes an operating permit
53 program, enhanced civil penalties, new administrative enforcement provisions, motor vehicle
54 inspections, and provisions addressing ozone and acid rain.
55

1 Washington State also has an extensive set of regulations governing toxic air pollutants
2 (TAPs) (WAC 173-460). These regulations are similar to the programs for regulating hazardous
3 air pollutants (HAP) required by the Federal CAAA. In contrast to the Federal CAAA HAPs
4 program, which applies to new and existing emission sources, the TAP rules apply only to new
5 sources of TAPs, including any modification of an existing source where the modification will
6 increase TAP emissions. Furthermore, Ecology refers to a list of more than 450 individual
7 chemicals that are deemed to be TAPs. The list overlaps with the Federal CAAA list of HAPs,
8 but is considerably longer. The TAP rules are implemented under the New Source Review
9 Program, and the regulatory standard for TAPs is “best available control technology.”

10
11 The Washington State Department of Health regulations, “Radiation Protection—Air
12 Emissions” (WAC 246-247), contain standards and permit requirements for the emission of
13 radionuclides to the atmosphere from DOE facilities based on Ecology standards, “Ambient Air
14 Quality Standards and Emission Limits for Radionuclides” (WAC 173-480).

15
16 The local air authority, Benton County Clean Air Authority, enforces regulations pertaining
17 to detrimental effects, fugitive dust, incineration products, odor, opacity, asbestos, and sulfur
18 oxide emissions. The Benton County Clean Air Authority also has been delegated authority to
19 enforce the EPA asbestos regulations.

20 21 **7.2.7 The Shoreline Management Act of 1971**

22
23 The *Shoreline Management Act of 1971* (RCW 90.58) uses authority passed to the state
24 by the *Federal Rivers and Harbors Act of 1899* (33 U.S.C. 401-413; Section 407, referred to as
25 the *Refuse Act*). Section 10 of the *Rivers and Harbors Act of 1899* prohibits the unauthorized
26 obstruction or alteration of any navigable waters of the United States. Examples of activities
27 requiring a U.S. Army Corps of Engineers permit (33 CFR 322) include constructing a structure
28 in or over any waters of the United States, excavation or deposit of material in such waters, and
29 various types of work performed in such waters, including fill and stream channelization. The
30 state is considered the owner of all navigatable waterways within its boundaries.

31
32 The state has passed regulatory responsibility for the *Shoreline Management Act of 1971*
33 to the affected county. Counties in Washington State regulate the shoreline (i.e., from the high-
34 water mark to the low-water mark) through each county’s Shoreline Management Master Plan
35 and a shoreline permit system consistent with Ecology guidelines (WAC 173-16).

36 37 38 **7.3 Executive Orders**

39
40 This section identifies Presidential Executive Orders that clarify issues of national policy
41 and provide guidelines relevant to Hanford Site land-use planning.

42 43 **7.3.1 Executive Order 11593, Protection and Enhancement of the Cultural Environment**

44
45 Executive Order 11593 requires Federal agencies to direct their policies, plans, and
46 programs in a way that preserves, restores, and maintains federally owned sites, structures,
47 and objects of historical or archaeological significance.

1
2 **7.3.2 Executive Order 11988, Floodplain Management**
3

4 Executive Order 11988 directs Federal agencies to establish procedures to ensure that
5 the potential effects of flood hazards and floodplain management are considered for actions
6 undertaken in a floodplain. The Order further directs that floodplain impacts are to be avoided to
7 the extent practicable.
8

9 **7.3.3 Executive Order 11990, Protection of Wetlands**
10

11 Governmental agencies are directed by Executive Order 11990 to avoid, to the extent
12 practicable, any short- and long-term adverse impacts on wetlands wherever there is a
13 practicable alternative. The DOE has issued regulations for compliance with this Order and
14 Executive Order 11988 (10 CFR 1022).
15

16 **7.3.4 Executive Order 12088, Federal Compliance with Pollution Control Standards**
17

18 Executive Order 12088 was issued on October 13, 1978. This Order directs Federal
19 agencies to comply with applicable administrative and procedural pollution control standards
20 established by, but not limited to, the CWA, the CAA, the SDWA, TSCA, and RCRA. This Order
21 was amended by Executive Order 12580, issued on January 23, 1987.
22

23 **7.3.5 Executive Order 12372, Intergovernmental Review of Federal Programs**
24

25 Executive Order 12372 applies to state review of NEPA documents and to the
26 coordination of state and Federal NEPA processes. The goal of this Executive Order is to foster
27 an intergovernmental partnership and a strengthened coordination and consultation process.
28

29 **7.3.6 Executive Order 12411, Government Work Space Management Reforms**
30

31 Executive Order 12411 requires the heads of all Federal executive agencies to establish
32 programs to reduce the amount of work space, used or held, to that amount which is essential
33 for known agency missions; to produce and maintain a total inventory of work space and related
34 furnishings and declare excess to the Administrator of General Services all such holdings that
35 are not necessary to satisfy existing or known and verified planned programs; and to ensure that
36 the amount of office space used by each employee of the agency, or others using agency-
37 controlled space, is held to the minimum necessary to accomplish the task that must be
38 performed.
39

40 **7.3.7 Executive Order 12512, Federal Real Property Management**
41

42 Executive Order 12512 authorizes the Administrator of General Services to provide
43 government-wide policy oversight and guidance for Federal real property management. This
44 Executive Order requires all executive departments and agencies to establish internal policies
45 and systems of accountability that ensure effective use of real property in support of mission-
46 related activities, consistent with Federal policies regarding the acquisition, management, and
47 disposal of such assets. All such agencies shall also develop annual real property management
48 improvement plans that include clear and concise goals and objectives related to all aspects of
49 real property management; and identify sales, work space management, productivity, and
50 excess property targets.
51

52 **7.3.8 Executive Order 12580, Superfund Implementation**
53

54 Executive Order 12580 delegates to the heads of executive departments and agencies
55 the responsibility (1) for undertaking remedial actions for releases, or threatened releases, that

1 are not on the National Priorities List; and (2) for removal actions where the release is from a
2 facility under the jurisdiction or control of executive departments and agencies.

3
4 **7.3.9 Executive Order 12856, Federal Compliance with Right-to-Know Laws**
5 **and Pollution Prevention Requirements**

6
7 Executive Order 12856 directs Federal agencies to reduce and report toxic chemicals
8 entering any waste stream; improve emergency planning, response, and accident notification;
9 and encourage clean technologies and testing of innovative prevention technologies. The
10 Executive Order also provides that Federal agencies are persons for purposes of the
11 *Emergency Planning and Community Right-to-Know Act of 1986* (SARA Title III), which obliges
12 agencies to meet the requirements of that Act.

13
14 **7.3.10 Executive Order 12866, Regulatory Planning and Review**

15
16 Executive Order 12866 requires Federal agencies to promulgate only regulations that are
17 required by law, necessary to interpret the law, or necessary by compelling public need.
18 Agencies are further required to assess costs and benefits associated with available regulatory
19 alternatives in deciding how, and whether, to regulate. This Executive Order also outlines
20 principles that agencies are to follow in the regulatory process, including avoidance of
21 regulations that are inconsistent, incompatible, or duplicative with other regulations and tailoring
22 regulations to impose the least burden on society. The Order also addresses the regulatory
23 planning and review process, including coordination of regulations and maximizing consultation
24 and resolution of conflicts at an early stage in the process. Agencies are also directed to review
25 existing regulations to determine if those regulations should be modified or eliminated.
26 Procedures for centralized review of regulations and resolution of conflicts are also identified in
27 this Executive Order. This Order revokes Executive Orders 12291 and 12498.

28
29 **7.3.11 Executive Order 12875, Enhancing the Intergovernmental Partnership**

30
31 Executive Order 12875 addresses the imposition of unfunded mandates upon State,
32 local and Tribal governments by Federal agencies. The Order directs agencies to avoid
33 promulgating regulations that create an unfunded mandate that is not required by statute unless
34 funding is available to pay costs incurred by State, local, or Tribal governments, and to develop
35 an effective process for representatives of these governments to provide meaningful and timely
36 input into the development of regulatory proposals that contain significant unfunded mandates.
37 The Order further directs agencies to increase flexibility for State and local waivers. Executive
38 Order 12875 supplements, but does not supercede, Executive Order 12866.

39
40 **7.3.12 Executive Order 12898, Federal Actions to Address Environmental Justice**
41 **in Minority Populations and Low-Income Populations**

42
43 Executive Order 12898 directs all Federal agencies, to the greatest extent practicable
44 and permitted by law, to achieve environmental justice by identifying and addressing
45 disproportionately high and adverse human health or environmental effects of agency programs,
46 policies, and activities on minority populations and low-income populations in the United States
47 and its territories and possessions. The Executive Order creates an Interagency Working Group
48 on Environmental Justice and directs each Federal agency, to the extent permitted by existing
49 law, to develop strategies to identify and address environmental justice concerns. The Order
50 further directs each Federal agency, to the extent permitted by existing law, to collect, maintain,
51 analyze, and make available information on the race, national origin, income level, and other
52 readily accessible and appropriate information for areas surrounding facilities or sites expected
53 to have a substantial environmental, human health, or economic effect on the surrounding
54 populations. This action is required when these facilities or sites become the subject of a
55 substantial Federal environmental administrative or judicial action. The accompanying

1 Presidential letter to heads of agencies identifies documents prepared under NEPA as the
2 vehicle for complying with the Order.

3 4 **7.3.13 Executive Order 13007, Indian Sacred Sites**

5
6 Executive Order 13007 directs Federal agencies to take measures to protect and
7 preserve American Indian Tribes' religious practices. Federal agencies shall, to the extent
8 practicable and permitted by law, and when consistent with essential agency functions,
9 accommodate access to and ceremonial uses of sacred sites by American Indian Tribes'
10 religious practitioners. Further, the Executive Order states that Federal agencies will comply
11 with presidential direction to maintain government-to-government relations with Tribal
12 governments.

13 14 **7.3.14 Executive Order 13045, Protection of Children from Environmental Health Risks 15 and Safety Risks**

16
17 Because a growing body of scientific knowledge demonstrates that children may suffer
18 disproportionately from environmental health and safety risks, Executive Order 13045 directs
19 each Federal agency to make it a high priority to identify and assess environmental health and
20 safety risks that may disproportionately affect children. Each Federal agency will, to the extent
21 permitted by law and appropriate, and consistent with the agency mission, ensure that its
22 policies, programs, activities, and standards address potential disproportionate risks to children.

23 24 **7.3.15 Executive Order, Invasive Species**

25
26 Issued on February 11, 1999, Executive Order 13112, *Invasive Species*, is intended to
27 prevent the introduction of invasive species and provide for their control and to minimize the
28 economic, ecological, and human health impacts that invasive species cause. The Executive
29 Order establishes an Invasive Species Council, whose members include the Secretaries of
30 numerous Federal agencies (not including DOE), and a stakeholders' Advisory Committee to
31 provide information and advice to the Council. Within 18 months after issuance of this Executive
32 Order, the Council is to have prepared and issued a National Invasive Species Management
33 Plan detailing and recommending performance-oriented goals and objectives and specific
34 measures of success for Federal agencies concerned about invasive species. The
35 Management Plan, which will be updated biennially, is to be developed through a public process
36 and in consultation with Federal agencies and stakeholders.

37 38 39 **7.4 Presidential and Executive Branch Policies**

40
41 President Clinton issued a memorandum to the heads of executive departments and
42 agencies regarding government-to-government relations with Tribal governments on April 29,
43 1994. This memorandum directed executive departments and agencies to implement activities
44 that affect Tribal rights in a "knowledgeable, sensitive manner respectful of tribal sovereignty."
45 The memorandum outlined principles for executive departments and agencies to follow in their
46 interactions with Tribal governments and clarify the responsibility of the Federal government to
47 operate within a government-to-government relationship with federally recognized American
48 Indian Tribes.

49
50 The U.S. Department of Justice recently reaffirmed a long-standing policy regarding the
51 relationship between the Federal government and American Indian Tribes (61 FR 29424). The
52 policy states that the United States recognizes the sovereign status of Indian Tribes as
53 "domestic dependent nations" from its earliest days. The Constitution recognizes Indian
54 sovereignty by classifying Indian treaties among the "supreme Law of the Land," and establishes

1 Indian affairs as a unique area of Federal concern.

2
3 The DOE American Indian policy commits DOE to working with Tribal governments on a
4 government-to-government basis, recognizes the Federal trust relationship with Tribes and
5 Tribal members' treaty rights, and commits the department to consultation with Tribes regarding
6 agency activities that could potentially affect the Tribes.
7

8 9 **7.5 U.S. Department of Energy Regulations, Orders, and Other** 10 **Agreements and Requirements**

11
12 This section identifies DOE regulations implementing statutory environmental, health,
13 and safety protection responsibilities and requirements that must be met by operating
14 contractors.
15

16 The DOE is responsible for establishing a comprehensive health, safety, and
17 environmental program for its facilities, as authorized by the *Atomic Energy Act of 1954* (AEA).
18 The regulatory mechanisms used by DOE to manage its facilities are the promulgation of
19 regulations and issuance of DOE orders.
20

21 DOE regulations are found in Title 10 of the CFR. These regulations address such
22 areas as energy conservation, administrative requirements and procedures, nuclear safety, and
23 classified information. For purposes of this EIS, relevant regulations include the following:
24

- 25 c 10 CFR 820, "Procedural Rules for U.S. Department of Energy Nuclear Activities"
- 26
- 27 c 10 CFR 830.120, "Quality Assurance Requirements"
- 28
- 29 c 10 CFR 834, "Radiation Protection of the Public and the Environment"
- 30
- 31 c 10 CFR 835, "Occupational Radiation Protection"
- 32
- 33 c 10 CFR 1021, "*National Environmental Policy Act* Implementing Procedures"
- 34
- 35 c 10 CFR 1022, "Compliance with Floodplain/Wetlands Environmental Review
36 Requirements."
37

38 The DOE orders generally set forth policies and identify the need for programs and
39 internal procedures to implement those policies.
40

41 The DOE, represented by the Bonneville Power Administration, entered into the *Vernita*
42 *Bar Settlement Agreement* with several Public Utility Districts, the National Marine Fisheries
43 Service, the States of Washington and Oregon, the Confederated Tribes of the Yakama Nation,
44 the CTUIR, and the Confederated Tribes of the Colville Indian Reservation in June 1988. The
45 Agreement established the obligation of the parties to protect mid Columbia summer/fall Chinook
46 Salmon run at Vernita Bar by requiring maintenance of a sufficient amount of water flowing over
47 Vernita Bar (protection-level flow) to provide protection to salmon redds. The Agreement was
48 approved by the Federal Energy Regulatory Commission as a condition of license for the Priest
49 Rapids Dam. Flows are to be maintained through the spawning period, pre-hatch period, post-
50 hatch period, and emergence period, from approximately December 15 through May 31 each
51 year. The Agreement limits river flow in the fall to 1,960 cubic meters per second (70,000 cubic
52 feet per second), with post-spawning flows determined annually based on field surveys that
53 identify when, where, and to what extent spawning has occurred (NPS 1994). Parties to the
54 agreement may request reopening of the agreement and the imposition by the Federal Energy

1 Regulatory Commission of different, additional, or modified fall Chinook salmon protection
2 measures at Vernita Bar.

3
4 The Office of Management and Budget Circular A-95 provides guidance to Federal
5 agencies for cooperation with state and local agencies in the evaluation, review, and
6 coordination of Federal and federally assisted programs and projects.
7

8 9 **7.6 Consultations**

10 The NEPA and the Council on Environmental Quality (CEQ) regulations require
11 consultation with Federal, Tribal, state, and local agencies with jurisdiction or special expertise
12 regarding any environmental impact. Agencies involved include those with authority to issue
13 applicable permits, licenses, and other regulatory approvals; as well as those agencies
14 responsible for protecting significant resources (e.g., endangered species, critical habitats, or
15 historic resources). Federal and state agencies and Tribal governments have been, and will
16 continue to be, consulted during the development of the Final HCP EIS. Representatives of
17 Federal, Tribal, state, and local agencies were involved in scoping for the HRA-EIS through
18 involvement in the Hanford Future Site Uses Working Group and will be consulted in the
19 preparation of the Final HCP EIS. Copies of letters from DOE inviting the participation of
20 cooperating agencies and consulting Tribal governments are presented in Appendix B. Copies
21 of response letters received by DOE are also included.
22

23 24 **7.6.1 Consultation with Other Federal Agencies**

25 In accordance with CEQ guidance encouraging lead agencies to consult with other
26 agencies during the NEPA process, DOE invited other Federal agencies to participate in scoping
27 and development of the Final HCP EIS. The DOI (USFWS and the National Park Service [NPS])
28 and the EPA were represented on the Hanford Future Site Uses Working Group and assisted in
29 developing the group's report (FSUWG 1992), which was adopted as a scoping comment for the
30 HRA-EIS. The emphasis of the HRA-EIS on future land use led to the development of a
31 comprehensive land-use plan for the Hanford Site, which was issued as Appendix M to the
32 August 1996 Draft HRA-EIS. Other Federal agencies were invited to participate in a series of
33 meetings geared to identify values associated with Hanford Site resources. The DOI (USFWS,
34 BLM, and the Bureau of Indian Affairs [BIA]), EPA, and Department of Commerce (National
35 Marine Fisheries Service) were invited to participate in these meetings. Subsequent to
36 identification of values, DOE developed a comprehensive land-use plan that incorporated values
37 identified by the participants in the meetings.
38

39 The DOE received numerous comments on the August 1996 Draft HRA-EIS that
40 emphasized the need for more extensive agency participation in land-use planning at the
41 Hanford Site and the need to consider alternatives to the single plan presented in the
42 Comprehensive Land-Use Plan. The DOI, in particular, requested formal involvement in the
43 land-use planning process for the Hanford Site. As a result of these comments, DOE cut the
44 scope of the HRA-EIS to emphasize future land use at the Hanford Site and formally invited other
45 Federal agencies to cooperate in preparation of the downsized Revised Draft and the Final HCP
46 EIS.
47

48 The DOE also initiated a series of meetings through which alternative land-use plans
49 were developed and analyzed. Representatives of the DOI (USFWS, BLM, and Bureau of
50 Reclamation [BoR]) have participated in these meetings and have assisted in the development
51 of the Final HCP EIS.
52

53 In addition to consultation on the land-use planning process, DOE has formally requested
54

1 updated lists of endangered species from the USFWS and the National Marine Fisheries
2 Service. The DOE has also requested that the BoR provide information regarding the availability
3 of water for potential development of irrigated agriculture on the Wahluke Slope. The DOE also
4 consulted with the Natural Resources Conservation Service (formerly known as the Soil
5 Conservation Service) regarding “prime and unique farmlands” on the Hanford Site (Jason
6 Associates 1996).
7

8 **7.6.2 Consultation with Affected Tribal Governments**

9
10 The policy of the Federal government for relations with Tribal governments is clearly
11 stated. The Department of Justice recently reaffirmed a long-standing policy regarding the
12 relationship between the Federal government and American Indian Tribes (61 FR 29424). The
13 policy emphasizes the Federal trust responsibility in government-to-government relations with
14 Indian Tribes. Furthermore, the policy of the present Presidential Administration recognizes the
15 sovereignty of Tribal governments, supports the Tribal Governments’ rights of self-government
16 and self-determination, and to commit to government-to-government relationships with Tribal
17 governments. The official policy also emphasizes the responsibility of Federal agencies to
18 remove impediments to working directly with Tribal governments on activities that effect the trust
19 property and/or governmental rights of the Tribes. The DOE American Indian policy commits
20 DOE to working with American Indian Tribal governments on a government-to-government
21 basis, recognizes that some Tribes have treaty-protected interests in resources outside
22 reservation boundaries, recognizes the Federal trust relationship to American Indian Tribes
23 imposes duties on DOE, commits to consult with American Indian Tribal governments
24 concerning DOE activities that potentially affect Tribes, and commits to remove impediments to
25 working directly and effectively with Tribal governments in accordance with the Presidential
26 policy. Consultations with Tribal governments have been, and will continue to be, carried out in
27 accordance with these policies.
28

29 The DOE invited Tribal Governments to participate in the scoping of the August 1996
30 Draft HRA-EIS through the Hanford Future Site Uses Working Group, in development of the
31 Comprehensive Land-Use Plan through the meeting held by DOE to identify values associated
32 with Hanford Site resources, and in development of the Final HCP EIS as consulting Tribal
33 governments. Representatives of the CTUIR, Yakama Nation, and Nez Perce Tribe were
34 participants on the Working Group. The Wanapum Band, CTUIR, Yakama Nation, and Nez
35 Perce Tribe all participated in meetings on comprehensive land-use planning prior to issuance of
36 the August 1996 Draft HRA-EIS. Nevertheless, Tribal governments expressed concern that the
37 August 1996 Draft HRA-EIS presented only one alternative for land use at the Hanford Site and
38 indicated a desire to have a greater role in the planning process. As a result of these concerns,
39 and the concerns of other entities regarding land-use planning at the Hanford Site, DOE invited
40 the affected Tribes to participate in the land-use planning process. Representatives of the
41 CTUIR, Nez Perce Tribe, and Yakama Nation have been consulted with in the process. The
42 CTUIR and Nez Perce Tribe representatives have provided alternatives for analysis in the Final
43 HCP EIS.
44

45 **7.6.3 Consultation with State and Local Governments**

46
47 The DOE has invited state and local government agencies to participate in all phases of
48 the Final HCP EIS. State and local governments were invited, through their participation in the
49 Hanford Future Site Uses Working Group, to participate in the scoping of the August 1996 Draft
50 HRA-EIS. They participated in the development of the Comprehensive Land-Use Plan through a
51 meeting held by DOE to identify values associated with Hanford Site resources, and, as
52 cooperating agencies, they helped develop the Final HCP EIS. Representatives from the states
53 of Washington and Oregon; Benton, Franklin, and Grant counties; and the Port of Benton
54 participated on the Working Group. Representatives from Ecology and the Washington
55 Department of Fish and Wildlife; Benton, Adams, Franklin, and Grant County Commissioners’

1 offices; Benton County and City of Richland Planning Departments; and the Port of Benton were
2 invited to participate in meetings on comprehensive land-use planning prior to development of
3 the August 1996 Draft HRA-EIS. Upon issuance of the August 1996 Draft HRA-EIS, these
4 government entities expressed concern that the Comprehensive Land-Use Plan presented only
5 one alternative for land use at the Hanford Site. Several local agencies expressed an interest in
6 working with DOE in the planning process. As a result of these concerns, and concerns of other
7 entities regarding land-use planning at the Hanford Site, DOE invited state and local
8 governments to cooperate in development of this Final HCP EIS. Representatives of these |
9 entities have either participated in the planning process or been consulted during the process of |
10 developing this Final HCP EIS.

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Appendix A — Treaties

The US GenWeb Archives provide genealogical and historical data to the general public without fee or charge of any kind. It is intended that this material not be used in a commercial manner.

Submitted by Kevin Fraley from public records Jan. 21, 1997.
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Blackfeet Treaty of Fort Benton, 1855

Articles of agreement and convention made and concluded at the council-ground on the Upper Missouri, near the mouth of the Judith River, in the Territory of Nebraska, this seventeenth day of October, in the year one thousand eight hundred and fifty-five, by and between A. Cumming and Isaac I. Stevens, commissioners duly appointed and authorized, on the part of the United States, and the undersigned chiefs, headmen, and delegates of the following nations and tribes of Indians, who occupy, for the purposes of hunting, the territory on the Upper Missouri and Yellowstone Rivers, and who have permanent homes as follows: East of the Rocky Mountains, the Blackfoot Nation, consisting of the Piegan, Blood, Blackfoot, and Gros Ventres tribes of Indians. West of the Rocky Mountains, the Flathead Nation, consisting of the Flathead, Upper Pend 'Oreille, and Kootenay tribes of Indians, and the Nez Perce tribe of Indians, the said chiefs, headmen and delegates, in behalf of and acting for said nations and tribes, and being duly authorized thereto by them.

ARTICLE 1. Peace, friendship and amity shall hereafter exist between the United States and the aforesaid nations and tribes of Indians, parties to this treaty, and the same shall be perpetual.

ARTICLE 2. The aforesaid nations and tribes of Indians, parties to this treaty, do hereby jointly and severally covenant that peaceful relations shall likewise be maintained among themselves in future; and that they will abstain from all hostilities whatsoever against each other, and cultivate mutual good-will and friendship. And the nations and tribes aforesaid do furthermore jointly and severally covenant, that peaceful relations shall be maintained with and that they will abstain from all hostilities whatsoever, excepting in self-defense, against the following-named nations and tribes of Indians, to wit: the Crows, Assineboins, Crees, Snakes, Blackfeet, Sans Arcs, and Auncepa-pas bands of Sioux, and all other neighboring nations and tribes of Indians.

ARTICLE 3. The Blackfoot Nation consent and agree that all that portion of the country recognized and defined by the treaty of Laramie as Blackfoot territory, lying within lines drawn from the Hell Gate or Medicine Rock Passes in the main range of the Rocky Mountains, in an easterly direction to the nearest source of the Muscle Shell River, thence to the mouth of Twenty-five Yard Creek, thence up the Yellowstone River to its northern source, and thence along the main range of the Rocky Mountains, in a northerly direction, to the point of beginning, shall be a common hunting-ground for ninety-nine years, where all the nations, tribes and bands of Indians, parties to this treaty, may enjoy equal and uninterrupted privileges of hunting, fishing and gathering fruit, grazing animals, curing meat and dressing robes. They further agree that they will not establish villages, or in any other way exercise exclusive rights within ten miles of the northern line of the common hunting-ground, and that the parties to this treaty may hunt on said northern boundary line and within ten miles thereof.

Provided, That the western Indians, parties to this treaty, may hunt on the trail leading down the Muscle Shell to the Yellowstone; the Muscle Shell River being the boundary separating the

1 Blackfoot from the Crow territory.

2
3 And provided, That no nation, band, or tribe of Indians, parties to this treaty, nor any other
4 Indians, shall be permitted to establish permanent settlements, or in any other way exercise,
5 during the period above mentioned, exclusive rights or privileges within the limits of the
6 above-described hunting-ground.

7
8 And provided further, That the rights of the western Indians to a whole or a part of the common
9 hunting-ground, derived from occupancy and possession, shall not be affected by this article,
10 except so far as said rights may be determined by the treaty of Laramie.

11
12 **ARTICLE 4.** The parties to this treaty agree and consent, that the tract of country lying within
13 lines drawn from the Hell Gate or Medicine Rock Passes, in an easterly direction, to the nearest
14 source of the Muscle Shell River, thence down said river to its mouth, thence down the channel
15 of the Missouri River to the mouth of Milk River, thence due north to the forty-ninth parallel,
16 thence due west on said parallel to the main range of the Rocky Mountains, and thence southerly
17 along said range to the place of beginning, shall be the territory of the Blackfoot Nation, over
18 which said nation shall exercise exclusive control, excepting as may be otherwise provided in
19 this treaty. Subject, however, to the provisions of the third article of this treaty, giving the right to
20 hunt, and prohibiting the establishment of permanent villages and the exercise of any exclusive
21 rights within ten miles of the northern line of the common hunting-ground, drawn from the
22 nearest source of the Muscle Shell River to the Medicine Rock Passes, for the period of
23 ninety-nine years.

24
25 Provided also, That the Assiniboins shall have the right of hunting, in common with the Blackfeet,
26 in the country lying between the aforesaid eastern boundary line, running from the mouth of Milk
27 River to the forty-ninth parallel, and a line drawn from the left bank of the Missouri River, opposite
28 the Round Butte north, to the forty-ninth parallel.

29
30 **ARTICLE 5.** The parties to this treaty, residing west of the main range of the Rocky Mountains,
31 agree and consent that they will not enter the common hunting ground, nor any part of the
32 Blackfoot territory, or return home, by any pass in the main range of the Rocky Mountains to the
33 north of the Hell Gate or Medicine Rock Passes. And they further agree that they will not hunt or
34 otherwise disturb the game, when visiting the Blackfoot territory for trade or social intercourse.

35
36 **ARTICLE 6.** The aforesaid nations and tribes of Indians, parties to this treaty, agree and
37 consent to remain within their own respective countries, except when going to or from, or whilst
38 hunting upon, the "common hunting ground," or when visiting each other for the purpose of trade
39 or social intercourse.

40
41 **ARTICLE 7.** The aforesaid nations and tribes of Indians agree that citizens of the United States
42 may live in and pass unmolested through the countries respectively occupied and claimed by
43 them. And the United States is hereby bound to protect said Indians against depredations and
44 other unlawful acts which white men residing in or passing through their country may commit.

45
46 **ARTICLE 8.** For the purpose of establishing traveling thoroughfares through their country, and
47 the better to enable the President to execute the provisions of this treaty, the aforesaid nations
48 and tribes do hereby consent and agree, that the United States may, within the countries
49 respectively occupied and claimed by them, construct roads of every description; establish lines
50 of telegraph and military posts; use materials of every description found in the Indian country;
51 build houses for agencies, missions, schools, farms, shops, mills, stations, and for any other
52 purpose for which they may be required, and permanently occupy as much land as may be
53 necessary for the various purposes above enumerated, including the use of wood for fuel and
54 land for grazing, and that the navigation of all lakes and streams shall be forever free to citizens

1 of the United States.

2
3 **ARTICLE 9.** In consideration of the foregoing agreements, stipulations, and cessions, and on
4 condition of their faithful observance, the United States agree to expend, annually, for the Piegan,
5 Blood, Blackfoot, and Gros Ventres tribes of Indians, constituting the Blackfoot Nation, in addition
6 to the goods and provisions distributed at the time of signing the treaty, twenty thousand dollars,
7 annually, for ten years, to be expended in such useful goods and provisions, and other articles,
8 as the President, at his discretion, may from time to time determine; and the superintendent, or
9 other proper officer, shall each year inform the President of the wishes of the Indians in relation
10 thereto: Provided, however, That if, in the judgment of the President and Senate, this amount
11 be deemed insufficient, it may be increased not to exceed the sum of thirty-five thousand dollars
12 per year.

13
14 **ARTICLE 10.** The United States further agree to expend annually, for the benefit of the aforesaid
15 tribes of the Blackfoot Nation, a sum not exceeding fifteen thousand dollars annually, for ten
16 years, in establishing and instructing them in agricultural and mechanical pursuits, and in
17 educating their children, and in any other respect promoting their civilization and Christianization:
18 Provided, however, That to accomplish the objects of this article, the President may, at his
19 discretion, apply any or all the annuities provided for in this treaty: And provided, also, That the
20 President may, at his discretion, determine in what proportions the said annuities shall be
21 divided among the several tribes.

22
23 **ARTICLE 11.** The aforesaid tribes acknowledge their dependence on the Government of the
24 United States, and promise to be friendly with all citizens thereof, and to commit no depredations
25 or other violence upon such citizens. And should any one or more violate this pledge, and the
26 fact be proved to the satisfaction of the President, the property taken shall be returned, or, in
27 default thereof, or if injured or destroyed, compensation may be made by the Government out of
28 the annuities. The aforesaid tribes are hereby bound to deliver such offenders to the proper
29 authorities for trial and punishment, and are held responsible, in their tribal capacity, to make
30 reparation for depredations so committed.

31
32 Nor will they make war upon any other tribes, except in self-defense, but will submit all matter of
33 difference, between themselves and other Indians, to the Government of the United States,
34 through its agents, for adjustment, and will abide thereby. And if any of the said Indians, parties
35 to this treaty, commit depredations on any other Indians within the jurisdiction of the United
36 States, the same rule shall prevail as that prescribed in this article in case of depredations
37 against citizens. And the said tribes agree not to shelter or conceal offenders against the laws
38 of the United States, but to deliver them up to the authorities for trial.

39
40 **ARTICLE 12.** It is agreed and understood, by and between the parties to this treaty, that if any
41 nation or tribe of Indians aforesaid, shall violate any of the agreements, obligations, or
42 stipulations, herein contained, the United States may withhold, for such length of time as the
43 President and Congress may determine, any portion or all of the annuities agreed to be paid to
44 said nation or tribe under the ninth and tenth articles of this treaty.

45
46 **ARTICLE 13.** The nations and tribes of Indians, parties to this treaty, desire to exclude from
47 their country the use of ardent spirits or other intoxicating liquor, and to prevent their people from
48 drinking the same. Therefore it is provided, that any Indian belonging to said tribes who is guilty
49 of bringing such liquor into the Indian country, or who drinks liquor, may have his or her
50 proportion of the annuities withheld from him or her, for such time as the President may
51 determine.

52
53 **ARTICLE 14.** The aforesaid nations and tribes of Indians, west of the Rocky Mountains, parties
54 to this treaty, do agree, in consideration of the provisions already made for them in existing

1 treaties, to accept the guarantees of the peaceful occupation of their hunting-grounds, east of
2 the Rocky Mountains, and of remuneration for depredations made by the other tribes, pledged to
3 be secured to them in this treaty out of the annuities of said tribes, in full compensation for the
4 concessions which they, in common with the said tribes, have made in this treaty.
5

6 The Indians east of the mountains, parties to this treaty, likewise recognize and accept the
7 guarantees of this treaty, in full compensation for the injuries or depredations which have been,
8 or may be committed by the aforesaid tribes, west of the Rocky Mountains.
9

10 **ARTICLE 15.** The annuities of the aforesaid tribes shall not be taken to pay the debts of
11 individuals.
12

13 **ARTICLE 16.** This treaty shall be obligatory upon the aforesaid nations and tribes of Indians,
14 parties hereto, from the date hereof, and upon the United States as soon as the same shall be
15 ratified by the President and Senate.
16

17 In testimony whereof the said A. Cumming and Isaac I. Stevens, commissioners on the part of
18 the United States, and the undersigned chiefs, headmen, and delegates of the aforesaid nations
19 and tribes of Indians, parties to this treaty, have hereunto set their hands and seals at the place
20 and on the day and year hereinbefore written.
21

22
23 A. Cumming. (L.S.)

Bloods:

24
25 Isaac I. Stevens. (L.S.)

Onis-tay-say-nah-que-im, his x mark. (L.S.)

26
27 ***Piegans:***

The Father of All Children, his x mark. (L.S.)

28
29 Nee-ti-nee, or "the only chief," now called
30 the Lame Bull, his x mark. (L.S.)

The Bull's Back Fat, his x mark. (L.S.)

31
32 Mountain Chief, his x mark. (L.S.)

Heavy Shield, his x mark. (L.S.)

33
34 Low Horn, his x mark. (L.S.)

Nah-tose-onistah, his x mark. (L.S.)

35
36 Little Gray Head, his x mark. (L.S.)

The Calf Shirt, his x mark. (L.S.)

37
38 Little Dog, his x mark. (L.S.)

Gros Ventres:

Bear's Shirt, his x mark. (L.S.)

39
40 Big Snake, his x mark. (L.S.)

Little Soldier, his x mark. (L.S.)

41
42 The Skunk, his x mark. (L.S.)

Star Robe, his x mark. (L.S.)

43
44 The Bad Head, his x mark. (L.S.)

Sitting Squaw, his x mark. (L.S.)

45
46 Kitch-ee-pone-istah, his x mark. (L.S.)

Weasel Horse, his x mark. (L.S.)

47
48 Middle Sitter, his x mark. (L.S.)

The Rider, his x mark. (L.S.)

Eagle Chief, his x mark. (L.S.)

Heap of Bears, his x mark. (L.S.)

1 **Blackfeet:**
2
3 The Three Bulls, his x mark. (L.S.)
4
5 The Old Kootomais, his x mark. (L.S.)
6
7 Pow-ah-que, his x mark. (L.S.)
8
9 Chief Rabbit Runner, his x mark. (L.S.)
10
11 **Nez Perces:**
12
13 Spotted Eagle, his x mark. (L.S.)
14
15 Looking Glass, his x mark. (L.S.)
16
17 The Three Feathers, his x mark. (L.S.)
18
19 Eagle from the Light, his x mark. (L.S.)
20
21 The Lone Bird, his x mark. (L.S.)
22
23 Ip-shun-nee-wus, his x mark. (L.S.)
24
25 Jason, his x mark. (L.S.)
26
27 Wat-ti-wat-ti-we-hinck, his x mark. (L.S.)
28
29 White Bird, his x mark. (L.S.)
30
31 Stabbing Man, his x mark. (L.S.)
32
33 Jesse, his x mark. (L.S.)
34
35 Plenty Bears, his x mark. (L.S.)
36
37 **Flathead Nation:**
38
39 Victor, his x mark. (L.S.)
40
41 Alexander, his x mark. (L.S.)
42
43 Moses, his x mark. (L.S.)
44
45 Big Canoe, his x mark. (L.S.)
46
47 Ambrose, his x mark. (L.S.)
48
49 Kootle-cha, his x mark. (L.S.)
50
51 Michelle, his x mark. (L.S.)
52
53 Francis, his x mark. (L.S.)
54
55 Vincent, his x mark. (L.S.)

Andrew, his x mark. (L.S.)
Adolphe, his x mark. (L.S.)
Thunder, his x mark. (L.S.)
Piegans:
Running Rabbit, his x mark. (L.S.)
Chief Bear, his x mark. (L.S.)
The Little White Buffalo, his x mark. (L.S.)
The Big Straw, his x mark. (L.S.)
Flathead:
Bear Track, his x mark. (L.S.)
Little Michelle, his x mark. (L.S.)
Palchinah, his x mark. (L.S.)
Bloods:
The Feather, his x mark. (L.S.)
The White Eagle, his x mark. (L.S.)

1	<i>Executed in presence of - -</i>	
2		
3	James Doty, Secretary.	W. Craig, Nez Perce interpreters
4		
5	Alfred J. Vaughan, Jr.	Delaware Jim, his x mark, Nez Perce interpreters
6		
7	E. Alw. Hatch, agent for Blackfeet	
8		Witness, James Doty, Nez Perce interpreters
9	Thomas Adams, special agent Flathead Nation	
10		
11		A Cree Chief (Broken Arm,) his mark
12	R. H. Lansdale, Indian agent Flathead Nation	
13		Witness, James Doty
14	W. H. Tappan, sub-agent for the Nez Perce	
15		A. J. Hoeekeorsg
16	James Bird, Blackfoot interpreters	
17		James Croke
18	A. Culbertson, Blackfoot interpreters	
19		E. S. Wilson
20	Benj. Deroche, Blackfoot interpreters	
21		A. C. Jackson
22	Benj. Kiser, his x mark, Flat Head interpreters	
23		Charles Shucette, his x mark
24		
25	Witness, James Doty, Flat Head interpreters	
26		Christ. P. Higgins
27		A. H. Robie
28	Gustavus Sohon, Flat Head interpreters	
		S. S. Ford, Jr.
29		
30		
31	Ratified Apr. 15, 1856.	
32	Proclaimed Apr. 25, 1856.	
33		

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10 ***Nez Perce Treaty of Lapwai, 1863***

11
12
13
14 Articles of agreement made and concluded at the council-ground, in the valley of the Lapwai,
15 Washington Territory, on the ninth day of June, one thousand eight hundred and sixty-three,
16 between the United States of America, by C. H. Hale, superintendent of Indian affairs, and
17 Charles Hutchins and S. D. Howe, U.S. Indian agents for the Territory of Washington, acting on
18 the part and in behalf of the United States, and the Nez Perce Indians, by the chiefs, head-men,
19 and delegates of said tribe, such articles being supplementary and amendatory to the treaty
20 made between the United States and said tribe on the 11th day of June 1855.
21

22 **ARTICLE 1.** The said Nez Perce tribe agree to relinquish, and do hereby relinquish, to the
23 United States the lands heretofore reserved for the use and occupation of the said tribe, saving
24 and excepting so much thereof as is described in Article II for a new reservation.
25

26 **ARTICLE 2.** The United States agree to reserve for a home, and for the sole use and
27 occupation of said tribe, the tract of land included within the following boundaries, to wit:
28 Commencing at the northeast corner of Lake Wa-ha, and running thence, northerly, to a point on
29 the north bank of the Clearwater River, three miles below the mouth of the Lapwai, thence down
30 the north bank of the Clearwater to the mouth of the Hatwai Creek; thence, due north, to a point
31 seven miles distant; thence, eastwardly, to a point on the north fork of the Clearwater, seven
32 miles distant from its mouth; thence to a point on Oro Fino Creek, five miles above its mouth;
33 thence to a point on the north fork of the south fork of the Clearwater, five miles above its mouth;
34 thence to a point on the south fork of the Clearwater, one mile above the bridge, on the road
35 leading to Elk City, (so as to include all the Indian farms now within the forks;) thence in a
36 straight line, westwardly, to the place of beginning.
37

38 All of which tract shall be set apart, and the above-described boundaries shall be surveyed and
39 marked out for the exclusive use and benefit of said tribe as an Indian reservation, nor shall any
40 white man, excepting those in the employment of the Indian Department, be permitted to reside
41 upon the said reservation without permission of the tribe and the superintendent and agent; and
42 the said tribe agrees that so soon after the United States shall make the necessary provision for
43 fulfilling the stipulations of this instrument as they can conveniently arrange their affairs, and not
44 to exceed one year from its ratification, they will vacate the country hereby relinquished, and
45 remove to and settle upon the lands herein reserved for them, (except as may be hereinafter
46 provided.) In the meantime it shall be lawful for them to reside upon any ground now occupied or
47 under cultivation by said Indians at this time, and not included in the reservation above named.
48 And it is provided, that any substantial improvement heretofore made by any Indian, such as
49 fields enclosed and cultivated, or houses erected upon the lands hereby relinquished, and which
50 he may be compelled to abandon in consequence of this treaty, shall be valued under the
51 direction of the President of the United States, and payment therefore shall be made in stock or
52 in improvements of an equal value for said Indian upon the lot which may be assigned to him
53 within the bounds of the reservation, as he may choose, and no Indian will be required to
54 abandon the improvements aforesaid, now occupied by him, until said payment or improvement
55 shall have been made. And it is further provided, that if any Indian living on any of the land
56 hereby relinquished should prefer to sell his improvements to any white man, being a loyal

1 citizen of the United States, prior to the same being valued as aforesaid, he shall be allowed so
2 to do, but the sale or transfer of said improvements shall be made in the presence of, and with
3 the consent and approval of, the agent or superintendent, by whom a certificate of sale shall be
4 issued to the party purchasing, which shall set forth the amount of the consideration in kind.
5 Before the issue of said certificate, the agent or superintendent shall be satisfied that a valuable
6 consideration is paid, and that the party purchasing is of undoubted loyalty to the United States
7 Government. No settlement or claim made upon the improved lands by any Indian will be
8 permitted, except as herein provided, prior to the time specified for their removal. Any sale or
9 transfer thus made shall be in the stead of payment for improvements from the United States.

10
11 **ARTICLE 3.** The President shall, immediately after the ratification of this treaty, cause the
12 boundary-lines to be surveyed, and properly marked and established; after which, so much of
13 the lands hereby reserved as may be suitable for cultivation shall be surveyed into lots of twenty
14 acres each, and every male person of the tribe who shall have attained the age of twenty-one
15 years, or is the head of a family, shall have the privilege of locating upon one lot as a permanent
16 home for such person, and the lands so surveyed shall be allotted under such rules and
17 regulations as the President shall prescribe, having such reference to their settlement as may
18 secure adjoining each other the location of the different families pertaining to each band, so far
19 as the same may be practicable. Such rules and regulations shall be prescribed by the
20 President, or under his direction, as will insure to the family, in case of the death of the head
21 thereof, the possession and enjoyment of such permanent home, and the improvements
22 thereon. When the assignments as above shall have been completed, certificates shall be
23 issued by the Commissioner of Indian Affairs, or under his direction, for the tracts assigned in
24 severalty, specifying the names of the individuals to whom they have been assigned
25 respectively, and that said tracts are set apart for the perpetual and exclusive use and benefit of
26 such assignees and their heirs. Until otherwise provided by law, such tracts shall be exempt
27 from levy, taxation, or sale, and shall be alienable in fee, or leased, or otherwise disposed of,
28 only to the United States, or to persons then being members of the Nez Perce tribe, and of
29 Indian blood, with the permission of the President, and under such regulations as the Secretary
30 of the Interior or the Commissioner of Indian Affairs shall prescribe; and if any such person or
31 family shall at any time neglect or refuse to occupy and till a portion of the land so assigned, and
32 on which they have located, or shall rove from place to place, the President may cancel the
33 assignment, and may also withhold from such person or family their proportion of the annuities
34 or other payments due them until they shall have returned to such permanent home, and
35 resumed the pursuits of industry; and in default of their return, the tract may be declared
36 abandoned, and thereafter assigned to some other person or family of such tribe. The residue
37 of the land hereby reserved shall be held in common for pasturage for the sole use and benefit of
38 the Indians: Provided, however, from time to time, as members of the tribe may come upon the
39 reservation, or may become of proper age, after the expiration of the time of one year after the
40 ratification of this treaty, as aforesaid, and claim the privileges granted under this article, lots
41 may be assigned from the lands thus held in common, wherever the same may be suitable for
42 cultivation. No State or territorial legislature shall remove the restriction herein provided for,
43 without the consent of Congress, and no State or territorial law to that end shall be deemed valid
44 until the same has been specially submitted to Congress for its approval.

45
46 **ARTICLE 4.** In consideration of the relinquishment herein made the United States agree to pay
47 to the said tribe, in addition to the annuities provided by the treaty of June 11, 1855, and the
48 goods and provisions distributed to them at the time of signing this treaty, the sum of two
49 hundred and sixty-two thousand and five hundred dollars, in manner following, to wit,

50
51 First. One hundred and fifty thousand dollars, to enable the Indians to remove and locate upon
52 the reservation, to be expended in the ploughing of land, and the fencing of the several lots,
53 which may be assigned to those individual members of the tribe who will accept the same in
54 accordance with the provisions of the preceding article, which said sum shall be divided into four

1 annual instalments, as follows: For the first year after the ratification of this treaty, seventy
2 thousand dollars; for the second year, forty thousand dollars; for the third year, twenty-five
3 thousand dollars; for the fourth year, fifteen thousand dollars.

4
5 Second. Fifty thousand dollars to be paid the first year after the ratification of this treaty in
6 agricultural implements, to include wagons or carts, harness, and cattle, sheep, or other stock,
7 as may be deemed most beneficial by the superintendent of Indian affairs, or agent, after
8 ascertaining the wishes of the Indians in relation thereto.

9
10 Third. Ten thousand dollars for the erection of a saw and flouring mill, to be located at Kamia,
11 the same to be erected within one year after the ratification hereof.

12
13 Fourth. Fifty thousand dollars for the boarding and clothing of the children who shall attend the
14 schools, in accordance with such rules or regulations as the Commissioner of Indian Affairs
15 may prescribe, providing the schools and boarding-houses with necessary furniture, the
16 purchase of necessary wagons, teams, agricultural implements, tools, etc., for their use, and for
17 the fencing of such lands as may be needed for gardening and farming purposes, for the use
18 and benefit of the schools, to be expended as follows: The first year after the ratification of this
19 treaty, six thousand dollars; for the next fourteen years, three thousand dollars each year; and for
20 the succeeding year, being the sixteenth and last instalment, two thousand dollars.

21
22 Fifth. A further sum of two thousand five hundred dollars shall be paid within one year after the
23 ratification hereof, to enable the Indians to build two churches, one of which is to be located at
24 some suitable point on the Kamia, and the other on the Lapwai.

25
26 **ARTICLE 5.** The United States further agree, that in addition to a head chief the tribe shall elect
27 two subordinate chiefs, who shall assist him in the performance of his public services, and each
28 subordinate chief shall have the same amount of land ploughed and fenced, with comfortable
29 house and necessary furniture, and to whom the same salary shall be paid as is already
30 provided for the head chief in Article 5 of the treaty of June 11, 1855, the salary to be paid and the
31 houses and land to be occupied during the same period and under like restrictions as therein
32 mentioned.

33
34 And for the purpose of enabling the agent to erect said buildings, and to plough and fence the
35 land, as well as to procure the necessary furniture, and to complete and furnish the house of the
36 head chief, as heretofore provided, there shall be appropriated, to be expended within the first
37 year after the ratification hereof, the sum of two thousand five hundred dollars.

38
39 And inasmuch-as several of the provisions of said art. 5th of the treaty of June 11, 1855,
40 pertaining to the erection of school-houses, hospital, shops, necessary buildings for employees
41 and for the agency, as well as providing the same with necessary furniture, tools, etc., have not
42 yet been complied with, it is hereby stipulated that there shall be appropriated, to be expended
43 for the purposes herein specified during the first year after the ratification hereof, the following
44 sums, to wit:

45
46 First. Ten thousand dollars for the erection of the two schools, including boarding-houses and
47 the necessary out-buildings; said schools to be conducted on the manual-labor system as far as
48 practicable.

49
50 Second. Twelve hundred dollars for the erection of the hospital, and providing the necessary
51 furniture for the same.

52
53 Third. Two thousand dollars for the erection of a blacksmith's shop, to be located at Kamia, to
54 aid in the completion of the smith's shop at the agency, and to purchase the necessary tools,

1 iron, steel, etc.; and to keep the same in repair and properly stocked with necessary tools and
2 materials, there shall be appropriated thereafter, for the fifteen years next succeeding, the sum
3 of five hundred dollars each year.

4
5 Fourth. Three thousand dollars for erection of houses for employees, repairs of mills, shops,
6 etc., and providing necessary furniture, tools, and materials. For the same purpose, and to
7 procure from year to year the necessary articles - - that is to say, saw-logs, nails, glass,
8 hardware, etc. - - there shall be appropriated thereafter, for the twelve years next succeeding,
9 the sum of two thousand dollars each year; and for the next three years, one thousand dollars
10 each year.

11
12 And it is further agreed that the United States shall employ, in addition to those already
13 mentioned in art. 5th of the treaty of June 11, 1855, two matrons to take charge of the
14 boarding-schools, two assistant teachers, one farmer, one carpenter, and two millers.

15
16 All the expenditures and expenses contemplated in this treaty, and not otherwise provided for,
17 shall be defrayed by the United States.

18
19 **ARTICLE 6.** In consideration of the past services and faithfulness of the Indian chief, Timothy, it
20 is agreed that the United States shall appropriate the sum of six hundred dollars, to aid him in the
21 erection of a house upon the lot of land which may be assigned to him, in accordance with the
22 provisions of the third article of this treaty.

23
24 **ARTICLE 7.** The United States further agree that the claims of certain members of the Nez
25 Perce tribe against the Government for services rendered and for horses furnished by them to
26 the Oregon mounted volunteers, as appears by certificate issued by W. H. Fauntleroy, A. R. Qr.
27 M. and Com. Oregon volunteers, on the 6th of March, 1856, at Camp Cornelius, and amounting
28 to the sum of four thousand six hundred and sixty-five dollars, shall be paid to them in full, in gold
29 coin.

30
31 **ARTICLE 8.** It is also understood that the aforesaid tribe do hereby renew their
32 acknowledgments of dependence upon the Government of the United States, their promises of
33 friendship, and other pledges, as set forth in the eighth article of the treaty of June 11, 1855; and
34 further, that all the provisions of said treaty which are not abrogated or specifically changed by
35 any article herein contained, shall remain the same to all intents and purposes as formerly, -- the
36 same obligations resting upon the United States, the same privileges continued to the Indians
37 outside of the reservation, and the same rights secured to citizens of the U.S. as to right of way
38 upon the streams and over the roads which may run through said reservation, as are therein set
39 forth.

40
41 But it is further provided, that the United States is the only competent authority to declare and
42 establish such necessary roads and highways, and that no other right is intended to be hereby
43 granted to citizens of the United States than the right of way upon or over such roads as may
44 thus be legally established. Provided, however, that the roads now usually travelled shall, in the
45 mean time, be taken and deemed as within the meaning of this article, until otherwise enacted
46 by act of Congress or by the authority of the Indian Department.

47
48 And the said tribe hereby consent, that upon the public roads which may run across the
49 reservation there may be established, at such points as shall be necessary for public
50 convenience, hotels, or stage-stands, of the number and necessity of which the agent or
51 superintendent shall be the sole judge, who shall be competent to license the same, with the
52 privilege of using such amount of land for pasturage and other purposes connected with such
53 establishment as the agent or superintendent shall deem necessary, it being understood that
54 such lands for pasturage are to be enclosed, and the boundaries thereof described in the

1 license.

2
3 And it is further understood and agreed that all ferries and bridges within the reservation shall be
4 held and managed for the benefit of said tribe.

5
6 Such rules and regulations shall be made by the Commissioner of Indian Affairs, with the
7 approval of the Secretary of the Interior, as shall regulate the travel on the highways, the
8 management of the ferries and bridges, the licensing of public houses, and the leasing of lands,
9 as herein provided, so that the rents, profits, and issues thereof shall inure to the benefit of said
10 tribe, and so that the persons thus licensed, or necessarily employed in any of the above
11 relations, shall be subject to the control of the Indian Department, and to the provisions of the act
12 of Congress "to regulate trade and intercourse with the Indian tribes, and to preserve peace on
13 the frontiers."

14
15 All timber within the bounds of the reservation is exclusively the property of the tribe, excepting
16 that the U.S. Government shall be permitted to use thereof for any purpose connected with its
17 affairs, either in carrying out any of the provisions of this treaty, or in the maintaining of its
18 necessary forts or garrisons.

19
20 The United States also agree to reserve all springs or fountains not adjacent to, or directly
21 connected with, the streams or rivers within the lands hereby relinquished, and to keep back
22 from settlement or entry so much of the surrounding land as may be necessary to prevent the
23 said springs or fountains being enclosed; and, further, to preserve a perpetual right of way to and
24 from the same, as watering places, for the use in common of both whites and Indians.

25
26 **ARTICLE 9.** Inasmuch as the Indians in council have expressed their desire that Robert Newell
27 should have confirmed to him a piece of land lying between Snake and Clearwater Rivers, the
28 same having been given to him on the 9th day of June, 1861, and described in an instrument of
29 writing bearing that date, and signed by several chiefs of the tribe, it is hereby agreed that the
30 said Robert Newell shall receive from the United States a patent for the said tract of land.

31
32 **ARTICLE 10.** This treaty shall be obligatory upon the contracting parties as soon as the same
33 shall be ratified by the President and Senate of the United States.

34
35 In testimony whereof the said C. H. Hale, superintendent of Indian affairs, and Charles Hutchins
36 and S. D. Howe, United States Indian agents in the Territory of Washington, and the chiefs,
37 headmen, and delegates of the aforesaid Nez Perce tribe of Indians, have hereunto set their
38 hands and seals at the place and on the day and year hereinbefore written.

39
40 Calvin H. Hale, Superintendent Indian
41 Affairs, Wash. T. (SEAL.)

Tip-ulania-timecca, x (SEAL.)

42
43 Chas. Hutchins, United States Indian agent,
44 Wash. T. (SEAL.)

Es-coatum, x (SEAL.)

Timothy, x (SEAL.)

45
46 S. D. Howe, United States Indian agent,
47 Wash. t. (SEAL.)

Levi, x (SEAL.)

48
49 Fa-Ind-7-1803 Lawyer
50 Head Chief Nez Perce Nation. (SEAL.)

Jason, x (SEAL.)

Ip-she-ne-wish-kin, (Capt. John,) x (SEAL.)

51
52 Ute-sin-male-e-cum, x (SEAL.)

Weptas-jump-ki, x (SEAL.)

53
54 Ha-harch-tuesta, x (SEAL.)

We-as-cus, x (SEAL.)

1	Pep-hoom-kan, (Noah,) x (SEAL.)	Sah-kan-tai, (Eagle,) x (SEAL.)
2		
3	Shin-ma-sha-ho-soot, x (SEAL.)	We-ah-se-nat, x (SEAL.)
4		
5	Nie-ki-lil-meh-hoom, (Jacob,) x (SEAL.)	Hin-mia-tun-pin, x (SEAL.)
6		
7	Stoop-toop-nin, x (SEAL.)	Ma-hi-a-kim, x (SEAL.)
8		
9	Su-we-cus, x (SEAL.)	Shock-lo-turn-wa-haikt, (Jo-nah,) x (SEAL.)
10		
11	Wal-la-ta-mana, x (SEAL.)	Kunness-tak-mal, x (SEAL.)
12		
13	He-kaikt-il-pilp, x (SEAL.)	Tu-lat-sy-wat-kin, x (SEAL.)
14		
15	Whis-tas-ket, x (SEAL.)	Tuck-e-tu-et-as, x (SEAL.)
16		
17	Neus-ne-keun, x (SEAL.)	Nic-a-las-in, x (SEAL.)
18		
19	Kul-lou-o-haikt, x (SEAL.)	Was-atis-il-pilp, x (SEAL.)
20		
21	Wow-en-am-ash-il-pilp, x (SEAL.)	Wow-es-en-at-im, x (SEAL.)
22		
23	Kan-pow-e-een, x (SEAL.)	Hiram, x (SEAL.)
24		
25	Watai-watai-wa-haikt, x (SEAL.)	Howlish-wampum, x (SEAL.)
26		
27	Kup-kup-pellia, x (SEAL.)	Wat-ska-leeks, x (SEAL.)
28		
29	Wap-tas-ta-mana, x (SEAL.)	Wa-lai-tus, x (SEAL.)
30		
31	Peo-peo-ip-se-wat, x (SEAL.)	Ky-e-wee-pus, x (SEAL.)
32		
33	Louis-in-ha-cush-nim, x (SEAL.)	Ko-ko-il-pilp, x (SEAL.)
34		
35	Lam-lim-si-lilp-nim, x (SEAL.)	Reuben, Tip-ia-la-na-uy-kala-tsekin, x (SEAL.)
36		
37	Tu-ki-lai-kish, x (SEAL.)	Wish-la-na-ka-nin, x (SEAL.)
		Me-tat-ueptas, (Three Feathers,) x (SEAL.)
		Ray-kay-mass, x (SEAL.)

38 ***Signed and sealed in presence of - -***

39		
40	George F. Whitworth, Secretary	William Kapus, First Lieutenant and Adjutant
41		First W. T. Infantry U.S. Volunteers
42	Justus Steinberger, Colonel U.S. Volunteers	
43		Harrison Olmstead
44	R. F. Malloy, Colonel Cavalry, O.V.	
45		Jno. Owen, (Bitter Root.)
46	J. S. Rinearson, Major First Cavalry Oregon	
47	Volunteers	James O'Neil
48		

1 J. B. Buker, M. D.

George W. Elber

A. A. Spalding, assistant interpreter

Perrin B. Whitman, interpreter for the
council

2 Ratified Apr. 17, 1867

3 Proclaimed Apr. 20, 1867

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2 general public without fee or charge of any kind. It is intended that
3 this material not be used in a commercial manner.
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10 ***Third Nez Perce Treaty, 1868***

11
12
13
14 Whereas certain amendments are desired by the Nez Perce tribe of Indians to their treaty
15 concluded at the council ground in the valley of the Lapwai, in the Territory of Washington, on the
16 ninth day of June, in the year of our Lord one thousand eight hundred and sixty-three; and
17 whereas the United States are willing to assent to said amendments; it is therefore agreed by
18 and between Nathaniel G. Taylor, commissioner, on the part of the United States, thereunto duly
19 authorized, and Lawyer, Timothy, and Jason, chiefs of said tribe, also being thereunto duly
20 authorized, in manner and form following, that is to say:
21

22 **ARTICLE 1.** That all lands embraced within the limits of the tract set apart for the exclusive use
23 and benefit of said Indians by the 2d article of said treaty of June 9th, 1863, which are
24 susceptible of cultivation and suitable for Indian farms, which are not now occupied by the United
25 States for military purposes, or which are not required for agency or other buildings and
26 purposes provided for by existing treaty stipulations, shall be surveyed as provided in the 3d
27 article of said treaty of June 9th, 1863, and as soon as the allotments shall be plowed and
28 fenced, and as soon as schools shall be established as provided by existing treaty stipulations,
29 such Indians now residing outside the reservation as may be decided upon by the agent of the
30 tribe and the Indians themselves, shall be removed to and located upon allotments within the
31 reservation.
32

33 Provided, however, That in case there should not be a sufficient quantity of suitable land within
34 the boundaries of the reservation to provide allotments for those now there and those residing
35 outside the boundaries of the same, then those residing outside, or as many thereof as
36 allotments cannot be provided for, may remain upon the lands now occupied and improved by
37 them, provided, that the land so occupied does not exceed twenty acres for each and every
38 male person who shall have attained the age of twenty-one years or is the head of a family, and
39 the tenure of those remaining upon lands outside the reservation shall be the same as is
40 provided in said 3d article of said treaty of June 9th, 1863, for those receiving allotments within
41 the reservation; and it is further agreed that those now residing outside of the boundaries of the
42 reservation and who may continue to so reside shall be protected by the military authorities in
43 their rights upon the allotments occupied by them, and also in the privilege of grazing their
44 animals upon surrounding unoccupied lands.
45

46 **ARTICLE 2.** It is further agreed between the parties hereto that the stipulations contained in the
47 8th article of the treaty of June 9th, 1863, relative to timber, are hereby annulled as far as the
48 same provides that the United States shall be permitted to use thereof in the maintaining of forts
49 or garrisons, and that the said Indians shall have the aid of the military authorities to protect the
50 timber upon their reservation, and that none of the same shall be cut or removed without the
51 consent of the head-chief of the tribe, together with the consent of the agent and superintendent
52 of Indian affairs, first being given in writing, which written consent shall state the part of the
53 reservation upon which the timber is to be cut, and also the quantity, and the price to be paid
54 therefore.
55

56 **ARTICLE 3.** It is further hereby stipulated and agreed that the amount due said tribe for school

1 purposes and for the support of teachers that has not been expended for that purpose since the
2 year 1864, but has been used for other purposes, shall be ascertained and the same shall be
3 reimbursed to said tribe by appropriation by Congress, and shall be set apart and invested in
4 United States bonds and shall be held in trust by the United States, the interest on the same to
5 be paid to said tribe annually for the support of teachers.
6

7 In testimony whereof the said Commissioner on the part of the United States and the said chiefs
8 representing said Nez Perce tribe of Indians have hereunto set their hands and seals this 13th
9 day of August, in the year of our Lord one thousand eight hundred and sixty-eight, at the city of
10 Washington, D.C.

11 N. G. Taylor, (L.S.) Commissioner Indian Affairs. Lawyer, Head Chief Nez Perces. (L.S.)

12 Timothy, his x mark, Chief. (L.S.)

13
14 Jason, his x mark, Chief. (L.S.)
15

16
17
18
19 ***In presence of - -***

20
21 Charles E. Mix

22
23 Robert Newell, United States Agent

24
25 W. R. Irwin
26

27
28 Ratified Feb. 16, 1869

29 Proclaimed Feb. 24, 1869
30
31

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2 general public without fee or charge of any kind. It is intended that
3 this material not be used in a commercial manner.
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8 swimref@cmc.net
9

10 *The Nez Perce Treaty, 1855*

11
12
13
14 Articles of agreement and convention made and concluded at the treaty ground, Camp Stevens,
15 in the Walla-Walla Valley, this eleventh day of June, in the year one thousand eight hundred and
16 fifty-five, by and between Isaac I. Stevens, governor and superintendent of Indian affairs for the
17 Territory of Washington, and Joel Palmer, superintendent of Indian affairs for Oregon Territory,
18 on the part of the United States, and the undersigned chiefs, head-men, and delegates of the
19 Nez Perce tribe of Indians occupying lands lying partly in Oregon and partly in Washington
20 Territories, between the Cascade and Bitter Root Mountains, on behalf of, and acting for said
21 tribe, and being duly authorized thereto by them, it being understood that Superintendent Isaac I.
22 Stevens assumes to treat only with those of the above-named tribe of Indians residing within the
23 Territory of Washington, and Superintendent Palmer with those residing exclusively in Oregon
24 Territory.
25

26 **ARTICLE 1.** The said Nez Perce tribe of Indians hereby cede, relinquish and convey to the
27 United States all their right, title, and interest in and to the country occupied or claimed by them,
28 bounded and described as follows, to wit: Commencing at the source of the Wo-na-ne-she or
29 southern tributary of the Palouse River; thence down that river to the main Palouse; thence in a
30 southerly direction to the Snake River, at the mouth of the Tucanon River; thence up the
31 Tucanon to its source in the Blue Mountains; thence southerly along the ridge of the Blue
32 Mountains; thence to a point on Grand Ronde River, midway between Grand Ronde and the
33 mouth of the Woll-low-how River; thence along the divide between the waters of the
34 Woll-low-how and Powder River; thence to the crossing of Snake River, at the mouth of Powder
35 River; thence to the Salmon River, fifty miles above the place known (as) the "crossing of the
36 Salmon River;" thence due north to the summit of the Bitter Root Mountains; thence along the
37 crest of the Bitter Root Mountains to the place of beginning.
38

39 **ARTICLE 2.** There is, however, reserved from the lands above ceded for the use and
40 occupation of the said tribe, and as a general reservation for other friendly tribes and bands of
41 Indians in Washington Territory, not to exceed the present numbers of the Spokane,
42 Walla-Walla, Cayuse, and Umatilla tribes and bands of Indians, the tract of land included within
43 the following boundaries, to wit: Commencing where the Moh-ha-na-she or southern tributary of
44 the Palouse River flows from the spurs of the Bitter Root Mountains; thence down said tributary
45 to the mouth of the Ti-nat-pan-up Creek; thence southerly to the crossing of the Snake River ten
46 miles below the mouth of the Al-po-wa-wi River; thence to the source of the Al-po-wa-wi River in
47 the Blue Mountains; thence along the crest of the Blue Mountains; thence to the crossing of the
48 Grand Ronde River, midway between the Grand Ronde and the mouth of the Woll-low-how
49 River; thence along the divide between the waters of the Woll-low-how and Powder Rivers;
50 thence to the crossing of the Snake River fifteen miles below the mouth of the Powder River;
51 thence to the Salmon River above the crossing; thence by the spurs of the Bitter Root Mountains
52 to the place of beginning.
53

54 All which tract shall be set apart, and, so far as necessary, surveyed and marked out for the
55 exclusive use and benefit of said tribe as an Indian reservation; nor shall any white man,
56 excepting those in the employment of the Indian Department, be permitted to reside upon the

1 said reservation without permission of the tribe and the superintendent and agent; and the said
2 tribe agrees to remove to and settle upon the same within one year after the ratification of this
3 treaty. In the mean time it shall be lawful for them to reside upon any ground not in the actual
4 claim and occupation of citizens of the United States, and upon any ground claimed or occupied,
5 if with the permission of the owner or claimant, guarantying, however, the right to all citizens of
6 the United States to enter upon and occupy as settlers any lands not actually occupied and
7 cultivated by said Indians at this time, and not included in the reservation above named. And
8 provided that any substantial improvement heretofore made by any Indian, such as fields
9 enclosed and cultivated, and houses erected upon the lands hereby ceded, and which he may
10 be compelled to abandon in consequence of this treaty, shall be valued under the direction of the
11 President of the United States, and payment made therefor in money, or improvements of an
12 equal value be made for said Indian upon the reservation, and no Indian will be required to
13 abandon the improvements aforesaid, now occupied by him, until their value in money or
14 improvements of equal value shall be furnished him as aforesaid.

15
16 **ARTICLE 3.** And provided that, if necessary for the public convenience, roads may be run
17 through the said reservation, and, on the other hand, the right of way, with free access from the
18 same to the nearest public highway, is secured to them, as also the right, in common with
19 citizens of the United States, to travel upon all public highways. The use of the Clear Water and
20 other streams flowing through the reservation is also secured to citizens of the United States for
21 rafting purposes, and as public highways.

22
23 The exclusive right of taking fish in all the streams where running through or bordering said
24 reservation is further secured to said Indians; as also the right of taking fish at all usual and
25 accustomed places in common with citizens of the Territory; and of erecting temporary buildings
26 for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their
27 horses and cattle upon open and unclaimed land.

28
29 **ARTICLE 4.** In consideration of the above cession, the United States agree to pay to the said
30 tribe in addition to the goods and provisions distributed to them at the time of signing this treaty,
31 the sum of two hundred thousand dollars, in the following manner, that is to say, sixty thousand
32 dollars, to be expended under the direction of the President of the United States, the first year
33 after the ratification of this treaty, in providing for their removal to the reserve, breaking up and
34 fencing farms, building houses, supplying them with provisions and a suitable outfit, and for such
35 other objects as he may deem necessary, and the remainder in annuities, as follows: for the
36 first five years after the ratification of this treaty, ten thousand dollars each year, commencing
37 September 1, 1856; for the next five years, eight thousand dollars each year; for the next five
38 years, six thousand each year, and for the next five years, four thousand dollars each year. All
39 which said sums of money shall be applied to the use and benefit of the said Indians, under the
40 direction of the President of the United States, who may from time to time determine, at his
41 discretion, upon what beneficial objects to expend the same for them. And the superintendent of
42 Indian affairs, or other proper officer, shall each year inform the President of the wishes of the
43 Indians in relation thereto.

44
45 **ARTICLE 5.** The United States further agree to establish, at suitable points within said
46 reservation, within one year after the ratification hereof, two schools, erecting the necessary
47 buildings, keeping the same in repair, and providing them with furniture, books, and stationery,
48 one of which shall be an agricultural and industrial school, to be located at the agency, and to be
49 free to the children of said tribe, and to employ one superintendent of teaching and two teachers;
50 to build two blacksmiths' shops, to one of which shall be attached a tinshop and to the other a
51 gunsmith's shop; one carpenter's shop, one wagon and plough maker's shop, and to keep the
52 same in repair, and furnished with the necessary tools to employ one superintendent of farming
53 and two farmers, two blacksmiths, one tinner, one gunsmith, one carpenter, one wagon and
54 plough maker, for the instruction of the Indians in trades, and to assist them in the same; to erect

1 one saw-mill and one flouring-mill, keeping the same in repair, and furnished with the necessary
2 tools and fixtures, and to employ two millers; to erect a hospital, keeping the same in repair, and
3 provided with the necessary medicines and furniture, and to employ a physician; and to erect,
4 keep in repair, and provide with the necessary furniture the buildings required for the
5 accommodation of the said employees. The said buildings and establishments to be maintained
6 and kept in repair as aforesaid, and the employees to be kept in service for the period of twenty
7 years.

8
9 And in view of the fact that the head chief of the tribe is expected, and will be called upon, to
10 perform many services of a public character, occupying much of his time, the United States
11 further agrees to pay to the Nez Perce tribe five hundred dollars per year for the term of twenty
12 years, after the ratification hereof, as a salary for such person as the tribe may select to be its
13 head chief. To build for him, at a suitable point on the reservation, a comfortable house, and
14 properly furnish the same, and to plough and fence for his use ten acres of land. The said salary
15 to be paid to, and the said house to be occupied by, such head chief so long as he may be
16 elected to that position by his tribe, and no longer. And all the expenditures and expenses
17 contemplated in this fifth article of this treaty shall be defrayed by the United States, and shall not
18 be deducted from the annuities agreed to be paid to said tribe, nor shall the cost of transporting
19 the goods for the annuity-payments be a charge upon the annuities, but shall be defrayed by the
20 United States.

21
22 **ARTICLE 7.** The President may from time to time, at his discretion, cause the whole, or such
23 portions of such reservation as he may think proper, to be surveyed into lots, and assign the
24 same to such individuals or families of the said tribe as are willing to avail themselves of the
25 privilege, and will locate on the same as a permanent home, on the same terms and subject to
26 the same regulations as are provided in the sixth article of the treaty with the Omahas in the year
27 1854, so far as the same may be applicable.

28
29 **ARTICLE 8.** The annuities of the aforesaid tribe shall not be taken to pay the debts of
30 individuals.

31
32 **ARTICLE 9.** The aforesaid tribe acknowledge their dependence upon the Government of the
33 United States, and promise to be friendly with all citizens thereof, and pledge themselves to
34 commit no depredations on the property of such citizens; and should any one or more of them
35 violate this pledge, and the fact be satisfactorily proved before the agent, the property taken shall
36 be returned, or in default thereof, or if injured or destroyed, compensation may be made by the
37 Government out of the annuities. Nor will they make war on any other tribe except in
38 self-defense, but will submit all matters of difference between them and the other Indians to the
39 Government of the United States, or its agent, for decision, and abide thereby; and if any of the
40 said Indians commit any depredations on any other Indians within the Territory of Washington,
41 the same rule shall prevail as that prescribed in this article in cases of depredations against
42 citizens. And the said tribe agrees not to shelter or conceal offenders against the laws of the
43 United States, but to deliver them up to the authorities for trial.

44
45 **ARTICLE 10.** The Nez Perce desire to exclude from their reservation the use of ardent spirits,
46 and to prevent their people from drinking the same; and therefore it is provided that any Indian
47 belonging to said tribe who is guilty of bringing liquor into said reservation, or who drinks liquor,
48 may have his or her proportion of the annuities withheld from him or her for such time as the
49 President may determine.

50
51 **ARTICLE 11.** The Nez Perce Indians having expressed in council a desire that William Craig
52 should continue to live with them, he having uniformly shown himself their friend, it is further
53 agreed that the tract of land now occupied by him, and described in his notice to the register and
54 receiver of the land-office of the Territory of Washington, on the fourth day of June last, shall not

1 be considered a part of the reservation provided for in this treaty, except that it shall be subject in
2 common with the lands of the reservation to the operations of the intercourse act.
3

4 **ARTICLE 12.** This treaty shall be obligatory upon the contracting parties as soon as the same
5 shall be ratified by the President and Senate of the United States.
6

7 In testimony whereof, the said Isaac I. Stevens, governor and superintendent of Indian affairs for
8 the Territory of Washington, and Joel Palmer, superintendent of Indian affairs for Oregon
9 Territory, and the chiefs, headmen, and delegates of the aforesaid Nez Perce tribe of Indians,
10 have hereunto set their hands and seals, at the place, and on the day and year hereinbefore
11 written.

12
13 Isaac I. Stevens, (L.S.), Governor and
14 Superintendent Washington Territory.

Ish-coh-tim, his x mark. (L.S.)

15
16 Joel Palmer, (L.S.), Superintendent Indian
17 Affairs.

Wee-as-cus, his x mark. (L.S.)

18
19 Aleiya, or Lawyer, Head-chief of the Nez
20 Perce, (L.S.)

Hah-hah-stoore-tee, his x mark. (L.S.)

21
22 Appushwa-hite, or Looking-glass, his x
23 mark. (L.S.)

Eee-maht-sin-pooh, his x mark. (L.S.)

24
25 Joseph, his x mark. (L.S.)

Tow-wish-au-il-pilp, his x mark. (L.S.)

26
27 James, his x mark. (L.S.)

Kay-kay-mass, his x mark. (L.S.)

28
29 Red Wolf, his x mark. (L.S.)

Speaking Eagle, his x mark. (L.S.)

30
31 Timothy, his x mark. (L.S.)

Wat-ti-wat-ti-wah-hi, his x mark. (L.S.)

32
33 U-ute-sin-male-cun, his x mark, (L.S.)

Howh-no-tah-kun, his x mark. (L.S.)

34
35 Spotted Eage, his x mark. (L.S.)

Tow-wish-wane, his x mark. (L.S.)

36
37 Stoop-toop-nin, or Cut-hair, his x mark.
38 (L.S.)

Wahpt-tah-shooshe, his x mark. (L.S.)

39
40 Tah-moh-moh-kin, his x mark. (L.S.)

Bead Necklace, his x mark. (L.S.)

41
42 Tippelanecbupoo, his x mark. (L.S.)

Koos-koos-tas-kut, his x mark. (L.S.)

43
44 Hah-hah-stilpilp, his x mark. (L.S.)

Levi, his x mark. (L.S.)

45
46 Cool-cool-shua-nin, his x mark. (L.S.)

Pee-oo-pe-whi-hi, his x mark. (L.S.)

47
48 Silish, his x mark. (L.S.)

Pee-oo-pee-iecteim, his x mark. (L.S.)

49
50 Toh-toh-molewit, his x mark. (L.S.)

Pee-poome-kah, his x mark. (L.S.)

51
52 Tuky-in-lik-it, his x mark. (L.S.)

Hah-hah-still-at-me, his x mark. (L.S.)

53
54 Te-hole-hole-soot, his x mark. (L.S.)

Wee-yoke-sin-ate, his x mark. (L.S.)

Wee-ah-ki, his x mark. (L.S.)

Necalahtsin, his x mark. (L.S.)

1	Suck-on-tie, his x mark. (L.S.)	Ko-ko-whay-nee, his x mark. (L.S.)
2		
3	Ip-nat-tam-moose, his x mark. (L.S.)	Kwin-to-kow, his x mark. (L.S.)
4		
5	Jason, his x mark. (L.S.)	Pee-wee-au-ap-tah, his x mark. (L.S.)
6		
7	Kole-kole-til-ky, his x mark. (L.S.)	Wee-at-tenat-il-pilp, his x mark. (L.S.)
8		
9	In-mat-tute-kah-ky, his x mark. (L.S.)	Pee-oo-pee-u-il-pilp, his x mark. (L.S.)
10		
11	Moh-see-chee, his x mark. (L.S.)	Wah-tass-tum-mannee, his x mark. (L.S.)
12		
13	George, his x mark. (L.S.)	Tu-wee-si-ce, his x mark. (L.S.)
14		
15	Nicke-el-it-may-ho, his x mark.	Lu-ee-sin-kah-koose-sin, his x mark. (L.S.)
16	(L.S.) Say-i-ee-ouse, his x mark. (L.S.)	
17		Hah-tal-ee-kin, his x mark. (L.S.)
18	Wis-tasse-cut, his x mark. (L.S.)	
19		
20	Ky-ky-soo-te-lum, his x mark. (L.S.)	
21		
22		

23
24 ***Signed and sealed in presence of us - -***

25		
26	James Doty, secretary of treaties, W.T.	Geo. C. Bomford
27		
28	Wm. C. McKay, secretary of treaties, O.T.	C. Chirouse, O.M.T.
29		
30	W. H. Tappan, sub-Indian agent	Mie. Cles. Pandosy
31		
32	William Craig, interpreter	Lawrence Kip
33		
34	A. D. Pamburn, interpreter	W. H. Pearson
35		
36	Wm. McBean	

37
38 Ratified Mar. 8, 1859
39 Proclaimed Apr. 29, 1859

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2 general public without fee or charge of any kind. It is intended that
3 this material not be used in a commercial manner.
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9

10 *Yakima Treaty of Camp Stevens, 1855*

11
12
13
14 Articles of agreement and convention made and concluded at the treaty-ground, Camp Stevens,
15 Walla-Walla Valley, this ninth day of June, in the year one thousand eight hundred and fifty-five,
16 by and between Isaac I. Stevens, governor and superintendent of Indian affairs for the Territory of
17 Washington, on the part of the United States, and the undersigned head chiefs, chiefs,
18 head-men, and delegates of the Yakama, Palouse, Pisuouse, Wenatshapam, Klikatat, Klinquit,
19 Kow-was-say-ee, Li-ay-was, Skin-pah, Wish-ham, Shyiks, Oche-chotes, Kah-milt-pah, and
20 Se-ap-cat, confederated tribes and bands of Indians, occupying lands hereinafter bounded and
21 described and lying in Washington Territory, who for the purposes of this treaty are to be
22 considered as one nation, under the name of "Yakama," with Kamaiakun as its head chief, on
23 behalf of and acting for said tribes and bands, and being duly authorized thereto by them.
24

25 **ARTICLE 1.** The aforesaid confederated tribes and bands of Indians hereby cede, relinquish,
26 and convey to the United States all their right, title, and interest in and to the lands and country
27 occupied and claimed by them, and bounded and described as follows, to wit: Commencing at
28 Mount Ranier, thence northerly along the main ridge of the Cascade Mountains to the point
29 where the northern tributaries of Lake Che-lan and the southern tributaries of the Methow River
30 have their rise; thence southeasterly on the divide between the waters of Lake Che-lan and the
31 Methow River to the Columbia River; thence, crossing the Columbia on a true east course, to a
32 point whose longitude is one hundred and nineteen degrees and ten minutes, (119 degrees 10',)
33 which two latter lines separate the above confederated tribes and bands from the Oakinakane
34 tribe of Indians; thence in a true south course to the forty-seventh (47 degrees) parallel of
35 latitude; thence east on said parallel to the main Palouse River, which two latter lines of
36 boundary separate the above confederated tribes and bands from the Spokanes; thence down
37 the Palouse River to its junction with the Moh-hah-ne-she, or southern tributary of the same;
38 thence in a southeasterly direction, to the Snake River, at the mouth of the Tucannon River,
39 separating the above confederated tribes from the Nez Perce tribe of Indians; thence down the
40 Snake River to its junction with the Columbia River; thence up the Columbia River to the "White
41 Banks" below the Priest's Rapids; thence westerly to a lake called "LaLac"; thence southerly to a
42 point on the Yakama River called Toh-mah-luke; thence, in a southwesterly direction, to the
43 Columbia River, at the western extremity of the "Big Island," between the mouths of the Umatilla
44 River and Butler Creek; all which latter boundaries separate the above confederated tribes and
45 bands from the Walla-Walla, Cayuse, and Umatilla tribes and bands of Indians; thence down the
46 Columbia River to midway between the mouths of White Salmon and Wind Rivers thence along
47 the divide between said rivers to the main ridge of the Cascade Mountains; and thence along
48 said ridge to the place of beginning.
49

50 **ARTICLE 2.** There is, however, reserved, from the lands above ceded for the use and
51 occupation of the aforesaid confederated tribes and bands of Indians, the tract of land included
52 within the following boundaries, to wit: Commencing on the Yakama River, at the mouth of the
53 Attah-nam River; thence westerly along said Attah-nam River to the forks; thence along the
54 southern tributary to the Cascade Mountains; thence southerly along the main ridge of said
55 mountains, passing south and east of Mount Adams, to the spur whence flows the waters of the
56 Klickatat and Pisco Rivers; thence down said spur to the divide between the waters of said

1 rivers; thence along said divide to the divide separating the waters of the Satass River from
2 those flowing into the Columbia River; thence along said divide to the main Yakama, eight miles
3 below the mouth of the Satass River; and thence up the Yakama River to the place of beginning.
4 All which tract shall be set apart and, so far as necessary, surveyed and marked out, for the
5 exclusive use and benefit of said confederated tribes and bands of Indians, as an Indian
6 reservation; nor shall any white man, excepting those in the employment of the Indian
7 Department, be permitted to reside upon the said reservation without permission of the tribe and
8 the superintendent and agent. And the said confederated tribes and bands agree to remove to,
9 and settle upon, the same, within one year after the ratification of this treaty. In the mean time it
10 shall be lawful for them to reside upon any ground not in the actual claim and occupation of
11 citizens of the United States; and upon any ground claimed or occupied, if with the permission of
12 the owner or claimant. Guaranteeing, however, the right to all citizens of the United States to
13 enter upon and occupy as settlers any lands not actually occupied and cultivated by said Indians
14 at this time, and not included in the reservation above named.

15
16 And provided, That any substantial improvements heretofore made by any Indian, such as fields
17 enclosed and cultivated, and houses erected upon the lands hereby ceded, and which he may
18 be compelled to abandon in consequence of this treaty, shall be valued, under the direction of
19 the President of the United States, and payment made therefor in money; or improvements of an
20 equal value made for said Indian upon the reservation. And no Indian will be required to abandon
21 the improvements aforesaid, now occupied by him, until their value in money, or improvements
22 of an equal value shall be furnished him as aforesaid.

23
24 **ARTICLE 3.** And provided, That, if necessary for the public convenience, roads may be run
25 through the said reservation; and on the other hand, the right of way, with free access from the
26 same to the nearest public highway, is secured to them; as also the right, in common with
27 citizens of the United States, to travel upon all public highways.

28
29 The exclusive right of taking fish in all the streams, where running through or bordering said
30 reservation, is further secured to said confederated tribes and bands of Indians, as also the right
31 of taking fish at all usual and accustomed places, in common with the citizens of the Territory,
32 and of erecting temporary buildings for curing them; together with the privilege of hunting,
33 gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed
34 land.

35
36 **ARTICLE 4.** In consideration of the above cession, the United States agree to pay to the said
37 confederated tribes and bands of Indians, in addition to the goods and provisions distributed to
38 them at the time of signing this treaty, the sum of two hundred thousand dollars, in the following
39 manner, that is to say: Sixty thousand dollars, to be expended under the direction of the
40 President of the United States, the first year after the ratification of this treaty, in providing for
41 their removal to the reservation, breaking up and fencing farms, building houses for them,
42 supplying them with provisions and a suitable outfit, and for such other objects as he may deem
43 necessary, and the remainder in annuities, as follows: For the first five years after the
44 ratification of the treaty, ten thousand dollars each year, commencing September first, 1856; for
45 the next five years, eight thousand dollars each year; for the next five years, six thousand dollars
46 per year; and for the next five years, four thousand dollars per year.

47
48 All which sums of money shall be applied to the use and benefit of said Indians, under the
49 direction of the President of the United States, who may from time to time determine, at his
50 discretion, upon what beneficial objects to expend the same for them. And the superintendent of
51 Indian affairs, or other proper officer, shall each year inform the President of the wishes of the
52 Indians in relation thereto.

53
54 **ARTICLE 5.** The United States further agree to establish at suitable points within said

1 reservation, within one year after the ratification hereof, two schools, erecting the necessary
2 buildings, keeping them in repair, and providing them with furniture, books, and stationery, one of
3 which shall be an agricultural and industrial school, to be located at the agency, and to be free to
4 the children of the said confederated tribes and bands of Indians, and to employ one
5 superintendent of teaching and two teachers; to build two blacksmiths' shops, to one of which
6 shall be attached a tin-shop, and to the other a gunsmith's shop; one carpenter's shop, one
7 wagon and plough maker's shop, and to keep the same in repair and furnished with the
8 necessary tools; to employ one superintendent of farming and two farmers, two blacksmiths,
9 one tinner, one gunsmith, one carpenter, one wagon and plough maker, for the instruction of the
10 Indians in trades and to assist them in the same; to erect one saw-mill and one flouring-mill,
11 keeping the same in repair and furnished with the necessary tools and fixtures; to erect a
12 hospital, keeping the same in repair and provided with the necessary medicines and furniture,
13 and to employ a physician; and to erect, keep in repair, and provided with the necessary
14 furniture, the building required for the accommodation of the said employees. The said buildings
15 and establishments to be maintained and kept in repair as aforesaid, and the employees to be
16 kept in service for the period of twenty years.

17
18 And in view of the fact that the head chief of the said confederated tribes and bands of Indians is
19 expected, and will be called upon to perform many services of a public character, occupying
20 much of his time, the United States further agree to pay to the said confederated tribes and
21 bands of Indians five hundred dollars per year, for the term of twenty years after the ratification
22 hereof, as a salary for such person as the said confederated tribes and bands of Indians may
23 select to be their head chief, to build for him at a suitable point on the reservation a comfortable
24 house, and properly furnish the same, and to plough and fence ten acres of land. The said
25 salary to be paid to, and the said house to be occupied by, such head chief so long as he may
26 continue to hold that office.

27
28 And it is distinctly understood and agreed that at the time of the conclusion of this treaty
29 Kamaiakun is the duly elected and authorized head chief of the confederated tribes and bands
30 aforesaid, styled the Yakama Nation, and is recognized as such by them and by the
31 commissioners on the part of the United States holding this treaty; and all the expenditures and
32 expenses contemplated in this article of this treaty shall be defrayed by the United States, and
33 shall not be deducted from the annuities agreed to be paid to said confederated tribes and band
34 of Indians. Nor shall the cost of transporting the goods for the annuity payments be a charge
35 upon the annuities, but shall be defrayed by the United States.

36
37 **ARTICLE 6.** The President may, from time to time, at his discretion, cause the whole or such
38 portions of such reservation as he may think proper, to be surveyed into lots, and assign the
39 same to such individuals or families of the said confederated tribes and bands of Indians as are
40 willing to avail themselves of the privilege, and will locate on the same as a permanent home, on
41 the same terms and subject to the same regulations as are provided in the sixth article of the
42 treaty with the Omahas, so far as the same may be applicable.

43
44 **ARTICLE 7.** The annuities of the aforesaid confederated tribes and bands of Indians shall not
45 be taken to pay the debts of individuals.

46
47 **ARTICLE 8.** The aforesaid confederated tribes and bands of Indians acknowledge their
48 dependence upon the Government of the United States, and promise to be friendly with all
49 citizens thereof, and pledge themselves to commit no depredations upon the property of such
50 citizens. And should any one or more of them violate this pledge, and the fact be satisfactorily
51 proved before the agent, the property taken shall be returned, or in default thereof, or if injured or
52 destroyed, compensation may be made by the Government out of the annuities. Nor will they
53 make war upon any other tribe, except in self-defense, but will submit all matters of difference
54 between them and other Indians to the Government of the United States or its agent for decision,

1 and abide thereby. And if any of the said Indians commit depredations on any other Indians
2 within the Territory of Washington or Oregon, the same rule shall prevail as that provided in this
3 article in case of depredations against citizens. And the said confederated tribes and bands of
4 Indians agree not to shelter or conceal offenders against the laws of the United States, but to
5 deliver them up to the authorities for trial.
6

7 **ARTICLE 9.** The said confederated tribes and bands of Indians desire to exclude from their
8 reservation the use of ardent spirits, and to prevent their people from drinking the same, and,
9 therefore, it is provided that any Indian belonging to said confederated tribes and bands of
10 Indians, who is guilty of bringing liquor into said reservation, or who drinks liquor, may have his or
11 her annuities withheld from him or her for such time as the President may determine.
12

13 **ARTICLE 10.** And provided, That there is also reserved and set apart from the lands ceded by
14 this treaty, for the use and benefit of the aforesaid confederated tribes and bands, a tract of land
15 not exceeding in quantity one township of six miles square, situated at the forks of the Pisquouse
16 or Wenatshapam River, and known as the "Wenatshapam Fishery," which said reservation shall
17 be surveyed and marked out whenever the President may direct, and be subject to the same
18 provisions and restrictions as other Indian reservations.
19

20 **ARTICLE 11.** This treaty shall be obligatory upon the contracting parties as soon as the same
21 shall be ratified by the President and Senate of the United States. In testimony whereof, the said
22 Isaac I. Stevens, governor and superintendent of Indian affairs for the Territory of Washington,
23 and the undersigned head chief, chiefs, headmen, and delegates of the aforesaid confederated
24 tribes and bands of Indians, have hereunto set their hands and seals, at the place and on the day
25 and year hereinbefore written.
26

27 ISAAC I. STEVENS, Governor and
28 Superintendent. (L.S.)

Elit Palmer, his x mark. (L.S.)

29 Kamaiakun, his x mark. (L.S.)

Wish-och-kmpits, his x mark. (L.S.)

30 Skloom, his x mark. (L.S.)

Koo-lat-toose, his x mark. (L.S.)

31 Owhi, his x mark. (L.S.)

Shee-ah-cotte, his x mark. (L.S.)

32 Te-cole-kun, his x mark. (L.S.)

Tuck-quille, his x mark. (L.S.)

33 La-hoom, his x mark. (L.S.)

Ka-loo-as, his x mark. (L.S.)

34 Me-ni-nock, his x mark. (L.S.)

Scha-noo-a, his x mark. (L.S.)

Sla-kish, his x mark. (L.S.)

1 ***Signed and sealed in the presence of - -***
2
3 James Doty, secretary of treaties A. D. Pamburn, interpreter
4
5 Mie. Cles. Pandosy, O. M. T. Joel Palmer, superintendent Indian affairs,
6 O. T.
7 Wm. C. McKay W. D. Biglow
8
9 W. H. Tappan, sub Indian agent, W. T. A. D. Pamburn, interpreter
10
11 C. Chirouse, O. M. T.
12
13 Patrick McKenzie, interpreter

14
15 Ratified Mar. 8, 1859
16 Proclaimed Apr. 18, 1859

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7

8 swimref@cmc.net
9

10 *Walla Walla Treaty of Camp Stevens, 1855*

11
12
13
14
15 Articles of agreement and convention made and concluded at the treatyground, Camp Stevens,
16 in the Walla-Walla Valley, this ninth day of June, in the year one thousand eight hundred and
17 fifty-five, by and between Isaac I. Stevens, governor and superintendent of Indian affairs for the
18 Territory of Washington, and Joel Palmer, superintendent of Indian affairs for Oregon Territory,
19 on the part of the United States, and the undersigned chiefs, head-men, and delegates of the
20 Walla-Wallas, Cayuses, and Umatilla tribes, and bands of Indians, occupying lands partly in
21 Washington and partly in Oregon Territories, and who, for the purposes of this treaty, are to be
22 regarded as one nation acting for and in behalf of their respective bands and tribes, they being
23 duly authorized thereto; it being understood that Superintendent I. I. Stevens assumes to treat
24 with that portion of the above-named bands and tribes residing within the Territory of
25 Washington, and Superintendent Palmer with those residing within Oregon.
26

27 **ARTICLE 1.** The above-named confederated bands of Indians cede to the United States all their
28 right, title, and claim to all and every part of the country claimed by them included in the following
29 boundaries, to wit: Commencing at the mouth of the Tocannon River, in Washington Territory,
30 running thence up said river to its source; thence easterly along the summit of the Blue
31 Mountains, and on the southern boundaries of the purchase made of the Nez Perces Indians,
32 and easterly along that boundary to the western limits of the country claimed by the Shoshonees
33 or Snake Indians; thence southerly along that boundary (being the waters of Powder River) to the
34 source of Powder River, thence to the head-waters of Willow Creek, thence down Willow Creek
35 to the Columbia River, thence up the channel of the Columbia River to the lower end of a large
36 island below the mouth of Umatilla River, thence northerly to a point on the Yakama River, called
37 Tomah-luke, thence to Le Lac, thence to the White Banks on the Columbia below Priest's
38 Rapids, thence down the Columbia River to the junction of the Columbia and Snake Rivers,
39 thence up the Snake River to the place of beginning: Provided, however, That so much of the
40 country described above as is contained in the following boundaries shall be set apart as a
41 residence for said Indians, which tract for the purposes contemplated shall be held and regarded
42 as an Indian reservation; to wit: Commencing in the middle of the channel of Umatilla River
43 opposite the mouth of Wild Horse Creek, thence up the middle of the channel of said creek to its
44 source, thence southerly to a point in the Blue Mountains, known as Lee's Encampment, thence
45 in a line to the head-waters of Howtome Creek, thence west to the divide between Howtome and
46 Birch Creeks, thence northerly along said divide to a point due west of the southwest corner of
47 William C. McKay's land-claim, thence east along his line to his southeast corner, thence in a
48 line to the place of beginning; all of which tract shall be set apart and, so far as necessary,
49 surveyed and marked out for their exclusive use; nor shall any white person be permitted to
50 reside upon the same without permission of the agent and superintendent. The said tribes and
51 bands agree to remove to and settle upon the same within one year after the ratification of this
52 treaty, without any additional expense to the Government other than is provided by this treaty,
53 and until the expiration of the time specified, the said bands shall be permitted to occupy and
54 reside upon the tracts now possessed by them, guaranteeing to all citizen(s) of the United
55 States, the right to enter upon and occupy as settlers any lands not actually enclosed by said
56 Indians:

1 Provided, also, That the exclusive right of taking fish in the streams running through and
2 bordering said reservation is hereby secured to said Indians, and at all other usual and
3 accustomed stations in common with citizens of the United States, and of erecting suitable
4 buildings for curing the same; the privilege of hunting, gathering roots and berries and pasturing
5 their stock on unclaimed lands in common with citizens, is also secured to them. And provided,
6 also, That if any band or bands of Indians, residing in and claiming any portion or portions of the
7 country described in this article, shall not accede to the terms of this treaty, then the bands
8 becoming parties hereunto agree to reserve such part of the several and other payments herein
9 named, as a consideration for the entire country described as aforesaid, as shall be in the
10 proportion that their aggregate number may have to the whole number of Indians residing in and
11 claiming the entire country aforesaid, as consideration and payment in full for the tracts in said
12 country claimed by them. And provided, also, That when substantial improvements have been
13 made by any member of the bands being parties to this treaty, who are compelled to abandon
14 them in consequence of said treaty, (they) shall be valued under the direction of the President of
15 the United States, and payment made therefor.

16
17 **ARTICLE 2.** In consideration of and payment for the country hereby ceded, the United States
18 agree to pay the bands and tribes of Indians claiming territory and residing in said country, and
19 who remove to and reside upon said reservation, the several sums of money following, to wit:
20 eight thousand dollars per annum for the term of five years, commencing on the first day of
21 September, 1856; six thousand dollars per annum for the term of five years next succeeding the
22 first five; four thousand dollars per annum for the term of five years next succeeding the second
23 five, and two thousand dollars per annum for the term of five years next succeeding the third five;
24 all of which several sums of money shall be expended for the use and benefit of the
25 confederated bands herein named, under the direction of the President of the United States, who
26 may from time to time at his discretion, determine what proportion thereof shall be expended for
27 such objects as in his judgment will promote their well-being, and advance them in civilization,
28 for their moral improvement and education, for buildings, opening and fencing farms, breaking,
29 land, purchasing teams, wagons, agricultural implements and seeds, for clothing, provision and
30 tools, for medical purposes, providing mechanics and farmers, and for arms and ammunition.

31
32 **ARTICLE 3.** In addition to the articles advanced the Indians at the time of signing this treaty, the
33 United States agree to expend the sum of fifty thousand dollars during the first and second years
34 after its ratification, for the erection of buildings on the reservation, fencing and opening farms,
35 for the purchase of teams, farming implements, clothing, and provisions, for medicines and
36 tools, for the payment of employees, and for subsisting the Indians the first year after their
37 removal.

38
39 **ARTICLE 4.** In addition to the consideration above specified, the United States agree to erect, at
40 suitable points on the reservation, one saw-mill, and one flouring-mill, a building suitable for a
41 hospital, two school-houses, one blacksmith shop, one building for wagon and plough maker
42 and one carpenter and joiner shop, one dwelling for each, two millers, one farmer, one
43 superintendent of farming operations, two school-teachers, one blacksmith, one wagon and
44 plough maker, one carpenter and joiner, to each of which the necessary out-buildings. To
45 purchase and keep in repair for the term of twenty years all necessary mill fixtures and
46 mechanical tools, medicines and hospital stores, books and stationery for schools, and furniture
47 for employees.

48
49 The United States further engage to secure and pay for the services and subsistence, for the
50 term of twenty years, (of) one superintendent of farming operations, one farmer, one blacksmith,
51 one wagon and plough maker, one carpenter and joiner, one physician, and two
52 school-teachers.

53
54 **ARTICLE 5.** The United States further engage to build for the head chiefs of the Walla-Walla,

1 Cayuse, and Umatilla bands each one dwelling-house, and to plough and fence ten acres of land
2 for each, and to pay to each five hundred dollars per annum in cash for the term of twenty years.
3 The first payment to the Walla-Walla chief to commence upon the signing of this treaty. To give
4 to the Walla-Walla chief three yoke of oxen, three yokes and four chains, one wagon, two
5 ploughs, twelve hoes, twelve axes, two shovels, and one saddle and bridle, one set of
6 wagon-harness, and one set of plough-harness, within three months after the signing of this
7 treaty.

8
9 To build for the son of Pio-pio-mox-mox one dwelling-house, and plough and fence five acres of
10 land, and to give him a salary for twenty years, one hundred dollars in cash per annum,
11 commencing September first, eighteen hundred and fifty-six. The improvement named in this
12 section to be completed as soon after the ratification of this treaty as possible.

13
14 It is further stipulated that Pio-pio-mox-mox is secured for the term of five years, the right to build
15 and occupy a house at or near the mouth of Yakama River, to be used as a trading-post in the
16 sale of his bands of wild cattle ranging in that district: And provided, also, That in consequence
17 of the immigrant wagon-road from Grand Round to Umatilla, passing through the reservation
18 herein specified, thus leading to turmoils and disputes between Indians and immigrants, and as
19 it is known that a more desirable and practicable route may be had to the south of the present
20 road, that a sum not exceeding ten thousand dollars shall be expended in locating and opening a
21 wagon-road from Powder River or Grand Round, so as to reach the plain at the western base of
22 the Blue Mountain, south of the southern limits of said reservation.

23
24 **ARTICLE 6.** The President may, from time to time at his discretion cause the whole or such
25 portion as he may think proper, of the tract that may now or hereafter be set apart as a
26 permanent home for those Indians, to be surveyed into lots and assigned to such Indians of the
27 confederated bands as may wish to enjoy the privilege, and locate thereon permanently, to a
28 single person over twenty-one years of age, forty acres, to a family of two persons, sixty acres,
29 to a family of three and not exceeding five, eighty acres; to a family of six persons and not
30 exceeding ten, one hundred and twenty acres; and to each family over ten in number, twenty
31 acres to each additional three members; and the President may provide for such rules and
32 regulations as will secure to the family in case of the death of the head thereof, the possession
33 and enjoyment of such permanent home and improvement thereon; and he may at any time, at
34 his discretion, after such person or family has made location on the land assigned as a
35 permanent home, issue a patent to such person or family for such assigned land, conditioned
36 that the tract shall not be aliened or leased for a longer term than two years, and shall be exempt
37 from levy, sale, or forfeiture, which condition shall continue in force until a State constitution,
38 embracing such land within its limits, shall have been formed and the legislature of the State
39 shall remove the restriction: Provided, however, That no State legislature shall remove the
40 restriction herein provided for without the consent of Congress: And provided, also, That if any
41 person or family, shall at any time, neglect or refuse to occupy or till a portion of the land
42 assigned and on which they have located, or shall roam from place to place, indicating a desire
43 to abandon his home, the President may if the patent shall have been issued, cancel the
44 assignment, and may also withhold from such person or family their portion of the annuities or
45 other money due them, until they shall have returned to such permanent home, and resumed the
46 pursuits of industry, and in default of their return the tract may be declared abandoned, and
47 thereafter assigned to some other person or family of Indians residing on said reservation: And
48 provided, also, That the head chiefs of the three principal bands, to wit, Pio-pio-mox-mox,
49 Weyatenatmany, and Wenap-snoot, shall be secured in a tract of at least one hundred and
50 sixty acres of land.

51
52 **ARTICLE 7.** The annuities of the Indians shall not be taken to pay the debts of individuals.

53
54 **ARTICLE 8.** The confederated bands acknowledge their dependence on the Government of the

1 United States and promise to be friendly with all the citizens thereof, and pledge themselves to
2 commit no depredation on the property of such citizens, and should any one or more of the
3 Indians violate this pledge, and the fact be satisfactorily proven before the agent, the property
4 taken shall be returned, or in default thereof, or if injured or destroyed, compensation may be
5 made by the Government out of their annuities; nor will they make war on any other tribe of
6 Indians except in self-defense, but submit all matter of difference between them and other
7 Indians, to the Government of the United States or its agents for decision, and abide thereby; and
8 if any of the said Indians commit any depredations on other Indians, the same rule shall prevail
9 as that prescribed in the article in case of depredations against citizens. Said Indians further
10 engage to submit to and observe all laws, rules, and regulations which may be prescribed by the
11 United States for the government of said Indians.

12
13 **ARTICLE 9.** In order to prevent the evils of intemperance among said Indians, it is hereby
14 provided that if any one of them shall drink liquor, or procure it for others to drink, (such one)
15 may have his or her proportion of the annuities withheld from him or her for such time as the
16 President may determine.

17
18 **ARTICLE 10.** The said confederated bands agree that, whenever in the opinion of the President
19 of the United States the public interest may require it, that all roads highways and railroads shall
20 have the right of way through the reservation herein designated or which may at any time
21 hereafter be set apart as a reservation for said Indians.

22
23 **ARTICLE 11.** This treaty shall be obligatory on the contracting parties as soon as the same
24 shall be ratified by the President and Senate of the United States. In testimony whereof, the said
25 I. I. Stevens and Joel Palmer, on the part of the United States, and the undersigned chiefs,
26 headmen, and delegates of the said confederated bands, have hereunto set their hands and
27 seals, this ninth day of June, eighteen hundred and fifty-five.

28		
29	Isaac I. Stevens, (L.S.)	Five Crows, his x mark. (L.S.)
30		
31	Governor and Superintendent Washington	Stocheania, his x mark. (L.S.)
32	Territory	
33		Mu-howlish, his x mark. (L.S.)
34	Joel Palmer, (L.S.)	
35		Lin-tin-met-cheania, his x mark. (L.S.)
36	Superintendent Indian Affairs, O.T.	
37		Petamyo-mox-mox, his x mark. (L.S.)
38	Pio-pio-mox-mox, his x mark, head chief of	
39	Walla-Wallas. (L.S.)	Watash-te-waty, his x mark. (L.S.)
40		
41	Meani-teat or Pierre, his x mark. (L.S.)	She-yam-na-kon, his x mark. (L.S.)
42		
43	Weyatenatemany, his x mark, head chief of	Qua-chim, his x mark. (L.S.)
44	Cayuses. (L.S.)	
45		Te-walca-temany, his x mark. (L.S.)
46	Wenap-snoot, his x mark, head chief of	
47	Umatilla. (L.S.)	Keantoan, his x mark. (L.S.)
48		
49	Kamaspello, his x mark. (L.S.)	U-wait-quaick, his x mark. (L.S.)
50		
51	Steachus, his x mark. (L.S.)	Tilch-a-waix, his x mark. (L.S.)
52		
53	Howlish-wampo, his x mark. (L.S.)	La-ta-chin, his x mark. (L.S.)
54		

1	Kacho-rolich, his x mark. (L.S.)	Na-kas, his x mark. (L.S.)
2		
3	Kanocey, his x mark. (L.S.)	Stop-cha-yeou, his x mark. (L.S.)
4		
5	Som-na-howlish, his x mark. (L.S.)	He-yeau-she-keaut, his x mark. (L.S.)
6		
7	Ta-we-way, his x mark. (L.S.)	Sha-wa-way, his x mark. (L.S.)
8		
9	Ha-hats-me-cheat-pus, his x mark. (L.S.)	Tam-cha-key, his x mark. (L.S.)
10		
11	Pe-na-cheanit, his x mark. (L.S.)	Te-na-we-na-cha, his x mark. (L.S.)
12		
13	Ha-yo-ma-kin, his x mark. (L.S.)	Johnson, his x mark. (L.S.)
14		
15	Ya-ca-lox, his x mark. (L.S.)	Whe-la-chey, his x mark. (L.S.)

16
17 ***Signed in the presence of - -***

18		
19	James Doty, secretary treaties	James Coxey, his x mark, interpreter
20		
21	Wm. C. McKay, secretary treaties	Patrick McKenzie, interpreter
22		
23	C. Chirouse, O.M.I.	Arch. Gracie, Jr., brevet second lieutenant, Fourth Infantry
24		
25	A. D. Pamburn, interpreter	
26		R. R. Thompson, Indian agent
27	John Whitford, his x mark, interpreter	
28		R. B. Metcalfe, Indian sub-agent
29	Mathew Dofa, his x mark, interpreter	
30		
31	William Craig, interpreter	

32
33 Ratified Mar. 8, 1859
34 Proclaimed Apr. 11, 1859
35

1 ***Appendix B — Response Letters From Cooperating***
2 ***Agencies***

3
4
5

Currently not available in electronic format.

Appendix C — Floodplain/Wetlands Assessment

Floodplains and wetlands on the Hanford Site (including portions of the Columbia River, Yakima River, and Cold Creek floodplains; associated wetlands; and other wetlands and deep water habitats on the Hanford Site) could be affected under each of the land-use alternatives that are identified in this Final HCP EIS. The magnitude of these effects depends, in part, on the land-use designations associated with the floodplains and wetlands under each alternative. Floodplains and wetlands are protected from any adverse Federal actions by several laws, regulations, and orders. This Floodplain/Wetlands Assessment identifies the floodplains and wetlands potentially affected by future land-use designations under each alternative. This appendix also provides a brief discussion of floodplain and wetland natural functions and values, as well as the steps to minimize impacts on floodplains and wetlands. The alternatives identified in this assessment are described in detail in Chapter 3.

C.1 Introduction

Under Executive Order 11988, *Floodplain Management*, and Executive Order 11990, *Protection of Wetlands*, Federal agencies are required to consider the impact of proposed actions on wetlands and floodplains. The U.S. Department of Energy (DOE) requirements for compliance with Executive Orders 11988 and 11990 are found in Title 10, *Code of Federal Regulations* (CFR), Part 1022, “Compliance with Floodplain/Wetlands Environmental Review Requirements.” A floodplain/wetlands assessment consists of a description of the proposed action, a discussion of its effects on the floodplain and wetlands, and consideration of the alternatives. The Executive Orders are intended to be used by Federal agencies to implement floodplain and wetland requirements through existing procedures, such as those established to implement the *National Environmental Policy Act of 1969* (NEPA).

If DOE determines that there is no alternative to implementing a proposed project in a floodplain or wetland, a brief statement of findings must be prepared. This statement of findings would include a description of the proposed action, an explanation indicating why the project must be located in a floodplain or wetland, a list of alternatives considered, measures that will be taken to comply with state and local floodplain protection standards, and a description of the steps to be taken to minimize adverse impacts to the floodplain or wetland.

C.1.1 Floodplains Potentially Affected

A floodplain is defined as “. . . lowlands adjoining inland and coastal waters and relatively flat areas and flood-prone areas of offshore islands including, at a minimum, that area inundated by a 1 percent or greater chance flood in any given year. The base floodplain is defined as the 100-year (1.0 percent) floodplain. The critical floodplain is defined as the 500-year (0.2 percent) floodplain. . .” (10 CFR 1022).

When maintained in a natural state, floodplains provide valuable services by moderating the extent of flooding, thereby (1) reducing the risk of downstream flood loss; (2) minimizing the impacts of floods on human safety, health, and welfare; and (3) providing support to wetlands, fish, and wildlife.

For the purposes of this assessment, the extent of the 100-year floodplains for the Columbia River, Yakima River, and Cold Creek was derived from a number of sources (Neitzel et al. 1997; USACE 1970; Skaggs and Walters 1981; and DOE 1987). The water flow of both the Yakima and Columbia Rivers is regulated by dams located upstream of the Hanford Site. This flow regulation serves to significantly dampen the 100-year floods. For example, on the Hanford Site, the dam-regulated, 100-year flood for the Columbia River only extends beyond the

1 existing riverbed in certain isolated and shallow zones. A 100-year flood would inundate marshy
2 areas located upstream of the 100-B Reactor and a portion of the low-lying horn of land located
3 downstream of the 100-D Reactor, but is not expected to completely inundate the islands in the
4 Columbia River. Of the 1,142 ha (2,821 ac) of land area associated with these islands, 744 ha
5 (1,838 ac) would be inundated by a 100-year flood.
6

7 Although the 100-year floodplain of the ephemeral Cold Creek has not been mapped, it is
8 possible to draw preliminary conclusions from a 1981 Flood Risk Analysis (Skaggs and Walters
9 1981) to determine the historical extent of the watershed. In this analysis, at least two distinct
10 segments were described: (1) an upper reach extending from the headwaters to just south of
11 the 200 West Area, and (2) a lower reach extending from near the confluence with Dry Creek,
12 which is located on the Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve), to Horn
13 Rapids on the Yakima River. As the upper reach of Cold Creek enters the Hanford Site,
14 gradients diminish significantly. As a result, the channel becomes braided and interconnected.
15 The floodplain essentially follows State Highway 240 through the Hanford Site. Conservative
16 values for precipitation events and magnitudes of infiltration, surface roughness, and topographic
17 parameters were used for the preliminary estimates of probable maximum flooding conditions
18 for the Cold Creek watershed. Based on the estimate and location of the probable maximum
19 flood, it is possible to estimate the potential impact of Hanford Site remedial actions on the much
20 smaller 100-year floodplain of Cold Creek. The 100-year floodplain of Cold Creek probably
21 would not include land within the boundary of the Central Plateau geographic area.
22

23 **C.1.2 Wetlands Potentially Affected**

24
25 The *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (EPA
26 et al. 1989) defines wetlands by the presence of hydric soils, hydrophytic vegetation, and
27 wetlands hydrology. Hydric soils are soils with the seasonal high-water table within 2.5 cm
28 (1 in.) of the surface of the ground for at least 1 week of the growing season. As a result, hydric
29 soils typically experience an oxygen depletion. Hydrophytic vegetation may grow in soils at least
30 periodically depleted of oxygen as a result of water saturation. Hydrophytic vegetation might be
31 able to grow only in wetlands (obligate wetlands vegetation) or may be found in upland
32 environments as well (facultative wetlands vegetation). Wetlands hydrology requires permanent
33 or temporary inundation of soils for at least one week during the growing season and the
34 resultant depletion of oxygen. All three conditions must be met for a site to be defined as a
35 wetland.
36

37 Wetlands serve a variety of functions within the ecosystem. Consideration of these
38 wetland functions is essential in the evaluation of potential impacts. Wetland functions and
39 values include the following:
40

- 41 C **Water quality preservation** -- Wetlands help maintain and improve the water quality
42 of rivers, lakes, and estuaries. Because wetlands are located between uplands and
43 water resources, many wetlands can intercept runoff from the land before it reaches
44 open water. As runoff and surface water pass through, wetlands remove or
45 transform pollutants through physical, chemical, and biological processes.
46
- 47 C **Flood protection** -- Wetlands help protect adjacent and downstream properties
48 from potential flood damage by receiving and temporarily storing water during periods
49 of high runoff or high flows in adjacent streams. Wetlands within and upstream of
50 urban areas are particularly valuable for flood protection because the impervious
51 surface in urban areas greatly increases the rate and volume of runoff, thereby
52 increasing the risk of flood damage.
53
- 54 C **Erosion control** -- By virtue of their place in the landscape, riparian wetlands, salt

1 marshes, and marshes located at the margin of lakes and rivers protect shorelines
2 and streambanks against erosion. Wetland plants hold the soil in place with their
3 roots, absorb wave energy, and reduce the velocity of stream or river currents.
4

5 C **Biological productivity** -- Wetlands are among the most productive ecosystems in
6 the world. The unstable nature of many wetlands produces a great diversity of
7 niches that, in turn, support a great diversity of plant and animal species. Numerous
8 species of microbes, plants, insects, amphibians, reptiles, birds, fish, and other
9 wildlife depend in some way on wetlands for at least part of their life cycles.
10 Wetlands with seasonal hydrologic pulsing are the most productive. Wetland plants
11 play an integral role in the ecology of the watershed by providing breeding and
12 nursery sites, resting areas for migratory species, and refuge from predators.
13

14 C **Fish and wildlife habitat** -- Diverse species of plants, insects, amphibians, reptiles,
15 birds, fish, and mammals depend on wetlands for food, habitat, or temporary shelter.
16 Many bird species use wetlands as a source of food, water, nesting material, or
17 shelter. Migratory waterbirds rely on wetlands for staging areas, resting, feeding,
18 breeding, or nesting grounds.
19

20 C **Cultural value** -- Wetlands have archaeological, historical, and cultural values.
21 Societies traditionally have formed along bodies of water, and artifacts found in
22 wetlands provide information about these societies.
23

24 C **Aesthetic value** -- Historically, painters and writers have used wetlands as their
25 subject matter. Today, such artists are often joined by others with cameras,
26 camcorders, and binoculars.
27

28 C **Economic value** -- More than half of all adults in the United States hunt, fish,
29 birdwatch, or photograph wildlife, spending a total of \$59.5 billion annually (OTA
30 1993). Waterfowl hunters alone spend more than \$600 million annually to harvest
31 wetland-dependent birds (OTA 1993).
32

33 C **Scientific value** -- Scientists value the processes of wetlands individually,
34 particularly the role of wetlands in the global cycles of carbon, nitrogen, and water.
35 Many scientists consider the removal of carbon dioxide from the atmosphere the
36 most valuable function of wetlands (OTA 1993). Carbon sequestration is thought to
37 be an important process in reducing the greenhouse effect and the threat of global
38 warming.
39

40 Wetlands regulated under the *Clean Water Act of 1977* generally include swamps,
41 marshes, bogs, and similar areas. The Hanford Site has a number of cribs, trenches, and
42 cooling water ponds, a few of which support diverse wetland communities. Because these
43 features serve waste water treatment or cooling water functions, they are not regulated as
44 wetlands under the *Clean Water Act of 1977* and are not addressed in the scope of this
45 assessment.
46

47 Wetlands on the Hanford Site have been identified from several sources, including the
48 *National Wetlands Inventory* maps (USFWS 1976), *Priority Habitats & Species and Natural*
49 *Heritage Data (Maps)* (WDFW 1993), and *Habitat Types on the Hanford Site: Wildlife and Plant*
50 *Species of Concern* (PNL 1993c). Wetlands on the Hanford Site have not been formally
51 delineated, but most Hanford Site wetlands are found in poorly developed riparian zones along
52 the Columbia River and in association with irrigation runoff in the Wahluke Slope geographic
53 area. Because of strong currents, rocky substrate, and often widely fluctuating water levels, the
54 Columbia River supports a poorly developed riparian vegetation community. Other wetlands

1 present on the Hanford Site include several springs and ephemeral seeps on the ALE
2 Reserve geographic area.

3
4 Columbia yellowcress, which is a State of Washington endangered species, occurs in
5 wetlands along the Hanford Reach of the Columbia River. Pacific Northwest National Laboratory
6 biologists recently found 18 separate groups of Columbia yellowcress along the shoreline of the
7 300 Area (WHC 1993). This species is usually found near the water line and is often submerged
8 during periods of high water.

9 10 11 **C.2 Potential Impacts on Floodplains and Wetlands**

12
13 The following discussion of the proposed action evaluates potential impacts to wetlands
14 and floodplains on the Hanford Site that could be associated with land-use designations under
15 each alternative. The discussion is organized by geographic areas as defined for the Hanford
16 Site in the *Final Report of the Hanford Future Site Uses Working Group* (FSUWG 1992) (except
17 that the Columbia River and Reactors on the River geographic areas defined in the final report
18 have been combined as the Columbia River Corridor geographic area), and is followed by a
19 summary of impacts for each alternative. This organization takes advantage of similarities in
20 land-use designations across alternatives for some geographic areas.

21
22 The Columbia River and Yakima River floodplains occur on the Hanford Site
23 (Figure C-1). The floodplain associated with the Columbia River occurs along the entire length
24 of the Hanford Reach and includes many of the islands in the river. A small portion of the
25 Yakima River floodplain intersects the southern edge of the Hanford Site where State Highway
26 240 crosses onto the Site. A probable maximum floodplain associated with Cold Creek and a
27 tributary, Dry Creek, has also been identified (Figure C-2). These creeks are ephemeral
28 streams within the Yakima River drainage system that drain areas to the west of the Hanford
29 Site and cross the southern portion of the Hanford Site toward the Yakima River. Surface flow,
30 when it occurs in Cold Creek and Dry Creek, infiltrates rapidly and disappears into the surface
31 sediments in the western portion of the Hanford Site. The natural and beneficial functions of the
32 floodplains could be adversely affected by activities that might occur within the floodplains of
33 Cold Creek, the Columbia River, or the Yakima River under certain land-use designations.

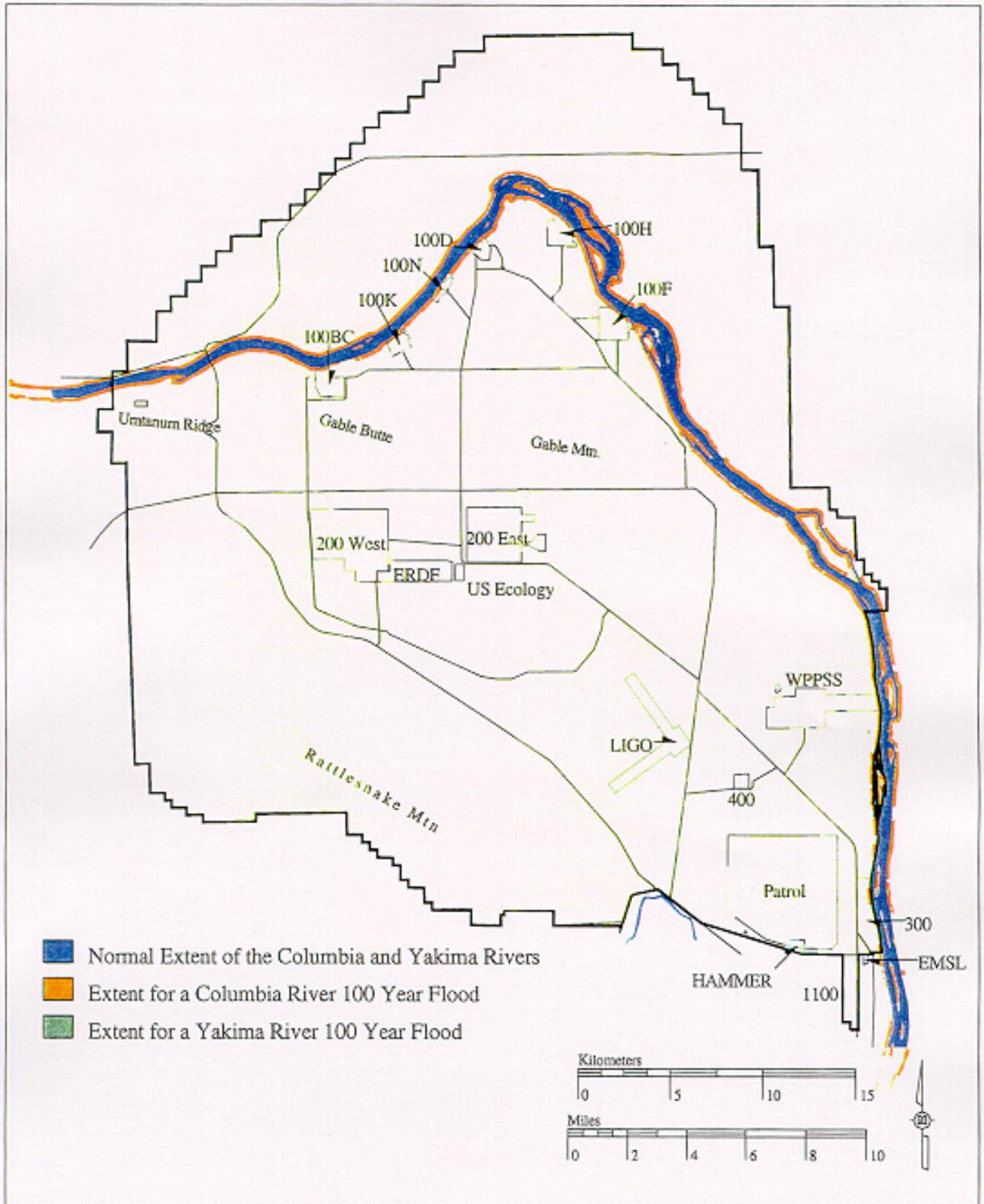
34
35 Wetlands on the Hanford Site are associated with the Columbia River, irrigation runoff,
36 and irrigation water wasteways from the Wahluke Slope; and riparian zones associated with
37 spring-fed streams on the ALE Reserve (Figure C-3). Many of the beneficial wetland functions
38 could be adversely affected by activities that might occur under certain land-use designations.

39 40 **C.2.1 No-Action Alternative**

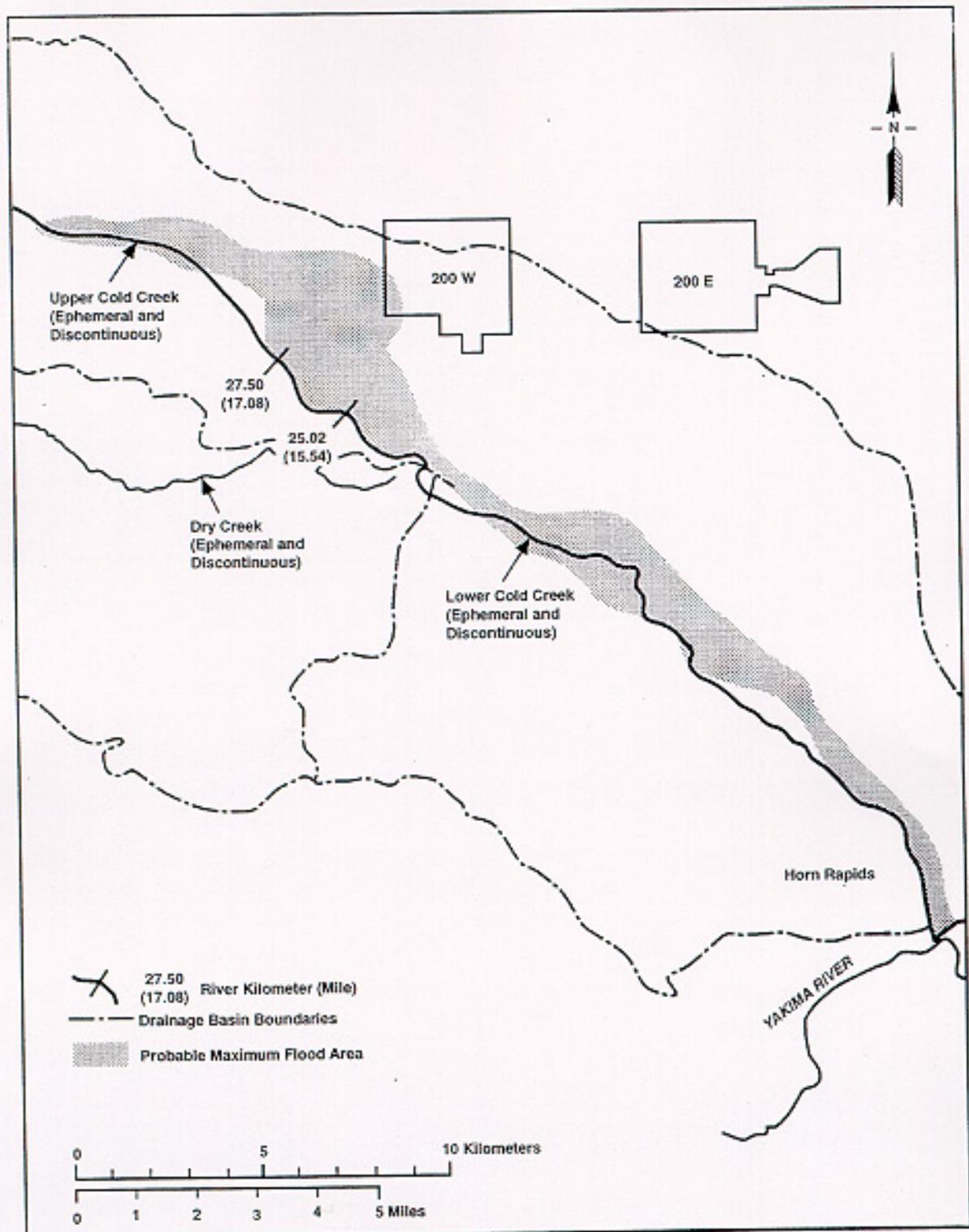
41
42 Under the No-Action Alternative, impacts to wetlands and floodplains in the ALE Reserve
43 would be minimal. The area is presently managed in a way similar to a Preservation
44 designation. This management is anticipated to continue into the future. However, in the
45 absence of a formal designation, proposals to develop parcels located in the ALE Reserve could
46 be considered.

47
48 The USFWS would manage the Wahluke Slope as the Saddle Mountain National Wildlife
49 Refuge (similar to Preservation) and the Wahluke Wildlife Recreation Area (similar to
50 Conservation). Impacts to wetlands and floodplains in the Wahluke Slope geographic area
51 would be minimal as long as these areas continue to be managed in similar ways.

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Figure C-1. 100-Year Floodplain of the Columbia and Yakima Rivers.



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2
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5
Figure C-2. Extent of the Probable Maximum Flood in the Cold Creek Area.



1 The No-Action Alternative would also maintain the status quo for the Columbia River
2 Corridor. The river could be used for recreation, but access to the islands would not be
3 permitted.
4

5 The Central Plateau would continue to be used for waste management (Industrial-
6 Exclusive use) under the No-Action Alternative. Although disturbance of wetlands and
7 development of floodplains would be anticipated to be high with this land-use, wetlands and
8 floodplains are essentially absent in this area. The lack of wetlands and floodplains is a primary
9 consideration in designating the area for Industrial-Exclusive land use.
10

11 The No-Action Alternative does not include any particular land-use designations for the
12 remainder. All areas could potentially be developed if appropriate uses were identified in the
13 future. Floodplains and wetlands along the Columbia River could be impacted by future
14 development.
15

16 **C.2.2 Preferred Alternative** 17

18 Although the Preferred Alternative would designate an area immediately south of State
19 Highway 240 for Conservation (Mining) to allow for possible development of a quarry within the
20 ALE Reserve, no wetlands are located in this area. No impacts to wetlands or floodplains are
21 anticipated to occur under the Preservation designation. The area designated for Conservation
22 (Mining) is adjacent to or located within the Cold Creek probable maximum floodplain, and
23 infrastructure developed to support a quarry site and transport materials would cross the
24 floodplain. This infrastructure could cause some small impacts to floodplain function because
25 the infrastructure could interfere with movement of water under flood conditions.
26

27 The Wahluke Slope is designated for Preservation under the Preferred Alternative. The
28 Preservation designation is applied to all wetland and floodplain areas within this area. Impacts
29 to wetlands on the Wahluke Slope would be minimal.
30

31 Land-use designations along the Columbia River Corridor would include Preservation,
32 Conservation (Mining), Low-Intensity Recreation, and High-Intensity Recreation. The
33 Preservation designation would be applied to the river islands, and the Conservation (Mining)
34 designation would encompass lands surrounding the surplus reactors, but not near the River.
35 Low-Intensity Recreation designations apply to places with existing boat launches that are not
36 presently available for public use, to the river itself, and to an area along the Columbia River
37 west of the B Reactor. High-Intensity Recreation is associated with the B Reactor, which may
38 be designated as a National Historic Landmark and open to tourists.
39

40 Under the High- and Low-Intensity Recreation land-use designations, impacts to
41 floodplains would be minimal. However, increased use of recreational watercraft could lead to
42 damage to wetlands. High-Intensity Recreation would lead to wetland damage due to intensive
43 use of recreational watercraft, potential off-road vehicle traffic, and foot traffic. Wetlands that
44 would be adversely impacted would be those in the vicinity of the areas designated for High-
45 Intensity Recreation, with impacts diminishing with distance from the high use areas.
46

47 Increased activity in the river under the Conservation designation would also potentially
48 lead to damage to wetlands associated with the Columbia River riparian zone. Impacts to
49 wetlands and floodplains associated with the Columbia River are influenced by the land-use
50 designations adjacent to the river, with more aggressive use of the land leading to a greater
51 degree of damage.
52

53 The Preferred Alternative would designate the Central Plateau for Industrial-Exclusive
54 use. No wetlands or floodplains are present within the Central Plateau and no impacts would be
55 anticipated. The lack of wetlands or floodplains in this geographic area is a primary

1 consideration in designating the area for Industrial-Exclusive land use.

2
3 The Preferred Alternative would designate portions of the remainder of the Hanford Site
4 for Preservation, Conservation (Mining), Industrial use, Low- and High-Intensity Recreation, and
5 Research and Development. Areas within the Cold Creek floodplain would be designated for
6 Conservation (Mining) and Research and Development. Areas within the Yakima River
7 floodplain would be designated for Industrial use and Research and Development. These
8 activities are anticipated to have little impact on the floodplain because development would be
9 minimal and the affected areas are small. Areas along the Columbia River designated for Low-
10 and High-Intensity Recreation could adversely impact wetlands in the vicinity of the land
11 designated for these uses. No wetlands are located within the areas designated for Industrial
12 use.

13 **C.2.3 Alternative One**

14
15
16 Alternative One would designate the majority of the Hanford Site as Preservation
17 consistent with the expansion of the Saddle Mountain National Wildlife Refuge. No impacts to
18 wetlands or floodplains are anticipated to occur under the Preservation designation.
19

20 Alternative One would designate land along the Columbia River Corridor as Preservation,
21 and for Low- and High-Intensity Recreation. The Preservation designation would apply to small
22 upland areas, the river islands, and land adjacent to the river. Low-Intensity Recreation
23 designations apply to places with existing boat launches that are not presently available for
24 public use, to the river itself, and to an area along the Columbia River west of the B Reactor.
25 High-Intensity Recreation is associated with the B Reactor, which may be designated as a
26 National Historic Landmark and open to tourists.
27

28 Under the High- and Low-Intensity Recreation land-use designations, impacts to
29 floodplains would be low. High-Intensity Recreation could lead to wetland damage due to
30 intensive use of recreational watercraft, potential off-road vehicle traffic, and foot traffic.
31 Increased activity in the river under the Conservation designation could potentially lead to
32 damage to wetlands associated with the Columbia River riparian zone. Impacts to wetlands and
33 floodplains associated with the Columbia River are influenced by the land-use designations
34 adjacent to the river, with more aggressive use of the land leading to a greater degree of
35 damage. Alternative One designates all land on both sides of the Columbia River for
36 Preservation, with the exception of a small area designated for High-Intensity Recreation in the
37 vicinity of the B Reactor. Impacts to wetlands and floodplains associated with the Columbia
38 River would be minimal under this alternative.
39

40 Alternative One would designate the Central Plateau for Industrial-Exclusive use. No
41 wetlands or floodplains are present within the Central Plateau and no impacts would be
42 anticipated. The lack of wetlands or floodplains in this geographic area is a primary
43 consideration in designating the area for Industrial-Exclusive use.
44

45 Alternative One includes an area designated for Industrial use in the South 600 Area. No
46 wetlands or floodplains are included in areas designated for this use pattern. Impacts to
47 floodplains and wetlands under this alternative would be minimal or nonexistent.
48

49 **C.2.4 Alternative Two**

50
51 Wetland areas on the ALE Reserve and the Wahluke Slope are designated for
52 Preservation under Alternative Two. Under this designation, no adverse impacts to the wetlands
53 or floodplains would be anticipated. The Preservation designation would provide protection for
54 the wetlands and floodplains from disturbance and development. All lands along the Columbia
55 River would also be designated for Preservation under Alternative Two except for the area

1 associated with the B Reactor, which is designated for High-Intensity Recreation. Impacts to
2 wetlands and floodplains associated with the river would be minimal.
3

4 Alternative Two would designate the Central Plateau for Industrial-Exclusive use. No
5 wetlands or floodplains are present within the Central Plateau and no impacts would be
6 anticipated. The lack of wetlands or floodplains in this geographic area is a primary
7 consideration in designating the area for Industrial-Exclusive land use.
8

9 Alternative Two includes an area designated for Industrial use and Preservation within the
10 “All Other Areas” geographic area. No areas within wetlands or floodplains are designated for
11 this use pattern. Impacts to floodplains and wetlands under this alternative would be minimal or
12 nonexistent.
13

14 **C.2.5 Alternative Three**

15
16 The ALE Reserve would be designated for Conservation (Mining) areas under Alternative
17 Three, including wetland and floodplain areas. Impacts to wetlands and floodplains that could
18 occur under a Conservation (Mining) designation are anticipated to be similar to impacts under
19 the Preservation designation. Mining activities would probably be similar to quarry operations
20 and would involve a quarry site operation. These operations would be localized and would be
21 anticipated to have minimal impact on floodplains.
22

23 Alternative Three designates portions of the Wahluke Slope for Agriculture, Conservation
24 (Mining and Grazing), and High-Intensity Recreation. Wetlands within the Wahluke Slope are
25 located in areas designated for Agriculture or Conservation (Mining and Grazing). Up to 261 ha
26 (645 ac) of wetlands and associated deep water habitats could be directly and adversely
27 impacted by Agriculture. Impacts to the remaining 739 ha (1,825 ac) of wetlands in the Wahluke
28 Slope could also include non-point source runoff of agricultural chemicals, and impacts to
29 wetlands due to runoff are anticipated to be minimal. Wetlands in this area exist as a result of
30 irrigation runoff from agricultural areas surrounding the Wahluke Slope. The Agriculture
31 designation also applies to land within the “Red Zone Area” designated for no irrigation. If
32 irrigated agriculture were ultimately developed in this area, increased slumping of the White
33 Bluffs would be expected to occur. This increased slumping would adversely affect existing
34 wetlands and riparian habitat along the Columbia River, and would cover any floodplain in the
35 area of the slump.
36

37 The Columbia River would continue to be used as a recreational river with additional
38 development associated with the High-Intensity Recreation designation. The Low-Intensity
39 Recreation designation under Alternative Three applies to a trail enabling access to the river
40 from State Highway 24 to the north of the river and running along the river. Although portions of
41 this trail would be located within the Columbia River floodplain, impacts to the floodplain would
42 be minimal. A small area adjacent to the Columbia River is designated for High-Intensity
43 Recreation and this designation would be anticipated to have a potential for adverse impacts to
44 the 5 ha (12 ac) of riparian habitat in the area designated for High-Intensity Recreation.
45

46 Under the High- and Low-Intensity Recreation designations, impacts to floodplains would
47 be minimal. However, increased use of recreational watercraft could lead to damage to
48 wetlands. High-Intensity Recreation could lead to wetland damage due to intensive use of
49 recreational watercraft, potential off-road vehicle traffic, and foot traffic. Wetlands that could be
50 adversely impacted would be those in the vicinity of the areas designated for High-Intensity
51 Recreation, with impacts diminishing with distance from the high use areas.
52

53 Alternative Three would designate the Central Plateau for Industrial-Exclusive use. No
54 wetlands or floodplains are present within the Central Plateau and no impacts would be
55 anticipated. The lack of wetlands or floodplains in this geographic area is a primary

1 consideration in designating the area for Industrial-Exclusive use.

2
3 Alternative Three would designate areas within the remainder of the Hanford Site for
4 Conservation (Mining), Industrial Use, Research and Development, Low-Intensity Recreation,
5 and High-Intensity Recreation. The Cold Creek floodplain overlaps with areas designated for
6 Conservation (Mining), Research and Development, and High-Intensity Recreation; the Yakima
7 River floodplain overlaps an area designated for High-Intensity Recreation. These land-use
8 designations, especially High-Intensity Recreation, could adversely impact these floodplains.

9
10 **C.2.6 Alternative Four**

11
12 Wetland areas on the ALE Reserve would be designated for Preservation. No impacts to
13 wetlands or floodplains are anticipated to occur under the Preservation designation. An area
14 immediately south of State Highway 240 would be designated for Conservation (Mining) to allow
15 for possible development of a quarry. The area designated for Conservation (Mining) under
16 Alternative Four is adjacent to or located within the Cold Creek probable maximum floodplain,
17 and infrastructure developed to support a quarry site and transport materials would cross the
18 floodplain. This infrastructure could cause some small impacts to floodplain function because
19 the infrastructure could interfere with movement of water under flood conditions. Potential
20 impacts to wetlands and floodplains in the ALE Reserve would be similar to impacts under the
21 Preservation designation. Mining activities would probably be similar to quarry operations and
22 would involve a quarry-site operation that would have minimal impact on the Cold Creek
23 floodplain.

24
25 Alternative Four would designate the Wahluke Slope and all lands on both sides of the
26 Columbia River for Preservation, and for High- and Low-Intensity Recreation. Impacts to
27 wetlands and floodplains in the Columbia River Corridor geographic area would be minimal, and
28 no adverse impacts to the wetlands or Columbia River floodplain on the Wahluke Slope
29 geographic area would be anticipated. The Preservation designation would provide protection
30 for the wetlands and floodplains from disturbance and development.

31
32 Alternative Four would designate the Central Plateau for Industrial-Exclusive use. No
33 wetlands or floodplains are present within the Central Plateau and no impacts would be
34 anticipated. The lack of wetlands or floodplains in this geographic area is a primary
35 consideration in designating the area for Industrial-Exclusive use.

36
37 Alternative Four would designate the majority of the land in the remainder of the Hanford
38 Site for Preservation and for Conservation. Areas would also be designated for Research and
39 Development and for Industrial use. All areas within the boundaries of wetlands and floodplains
40 would be designated for Preservation or Conservation, and impacts to these areas would be
41 negligible.

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Appendix D — Quarry Sites, Haul Roads, Railroads, and Cap Description

The need for mineral resources in support of Hanford Site remediation will likely require development or enlargement of quarries. One possible remediation technology that could be selected to isolate harmful substances from humans and the environment is construction of surface caps over the waste sites. Surface caps generally consist of successive layers of materials such as basalt riprap, sand, gravel, geotextile membranes, and asphalt. Materials required for cap construction could be obtained from sources located on or off the Hanford Site. Appendix D provides a description of a reference cap design (Section D.1) and identifies potential sources of materials required for cap construction (Section D.2). The reference cap provides a conservative estimate of materials that could be required for cap construction. Other cap designs that would require less material would be evaluated during the remediation process for each specific waste site. Quarries located on the Hanford Site would be constructed in areas with a designated land use that accommodates mining activities.

Two prospective quarries have been identified as potential sources of materials for construction of surface caps over waste sites: McGee Ranch and Pit 30. McGee Ranch would serve as a source of fine materials, and Pit 30 would provide coarser aggregates.

In addition to the above quarries, several potential sources of basalt that may be required for barrier construction have been tentatively identified and evaluated in an engineering study (BHI 1995). The basalt quarry would provide material for riprap and possibly for asphalt and asphalt-base layers of the reference barrier. Ten locations on or near the Hanford Site have been evaluated as candidate basalt quarry sites. Evaluations were based on qualifying criteria (i.e., proximity to the 200 Areas on the Hanford Site, basalt availability, suitability of basalt, and threatened and endangered species impacts) and engineering criteria (i.e., haul distance, safety, expansion potential, and land reclamation potential). Other important factors used in determining the suitability of a site for quarry development are the significant cultural, archaeological, and historical resources that might be present.

Cultural resource surveys indicate that the most favorable sites for basalt quarry development from an engineering perspective are the least favorable for development from a cultural resources perspective. The most favorable sites from an engineering perspective exhibit features valued by American Indian tribes for traditional cultural and religious reasons. Sites that are less favorable for quarry development from an engineering perspective typically consist of near-surface basalt sources that do not have the commanding view of the surrounding terrain that is valued by tribal members for traditional cultural and religious uses. Factors other than cultural resources (e.g., excavation requirements, transportation cost, and reclamation potential) make these near-surface basalt sources less desirable from an engineering perspective.

D.1 Reference Cap Design

To estimate the quantity of materials required for cap construction, a conservative reference cap design was used in the analysis. For additional conservatism, capping was assumed to be the selected remedy for most Hanford waste sites. Other cap designs involving less material and, therefore, having lower construction and environmental costs, would be considered in the evaluation of remediation technologies for use at each specific waste site. The reference cap design provides the most conservative estimates of materials that would be required.

1 The reference cap design, commonly referred to as the Hanford Cap or Hanford Barrier,
2 is a composite cap intended to protect waste sites from human intrusion, burrowing animals,
3 root penetration, and water infiltration. This reference cap was designed specifically for
4 conditions at the Hanford Site (i.e., a desert environment). The Hanford Cap consists of ten
5 layers divided into three zones (from top to bottom): a water retention and evapotranspiration
6 zone, a capillary break and biotic intrusion zone, and a low-permeability moisture barrier.
7

8 The water retention and evapotranspiration zone would consist of a 100-cm (39-in.)-thick
9 layer of silt and pea gravel over a 100-cm (39-in.)-thick layer of silt. The top layer of silt and pea
10 gravel would be seeded with various grasses. The silt and pea gravel layer would provide a
11 growing medium for vegetation as well as some resistance to wind and water erosion. Water
12 from precipitation would be held in this 200-cm (78-in.)-thick zone. The plants established on
13 top of this zone would extract water from the soil and, through evapotranspiration, return
14 moisture to the atmosphere.
15

16 The capillary break and biotic intrusion zone would be constructed of coarser materials
17 than the water retention zone and would consist of a sand filter, a gravel filter, and a layer of
18 crushed basalt. The capillary break would minimize water infiltration because moisture would
19 not flow into the larger gaps found in the coarser material until water pressure in the overlying
20 zone increased to nearly atmospheric pressure. The upper, fine-textured water retention zone
21 would need to be nearly saturated before moisture would break through into the underlying
22 coarse material. A geotextile filter would be located at the interface between the water retention
23 zone and the capillary break. The geotextile filter would impede downward migration of fine-soil
24 into the underlying sand filter, thereby maintaining the textural contrast that creates the capillary
25 break. The lack of moisture in the basalt layer would discourage root penetration. The larger
26 materials, particularly the crushed basalt, would provide a barrier to burrowing animals, root
27 penetration, and inadvertent human intrusion.
28

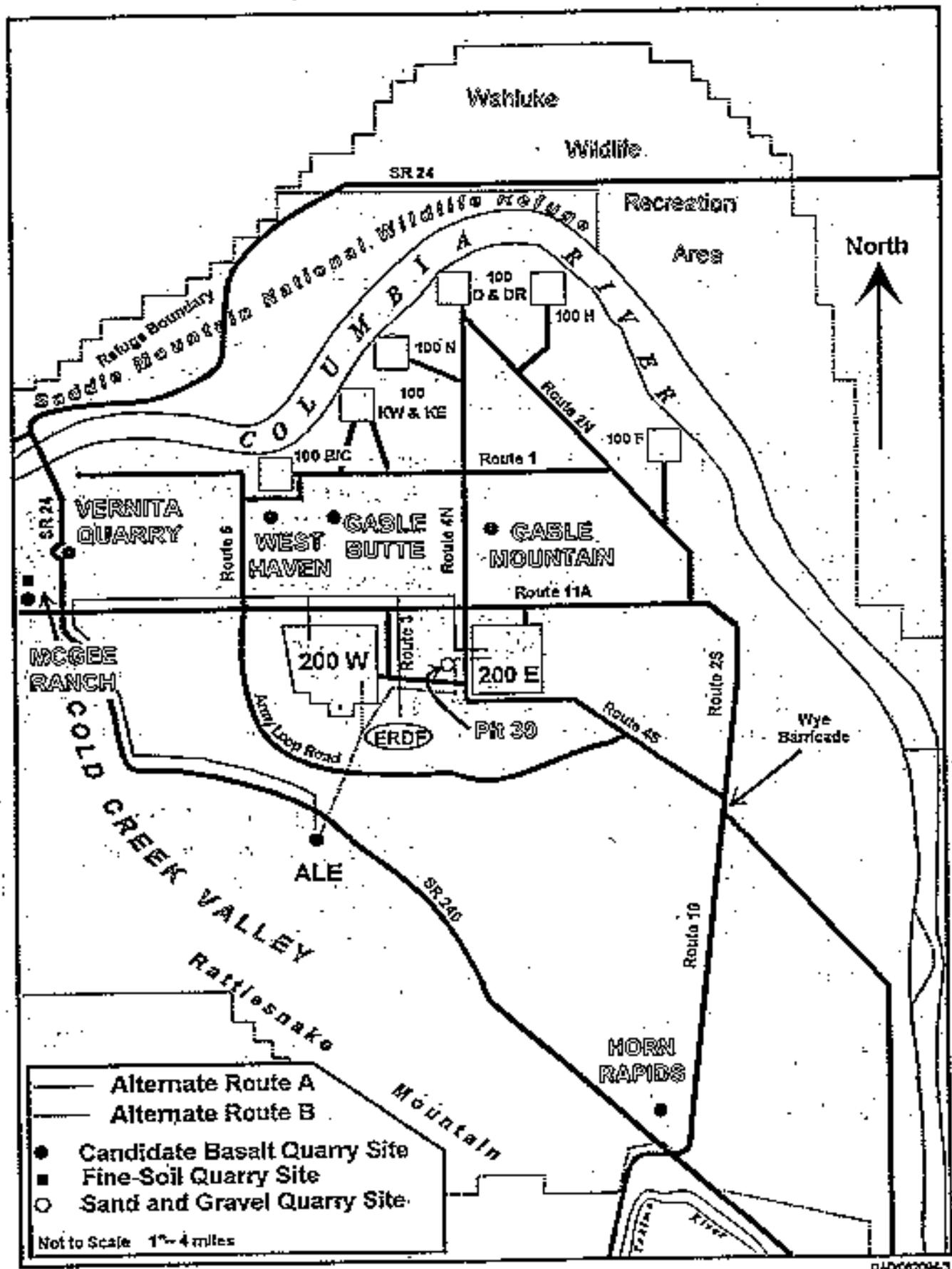
29 The low permeability moisture barrier would consist of a 30-cm (11.7-in.) crushed rock
30 or gravel drainage layer, a 10-cm (3.9-in.) asphaltic concrete layer, and a base course. This
31 zone would collect moisture that penetrated the upper layers and divert the moisture away from
32 the buried wastes that underlie this last zone. The low permeability moisture barrier would be
33 situated on top of the existing interim soil cover.
34
35

36 **D.2 Quarry Sites**

37

38 The following sites have been identified as preferred sources of cap materials (see
39 Figure D-1) based on engineering studies and other available information (BHI 1995;
40 Lindberg 1994; Skelly 1992). Final selection of quarry sites would depend on the amounts and
41 types of materials required, as determined on a site-specific basis. For example, use of a
42 modified *Resource Conservation and Recovery Act of 1976* (RCRA) C cap would require
43 minimal use of basalt and could make development of a basalt quarry unnecessary. Quarries
44 would be developed only in areas with future land-use designations consistent with mining
45 activities. The following sections discuss potential quarry sites and the land-use designations
46 for those sites under each alternative. Upon approval of the Record of Decision for the *Hanford* |
47 *Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS), development of a |
48 quarry in an area without a land-use designation consistent with mining activities would require
49 changing the land-use designation for that area through the *National Environmental Policy Act of*
50 *1969* (NEPA) process.
51

Figure D-1. Preferred Sources of Cap Materials.



01/06/2004-3

1 **D.2.1 McGee Ranch**
2

3 McGee Ranch has been identified as the preferred quarry site for fine-grained soils
4 potentially used in construction of caps for closure of waste sites at the Hanford Site.
5 Fine-grained soils might be used as topsoil for the cap.
6

7 McGee Ranch is located near the west boundary of the Hanford Site, north of State
8 Highway 24, west of State Highway 240, and south of the Columbia River. The site
9 encompasses 873 ha (2,182 ac) and has approximately 36.1 million m³ (47.3 million yd³) of
10 proven reserves of fine-textured soils (Lindberg 1994; Skelly 1992).
11

12 The Hanford Cultural Resources Laboratory conducted an archaeological survey of the
13 McGee Ranch (PNL 1992) and determined that historic and prehistoric cultural resources are
14 associated with this site. Prior to initiating activities at the McGee Ranch, requests for
15 determination of eligibility, findings of effect and adverse effect, and plans for mitigating adverse
16 impacts of the proposed action would be prepared and submitted to the appropriate Federal,
17 state, and tribal interests.
18

19 A survey for sensitive plant and animal species was conducted at the McGee Ranch site
20 in 1991 (Sonnichsen 1991). No threatened or endangered species were encountered.
21 Subsequent surveys of the site indicated the presence of two Washington State plant species of
22 concern, the crouching milkvetch and scilla onion (BHI 1995b). Two Washington State wildlife
23 species of concern, the loggerhead shrike and the sage sparrow, were observed at the McGee
24 Ranch site (BHI 1995). Swainson's hawk potentially could be associated with the McGee Ranch
25 site. Assuming total use of the site, operation of the McGee Ranch quarry would eradicate
26 652 ha (1,629 ac) of shrub-steppe habitat. This area serves as a wildlife movement corridor
27 between large blocks of shrub-steppe habitat on the Hanford Site and the Yakima Training
28 Center, located northwest of Hanford. Prior to initiating the development of the site, the State of
29 Washington and the U.S. Fish and Wildlife Service (USFWS) would be consulted regarding
30 potential impacts to sensitive species.
31

32 McGee Ranch is located in an area designated for Conservation (Mining) under
33 Alternative Three. Development of a quarry site at McGee Ranch would be consistent with the
34 land-use designation under this alternative. The area is designated for Preservation under the
35 Preferred Alternative and Alternatives One, Two, and Four; and this designation would preclude
36 use of McGee Ranch as a source of materials for construction of caps. McGee Ranch could
37 also be developed as a source of materials under the No-Action Alternative.
38

39 **D.2.2 Pit 30**
40

41 Pit 30 is an existing quarry site located immediately adjacent to the west side of the
42 200 East Area. Pit 30 could provide coarse sands and gravels required for cap construction.
43 Pit 30 is a disturbed site associated with pre-Hanford farming activity. Development and
44 expansion of Pit 30 would potentially impact 172 ha (426 ac), including the existing 49-ha
45 (120-ac) pit. A formal calculation of total reserves of coarse aggregate material is not available,
46 but reserves at Pit 30 are estimated to be approximately 15.3 million m³ (20 million yd³) of
47 material. Pit 30 would provide aggregate to be used as graded filter material in the reference
48 cap and other graded caps. Expansion of the existing pit would be necessary to provide
49 sufficient quantities of this material. Full use of the site would eradicate approximately 138 ha
50 (345 ac) of shrub-steppe habitat. Cultural resource and sensitive species surveys have not
51 been conducted for Pit 30 and would be required prior to excavation. Preliminary information
52 received from the USFWS and the State of Washington indicate that there are no sensitive
53 species associated with this site. Completion of these surveys and consultation with the State
54 of Washington and the USFWS would be required prior to initiating activity.
55

1 Pit 30 is located in an area designated for Industrial-Exclusive use under all alternatives.
2 Obtaining materials for construction of caps over waste sites would be consistent with this land-
3 use designation.
4

5 **D.2.3 Potential Basalt Quarry Sites** 6

7 Candidate quarry sites have been evaluated on the basis of qualifying criteria and
8 engineering criteria (BHI 1995). A broad range of possible quarry sites, including seven onsite
9 candidate quarries and three offsite privately operated quarries, were addressed. Candidate
10 quarries included exposed basalt outcrops and basalt sources at or slightly below grade. Sites
11 evaluated as potential basalt quarries were Vernita Quarry, McGee Ranch, the Fitzner/Eberhardt
12 Arid Lands Ecology Reserve (ALE Reserve) Site, Horn Rapids Site, Gable Mountain Site, Gable
13 Butte Site, West Haven Site, Section 9 Quarry, DeAtley Quarry, and Mahaffey Quarry. (The last
14 three sites are privately owned and operated off the Hanford Site.)
15

16 Factors considered in the evaluation were categorized into two groups:
17 (1) environmental, safety, and security factors; and (2) engineering and economic factors.
18 Qualifying criteria included proximity to the 200 Areas on the Hanford Site (Central Plateau),
19 basalt availability, suitability of basalt, and threatened and endangered species impacts.
20 Engineering criteria included haul distance, safety, expansion potential, and land reclamation.
21 Detailed descriptions of these criteria and evaluations are provided in the *Site Evaluation Report*
22 *for Candidate Basalt Quarry Sites* (BHI 1995).
23

24 Historical, archaeological, and cultural resource impacts were not used as qualifying
25 criteria because to date, only a portion of each candidate Hanford quarry has been surveyed and
26 the database is incomplete. These resources would be fully assessed, evaluated, and
27 mitigated, if necessary, prior to beginning any quarry operations. Mitigation would most likely be
28 undertaken in accordance with a Memorandum of Agreement developed in coordination with the
29 U.S. Department of Energy, Richland Operations Office (RL), the State Historic Preservation
30 Office, and Tribal governments.
31

32 Development of a surface (or near-surface) basalt site would be comparable to a typical
33 open-pit mine. A site occupying approximately 200 ha (500 ac) would need to be developed to a
34 depth of approximately 25 m (80 ft) to satisfy the potential materials need.
35

36 Ecological surveys for threatened or endangered species were conducted at each
37 Hanford Site candidate quarry. No Federal or state threatened or endangered species were
38 observed at these sites, although several Federal and state species of concern were observed.
39 Ecological surveys were not conducted at the three privately operated commercial quarries.
40

41 **D.2.3.1 Vernita Quarry.** Vernita Quarry is located off the east side of State Highway 24 near
42 Vernita Bridge and has been identified as a suitable source to supply riprap required for use in
43 constructing protective surface caps at the Hanford Site. NEPA documentation, including a
44 survey for threatened or endangered species and a cultural resource survey, was prepared to
45 support removing a small quantity of basalt from this quarry, and approximately 10,700 m³
46 (14,000 yd³) of riprap was removed in March 1994. This basalt was used to construct a
47 prototype Reference (Hanford) Cap over the B-57 crib in the 200-BP-1 Operable Unit. Vernita
48 Quarry could be developed by expanding the existing quarry or by developing a new quarry in the
49 vicinity.
50

51 The quarry is located in an extensive basalt outcrop and a considerable volume of basalt
52 exists outside of the area identified for quarry development. Initially, a 45-ha (110-ac) parcel
53 would be developed. This parcel could yield 11.9 million m³ (15.6 million yd³) of loose riprap.
54 Additional basalt could be obtained at this quarry by deeper excavation or by extending the quarry
55 deeper into the basalt bench. Additional overburden per unit area might be encountered on parts

1 of this outcrop, if the quarry were to be expanded beyond the identified boundaries. The potential
2 volume of useable basalt makes expansion of this site feasible, and the Vernita Quarry Site
3 could supply a sufficient quantity of basalt for cap construction.
4

5 Vernita Quarry is located in an exposed bench that could be reclaimed fairly successfully
6 from a physical and topographic perspective. The bench would be translocated into the original
7 outcrop and, when the quarry operations were complete, an exposed bench would remain. The
8 approach to the new bench could be graded to provide a natural transition from the surrounding
9 terrain. Revegetation would be used to further enhance the transition between undisturbed and
10 disturbed areas.

11
12 Two Washington State plant species of concern, the crouching milkvetch and the
13 stalked-pod milkvetch, were observed during a survey at the Vernita Quarry Site. A list of all
14 flora and fauna species observed at this site and other potential sites during the ecological
15 surveys is included as Appendix C in the *Site Evaluation Report for Candidate Basalt Quarry*
16 *Sites* (BHI 1995).
17

18 Vernita Quarry is located in an area designated for Conservation (Mining) in the Preferred
19 Alternative, and Conservation (Mining) in Alternative Three. Development of a quarry at this site
20 would be consistent with these land-use designations. Vernita Quarry is located in an area
21 designated for Preservation under Alternatives One, Two, and Four; and development of the
22 quarry would not be consistent with this land-use designation. Vernita Quarry could be
23 expanded under the No-Action Alternative.
24

25 **D.2.3.2 McGee Ranch.** A near-surface basalt source exists on the interior north portion of the
26 McGee Ranch site, northwest of the McGee well. Another portion of McGee Ranch is a potential
27 quarry site for fine-textured soils required for cap construction and the same infrastructure could
28 support both the fine-soil quarry and the basalt quarry. Basalt characteristics for this site are not
29 well known because surfaces or benches are not exposed. The formation exists as a knoll with
30 approximately 15 to 30 m (50 to 100 ft) of vertical relief. The thickness of the overburden is not
31 known. The most likely scenario for developing a quarry at this site would be to begin mining the
32 east end of the ridge. Quarry development would proceed to the west in blocks that span the
33 width of the formation, while maintaining grade above the 274 m (900 ft) contour level. If
34 additional basalt was required, excavation would proceed below this contour level. This potential
35 quarry site consists of a 47 ha (116 ac) parcel. Excavation of the site to the 274 m (900 ft)
36 contour level would yield 15.3 million m³ (20 million yd³) of loose riprap.
37

38 The basalt knoll at McGee Ranch would be developed similarly to an exposed outcrop.
39 The reclaimed landscape would not blend with the surrounding landscape to the same degree
40 as the Vernita Quarry Site. The knoll has several drainages running lengthwise on either side,
41 which would be eliminated by removal of the basalt formation during quarry operations. A pit
42 would be created if the formation were mined below the grade of the surrounding landscape to
43 provide additional basalt materials. A revegetation program would help the quarry area partially
44 blend with the surrounding landscape and would camouflage the quarry.
45

46 Two Washington State plant species of concern (the crouching milkvetch and scilla
47 onion) and two Washington State wildlife species of concern (the loggerhead shrike and the
48 sage sparrow) were observed at the McGee Ranch site.
49

50 The McGee Ranch site is located in an area designated for Conservation (Mining) in
51 Alternative Three. Development of a quarry at this site would be consistent with this land-use
52 designation. The proposed quarry site is located in an area designated for Preservation under
53 the Preferred Alternative and Alternatives One, Two, and Four. Development of the quarry would
54 not be consistent with this land-use designation. McGee Ranch could be developed under the
55 No-Action Alternative.

1 **D.2.3.3 The Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve).** The
2 Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve) consists of near-surface basalt
3 located approximately 300 m (1,000 ft) south of State Highway 240 near Gate 116. This site
4 would be developed similar to an open-pit surface mine, with adequate buffer zones surrounding
5 the excavation to maintain safe side slopes.
6

7 The near-surface portion of the basalt formation covers a fairly limited area compared to
8 the other sites. The quantity of basalt at this site is large and expansion could probably be
9 accommodated through deeper excavation. However, further geologic surveys would need to be
10 conducted to verify the extent of this formation and the depth of overburden and weak flow-top
11 material, and to determine if a sufficient quantity of basalt could be obtained from the ALE
12 Reserve.
13

14 One Washington State plant species of concern (the stalked-pod milkvetch) and two
15 Washington State bird species of concern (the grasshopper sparrow and sage sparrow) were
16 observed at the ALE Reserve.
17

18 The ALE Reserve is located within an ecology reserve that, for the most part, has
19 remained untouched by large development activities and has been set aside for ecological
20 preservation and research. The proximity of a quarry to the ALE Reserve might result in
21 avoidance behavior or other disturbance by sensitive species and animals (e.g., mule deer and
22 elk). A large-scale basalt quarry does not fit historical or current use designations for the ALE
23 Reserve.
24

25 The ALE Reserve is located in an area designated for Conservation (Mining) in the
26 Preferred Alternative and Alternatives Three and Four. Development of a quarry at this site
27 would be consistent with this land-use designation. The ALE Reserve is located in an area
28 designated for Preservation under Alternatives One and Two. Development of the quarry would
29 be consistent with this land-use designation. Development of the quarry would not be consistent
30 with current management practices and would be a nonconforming use under the No-Action
31 Alternative.
32

33 **D.2.3.4 Horn Rapids Site.** A basalt outcrop and potential quarry area exists 900 m (3,000 ft)
34 north of the Horn Rapids Dam. Characteristics of this site are not well known because few
35 basalt benches are exposed. The flow top is relatively flat at the 152-m (500-ft) contour with
36 abundant scattered basalt rocks in places. Some vertical relief exists near the south end and
37 near the center on the west side of the outcrop, and these two locations might provide the most
38 suitable locations to begin quarry operations. Initial quarry development would probably involve
39 an 84-ha (207-ac) parcel.
40

41 The Horn Rapids site could be developed in a manner similar to development of the
42 basalt formation at Vernita. A well-developed and exposed bench is not present at the Horn
43 Rapids site, but vertical relief at the south end would enable development of a 9- to 12-m (30- to
44 40-ft) bench.
45

46 The near-surface source at the Horn Rapids site is fairly extensive and could
47 accommodate future expansion. Further geologic surveys would need to be conducted to verify
48 the extent of this formation and to determine if a sufficient quantity of basalt could be obtained
49 from the Horn Rapids site.
50

51 One Washington State wildlife species of concern (two pairs of long-billed curlew) was
52 observed at the Horn Rapids site.
53

54 The Horn Rapids site is located in an area designated for Research and Development in
55 the Preferred Alternative and Alternative Three. Development of a quarry at this site would not

1 be consistent with this land-use designation. The Horn Rapids site is located in an area
2 designated for Preservation under Alternatives One, Two, and Four. Development of the quarry
3 would not be consistent with this land-use designation. The site would be available for
4 development under the No-Action Alternative.
5

6 **D.2.3.5 Gable Mountain Site.** Gable Mountain is a prominent geologic feature north of
7 Route 11A and north-to-northeast of the 200 East Area. A small quarry already exists at this
8 site, and observation of exposed basalt indicates that a suitable quality of basalt exists
9 throughout the west end of Gable Mountain. The existing quarry on the west end of Gable
10 Mountain has the capacity to supply all basalt needs at the Hanford Site. The quarry would be
11 expanded by advancing eastward into the mountain. A considerable quantity of naturally
12 occurring talus slope material exists at Gable Mountain and could provide many thousands of
13 cubic meters of riprap. Also, several large piles (thousands of cubic meters) of human-made
14 riprap exist in the old quarry site. Development of a quarry at the Gable Mountain site would
15 begin at the far west end of the mountain and proceed east.
16

17 Gable Mountain contains extensive exposed basalt benches that would be well suited for
18 quarry development. An open-pit mine would not be developed unless restrictions were placed
19 on quarry expansion. Land reclamation at the site would be capable of blending the quarry with
20 the surrounding landscape.
21

22 Gable Mountain has considerable cultural resource value as a sacred site for American
23 Indian tribes. Development of a quarry at Gable Mountain would adversely impact a cultural
24 resource valued by American Indians and would represent an irreversible and irretrievable (I&I)
25 commitment of this cultural resource.
26

27 One Washington State plant species of concern (the stalked-pod milkvetch) and two
28 state wildlife species of concern (the loggerhead shrike and the prairie falcon) were observed at
29 the Gable Mountain site.
30

31 Gable Mountain is located in an area designated for Preservation in the Preferred
32 Alternative and Alternatives One, Two, and Four. Development of a quarry at this site would not
33 be consistent with this land-use designation. Gable Mountain is located in an area designated
34 for Conservation (Mining) under Alternative Three, and development of the quarry would be
35 consistent with this land-use designation. A quarry could also be developed under the No-Action
36 Alternative.
37

38 **D.2.3.6 Gable Butte Site.** Gable Butte is a prominent geologic feature north of Route 11A and
39 north of the 200 West Area. The quarry site would consist of outcrops located west of the
40 railroad grade at Gable Butte, immediately west of Gable Butte proper. A considerable quantity
41 of naturally occurring talus slope material is associated with these outcrops and thousands of
42 cubic meters of riprap could possibly be obtained from this material. Development of a quarry at
43 the Gable Butte Site would begin at the south end of the area of interest. Sufficient space is
44 available for stockpiling material and for parking equipment in the southern portion of this area.
45 The outcrops that would be quarried range in elevation from about 152 m (500 ft) to 182 m
46 (600 ft).
47

48 Gable Butte and associated outcrops have the capacity to meet all basalt needs at the
49 Hanford Site. The outcrops immediately west of Gable Butte provide excellent opportunities for
50 quarry expansion. Talus slopes at the base of the outcrops could supply significant quantities of
51 basalt that is already broken into riprap-sized material that may be suitable for cap construction.
52

53 Gable Butte has cultural resource value as a sacred site for American Indian tribes.
54 Development of a quarry at Gable Butte would impact a cultural resource valued by American
55 Indians and would represent an I&I commitment of this cultural resource.

1 Two Washington State plant species of concern (the stalked-pod milkvetch and
2 crouching milkvetch) and one Washington State wildlife species of concern (the loggerhead
3 shrike) were observed at the Gable Butte site.

4
5 Gable Butte is located in an area designated for Preservation in the Preferred Alternative
6 and Alternatives One, Two, and Four. Development of a quarry at this site would not be
7 consistent with this land-use designation. Gable Butte is located in an area designated for
8 Conservation (Mining) under Alternative Three, and development of the quarry would be
9 consistent with this land-use designation. A Gable Butte quarry could also be developed under
10 the No-Action Alternative.

11
12 **D.2.3.7 West Haven Site.** The West Haven site consists of a single large basalt outcrop
13 located immediately east of Route 6 and west of Gable Butte. A considerable quantity of
14 naturally occurring talus slope material exists at this site and could provide many thousands of
15 cubic meters of riprap. The West Haven site and nearby outcrops have the capacity to supply
16 sufficient quantities of basalt material for cap construction. Development of a quarry at the West
17 Haven site would begin at the south end of the area of interest. Sufficient space is available for
18 stockpiling material and for parking equipment in the southern portion of this area.

19
20 West Haven contains extensive exposed basalt benches that would be well suited for
21 quarry development. An open-pit mine would not be developed unless restrictions were placed
22 on quarry expansion. Land reclamation at the site would be capable of blending the quarry with
23 the surrounding landscape.

24
25 Two Washington State plant species of concern (the crouching milkvetch and the
26 stalked-pod milkvetch) were observed at the West Haven site.

27
28 The West Haven Site is located in an area designated for Conservation (Mining) in the
29 Preferred Alternative and Conservation (Mining) in Alternative Three. Development of a quarry at
30 this site would be consistent with these land-use designations. The West Haven site is located
31 in an area designated for Preservation under Alternatives One, Two, and Four; and development
32 of the quarry would not be consistent with this land-use designation. The site could also be
33 developed under the No-Action Alternative.

34
35 **D.2.3.8 Section 9 Quarry.** The Section 9 quarry is a privately owned quarry located north of
36 Wanapum Dam. This quarry has considerable quantities of basalt in-place that could be blasted
37 and crushed to produce the desired riprap. Quarry development would be the responsibility of
38 the quarry operator. The status of threatened or endangered species and cultural resources at
39 this site is not known.

40
41 The Section 9 quarry and surrounding basalt formation could easily supply the volume
42 estimate of 15.3 million m³ (20 million yd³) of riprap used in evaluating sites (BHI 1995). Bank
43 reserve volumes at this quarry site are expected to be sufficient to meet the requirement for
44 basalt materials used in cap construction.

45
46 **D.2.3.9 DeAtley Quarry.** The DeAtley Quarry is a privately owned quarry located on the old
47 Highway 12, about 6.7 km (4.2 mi) east of Benton City, Washington. Development of the quarry
48 would be the responsibility of the quarry operator. The status of threatened or endangered
49 species and cultural resources at this site is not known.

50
51 The DeAtley Quarry and surrounding basalt formation could supply an estimated basalt
52 bank volume of 7.6 million m³ (10 million yd³) from this 24-ha (60-ac) site (BHI 1995). This
53 translates to approximately 11.6 million m³ (15.2 million yd³) of loose riprap. The DeAtley Quarry
54 might not have sufficient reserves to supply the quantity of basalt required for construction of all
55 caps on the Hanford Site.

1 **D.2.3.10 Mahaffey Quarry.** The Mahaffey Quarry is privately owned and located on Clodfelter
2 Road about 5.5 km (3.4 mi) from the intersection of Clodfelter Road and Clearwater Avenue in
3 Kennewick, Washington. Quarry development would be the responsibility of the quarry operator.
4 The status of threatened or endangered species and cultural resources at this site is not known.
5

6 An area of 5.7 ha (14 ac) of the 16-ha (40-ac) quarry site is currently permitted for
7 operations at the Mahaffey Quarry. Total reserve estimates at this site are not known. Much of
8 the basalt is subsurface, with as much as 2.4 m (8 ft) of topsoil in places. The reserve estimate
9 for this site is assumed to be similar to that of the 24-ha (60-ac) DeAtley Quarry. The Mahaffey
10 Quarry may not have sufficient reserves to supply the quantity of basalt required for construction
11 of all caps on the Hanford Site.
12
13
14

Appendix E – Supplementary Information for Cumulative Impacts Analysis

This appendix summarizes potential cumulative impacts associated with Hanford Site land-use designations for each alternative identified in Chapter 3. Cumulative impacts result

... from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time . . . (40 CFR 1508.7).

Reasonably foreseeable actions are identified and the relationship between these actions and the proposed land-use designations is discussed. The description of potential cumulative impacts couples impacts of each alternative with impacts from past and existing operations at the Hanford Site and impacts that may be associated with anticipated future actions.

Cumulative impacts to land use associated with present and reasonably foreseeable actions are discussed in Chapter 5, Section 5.5.1. Section 5.5.2 discusses potential cumulative impacts to the resources identified in Section 5.2; and Sections 5.5.3 and 5.5.4 discuss cumulative socioeconomic impacts and cumulative human health risk, respectively.

E.1 Past, Present and Reasonably Foreseeable Future Actions at the Hanford Site

This section describes additional, past, present and reasonably foreseeable actions that might not be fully implemented yet at the Hanford Site where potential impacts have been identified.

E.1.1 Wahluke Slope

The current management of lands within the Wahluke Slope is comparable to Preservation and Conservation. No new actions are presently planned for the Wahluke Slope, and DOE anticipates that the present management would continue under the No-Action Alternative. However, adoption of the alternative selected in the U.S. Department of the Interior (DOI) Record of Decision (ROD) for the *Hanford Reach of the Columbia River Final Environmental Impact Statement for Comprehensive River Study* (DOI 1996) would designate the Wahluke Slope as a wildlife refuge. This DOI designation requires Congressional action and the wildlife refuge would be managed similarly to the Preservation designation used in this Final HCP EIS. There are two proposals currently under consideration in Congress. The primary differences between the proposals include the extent of the geographic scope (i.e., whether the Wahluke Slope is addressed or not), and the designation of the land manager (local versus Federal control).

The DOE Preferred Alternative and Alternative One would designate the Wahluke Slope as Preservation as an overlay National Wildlife Refuge. Alternatives Two, and Four would designate the area for Preservation. Alternative Three would designate a large portion of the area for Agriculture, with the smaller areas designated for Conservation and Preservation. Small areas would also be designated for recreational use (High- and/or Low-Intensity) under all alternatives except Alternative Two. High-Intensity Recreation and Agriculture would not be consistent with the alternative selected in the DOI ROD for the Hanford Reach.

1 To the extent that DOE retains control of the Wahluke Slope, future actions in the
2 Wahluke Slope would be consistent with the land-use designation adopted through the ROD for
3 this Final HCP EIS.

4 5 **E.1.2 Columbia River Corridor**

6
7 Present and reasonably foreseeable actions with the Columbia River include the
8 following actions:

- 9
10 • ***Hanford Reach of the Columbia River Final Environmental Impact***
11 ***Statement for Comprehensive River Record of Decision (DOI 1996)***: This
12 EIS addressed the need to protect the Hanford Reach as the last free-flowing,
13 nontidal stretch of the Columbia River in the United States. The ROD selected
14 the alternative that combined a Wild and Scenic River designation for the Hanford
15 Reach of the Columbia River and its immediate corridor with a National Wildlife
16 Refuge (NWR) designation for the Wahluke Slope (NPS 1994). Recreational
17 access points would be improved but not expanded, and additional facilities and
18 programs for visitor interpretation and education would be provided. Damming
19 and major dredging would be prohibited. Development of new industrial facilities
20 on the Hanford Site within the immediate river corridor would be curtailed. Other
21 DOE activities would be specifically allowed or be subject to review and approval.
22 The following potential impacts and benefits were identified (NPS 1994):
23
24 -- Prohibiting damming and dredging would ensure favorable conditions for
25 salmon to migrate and spawn; preserve biodiversity and sensitive species
26 by preventing disturbance of habitat; maintain the existing high water
27 quality by reducing siltation; minimize water temperature change and the
28 potential contaminant releases associated with dredging; and would
29 prevent inundation and disturbance of cultural resources.
30
31 -- Ongoing cultural resource inventories and surveys would maintain the
32 quality of historic and archaeological sites, identify new sites, and
33 document existing sites.
34
35 -- Restricting development would reduce river siltation and prevent
36 disturbance of cultural and paleontological resources.
37
38 -- Controlling exotic vegetation would prevent this vegetation from crowding
39 out native plants. Controlling nuisance aquatic macrophytes, such as
40 water milfoil, would reduce the impacts of these plants on water quality
41 and aquatic habitats. Revegetating disturbed areas with native plant
42 species would restore the diversity and abundance of native plant and
43 animal communities.
44
45 -- Prohibiting off-road vehicle use would prevent disturbance of riparian and
46 upland habitats and cultural resource sites.
47
48 -- Prohibiting grazing would minimize further damage to upland and riparian
49 habitats, but would impact tribal access for the purpose of grazing
50 animals and private citizens currently holding grazing permits.
51
52 -- Increasing river patrols would reduce the impacts of wildfires, littering, and
53 disturbance of rare plants, wildlife, and cultural resources.
54

1 – Conducting a study to examine sloughing of the White Bluffs and identifying
2 possible protective actions could lead to reduced sloughing, which would
3 benefit this important visual and paleontological resource. Measures to
4 reduce the sloughing of the White Bluffs could adversely impact current
5 irrigation practices on adjacent lands if irrigation is shown to contribute to
6 the sloughing.

7
8 -- The Hanford Reach Study Team intends that the Wild and Scenic River
9 designation would not impose constraints on Hanford Site remediation.
10 New construction would be prohibited within the designated boundaries,
11 with the exception of intakes and outfall structures and required facilities
12 related to remediation of the Hanford Site.

13
14 -- Habitat protection and restoration efforts would benefit recreational use and
15 access, as would increased river patrols and improvements in public
16 education efforts and recreational facilities.

17
18 In mandating the study in 1988, Congress provided interim protection of the
19 Hanford Reach by prohibiting development until November 1996. In 1996, Public
20 Law 104-333 extended this protection indefinitely. Activities such as damming or
21 dredging have been permanently prohibited. Congress must determine the further
22 disposition of the Hanford Reach study area through legislative action (NPS 1994).

- 23
24 • **Decommissioning of eight surplus production reactors:** An EIS was prepared to
25 address the potential environmental impacts, benefits and costs, and institutional and
26 programmatic needs associated with decommissioning the eight surplus production
27 reactors in this area (DOE 1992a). The ROD for this action was published in
28 58 FR 48509. The DOE decided on safe storage followed by deferred one-piece
29 removal as the preferred alternative. The DOE intends to complete this
30 decommissioning action consistent with the schedule for remedial action in the
31 *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement)
32 (Ecology et al. 1989). Therefore, the safe storage period would be for less than the
33 75-year time frame outlined in the Decommissioning of Eight Surplus Production
34 Reactors EIS. This action includes continuing surveillance, monitoring, and
35 maintenance, followed by transport of intact reactor blocks from the present locations
36 in the 100 Areas to the 200 West Area for disposal. Contaminated materials
37 associated with the fuel storage basins also would be disposed of in the 200 West
38 Area, along with contaminated equipment and components associated with the
39 reactors. Uncontaminated portions of the fuel storage basins would be removed to
40 provide access for machinery required to move the reactor blocks. Other
41 uncontaminated structures and equipment would be demolished and placed in landfills
42 in the vicinity of the reactor sites.

43
44 Occupational radiation doses associated with this action were estimated to be
45 approximately 51 person-rem, and short-term public radiation doses were estimated
46 to be near zero (DOE 1992a). Near-term ecological impacts were considered
47 minimal because of the existing disturbance from other radioactive waste
48 management activities and nuclear facility operations. The maximum number of
49 workers required at any time would be less than 100. Portions of the B Reactor may
50 be preserved for display in recognition of the cultural significance of the reactor.

51
52 Approximately 6 ha (15 ac) in the 200 Areas would be disturbed to accommodate
53 disposal of wastes resulting from decommissioning activities. This disturbance would
54 be partially offset by the 5 ha (13 ac) that would be available for revegetation in the

1 100 Areas after removal or dismantlement of the eight reactors. Additional habitat
2 disturbance would be required for construction of haul roads from the 100 Areas to the
3 200 Area that are capable of handling the movers required to transport the reactor
4 blocks.

- 5
6 • **Deactivation of the N Reactor:** An environmental assessment (EA) was prepared
7 to address all nonroutine activities associated with the shutdown of the 105-N Reactor
8 (N Reactor) (DOE 1995e); the finding of no significant impact (FONSI) was issued on
9 May 1, 1995. The EA identifies impacts associated with activities required to prepare
10 the reactor for decommissioning. No additional ground disturbance would be
11 anticipated from deactivation of the reactor. The maximum exposed individual (MEI) in
12 the offsite population would receive a dose less than 0.001 mrem/yr and the collective
13 dose to the population would be 0.025 person-rem. Deactivation would require
14 approximately 200 workers for three years, with only three workers required after
15 deactivation was complete.

16
17 These actions are consistent with and would enable the land-use designations under all
18 alternatives.

19 20 **E.1.3 Central Plateau**

21
22 Present and reasonably foreseeable actions in the 200 Areas include the following:

- 23
24 • **Office of River Protection:** The DOE has issued a ROD for an EIS that analyzed
25 alternatives for remediating the waste currently contained in the 177 single-storage
26 tanks (SSTs) and double-storage tanks (DSTs) in the 200 Areas and in about 60
27 active and inactive miscellaneous underground storage tanks, and providing for safe
28 storage and disposal of strontium and cesium capsules used in research projects at
29 Hanford Site and offsite locations (DOE and Ecology 1996). The EIS evaluated a
30 range of waste retrieval and removal and in-place remediation options for the SSTs
31 and DSTs. The ROD presented the selected alternative of phased implementation
32 and deferred the decision on disposition of cesium and strontium capsules (DOE
33 1997). Under phased implementation, tank wastes would continue to be stored until
34 the waste is retrieved in a demonstration phase (Phase I) to verify that treatment
35 processes will function effectively. After Phase I, the full-scale production phase
36 (Phase II) would be implemented. Potential impacts associated with this project
37 include worker exposures to radiological and hazardous constituents during waste
38 disposition and habitat disturbance.
- 39
40 • Worker exposures to hazardous and/or radioactive constituents were evaluated in the
41 EIS. It is estimated that health effects due to radiation exposure would include
42 approximately three latent cancer fatalities in operational workers over the life of the
43 project.

44
45 Approximately 138 ha (340 ac) of shrub-steppe habitat would be disturbed.

- 46
47 • **In 1997, DOE prepared a supplement analysis to determine if additional NEPA**
48 **review was required for a series of tank farm infrastructure upgrades (DOE-RL**
49 **1997a):** These upgrades focus on capital improvements necessary for continued
50 safe operation of DST facilities and selected SST facilities. Most of the activities
51 would involve replacing or upgrading existing systems. In May 1997, DOE determined
52 that the potential impacts of the project were adequately bounded by the analysis in
53 the Tank Waste Remediation System (TWRS) EIS; therefore, an additional *National*
54 *Environmental Policy Act of 1969* (NEPA) analysis was not required.

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- **Plutonium Finishing Plant stabilization:** The DOE has issued a final EIS addressing stabilization of the radioactive materials present in the Plutonium Finishing Plant (PFP) (DOE-RL 1996a). Potential impacts include worker exposure and radiological air emissions. All activities will take place within the facility. There will be no change in land use.
 - **Environmental Restoration Disposal Facility (ERDF):** The ERDF was constructed adjacent to the 200 Areas and started operation in August 1996. The facility provides for storage and disposal of waste generated during environmental restoration activities at the Hanford Site (EPA 1995b). The ERDF is the disposal facility for most of the waste excavated during remediation of waste management units at the Hanford Site. Waste generated from remediation of past-practice waste sites and CERCLA remedial activities is placed in the ERDF. The facility accepts only waste that originates on the Hanford Site, which includes dangerous waste, radioactive waste, and mixed waste. The ERDF will be expanded, as needed, ultimately covering as much as 4.1 km² (1.6 mi²) south of the 200 Areas. Initial construction involved 65 ha (165 ac) of this area. In August 1997, DOE, the U.S. Environmental Protection Agency (EPA), and Ecology proposed to expand the existing two operating cells of the ERDF by initiating construction of two additional cells (DOE-RL 1997b). This expansion would require an additional 28 ha (70 ac) within the original ERDF footprint. The original cells were constructed using a double-liner with a leachate collection and recovery system. The new cells would be constructed using the same design.

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Under current climate conditions, contaminants placed in the ERDF are expected to reach groundwater within 10,000 years. After 10,000 years, estimated human health risks are a maximum incremental lifetime cancer rate (ILCR) of 5×10^{-6} and a maximum hazard quotient for noncarcinogens of 0.2 (a hazard quotient of 1 or greater indicates a health concern). Ecological impacts will occur at the ERDF site and at quarries for materials to be used in the liner and cover. The shrub-steppe habitat at the ERDF site is considered priority habitat by the State of Washington and a number of Washington State monitored or candidate species may be affected by the ERDF. The estimated disturbed area ranges from 14 to 54 ha (35 to 133 ac) for the silt quarry (McGee Ranch). The total disturbed area at the actual ERDF site (including the trench, stockpiling areas, roads, and supporting facilities) is estimated to be 260 ha (640 ac), or approximately 2.6 km² (1 mi²). Significant cultural resources have not been identified at the ERDF site. Operation of the ERDF provides up to 167 full-time positions at the Hanford Site. The total estimated capital costs for the ERDF range from \$246 million to \$663 million. Visual and noise impacts of ERDF construction and operation are considered negligible.

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- **Programmatic Spent Nuclear Fuel Management:** The DOE developed the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Draft Environmental Impact Statement* (DOE 1994a) and issued the ROD (60 FR 28680). This decision establishes DOE policies for the environmentally safe transport, storage, and management of spent nuclear fuels. A large portion of the DOE-owned inventory of SNF is already stored at the Hanford Site, and the Hanford Site has been identified as a participant in the management of spent fuel. The selected alternative – regionalization of SNF storage by fuel type – requires management of defense production spent fuel at the Hanford Site and transport of other spent fuel currently stored at the Hanford Site to the INEEL.

1 An amendment to the ROD (61 FR 9441) was issued to the public on March 8, 1996,
2 to reflect modifications to the original decision resulting from a settlement agreement
3 reached by DOE, the State of Idaho, and the U.S. Department of the Navy. The
4 amended ROD indicates that only 12 of the originally planned 524 shipments of SNF
5 would be shipped from the Hanford Site to Idaho. These 12 shipments will consist of
6 the sodium-bonded FFTF fuel.
7

8 Land disturbance associated with this action at the Hanford Site is estimated at 7 ha
9 (18 ac) of shrub-steppe habitat west of the 200 East Area. Estimates of employment
10 required for construction activities range from 176 to 1,065 employees during the
11 years from 1997 to 2000. Operations would require 208 to 230 employees through
12 2004, with levels gradually declining to 50 to 60 workers beyond the year 2004. Many
13 of these employees would be drawn from the existing Hanford Site workforce.
14 Construction of the new facilities is not expected to have any significant impact on
15 cultural resources. Solid waste generation would be a maximum of 330 m³/yr
16 (11,654 ft³/yr), or approximately 4 percent of the 21,000 m³/yr (740,000 ft³/yr) currently
17 generated at the Hanford Site. The MEI in the general population would receive a dose
18 of 0.007 to 0.02 mrem/yr from waste-processing activities. Resource (e.g., materials,
19 fuels, and public funds) required to implement this action would overlap with the time
20 periods when the same type of resources would be required by remediation activities
21 at the Hanford Site.
22

- 23 • **Hanford Spent Nuclear Fuel Management:** A Hanford Site EIS was prepared to
24 tier from the ROD (60 Fed. Reg. 28680) for the *Department of Energy Programmatic*
25 *Spent Nuclear Fuel Management and Idaho National Engineering Laboratory*
26 *Environmental Restoration and Waste Management Programs Draft Environmental*
27 *Impact Statement* (DOE 1994a). The EIS analyzed the potential environmental
28 impacts of the removal of SNF from the K Basins and subsequent management of the
29 fuel for up to 40 years (DOE 1995d). The ROD for management of K Basin SNF was
30 issued on March 4, 1996 (61 FR 10736).
31

32 The ROD indicates that the Preferred Alternative identified and analyzed in the EIS,
33 with minor modifications, will be implemented. This alternative consists of removing
34 the SNF from the basins, vacuum drying, conditioning, and sealing the SNF in inert
35 gas-filled canisters for dry vault storage in a new facility to be built at Hanford for up to
36 40 years, pending decisions on ultimate disposition. The K Basins will continue to be
37 operated during the period over which the alternative is implemented. The action also
38 includes transfer of the basin sludge to Hanford DSTs for management, disposal of
39 non-SNF debris in a low-level burial ground at the Hanford Site, disposition of basin
40 water, and deactivation of the basins pending decommissioning. A total of 3.5 ha
41 (8.7 ac) of land and native vegetation would be disturbed or destroyed during
42 land-clearing activities to provide new facilities for this project.
43

- 44 • **200 Area Effluent Treatment Facility:** In 1992, DOE prepared an EA and FONSI
45 (DOE 1992b) that addressed environmental upgrades to liquid waste effluent
46 systems, including the 200 Area Effluent Treatment Facility, located near the 200 East
47 Area. This facility provides effluent treatment and disposal capability required to
48 restart the 242-A Evaporator, which reduces tank waste volume by removing process
49 condensate. The Effluent Treatment Facility provides for effluent collection, a
50 treatment system to reduce the concentration of hazardous and radioactive waste
51 constituents in the effluent streams to acceptable levels, tanks to allow verification of
52 effluent characteristics before discharge, and a state-approved land disposal structure
53 (SALDS) for effluents. The SALDS infiltration gallery consists of a 35- by 61-m
54 (116- by 200-ft) rectangular drain field that is located north of the 200 West Area.

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2 Environmental impacts associated with this project include habitat destruction
3 associated with the construction of the treatment facility, transfer piping, and the
4 SALDS; and the discharge of small quantities of contaminants to the ground through
5 the SALDS. In particular, the discharge of tritiated streams is of concern, but because
6 of the relatively short half-life of tritium (12.3 years), the long residence time of the
7 effluent in the groundwater could be expected to be sufficient to attenuate the tritium
8 before it reaches the Columbia River.
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- 11 • **Operation of Low-Level Burial Grounds:** The low-level burial grounds located in
12 the 200 West and 200 East Areas are an active, permitted RCRA landfill and cover a
13 total area of 225 ha (556 ac). The landfill is divided into eight burial grounds and each
14 burial ground consists of a number of trenches that contain, or will contain, low-level
15 radioactive and mixed waste. Six burial grounds are located in the 200 West Area and
16 two burial grounds are located in the 200 East Area. Impacts associated with
17 operation of the burial grounds include habitat disturbance or loss and the potential for
18 generation of fugitive dust.

19 The DOE recently decided to widen one of the trenches in the 218-W-5 Low-Level
20 Burial Ground to accommodate large, packaged low level waste, and to facilitate
21 segregation of low-level waste.
22

- 23 • **Operation of the U.S. Ecology, Inc. Commercial Low-Level Radioactive Waste
24 Landfill for offsite commercial waste:** U.S. Ecology, Inc., operates a radioactive
25 waste landfill that accepts commercially generated low-level wastes from states
26 included in the Northwest low-level radioactive waste compact. U.S. Ecology, Inc.,
27 accepted 2,191 m³ (77,418 ft³) of naturally occurring wastes and 5,801 m³
28 (204,981 ft³) of low-level radioactive wastes in 1995 (TCH 1996b). The U.S. Ecology,
29 Inc., landfill is located directly east of the ERDF landfill. Habitat disturbance is the
30 primary impact associated with the facility. In February 1997, the Washington State
31 Departments of Health and Ecology determined that an EIS must be prepared under
32 SEPA before the state can make several key environmental decisions regarding this
33 site. These decisions include approval of a site closure plan, renewal of the operating
34 license, and an amendment to the regulations limiting the receipt of naturally occurring
35 and accelerator-generated radioactive materials. Public scoping took place through
36 March 27, 1997, and the draft EIS is currently in preparation.
37

- 38 • **Solid Waste Retrieval Complex, Enhanced Radioactive and Mixed Waste
39 Storage Facility, infrastructure upgrades, and Central Waste Support Complex:**
40 The DOE prepared an EA addressing several waste management projects in the
41 200 Areas (DOE-RL 1995b). A FONSI was issued on September 28, 1995, that
42 addressed the construction of the solid waste retrieval complex, an enhanced
43 radioactive and mixed waste storage facility, infrastructure upgrades, and a Central
44 Waste Support Complex. These projects will be undertaken in the 200 West Area and
45 involve approximately 36 ha (89 ac), or about 5 percent of the 777 ha (1,920 ac) in the
46 200 West Area. Most activities will occur in previously disturbed areas. The waste
47 storage facility, however, will be constructed on relatively undisturbed land, resulting in
48 an incremental loss of shrub-steppe habitat essential for species such as the
49 loggerhead shrike and sage sparrow.
50

51 Discharges of nonradioactive liquid effluents could incrementally increase discharges
52 of nonradioactive effluents in the 200 Areas by 43,000 m³ gal (11 million gal), which
53 would comprise approximately 2 percent of the total discharge. This additional volume
54 is not expected to produce any discernable mounding of the groundwater. Changes in

1 the movement of underground contaminant plumes also are not expected.

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3 Implementation of the proposed action would not be expected to produce a cumulative
4 socioeconomic impact, and discernable changes in the radiation dose to offsite
5 receptors would not be expected.

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- 8 • **Tank 241-C-106 sluicing and waste removal:** This project addresses the need to
9 retrieve the high-heat waste in SST 241-C-106 and transfer the waste to DST
10 241-AY-102. The DOE has identified a need to take this action to eliminate safety
11 concerns with the storage of high-heat waste in Tank 241-C-106, and to demonstrate
12 a tank waste retrieval technology. The removal of the waste would stabilize this tank
13 and eliminate the need to add cooling water. An EA (DOE 1994b) and FONSI were
14 issued in February 1995.

15 Tank 241-C-106, which is located in the 200 East Area, has a 31-cm (10-in) -thick
16 dished bottom, and a useable waste depth of approximately 4.8 m (16 ft) at the
17 sidewall. The waste in Tank 241-C-106 consists of 746,000 L (197,000 gal) of sludge
18 that is stratified into two layers. The top layer consists of 655,000 L (173,000 gal) of
19 sludge, containing a sufficient amount of strontium to be considered high-heat waste,
20 which generates approximately 32 kW of heat. The bottom layer consists of 91,000 L
21 (24,000 gal) of low-heat producing hardened material.

22
23 The high-heat waste will be sluiced from Tank 241-C-106 to a DST through a
24 double-encased (pipe-in-pipe design), bermed line. The system will be a closed loop,
25 continuous sluicing process. The scope of the project is to remove 75 percent, at a
26 minimum, of the high-heat waste. Sluicing of underground storage tanks involves
27 introducing a high-volume, low-pressure stream of liquid to mobilize underground
28 storage tank sludge waste before pumping the tank contents. Impacts associated
29 with this action are potential worker exposure concerns.

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- 32 • **Disposal of decommissioned, defueled cruiser, Los Angeles Class, and Ohio**
33 **Class naval reactor plants:** This final EIS, prepared by the U.S. Navy, evaluates the
34 potential impacts of disposing of approximately 100 defueled reactor plants from
35 decommissioned naval vessels (Navy 1996). The ROD was published in the *Federal*
36 *Register* on August 9, 1996. The selected alternative is to dismantle the vessels at
37 the Puget Sound Naval Shipyard and transport the reactor plants, by barge, to the low-
38 level burial grounds at the Hanford Site. The DOE was a cooperating agency in the
39 preparation of this EIS.
 - 40 • **Plutonium-Uranium Extraction Plant (PUREX)/Uranium Trioxide Plant**
41 **shutdown:** In 1993, DOE directed Westinghouse Hanford Company to terminate
42 operations at the PUREX Plant and provided guidance to proceed with shutdown
43 planning and terminal clean-out activities. This direction also covered the Uranium
44 Trioxide Plant at completion of the pending shutdown campaign. An EA addressing
45 transfer of the irradiated fuel from PUREX and the N Reactor irradiated fuel for storage
46 at the 105-KE and 105-KW Fuel Storage Basins was prepared (DOE 1995e) and a
47 FONSI was approved on July 12, 1995. The FONSI identified that unprocessed
48 irradiated fuel would be transported from the PUREX Plant and the 105-N Reactor to
49 the 105-KE and 105-KW fuel storage basins in the 100 K Area; the fuel would be
50 placed in storage at the K Basins and eventually would be dispositioned in the same
51 manner as the other existing irradiated fuel inventory stored in the K Basins. A
52 maximum of three railcar shipments of fuel would be made; two fuel shipments from
53 the PUREX Plant and one from the N Reactor would be shipped to the K basins,
54 unloaded, and stored with the existing fuel. The PUREX fuel removal action has been

1 completed. The 100-N Basin cleanout was completed in 1998.

2
3 These activities are consistent with the Industrial-Exclusive designation for the 200 Areas
4 under all alternatives.

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6 **E.1.4 All Other Areas**
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8 Present and reasonably foreseeable actions in other Hanford areas include the following:
9

- 10 • **Construction and operation of a Laser Interferometer Gravitational-Wave**
11 **Observatory (LIGO) on the Hanford Site:** An EA was prepared by the National
12 Science Foundation for construction and operation of a LIGO (NSF 1993), and
13 a FONSI was issued in December 1993. The LIGO site occupies approximately
14 6 km² (2.3 mi²), including a support facility at the vertex of two 4-km (2.5-mi) arms,
15 mid- and end-station buildings along the arms, service roads, parking areas and
16 construction laydown areas. Service roads, running the length of the 4-km (2.5-mi)
17 arms, fragment habitat that exists at the site. The facility will accommodate 10 to 20
18 permanent staff, with an additional 10 visiting scientists. The LIGO is currently
19 operating.
20

21 The LIGO is located in an area designated for Research and Development in the
22 Preferred Alternative and Alternatives Two and Three, and Conservation in
23 Alternatives One and Four. The LIGO represents a use that is consistent with
24 Research and Development and Industrial use designations.
25

- 26 • **Environmental Molecular Sciences Laboratory (EMSL):** A FONSI for the EMSL
27 EA (DOE 1990b) was issued in 1992. The EMSL would consist of an 18,500-m²
28 (200,000-ft²) building originally proposed for siting on a 12-ha (30-ac) site located near
29 the Columbia River, in the southeast portion of the Hanford Site. On the second day
30 of construction, April 12, 1994, construction crews uncovered human remains thought
31 to be those of American Indians. The DOE immediately halted construction and
32 proposed, consistent with the wishes of local American Indian tribes and with the spirit
33 of the *Native American Graves Protection and Repatriation Act of 1990* and the
34 *American Indian Religious Freedom Act of 1978*, to relocate the site of the facility.
35 Another EA was prepared to address re-siting the facility (DOE 1994c) in the south
36 part of the 300 Area; the FONSI was approved in July 1994. Construction of the facility
37 was recently completed at the new site. Approximately 200 to 250 employees are
38 located at the EMSL, including permanent staff and visiting scientists.
39

40 The EMSL is within an area designated for Industrial development under all
41 alternatives. The EMSL represents a use pattern that is consistent with this
42 designation.
43

- 44 • **Inert/Demolition Waste Landfill (Pit 9):** An EA was prepared for the proposal to
45 construct a waste landfill (Pit 9) to accommodate inert and demolition waste for the
46 Hanford Site (DOE 1995g). The DOE identified a need for convenient and economic
47 disposal capacity of these types of waste to support the decommissioning activities
48 planned for the southern areas of the Hanford Site. The current demolition waste
49 landfill, Pit 10, located approximately 25 m (82 ft) west of Route 4S, reached full
50 capacity in 1995. The projected decommissioning activities on the Hanford Site will
51 continue for up to 20 years; therefore, a replacement demolition landfill is required in
52 the near-term. The DOE proposed to use an existing alluvial gravel pit – Pit 9 – as a
53 new inert and demolition waste landfill for the Hanford Site. Pit 9 is located
54 approximately 3 km (1.9 mi) north of the 300 Area, in the 600 Area. Based on current

1 disposal projections, Pit 9 will be available for inert waste for 20 years. The FONSI for
2 this action was approved May 15, 1995, and Pit 9 has been open and operational
3 since approximately July 1995. Impacts associated with this action include minor
4 habitat disturbances.
5

6 Pit 9 is located within an area that is designated for Conservation under the Preferred
7 Alternative and Alternative Three, and this activity is consistent with this designation.
8 However, Alternatives One, Two, and Four designate the location of Pit 9 for
9 Preservation, which is not consistent with the current use of Pit 9 as an
10 inert/demolition waste landfill.
11

- 12 • ***Programmatic Environmental Impact Statement for Accomplishing Expanded
13 Civilian Nuclear Energy Research and Development and Isotope Production
14 Missions in the United States, Including the Role of the Fast Flux Test Facility***
15 (DOE/EIS-0310): The 400 Area, located southeast of the 200 East Area, is the site of
16 the Fast Flux Test Facility (FFTF). The FFTF is a 400 megawatt thermal, liquid metal
17 (sodium-cooled) nuclear research test reactor that was constructed in the late 1970s
18 and operated from 1982 to 1992. Although not designed nor operated as a breeder
19 reactor, the FFTF operated during these years as a national research facility for the
20 Liquid Metal Fast Breeder Reactor Program to test advanced nuclear fuels, materials,
21 components, systems, nuclear operating and maintenance procedures, and active
22 and passive safety technologies. The reactor was also used to produce a large
23 number of different isotopes for medical and industrial users, generate tritium for the
24 United States fusion research program, and conduct cooperative, international
25 research.
26

27 In December 1993, the FFTF was shutdown due largely at that time from
28 determinations that the facility could not continue to operate economically. In
29 April 1995, defueling was completed and usable fuel is stored on site in fuel storage
30 vessels or in the secure vault at the Plutonium Finishing Plant at the Hanford Site.
31 Unusable spent nuclear fuel (SNF) has been thoroughly washed to remove all sodium
32 residuals, dried, and placed in approved, 50-year Interim Storage Casks on the
33 400 Area Interim Storage Area pad. In November 1995, the reactor was placed in
34 standby mode with the main cooling system operating at approximately 200°C (400°F)
35 to keep the sodium coolant liquid and circulating to maintain DOE's option to restart
36 and operate the reactor in the future. Essential systems, staffing, and support
37 services are being maintained in a manner that will support either timely restart or
38 deactivation of the FFTF. In January 1997, the Secretary of Energy officially directed
39 that the FFTF be maintained in a standby condition while an evaluation was conducted
40 of any future role the facility might have in the DOE's national tritium production
41 strategy. In December 1998, the Secretary determined that the FFTF would not play a
42 role in the nation's tritium production strategy.
43

44 In May 1999, the Secretary announced that DOE would ask the Pacific Northwest
45 National Laboratory (PNNL) to complete a 90-day study that would resolve outstanding
46 informational needs for the FFTF. Results of this study were completed and
47 documented in a program scoping plan presented by PNNL to the DOE in early
48 August 1999. As a result of this study, the Secretary decided, on August 18, 1999,
49 that DOE would conduct a programmatic *National Environmental Policy Act* (NEPA)
50 review, including an Environmental Impact Statement (EIS), evaluating the potential
51 environmental impacts associated with proposed expansion of infrastructure,
52 including the possible role of the FFTF, for civilian nuclear energy research and
53 development activities; production of isotopes for medical, research, and industrial
54 uses; and production of plutonium-238 for use in advanced radioisotope power
55 systems for future National Aeronautic and Space Administration (NASA) space

1 missions. The Notice of Intent for this programmatic EIS is planned for publication in
2 the *Federal Register* on September 15, 1999. The Final EIS (FEIS) is planned for
3 completion in the Fall of 2000; a Record of Decision utilizing the NEPA review,
4 including the FEIS, is planned by December 2000.

6 ***E.1.5 Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve).***

8 No new actions are currently planned for the ALE Reserve. To ensure that the ALE
9 Reserve's natural resources would be protected, the U.S. Fish and Wildlife Service (USFWS)
10 manages the ALE Reserve for DOE. This management is comparable to a land-use designation
11 of Preservation, as defined in this Final HCP EIS.

13 The ALE Reserve is primarily designated for Preservation under all alternatives, except
14 Alternative Three, which designates the ALE Reserve for Conservation (Mining). The Preferred
15 Alternative and Alternative Four also include areas designated for Conservation (Mining). These
16 areas would accommodate the potential for development of a quarry. Land-use designations for
17 the ALE Reserve are consistent with anticipated future actions. The Conservation (Mining)
18 designation under Alternative Three would accommodate a greater range of uses throughout the
19 ALE Reserve. The impacts associated with this designation would be greater than for the
20 Preservation/Conservation (Mining) designation under the Preferred Alternative and Alternative
21 Four, or for the Preservation designation under Alternatives One and Two.

24 ***E.2 Other Potential Hanford Site Actions***

26 A number of other proposed actions at the Hanford Site are likely to be proposed and
27 evaluated in the future. Impacts of these projects cannot be considered in this analysis, because
28 impact analyses are not complete and decisions regarding implementation of a preferred action
29 have not been made. These projects may contribute to cumulative future impacts considered in
30 the HCP EIS. No additional actions that may affect cumulative impacts associated with the
31 Columbia River are proposed. However, actions in other Hanford areas may have indirect effects
32 on the river.

34 ***E.2.1 Central Plateau***

36 Actions that may contribute to cumulative impacts in the Central Plateau (200 Areas)
37 include the following.

- 39 • **Hanford Solid Waste EIS:** The DOE is considering preparation of an EIS to evaluate
40 alternatives for management of radioactive and hazardous wastes generated at the
41 Hanford Site or received at Hanford from offsite generators. The specific waste types
42 to be considered in the analysis include: low-level radioactive waste, mixed low-level
43 radioactive and hazardous waste, transuranic radioactive and mixed waste,
44 hazardous waste, and contaminated equipment and materials for reuse, recycle, or
45 disposal. The EIS would update NEPA analyses addressing ongoing activities,
46 implement associated waste management programmatic RODs, and facilitate site-
47 and program-specific decisions on the future operation of Hanford TSD facilities.

48 These activities are consistent with the Industrial-Exclusive land-use designation
49 proposed for the 200 Areas under all alternatives.
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51

1 **E.2.2 All Other Areas**
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3 Other actions that may contribute to cumulative impacts in the All Other Areas geographic
4 area of the Hanford Site include the *Bonneville Power Administration Transmission System*
5 *Vegetation Management Program Draft Environmental Impact Statement* (DOE/EIS-0285). This
6 DEIS establishes Planning Steps for managing vegetation across 24,000 km (15,000mi) of power
7 lines and 350 substations in the northwest and would determine the available vegetation control
8 techniques, herbicides used, and acceptable biological impacts.. The Draft EIS was issued
9 August, 1999 and public comment is open until October 9,1999.

10
11 An EIS DOE prepared on the disposition of the United States inventory of weapons
12 useable surplus plutonium examined reasonable alternatives and potential environmental impacts
13 for the proposed siting, construction, and operation of three types of facilities for plutonium
14 disposition and determined that Hanford's 400 Area was not a preferred site. The first was a
15 facility to disassemble and convert pits (a nuclear weapons component) into plutonium oxide
16 suitable for disposition. The facility would have been located at either the Hanford Site, INEEL,
17 Pantex Plant, or Savannah River Site (SRS). The second was a facility to immobilize surplus
18 plutonium in a glass or ceramic form for disposition in a geologic repository pursuant to the
19 Nuclear Waste Policy Act. The second facility would have been located at either the Hanford Site
20 or the SRS and included a collocated capability to convert nonpit plutonium materials into a form
21 suitable for immobilization. The third type of facility would have fabricated mixed oxide (MOX)
22 nuclear fuel from plutonium oxide. The MOX fuel fabrication facility would have been located at
23 either the Hanford Site, INEEL, Pantex Plant, or SRS. All of these proposed missions and the
24 *Tritium Supply and Recycling Programmatic Environmental Impact Statement* went to the SRS.
25
26

27 **E.3 Past, Present and Reasonably Foreseeable Actions Adjacent to the**
28 **Hanford Site**
29

30 No major actions have been identified outside the Hanford Site boundary that would
31 significantly contribute to environmental impacts of the proposed action. The Siemens Power
32 Corporation currently operates six waste water lagoons to dispose of approximately
33 95,000 kg/day (25,000 gal/day) of effluent containing fluoride, nitrates, and minor amounts of
34 radionuclides. This discharge is not considered during the analysis of cumulative environmental
35 impacts, however, because the facility recently initiated a program to switch to a dry
36 manufacturing system that will eliminate the waste stream. Siemens will complete conversion to
37 the dry manufacturing system by 1998 and will phase out the use of lagoons completely by the
38 year 2004 (TCH 1996b).
39

40 In 1996, DOE prepared an EA to address the transport of up to 5,120 m³ (6,696 yd³) of
41 contact-handled low-level mixed waste from the Hanford Site to the Allied Technology Group
42 (ATG) private gasification and vitrification building in Richland, Washington, for treatment (DOE-
43 RL 1996). Treated waste would be returned to the Hanford Site for disposal. The waste would
44 be staged to the ATG facility over a 10-year period. The building is on a 18.2 ha (45 ac) ATG site
45 adjacent to ATG's licensed low-level waste processing facility approximately 0.3 km (0.2 mi)
46 south of the 300 Area. The action by ATG is being undertaken as a private action in anticipation
47 of future work for a variety of contracts, including DOE. The ATG facility is located adjacent to the
48 Hanford Site boundary in an industrial area in the City of Richland. Effects of construction and
49 overall operation have been evaluated in an EIS under the SEPA which was issued on February
50 23, 1998.
51

52 City and county planning officials were consulted to assess other potential actions outside
53 the Hanford Site boundary. The actions identified are primarily road, bridge, and sewer system
54 improvements that are likely to have only minor impacts themselves and are limited compared to

1 the large scale of actions associated with the proposed future land-use objectives. Ongoing
2 economic and residential development in the region could contribute to cumulative
3 socioeconomic impacts. However, as discussed in Chapter 5, there is considerable uncertainty
4 associated with any analysis of such impacts, given available information on the scheduling of
5 potential actions at the Hanford Site.
6

7 Land-use planning efforts for areas outside of and surrounding the Hanford Site are
8 currently being undertaken by Benton, Franklin, and Grant counties; and by the City of Richland.
9 These planning efforts will establish land uses that will be permitted by local governments in
10 areas surrounding the Hanford Site. The City of Richland prepared a EIS under SEPA, finalized
11 on August 27, 1997, that identified an urban growth area involving Hanford Site land in the vicinity
12 of the 300 Area. A similar area, of varying size, is identified for Industrial use under all
13 alternatives. The City of Richland's Comprehensive Plan is consistent with current and proposed
14 future land uses at Hanford and DOE missions.
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2 **Appendix F — Revised Draft HRA-EIS Comment**
3 **Response Summary**
4
5

6 **F1.0 Introduction**

7
8 On April 23, 1999, the U.S. Department of Energy (DOE) issued the *Revised Draft*
9 *Hanford Remedial Action Environmental Impact Statement and Comprehensive Land-Use Plan*
10 (DOE/EIS-0222D) for review by Washington and Oregon state governments, Indian Tribes, other
11 Federal agencies, county and municipal governments, special-interest groups, environmental
12 groups, and the general public. The formal comment period ran for 45 days, from April 23, 1999
13 to June 7, 1999.

14
15 As part of the public comment process, DOE held four public hearings to receive
16 comments. These hearings were held in Portland, Oregon on May 18, 1999; Richland,
17 Washington on May 20, 1999; Mattawa, Washington on June 2, 1999; and Spokane, Washington
18 on June 3, 1999.

19
20 The DOE solicited public comment on a proposed name change for the document as well
21 as on the document itself. The DOE proposed changing the name of the EIS from the *Hanford*
22 *Remedial Action Environmental Impact Statement and Comprehensive Land-Use Plan* (HRA-
23 EIS) to a title that better reflects land use. The public endorsed this change and, in the Final EIS,
24 the name of the HRA-EIS has been changed to the *Hanford Comprehensive Land-Use Plan*
25 *Environmental Impact Statement* (HCP EIS).

26
27 The DOE received more than 400 comment documents on the Revised Draft HRA-EIS.
28 Comment documents included letters, postcards, questionnaires, and surveys as well as
29 electronic mail. Comment documents were received from tribes and Federal agencies,
30 Washington and Oregon state agencies, county and municipal governments, environmental
31 groups, and private citizens. In addition, more than 200 pages of transcripts were generated
32 during the public hearings.

33
34 Comments received on the Revised Draft HRA-EIS as well as the transcripts from the
35 public hearings are contained in a Final HCP EIS Comment Response Document which, in
36 addition to being sent to the EIS mailing list, is available for review in the DOE public reading
37 rooms. The Comment Response Document consists of three parts: 1) a summary of the major
38 topics raised by public comments received and DOE's generalized responses (also included as
39 Appendix F), 2) specific public comments and DOE's specific responses, and 3) a copy of each
40 public comment received by DOE on the Revised Draft HRA-EIS, and copies of the complete
41 transcripts from each of the four public hearings. Indices are provided in the Comment
42 Response Document to enable commenters to find their comments and DOE's responses.

43
44 The Final EIS is being transmitted to commenting agencies, made available to the public,
45 and filed with the Environmental Protection Agency (EPA). A DOE decision on proposed actions
46 would not be made earlier than 30 days after EPA publishes a Notice of Availability for the Final
47 EIS in the *Federal Register*. The DOE would record its decision as a publicly available Record of
48 Decision (ROD) published in the *Federal Register*.

49
50 **F1.1 Methodology**

51
52 The DOE considered all comments. Equal weight was given to spoken and written
53 comments, to comments received at the public hearings, and to comments received in other

1 ways. The comment period was not intended to solicit “votes” or “endorsements” regarding the
2 proposed action or any alternative analyzed. Rather, comments were reviewed for content and
3 relevance to the environmental analysis contained in the EIS.
4

5 Spoken comments presented at the public hearings were recorded by a court reporter
6 and a verbatim transcript produced (see transcripts at the end of this document). The written
7 comments and transcripts were reviewed and the major topics were identified. These major
8 topics are summarized below in Section F2.0 and repeated in the comment response document.
9 The summarized topics are followed by DOE’s generalized responses. The letter numbers are
10 indexed to the authors in the comment response document, but not in this Appendix.
11
12

13 ***F2.0 Major Topics (Summarized) and DOE’s Responses***

14
15 The DOE considered all comments received on the Revised Draft HRA-EIS. Many of the
16 comments supported particular alternatives or a combination of alternatives, while others
17 addressed environmental issues, such as the value of wildlife habitat and the importance of
18 preserving habitat for plants and animals (including the diminishing population of salmon).
19 A significant number of comments addressed designating the Hanford Reach as a Wild and
20 Scenic River.
21

22 ***F2.1 Major Topics***

23
24 The major topics associated with the comments received on the Revised Draft HRA-EIS
25 are presented collectively in this section. Each major topic raised through the comment process
26 (including the number of comments supporting or opposed to a particular subject) is summarized
27 below, followed by DOE’s generalized response to the summarized comments and the numbers
28 (codes) of those who commented.
29

30 ***F2.1.1 No-Action Alternative***

31
32 Four letters commented on the No-Action Alternative. Two of the three opposed the lack
33 of planning in this alternative. One comment supported this alternative. One commenter
34 supported the No-Action Alternative if Alternative Three was not selected. (Total No-Action
35 Alternative = 4). RL075, RL291, RL322, RTM015
36

37 ***DOE’s Response:*** The No-Action Alternative does not provide for overall planning at the Hanford
38 Site. The DOE is required, under 42 USC 7274k (Public Law 104-201, Section 3153, *National*
39 *Defense Authorization Act for Fiscal Year 1997*), to develop a future-use plan for the Hanford Site.
40 The DOE policy is to support critical DOE missions, stimulate the economy, and protect the
41 environment. This land-use plan provides a means for coordinating planning and plan
42 implementation with Tribal governments and local jurisdictions, as well as facilitating site and
43 infrastructure transition and privatization activities.
44

45 ***F2.1.2 DOE’s Preferred Alternative***

46
47 Numerous people offered comment on the DOE’s Preferred Alternative in the Revised
48 Draft HRA-EIS, with 27 letters in favor of the alternative, and 6 opposed. Many of the supporting
49 letters favored some modification of the alternative to further protect the environment, while those
50 opposing this alternative did so because of lack of economic development (specifically in Grant
51 County), and putting the Wahluke Slope under Federal control. Two of these specifically
52 expressed support of the B Reactor museum. Several expressed that this was the most
53 balanced of the alternatives, providing both development and protection. (Total DOE’s Preferred
54 Alternative = 33). RE028, RL024, RL025, RL032, RL039, RL098, RL106, RL120, RL121, RL181,

1 RL205, RL228, RL244, RL291, RL306, RL319, RL322, RL361, RL381, RL440, RL445, RLM002,
2 RLR002, RLR004, RTM008, RTM010, RTM011, RTP011, RTR001, RTR014, RTR021, RTS003,
3 RTS010
4

5 **DOE's Response:** The DOE has modified its Preferred Alternative in the Final HCP EIS in
6 response to these comments. The DOE believes that its new modified Preferred Alternative
7 gives the same balanced approach to future land development and protection of the environment
8 as did the DOE's Preferred Alternative in the Revised Draft HRA-EIS, while supporting the DOE
9 missions of Environmental Management (otherwise known as the "cleanup mission") and
10 science and technology at the Hanford Site. The B Reactor museum is retained in DOE's
11 Preferred Alternative in the Final HCP EIS. This alternative supports economic development on a
12 regional level, and protects the environment by placing a large portion of the Hanford Site under
13 management of the U.S. Fish and Wildlife Service (USFWS) as an overlay wildlife refuge.
14

15 **F2.1.3 Alternative One**

16
17 Alternative One was the subject of 15 letters, with 14 in favor of this alternative and
18 1 opposed. Those in favor were particularly interested in the emphasis on preservation and the
19 additional protection that it provides for high value or sensitive ecological areas on the Hanford
20 Site, and the prohibition against agriculture, mining, grazing, and intensive recreational use that
21 would compromise the ecological and wildlife values presented. They felt the DOE's Preferred
22 Alternative as presented in the Revised Draft HRA-EIS did not go far enough in furthering this
23 goal. A desire to further protect the unique shrub-steppe habitat was also expressed. The
24 opposing letter expressed the need for some economic development, in addition to some
25 environmental protection. (Total Alternative One = 15). RL003, RL222, RL282, RL283, RL291,
26 RL322, RL340, RL352, RL439, RL445, RTP001, RTP011, RTR014, RTR015, RTR018
27

28 **DOE's Response:** While Alternative One does meet the goal of environmental protection, it
29 does not fulfill all of DOE's missions. These include planning for continuation of the primary
30 missions of the site and planning for future economic development. In response to public
31 comment, DOE has eliminated grazing and increased the area of preservation in its Preferred
32 Alternative in the Final HCP-EIS, while allowing industrial development on land used for, or
33 adjacent to, land already used for industrial-type functions. This supports the DOE mission of
34 Science and Technology. Mining areas are needed for the primary mission of the site, which is
35 Environmental Management (otherwise known as the "cleanup mission"). To the extent that a
36 significant portion of the Hanford Site can be shared with these two primary missions, these
37 areas would be placed under management of the USFWS, to be managed as an overlay wildlife
38 refuge.
39

40 **F2.1.4 Alternative Two**

41
42 Alternative Two was supported by 47 commenters, with 2 opposing the alternative. The
43 primary issue expressed in the supporting comments was the additional protection given to the
44 environment, particularly that afforded to the high value ecological areas and natural and sensitive
45 lands on the Hanford Site. Some commenters expressed the desire for even more protection of
46 the environment, citing this alternative as the one closest to total preservation and restoration of
47 the site. One commenter was supporting this alternative also because of the alternative's
48 support for the B Reactor museum. The two opposing commenters cited the lack of any areas
49 for economic development. (Total Alternative Two = 49). RE013, RL119, RL154, RL159, RL185,
50 RL226, RL230, RL264, RL270, RL283, RL286, RL287, RL288, RL291, RL295, RL296, RL309,
51 RL310, RL311, RL312, RL322, RL331, RL338, RL339, RL344, RL346, RL347, RL356, RL358,
52 RL445, RLS002, RLS003, RLS004, RTP007, RTP008, RTP013, OR014, RTR019, RTS013,
53 RTS016, RTS018, RTS002, RTS003, RTS004, S008, RTS009, RTS020, RTS022, RTS025
54

55 **DOE's Response:** While Alternative Two does meet the goal of environmental protection, it

1 does not meet DOE's desires. These include planning for continuation of the primary missions of
2 the site, and planning for future economic development. In response to public comment, DOE
3 has eliminated grazing and increased the area of preservation in its Preferred Alternative in the
4 Final HCP-EIS, while allowing industrial development on land used for, or adjacent to, land
5 already used for industrial-type functions. This supports the DOE mission of science and
6 technology. Mining areas are needed for the primary mission of the site, which is Environmental
7 Management (otherwise known as the "cleanup mission"). To the extent that a significant portion
8 of the Hanford Site can be shared with these two primary missions, these areas would be placed
9 under management of the USFWS, to be managed as an overlay wildlife refuge.

10 11 **F2.1.5 Alternative Three**

12
13 Alternative Three was discussed by 69 commenters, with 12 in opposition to the
14 alternative and 57 in favor. Commenters who supported this alternative cited the need for
15 economic development of the land in Grant County (by turning the land over to farming). These
16 commenters felt that to be fair, the land should be given back to the farmers from whom it was
17 taken to create the Hanford Site in the 1940s. A comment was also made that the property tax
18 that would have been collected by the county would have gone into schools for children. These
19 commenters believed that Alternative Three supports environmental protection goals, and is
20 balanced between environmental protection and economic development. They supported
21 Alternative Three as the alternative which best represented the Wahluke 2000 Plan. Those
22 opposed to Alternative Three expressed the need for protection of the shrub-steppe habitat, and
23 the concern that irrigation would undermine the White Bluffs. (Total Alternative Three = 69).
24 RE028, RL100, RL120, RL131, RL200, RL220, RL222, RL258, RL285, RL291, RL297, RL298,
25 RL301, RL305, RL307, RL314, RL322, RL329, RL330, RL332, RL333, RL335, RL336, RL337,
26 RL340, RL341, RL345, RL348, RL349, RL350, RL351, RL354, RL358, RL372, RL373, RL374,
27 RL375, RL381, RL384, RL436, RL437, RL441, RL442, RL447, RLM003, RTM001, RTM002,
28 RTM003, RTM004, RTM005, RTM006, RTM007, RTM009, RTM011, RTM012, RTM014, RTM015,
29 RTM016, RTM017, RTM019, RTM020, RTM021, RTP007, RTP008, RTP011, RTP013, RTR014,
30 RTS001, RTS005

31
32 **DOE's Response:** While Alternative Three does have some aspects of balance, there is no
33 area set aside that is large enough to support DOE's Science and Technology Mission which
34 includes site stewardship. Alternative Three does support DOE's mission to provide economic
35 growth, and provides for the current and future missions of DOE on the Hanford Site. In the
36 DOE's Preferred Alternative in the Final HCP-EIS, there is a balance of development and
37 environmental protection. In a regional context, the area is served by both land area for economic
38 development and future missions, and by protecting a large area of shrub-steppe habitat that
39 supports many wildlife species, and provides an outdoor lifestyle.

40 41 **F2.1.6 Alternative Four**

42
43 Seven comments were received regarding Alternative Four. Five were in favor, and two
44 were against this alternative. The commenters opposing Alternative Four expressed concern that
45 there was no economic development allowed, while those in support cited either the necessity of
46 using the McGee Ranch silt in the cleanup effort as a modification, or support for the large
47 amount of preservation in this alternative. (Total Alternative Four = 7). RL270, RL291, RL322,
48 RL438, RTP011, RTS003, RTS012

49
50 **DOE's Response:** While Alternative Four does meet the goal of environmental protection, it
51 does not meet DOE's desires. These include planning for continuation of the primary missions of
52 the site and planning for future economic development. In response to public comment, DOE
53 has eliminated grazing and increased the area of preservation in its Preferred Alternative in the
54 Final HCP-EIS, while allowing industrial development on land used for, or adjacent to, land
55 already used for industrial-type functions. This supports the DOE mission of science and

1 technology. Mining areas are needed for the primary mission of the site, which is Environmental
2 Management (otherwise known as the “cleanup mission”). To the extent that a significant portion
3 of the Hanford Site can be shared with these two primary missions, these areas would be placed
4 under management of the USFWS, to be managed as an overlay wildlife refuge.
5

6 ***F2.1.7 National Wildlife Refuge/DOE’s Preferred Alternative***

7
8 More than 300 commenters wrote concerning the DOE’s Preferred Alternative, with the
9 modification that a National Wildlife Refuge be created/expanded for additional protection of the
10 environment. Six commenters were against this combination, citing as their reasons the
11 USFWS’s lack of adequate resources to properly manage the land, and the DOE’s ignoring the
12 previous use in farming and future economic development. (Total Refuge/Preferred Alternative =
13 306). RE001, RE002, RE003, RE004, RE006, RE007, RE009, RE010, RE014, RE015, RE017,
14 RE019, RE021, RE026, RE029, RL002, RL005, RL006, RL007, RL008, RL009, RL010, RL011,
15 RL012, RL013, RL014, RL015, RL016, RL017, RL018, RL019, RL020, RL021, RL022, RL023,
16 RL026, RL027, RL028, RL029, RL030, RL033, RL034, RL035, RL036, RL037, RL040, RL041,
17 RL042, RL043, RL044, RL045, RL046, RL048, RL049, RL051, RL052, RL053, RL055, RL057,
18 RL058, RL059, RL060, RL062, RL064, RL065, RL066, RL067, RL068, RL069, RL071, RL072,
19 RL074, RL076, RL077, RL078, RL079, RL080, RL081, RL082, RL083, RL084, RL085, RL086,
20 RL087, RL089, RL090, RL091, RL092, RL093, RL094, RL095, RL096, RL099, RL100, RL101,
21 RL102, RL103, RL104, RL105, RL107, RL109, RL110, RL111, RL112, RL114, RL115, RL122,
22 RL123, RL124, RL125, RL127, RL128, RL129, RL130, RL132, RL133, RL134, RL135, RL136,
23 RL137, RL138, RL139, RL140, RL141, RL142, RL145, RL148, RL149, RL150, RL151, RL152,
24 RL153, RL156, RL157, RL158, RL160, RL161, RL162, RL163, RL164, RL165, RL167, RL168,
25 RL170, RL172, RL173, RL174, RL175, RL177, RL179, RL180, RL183, RL184, RL186, RL187,
26 RL188, RL189, RL190, RL191, RL192, RL193, RL194, RL195, RL196, RL197, RL198, RL203,
27 RL204, RL207, RL208, RL209, RL211, RL213, RL214, RL215, RL216, RL217, RL218, RL219,
28 RL220, RL223, RL224, RL225, RL227, RL228, RL229, RL231, RL236, RL238, RL240, RL241,
29 RL242, RL243, RL245, RL246, RL247, RL248, RL249, RL252, RL253, RL254, RL255, RL256,
30 RL257, RL261, RL262, RL266, RL267, RL268, RL269, RL271, RL272, RL273, RL274, RL275,
31 RL276, RL277, RL278, RL279, RL280, RL281, RL288, RL289, RL291, RL294, RL300, RL302,
32 RL314, RL315, RL316, RL320, RL321, RL323, RL326, RL327, RL340, RL342, RL352, RL353,
33 RL355, RL359, RL360, RL362, RL363, RL364, RL365, RL366, RL367, RL368, RL369, RL370,
34 RL376, RL377, RL378, RL379, RL380, RL382, RL383, RL443, RL444, RL445, RL448, RL450,
35 RL451, RLR001, RLR003, RLR005, RLR006, RLS005, RTM001, RTM004, RTM005, RTM007,
36 RTM010, RTP004, RTP006, RTP011, RTP012, RTR002, RTR005, RTR006, RTR007, RTR008,
37 RTR009, RTR010, RTR011, RTR012, RTR013, RTR014, RTR016, RTR019, RTR024, RTR026,
38 RTS001, RTS002, RTS003, RTS006, RTS007, RTS009, RTS014, RTS015, RTS016, RTS018,
39 RTS019, RTS020, RTS024
40

41 ***DOE’s Response:*** The DOE has proposed a Preferred Alternative in the Final HCP-EIS which
42 embraces this combination of economic development, future missions, and environmental
43 protection. The USFWS would be given the responsibility to manage the Wahluke Slope, the
44 Hanford Reach (including the islands outside of Benton County), McGee Ranch, the riverlands,
45 and the Arid Lands Ecology (ALE) Reserve as an overlay wildlife refuge, while DOE retains
46 ownership of the land.
47

48 ***F2.1.8 Other Combinations***

49
50 More than 100 comments expressed concern or support for parts of alternatives or
51 additional alternatives. A few commenters submitted alternative maps they had made
52 themselves for DOE’s consideration. Some commenters addressed specifically the issue of
53 local versus Federal control. A few supported an extension to the public comment period. Two
54 commenters suggested that additional mapping be done to better represent the wildlife population
55 picture. Others suggested that cleanup, not planning, be the focus of the mission at the Hanford

1 Site. These “other combinations” comments are summarized below. (Total Other Combo =
2 118). RE004, RE005, RE008, RE012, RE015, RE016, RE020, RE022, RE023, RE024, RE025,
3 RE027, RE030, RL001, RL031, RL038, RL047, RL054, RL056, RL070, RL073, RL097, RL108,
4 RL117, RL118, RL143, RL144, RL152, RL166, RL169, RL176, RL181, RL182, RL197, RL199,
5 RL200, RL201, RL202, RL205, RL206, RL210, RL226, RL230, RL232, RL234, RL235, RL237,
6 RL239, RL240, RL241, RL248, RL249, RL251, RL259, RL260, RL263, RL270, RL282, RL283,
7 RL284, RL285, RL289, RL290, RL297, RL298, RL299, RL301, RL303, RL304, RL305, RL306,
8 RL308, RL309, RL311, RL313, RL314, RL317, RL318, RL319, RL321, RL322, RL325, RL328,
9 RL329, RL330, RL332, RL333, RL334, RL335, RL336, RL337, RL341, RL344, RL345, RL347,
10 RL349, RL350, RL351, RL356, RL357, RL358, RL361, RL371, RL373, RL381, RL384, RLM001,
11 RLM002, RLP001, RLS001, RLS004, RTM003, RTM018, RTM021, RTP004, RTP006, RTP014,
12 RTR009

13
14 **Local Control vs. Federal Control.** Many commenters were concerned about the issue of local
15 control versus Federal control of the land that currently comprises the Hanford Site. Overall, 65
16 commenters cited this issue, with 37 preferring Federal control and 28 preferring local control.
17

18 **DOE’s Response:** The Federal government would likely retain control of the entire Hanford Site
19 for the next 50 years, during which time it would be managed by a Federal agency. The DOE has
20 proposed that the USFWS manage a large portion of the Hanford Site as an overlay wildlife
21 refuge, while the current ownership remains under Federal control. Therefore, the decision being
22 made at this time is not whether the Federal government is relinquishing ownership of the land,
23 but instead, the decision of how to manage the land until such time that the land is considered
24 surplus.
25

26 **Extension to the Public Comment Period.** Three commenters requested a longer comment
27 period.
28

29 **DOE’s Response:** The DOE carefully considered the appropriate comment period length and
30 came to the decision that the NEPA-required 45 days was adequate. This decision was based
31 on several factors. These include the extended public comment period for the original Draft EIS
32 in 1996, and the fact that this is a revised draft of a descoped document. From the time the first
33 draft was issued in August 1996, to April 1999, extensive work was done with the participation of
34 the nine cooperating agencies to prepare a Revised Draft EIS that demonstrated many
35 perspectives of the land-use decision at the Hanford Site. The alternatives developed
36 encompassed the values and goals of many diverse groups within the region.
37

38 **Prioritizing Cleanup.** Six commenters urged DOE to keep cleanup efforts as its top priority, and
39 not allow land-use planning questions to delay any of the cleanup work.
40

41 **DOE’s Response:** The DOE recognizes the cleanup work at Hanford as its primary mission
42 and it is that cleanup mission that is the reason to implement a land-use plan which does not
43 address individual cleanup sites, but looks at the entire Hanford Site instead.
44

45 **Customized Alternatives.** Approximately 100 letters cited support for parts of alternatives, or
46 the comment writer’s own alternative. By an overwhelming majority, the support for more
47 preservation was expressed, ranging from more protection of the entire Hanford Site, to support
48 for additional wildlife refuge land. The commenters supporting local control cited the need for
49 agriculture on the Wahluke Slope.
50

51 **DOE’s Response:** The DOE has modified its Preferred Alternative in the Final HCP-EIS in
52 response to these comments. The new Preferred Alternative embraces additional wildlife refuge
53 acreage, yet retains economic development, planning for potential future site missions, and
54 recreational opportunities on the Hanford Site.
55

1 **Wildlife Mapping.** Two commenters suggested that additional wildlife mapping be done to
2 several of the maps in the Revised Draft HRA-EIS, to more accurately reflect the Hanford Site's
3 current wildlife populations.
4

5 **DOE's Response:** The maps (figures) included in the Final HCP-EIS have been labeled with the
6 caveat that any wildlife population map cannot be completely accurate, since nesting and
7 burrowing sites vary from season to season and year to year.
8

9 **Wahluke 2000 Plan.** Ten commenters supported the Wahluke 2000 Plan as an alternative that
10 was not considered by the Revised Draft HRA-EIS. These commenters expressed concern that
11 even the land use described in Alternative Three was not as balanced as the Wahluke 2000 Plan.
12 The commenters also cited that the Wahluke 2000 Plan had already gone through a public
13 process.
14

15 **DOE's Response:** The DOE worked with the Grant and Franklin County Planning Departments
16 as cooperating agencies on preparation of the Revised Draft HRA-EIS and, subsequently, on
17 preparation of this Final HCP EIS. The basis for the Wahluke Slope planning was the Wahluke
18 2000 Plan, as it was sent to Mr. Ron Izatt, then Director of the Environmental Restoration Division
19 for the Department of Energy Richland Operations Office, on November 18, 1992, from Mr. Mark
20 Hedman, representing the Wahluke 2000 Committee. The only difference between the map
21 submitted then, and the map presented in Alternative Three of the Revised Draft HRA-EIS is the
22 inclusion of wetlands protection as required by state and Federal regulations.
23

24 **F2.1.9 Preservation**

25
26 Several commenters expressed their support for preservation of the Hanford Site. Fifty-
27 eight letters supported preservation in some aspect, although the amount of preservation cited
28 varied from the addition of the 200 West Area sagebrush, to preservation of the entire Hanford
29 Site. Many cited the Hanford Reach, the creation of a National Wildlife Refuge, McGee Ranch,
30 May Junction, the islands, the LIGO land (when LIGO is complete), Gable Mountain, Gable Butte,
31 and the sand dunes. Reasons cited were historical, ecological, cultural, biological, and
32 economic. Some commenters thought there was enough preservation already. (Total
33 Preservation = 58). RE018, RE020, RL004, RL016, RL029, RL040, RL050, RL061, RL063,
34 RL074, RL088, RL102, RL113, RL116, RL119, RL123, RL126, RL146, RL171, RL178, RL204,
35 RL206, RL212, RL243, RL250, RL265, RL282, RL283, RL288, RL289, RL291, RL299, RL302,
36 RL322, RL326, RL355, RL358, RL360, RL367, RL439, RL440, RL443, RL445, RLR001,
37 RLR003, RLR004, RTP005, RTP012, RTR015, RTR017, RTR018, RTR021, RTR022, RTR023,
38 RTR025, RTS008, RTS010, RTS019
39

40 **DOE's Response:** It is because of the need to protect the environment (e.g., meeting DOE's
41 policy as a Natural Resource Trustee), that acreage for preservation was considered a high
42 priority. Many of the plants and animals on the Hanford Site need large expanses of land to
43 survive. The DOE's Preferred Alternative in the Final HCP-EIS protects and preserves the
44 environment by placing a large portion of the Hanford Site under management of the USFWS as
45 an overlay wildlife refuge.
46

47 **F2.1.10 Conservation (Mining)**

48
49 Of the 149 commenters expressing a view on Conservation (Mining), only 11 felt that no
50 mining at all should be allowed on the Hanford Site. The overwhelming majority felt that some
51 mining could be allowed but only for the necessary materials for the cleanup of the Hanford Site.
52 Some suggested that mining areas should be reclaimed and transferred into the Refuge after the
53 cleanup mission. One commenter wanted the definition of mining in the Final HCP EIS to state
54 that no removal of ore bodies or extraction of precious minerals would be included in the mining
55 activity. Ten letters described specific areas that should not be mined (primarily the ALE

1 Reserve), while one commenter cited the need for McGee Ranch silt specifically for the cleanup
2 program. (Total Conservation [Mining] = 149). RE006, RE007, RE009, RE010, RE014, RE017,
3 RE019, RE020, RE021, RE026, RL002, RL009, RL014, RL027, RL042, RL051, RL068, RL076,
4 RL077, RL085, RL086, RL092, RL095, RL099, RL100, RL103, RL107, RL112, RL114, RL115,
5 RL120, RL121, RL124, RL125, RL136, RL139, RL141, RL148, RL149, RL154, RL155, RL162,
6 RL167, RL170, RL172, RL173, RL174, RL179, RL180, RL184, RL185, RL186, RL187, RL188,
7 RL189, RL190, RL191, RL192, RL196, RL197, RL203, RL206, RL207, RL213, RL217, RL220,
8 RL222, RL224, RL225, RL226, RL229, RL230, RL236, RL238, RL239, RL242, RL243, RL249,
9 RL252, RL253, RL254, RL255, RL256, RL261, RL262, RL266, RL271, RL273, RL274, RL275,
10 RL277, RL279, RL280, RL281, RL282, RL283, RL289, RL294, RL309, RL314, RL320, RL326,
11 RL327, RL338, RL339, RL340, RL342, RL343, RL344, RL346, RL355, RL360, RL362, RL366,
12 RL368, RL371, RL376, RL379, RL438, RL443, RL446, RL448, RL450, RL451, RLR003,
13 RLR004, RLR005, RLR006, RTP005, RTP006, RTP007, RTP008, RTP011, RTP012, RTR002,
14 RTR005, RTR006, RTR008, RTR012, RTR016, RTR019, RTR022, RTS002, RTS010, RTS013,
15 RTS016, RTS017, RTS018, RTS019

16
17 **DOE's Response:** The total Conservation acreage (Conservation [Mining and Grazing] and
18 Conservation [Mining]) in the DOE's Preferred Alternative in approximately the same in the Final
19 HCP-EIS as it was in the Revised Draft HRA-EIS. However, in response to public comment, the
20 definition of mining has been modified to clarify what type of mining might be allowed. The new
21 definition specifies that mining on the Hanford Site must first undergo a permit application
22 process to determine need, and that only governmental mining would be allowed. The DOE
23 needs mineral resources to adequately perform the cleanup mission, and the State of
24 Washington needs mining capability to maintain the state highway that runs through the Hanford
25 Site. DOE has just converted its first gravel pit near the river into a wetland as a reclamation
26 project and intends to complete some type of reclamation when finished at the major mining
27 areas. No commercial mining would be allowed on the Hanford Site. Big Bend Alberta Mining
28 Company, which currently holds mining rights on about 518 ha (1,280 ac) on the ALE Reserve, is
29 not under the control of DOE.
30

31 **F2.1.11 Conservation (Mining and Grazing)**

32
33 More than 200 commenters were against allowing any commercial grazing on the Hanford
34 Site. Many commenters cited grazing as being incompatible with wildlife protection. One
35 commenter specifically mentioned the adverse impact on the elk population if fences were put up
36 to contain livestock. The spreading of noxious weeds was also attributed to livestock grazing,
37 because hoofs tear up the delicate ground cover habitat. There was a concern for possible
38 plutonium contamination, and it was expressed that livestock grazed on the Hanford Site would
39 be bad perceptually for all of Washington State agriculture. Three commenters supported limited
40 grazing, or supported local control instead of this being a Federal decision. (Total Conservation
41 [Mining and Grazing] = 240). RE006, RE007, RE009, RE010, RE014, RE017, RE019, RE020,
42 RE021, RE023, RE026, RL002, RL004, RL005, RL006, RL007, RL008, RL009, RL012, RL013,
43 RL014, RL015, RL016, RL017, RL018, RL019, RL020, RL021, RL023, RL026, RL027, RL028,
44 RL029, RL032, RL034, RL036, RL037, RL038, RL039, RL040, RL041, RL042, RL043, RL045,
45 RL049, RL051, RL055, RL057, RL058, RL059, RL060, RL062, RL064, RL065, RL067, RL068,
46 RL072, RL074, RL076, RL077, RL084, RL085, RL086, RL087, RL092, RL095, RL099, RL100,
47 RL101, RL103, RL107, RL112, RL114, RL115, RL119, RL120, RL121, RL124, RL125, RL136,
48 RL139, RL140, RL141, RL145, RL148, RL149, RL153, RL154, RL157, RL158, RL161, RL163,
49 RL164, RL165, RL167, RL168, RL170, RL172, RL173, RL174, RL175, RL176, RL177, RL178,
50 RL179, RL180, RL181, RL184, RL185, RL186, RL187, RL188, RL189, RL190, RL191, RL192,
51 RL196, RL197, RL198, RL203, RL204, RL206, RL207, RL208, RL210, RL212, RL213, RL217,
52 RL218, RL219, RL220, RL224, RL225, RL226, RL227, RL229, RL230, RL236, RL238, RL239,
53 RL242, RL243, RL249, RL252, RL253, RL254, RL255, RL256, RL261, RL262, RL266, RL267,
54 RL268, RL269, RL271, RL273, RL274, RL275, RL277, RL279, RL280, RL281, RL282, RL283,
55 RL288, RL289, RL292, RL293, RL294, RL296, RL302, RL309, RL312, RL314, RL320, RL326,

1 RL327, RL338, RL339, RL340, RL342, RL343, RL344, RL346, RL355, RL356, RL360, RL362,
2 RL366, RL368, RL369, RL371, RL376, RL379, RL383, RL438, RL439, RL443, RL445, RL448,
3 RL449, RL450, RL451, RLR001, RLR003, RLR004, RLR005, RLR006, RLS002, RLS005,
4 RTP004, RTP005, RTP006, RTP007, RTP008, RTP010, RTP011, RTP012, RTP013, RTR002,
5 RTR003, RTR004, RTR005, RTR006, RTR007, RTR008, RTR010, RTR011, RTR012, RTR014,
6 RTR016, RTR019, RTR022, RTS002, RTS010, RTS013, RTS016, RTS017, RTS018, RTS019
7

8 **DOE's Response:** In response to the strong public sentiment on this issue, DOE has eliminated
9 grazing from its Preferred Alternative in the Final HCP-EIS. In doing so, DOE considered the
10 effects of grazing on the wildlife habitat, including the potential for the spread of noxious weeds
11 when livestock hooves damage the ground cover. The land-use definition of Conservation
12 (Mining and Grazing) was included in DOE's Preferred Alternative in the Revised Draft HRA-EIS
13 to accommodate a grazing permit granted by the State of Washington for the Wahluke State
14 Wildlife Recreation Area. The state allowed this permit to expire on December 31, 1998.
15

16 **F2.1.12 Low-Intensity Recreation**

17
18 Twenty-five letters addressed Low-Intensity Recreation on the Hanford Site. Eight
19 commenters supported boat launches. Four of these supported a boat launch only at Vernita and
20 not at White Bluffs, while four supported a boat launch at both locations (although one stated the
21 boat launch at White Bluffs should be moved downstream of the White Bluffs townsite). Seven
22 commenters opposed a boat launch at White Bluffs, citing the need to minimize damage to the
23 bluffs. Two commenters opposed recreation of any type on the Hanford Site. Several expressed
24 the view that only non-motorized vehicles or recreation be allowed on constructed trails. Several
25 others supported access for limited recreation citing, as examples, camp sites for paddlers and
26 access for kayakers and rafters. (Total Low-Intensity Recreation = 25). RL104, RL120, RL154,
27 RL159, RL181, RL185, RL204, RL206, RL222, RL225, RL230, RL242, RL243, RL249, RL296,
28 RL314, RL346, RL355, RL360, RL438, RL440, RLR004, RTP010, RTR006, RTS019
29

30 **DOE's Response:** When the cooperating agencies looked at expanding recreational
31 opportunities along the Columbia River (e.g., boat launches at Vernita and the White Bluffs), two
32 resources areas – biological and cultural – were always scrutinized. The White Bluffs boat
33 launch has cultural significance that would be best preserved by continued operation of the old
34 ferry launches on both sides of the river. Further, establishing a new boat launch would most
35 likely impact existing tribal cultural resources. The two Hanford avian species that are currently
36 protected under the *Environmental Species Act* (ESA) have been placed in the delisting process
37 and will be removed in one to two years. Those Hanford species left on the ESA are three fishes
38 that could be impacted by installation of a new boat ramp near the Vernita Bridge. This type of
39 balancing between resource protection issues and greater access to those resources is why
40 advice from the Site Planning Advisory Board (SPAB) (see Chapter 6) would be so valuable to
41 DOE.
42

43 **F2.1.13 High-Intensity Recreation**

44
45 Thirty-two comments were received regarding High-Intensity Recreation. Twelve were
46 opposed to this land-use designation, while of the twenty in favor, most were in support of the
47 B Reactor museum proposal. One commenter supporting the designation disagreed with closing
48 off recreational opportunities (river access, for example) for 50 years, while another letter
49 expressed support for recreational opportunities in general. One letter expressed the view that no
50 High-Intensity Recreation should be allowed. (Total High-Intensity Recreation = 32). RL042,
51 RL147, RL159, RL170, RL179, RL185, RL204, RL206, RL221, RL225, RL242, RL243, RL249,
52 RL266, RL282, RL314, RL339, RL342, RL344, RL346, RL355, RL440, RL445, RTM009,
53 RTP003, RTP005, RTP007, RTP010, RTP011, RTR001, RTR006, RTS019, RE028, RL046,
54 RL185, RL201, RL204, RL206, RL230, RL288, RL296, RL314, RL343, RL347, RL360, RL445,
55 RTR012

1 **DOE's Response:** One of the assumptions DOE used in developing its Preferred Alternative
2 was that the public would support preservation of the Manhattan Project's historical legacy
3 consistent with the B Reactor Museum Association's proposal. The public validated this
4 assumption by supporting the B Reactor Museum proposal during the public comment period on
5 the Revised Draft HRA-EIS. The B Reactor would be designated High-Intensity Recreation to
6 allow tourism of the Federally registered landmark. The High-Intensity Recreation area near
7 Vernita Bridge (where the current Washington State rest stop is located) would be expanded
8 across State Highway 240 and to the south to include a boat ramp and other visitor-serving
9 facilities. Because of DOE Environmental Restoration operational concerns, a boat dock at the
10 B Reactor would not be permitted until the Environmental Restoration activities were completed.
11 However, upon completion of the ER efforts, the B Reactor Museum Association could apply for
12 the appropriate permits to construct a boat dock. Rail access to the site would not be hindered
13 by DOE's Preferred Alternative because the extant rail lines are considered pre-existing
14 nonconformances.

15 16 **F2.1.14 Research and Development**

17
18 Letters received on this land-use designation cited the need for restricting or prohibiting
19 Research and Development. Two letters expressed the view that this land use would be too
20 costly and too speculative at this time. Suggestions to limit Research and Development to the
21 300 Area, LIGO, and FFTF were made. One commenter discussed the need for the EIS to
22 distinguish between large-scale R&D and smaller scale, time-limited activities that would, by their
23 nature, consume less resources. (Total Research and Development = 15). RE028, RL046,
24 RL185, RL201, RL204, RL206, RL230, RL288, RL296, RL343, RL347, RL360, RL445, RTR012
25

26 **DOE's Response:** The DOE considered the need for Research and Development land use on
27 the Hanford Site and included in its Preferred Alternative in the Final HCP EIS an appropriate
28 amount of acreage to provide for any potential future missions for the Hanford Site as well as
29 economic development. The Research and Development land-use areas in the HCP EIS are
30 adjacent to, or on areas currently used for activities similar to, or the same as potential future
31 uses. This land-use designation reflects the DOE mission of science and technology as well as
32 economic development.

33 34 **F2.1.15 Industrial**

35
36 Thirty-five commenters addressed the Industrial land-use designation. Some
37 recommended limiting industrial development to the 300 Area and 1100 Area, or areas near the
38 Tri-Cities, which could support the industry with infrastructure. One commenter suggested that a
39 corridor from Energy Northwest (formerly WPPSS) south to the 300 Area. Some expressed that
40 timing was important, that cleanup proceed first, then development, and that existing high-density
41 industrial areas should be filled up first, before expanding land use. One commenter made it
42 clear that industrial development occur only where a documented need exists. A few commenters
43 were against any further industrial development on the Hanford Site. (Total Industrial = 35).
44 RE023, RL174, RL179, RL181, RL204, RL206, RL225, RL230, RL233, RL242, RL249, RL288,
45 RL289, RL314, RL319, RL320, RL322, RL326, RL342, RL343, RL344, RL349, RL355, RL358,
46 RL360, RL443, RL445, RLR001, RTM008, RTP001, RTP005, RTR006, RTR010, RTR011,
47 RTR012

48
49 **DOE's Response:** The need for the Industrial land-use designation is to support the DOE
50 missions of science and technology and Environmental Management (i.e., the cleanup mission).
51 The industrial areas would not be developed at the expense of the cleanup mission, in either
52 budget or schedule. The land designated as Industrial would be developed only with a strategy
53 that embraces development along with the infrastructure to support it.

54 55 **F2.1.16 Industrial-Exclusive**

1 Several commenters stated that the Industrial-Exclusive use area as shown in the
2 Revised Draft Preferred Alternative should be reconfigured to represent what was shown for
3 Industrial-Exclusive in Alternatives One and Two. Specifically, they felt the small western
4 extension of the 200 Areas should be Preservation. (Total Industrial-Exclusive = 9). RL174,
5 RL179, RL204, RL206, RL314, RL343, RL344, RL445, RTR006
6

7 **DOE's Response:** Preservation was only applied if there was some combination of exceptional
8 resource values (e.g., biological, cultural, and edaphic). This approach allowed Preservation to
9 be applied to the saline vernal pools, the sodic soil greasewood community, the sand dune
10 dependent Indian rice grass community, and other location dependent communities. Still, not all
11 areas with exceptional vegetational structure (e.g., the 200 West Area sagebrush stands) are
12 considered appropriate of the Preservation designation. The presence of sagebrush in the 200
13 Areas could interfere with DOE's conducting one of its primary missions and there is no
14 combination of values that would elevate the 200 Area sagebrush into a Preservation designation.
15

16 **F2.1.17 Agriculture**

17
18 Over 200 commenters addressed Agriculture as a land use. More than 180 were
19 opposed to any agriculture on the Hanford Site, citing the possible endangering of the health of
20 the Columbia River from irrigation runoff, the potential damage to the White Bluffs from irrigation,
21 the need for preservation of the shrub-steppe habitat for wildlife, and the possibility that agriculture
22 on the Hanford Site would be bad, perceptually, for all Washington State agriculture. The 20
23 letters in support of agriculture cited the need to support world food production, schools (with the
24 resultant taxes), and the rural area in Grant County in need of economic growth. (Total
25 Agriculture = 202). RE004, RE006, RE014, RE017, RE019, RE020, RE021, RE023, RE026,
26 RE029, RL004, RL005, RL006, RL007, RL008, RL012, RL013, RL015, RL016, RL017, RL018,
27 RL019, RL020, RL021, RL023, RL025, RL026, RL028, RL029, RL032, RL034, RL036, RL037,
28 RL038, RL039, RL040, RL041, RL042, RL043, RL044, RL045, RL049, RL055, RL056, RL057,
29 RL058, RL059, RL060, RL062, RL064, RL065, RL067, RL070, RL072, RL074, RL076, RL077,
30 RL084, RL086, RL090, RL092, RL094, RL095, RL099, RL101, RL107, RL112, RL114, RL115,
31 RL117, RL121, RL125, RL131, RL136, RL139, RL140, RL142, RL145, RL148, RL153, RL156,
32 RL157, RL158, RL159, RL161, RL162, RL163, RL164, RL168, RL174, RL175, RL176, RL178,
33 RL179, RL180, RL181, RL182, RL185, RL186, RL187, RL188, RL189, RL190, RL191, RL192,
34 RL194, RL196, RL198, RL206, RL208, RL210, RL212, RL213, RL217, RL218, RL219, RL221,
35 RL223, RL224, RL225, RL227, RL229, RL230, RL236, RL238, RL239, RL242, RL243, RL250,
36 RL252, RL253, RL254, RL255, RL258, RL261, RL266, RL269, RL271, RL280, RL283, RL284,
37 RL289, RL307, RL312, RL314, RL320, RL321, RL326, RL327, RL330, RL339, RL340, RL342,
38 RL343, RL346, RL355, RL356, RL362, RL363, RL369, RL371, RL376, RL379, RL384, RL439,
39 RL451, RLM003, RLR001, RLS005, RTM001, RTM002, RTM004, RTM005, RTM007, RTM009,
40 RTM010, RTM013, RTM015, RTM017, RTM019, RTP003, RTP004, RTP008, RTP011, RTR002,
41 RTR003, RTR004, RTR011, RTR012, RTR013, RTR014, RTR016, RTR018, RTR019, RTR020,
42 RTR024, RTS007, RTS011, RTS013, RTS017, RTS018, RTS019
43

44 **DOE's Response:** In its Preferred Alternative in the Final HCP EIS, DOE would preclude any
45 agriculture on the Hanford Site. In keeping with its policy as a Natural Resource Trustee, DOE
46 has placed entire Wahluke Slope under management of the USFWS as an overlay wildlife refuge.
47
48

49 **F2.1.18 Policy**

50
51 Forty-one letters relating to policy were received. Half of these addressed the payment in
52 lieu of taxes (PILT), expressing that future payments should be based on lost opportunity instead
53 of current use, and that these payments are important to providing equal educational opportunity
54 to the children of Grant County. Two commenters wanted to add to the Policy Statement in
55 Chapter 6 regarding protection and preservation of environmental resources. One commenter

1 wanted the *Hanford Strategic Plan* to go out for public review. One commenter wanted it noted
2 that there are groundwater and basaltic problems in the area by the river. One commenter
3 expressed a concern that land-use planning should not be used to drive cleanup standards.
4 Another commenter wanted DOE to remain open to the idea of bartering as a way to reach
5 agreement on land use. A summary of comments received under the “policy” category are listed
6 below. (Total Policy = 41). RL154, RL204, RL233, RL297, RL298, RL301, RL303, RL307,
7 RL329, RL332, RL333, RL335, RL336, RL337, RL350, RL351, RL441, RL445, RL447, RLM003,
8 RTM001, RTM004, RTM005, RTM006, RTM010, RTM011, RTM012, RTM016, RTM017, RTM020,
9 RTP001, RTP002, RTP003, RTP009, RTR012, RTS004, RTS006, RTS009, RTS012, RTS022,
10 RTS023

11
12 **PILT Payments.** Twenty letters were received addressing the payment of PILT to Grant County.
13 Fourteen of these cited the need to base future PILT payments on lost opportunity instead of
14 current land use. The remaining 6 letters cited the need for Grant County to receive PILT and the
15 importance of PILT to schools. One commenter cited the preference for opportunity, instead of
16 entitlement.

17
18 **DOE’s Response:** Because DOE has chosen to work with the USFWS to manage the
19 proposed wildlife refuge as an “overlay refuge,” DOE would retain land ownership which, in turn,
20 would maximize the PILT payments to the affected counties. (The DOE pays about 10 times
21 what DOI pays.)

22
23 The Grant County Assessor determined the value of developed farmland by computing the
24 average assessed value per acre for personal property, improvements, and land and trees, to
25 arrive at a total average of \$3,091.67. Personal property includes farm machinery and
26 equipment, including above ground irrigation systems. Improvements include the value of
27 farmhouses and farm buildings, including sheds, warehouses, cold storage, etc. Land includes
28 the value of land, plus underground irrigation systems. Trees include the value of orchards,
29 vineyards, etc. In addition, the assumption was made that 33,000 acres, or 94 percent of the
30 irrigable or previously irrigated land under DOE control in Grant County would be developed
31 farmland to arrive at a total estimated taxable value of \$102 million.

32
33 One commenter said he believes there is an inequality since DOE only pays PILT based upon
34 the value of land (\$1,225 an acre for irrigable land) and does not include additional values listed
35 above. This commenter’s computation of PILT does not comply with DOE’s PILT policies and is
36 not equitable, considering DOE uses very little of the services provided by the County. If the land
37 were transferred, individuals living on and farming the land would require significantly more
38 services by the County, the additional cost of which would probably be more than the additional
39 taxes, collected. The assumption that 33,000 acres would be developed is an aggressive one.
40 The Grant County Assessor has assumed only 27,000 acres would be developed farmland. The
41 same conditions are set forth in signed intergovernmental agreements with Benton and Franklin
42 Counties and PILT is being consistently applied.

43
44 **Continuation of Cleanup.** Five commenters reiterated the need for continuation of the cleanup
45 mission.

46
47 **DOE’s Response:** The DOE considers the cleanup mission at Hanford to be its primary
48 mission, and the land-use planning effort is complementary to and not in conflict with that
49 mission. In fact, the land-use plan would facilitate the cleanup mission.

50
51 **Human Health and Safety.** Commenters cited the need to consider human health and safety,
52 since parts of the Hanford Site would be contaminated for a long time, if not forever.

53
54 **DOE’s Response:** The DOE has taken into consideration that cleanup would take years to
55 complete to an acceptable level. This land-use plan would enable regulators to set cleanup

1 standards to levels commensurate with the land use planned at each cleanup site.

2
3 **Environmental Justice:** Some commenters stated that DOE did not adequately address the
4 Environmental Justice impact caused by not expanding farming opportunities on the Wahluke
5 Slope to Hispanic agricultural workers.

6
7 **DOE's Response:** On February 11, 1994, the President issued Executive Order 12898
8 (59 Fed. Reg. 7629, 1994), *Federal Actions to Address Environmental Justice in Minority*
9 *Populations and Low-Income Populations*. This Executive Order directs each Federal agency to
10 make environmental justice part of the agency mission. To the greatest extent practicable and
11 permitted by law, Federal agencies must identify and address disproportionately high and
12 adverse human health or environmental effects of their programs, policies, and activities on
13 minority populations and low-income populations.

14
15 As stated in the President's February 11, 1994 memorandum that accompanied the Executive
16 Order, "Each Federal agency shall analyze the environmental effects, including human health,
17 economic, and social effects, of Federal actions, including effects on minority communities and
18 low-income communities, when such analysis is required by NEPA (42 USC Section 4321,
19 et seq.). Mitigation measures outlined or analyzed in an environmental assessment,
20 environmental impact statement, or record of decision, whenever feasible, should address
21 significant and adverse environmental effects of proposed Federal actions on minority
22 communities and low-income communities." The memorandum and Executive Order ensure
23 that minority and low-income communities will have a voice in the development and
24 implementation of any Federal action that might adversely affect those communities.

25
26 In addition, the memorandum and Executive Order indicate that all Federal agencies are to be
27 proactive in identifying and, to the extent practicable, mitigating any potential disproportionately
28 high and adverse impacts on minority and low-income communities that could result from
29 proposed Federal actions.

30
31 In order to implement the provisions of Executive Order 12898, the *U.S. Department of Energy*
32 *Environmental Justice Strategy, Executive Order 12898* (DOE 1995a) was prepared. Guidance
33 provided in this publication, as well as CEQ's *Environmental Justice Guidance under NEPA*
34 (March 1998), and EPA's *Guidance for Incorporating Environmental Justice Concerns in EPA's*
35 *NEPA Compliance Analyses* (April 1998) were used, to the extent practicable, in the Revised
36 Draft HRA-EIS.

37
38 Because the proposed action for the Wahluke Slope is Preservation, there would no impacts to
39 the Hispanic population because no changes would be made to the current use of the lands.
40 Preservation is consistent with the wishes of the two Tribal Nations who served as consulting
41 Tribal governments for this EIS, and who represent the minority and low-income communities
42 who would be most directly affected by the proposed Federal action.

43 44 **F2.1.19 Procedure**

45
46 Several letters had comments regarding membership of the Site Planning Advisory Board
47 (SPAB). The SPAB could be established upon adoption of the Comprehensive Land-Use Plan in
48 the HCP EIS Record of Decision. The inclusion of equal seats for: 1) each Tribe as a sovereign
49 nation, 2) regulators, 3) the National Marine Fisheries Service, 4) the National Science
50 Foundation, and 5) the Washington State Department of Ecology; and less seats for the counties
51 were offered by six commenters as improvements to the SPAB membership as described in the
52 Revised Draft HRA-EIS (Chapter 6). Two commenters wanted the name of the document
53 changed to better reflect the emphasis on land-use planning. Several commenters expressed
54 the opinion that the Secretary of Energy's announcement in April 1999 of the Revised Draft's
55 Preferred Alternative prejudiced the outcome. One commenter noted that cultural reviews should

1 be prepared before land use is designated. One commenter would like the DOE to slow down
2 the decision, and one would like to speed up the decision. One commenter noted that all land-
3 use plans must support and preserve natural resources. A more detailed description of these
4 comments, along with DOE's responses, are listed below. (Total Procedure = 11). RL124,
5 RL154, RL204, RL290, RL292, RL293, RL446, RTM018, RTP013, RTP003, RTS004
6

7 **SPAB Membership.** Commenters cited concerns regarding membership of the SPAB.
8

9 **DOE's Response:** As presented in the Final HCP EIS, the makeup of the SPAB would be the
10 nine cooperating agencies that participated in the preparation of the Revised Draft HRA-EIS and
11 development of the land-use alternatives. However, membership is not necessarily fixed. As an
12 advisory board, the board would support DOE by reviewing and providing advice for Area
13 Management Plans and Resource Management Plans, providing policy advice to DOE in areas
14 involving coordination of land and resource management, and advising DOE during consideration
15 of nonconforming proposals within the boundary of the Hanford Site.
16

17 **Predecisional Announcement.** Some commenters felt the outcome of the public review had
18 been prejudiced by the Secretary of Energy's announcement in April 1999 of the DOE's Preferred
19 Alternative prior to the document being published and in the hands of the public.
20

21 **DOE's Response:** The Secretary's announcement is consistent with the NEPA process and
22 consistent with the DOE's Preferred Alternative. The DOE has indicated in previous drafts of the
23 EIS its support for the proposal to expand the wildlife refuge to include the entire Wahluke Slope
24 and management of the Wahluke Slope for Preservation. The Secretary's announcement
25 supported the DOE's Preferred Alternative proposed in the Revised Draft HRA-EIS. Management
26 of the entire Wahluke Slope for Preservation is consistent with the ROD for the DOI Hanford
27 Reach EIS issued in 1996.

28
29 The DOE has both the right and the responsibility under NEPA to identify the agency's Preferred
30 Alternative. Federal NEPA regulations under 40 CFR 1502.14(e) require the Agency to "...identify
31 the agency's preferred alternative or alternatives, if one of more exists, in the draft statement and
32 identify such alternative in the final statement unless another law prohibits the expression of such
33 as preference." The Secretary's announcement is consistent with the Preferred Alternative in the
34 Final HCP EIS.
35

36 The DOE does not believe that the Secretary's announcement has in any way prejudiced the
37 outcome of the HCP EIS or the development of the NEPA ROD. The DOE has repeatedly
38 expressed its support for management of the Wahluke Slope for Preservation, beginning in 1994
39 when the DOE concurred in the Hanford Reach EIS.
40

41 **Name Change:** Commenters wanted a name change for the document.
42

43 **DOE's Response:** During the public review and comment period on the Revised Draft HRA-EIS,
44 DOE solicited public input on a proposed name change for the EIS document to better reflect its
45 purpose. The DOE proposed changing the name from the *Hanford Remedial Action*
46 *Environmental Impact Statement and Comprehensive Land-Use Plan* (HRA-EIS) to the *Hanford*
47 *Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS). The public
48 supported this change, and in the Final EIS the name has been changed.
49

50 **Timing of the Decision:** The timing of the decision was commented on, both for speeding it up
51 and slowing it down.
52

53 **DOE's Response:** The DOE has several legal and policy drivers requiring the preparation of a
54 land-use plan. (Please see comment response under "No-Action Alternative").
55

1 **Cultural/Natural Resources Reviews:** Cultural reviews and natural resources should be taken
2 into account when land use is being planned.

3
4 **DOE's Response:** Both cultural reviews and natural resources have been, and would continue
5 to be taken into account when land-use decisions are made. The purpose of the SPAB is to
6 advise the DOE when land-use implementation is being considered.

7
8 **F2.1.20 Plan**

9
10 Eight letters addressed the comprehensive land-use plan. One of the commenters cited
11 concern that what appears to be “management by committee” is too risky. Another commenter
12 thanked DOE for keeping the process open. One commenter was glad that Hanford was
13 created, or there would not be all the land there is today available to preserve. One commenter
14 expressed that the time frame for land-use planning should be about seven generations out.
15 Another cited the lack of impacts described from industrial development. Two commenters were
16 concerned that the sensitivity of LIGO to noise and vibration from other activities at Hanford was
17 not adequately addressed. (Total Plan = 8). RL269, RL446, RTM015, RTR009, RTS013,
18 RTS020, RTS025, RTS026

19
20 **DOE's Response:** The CLUP is meant to be a living document that brings DOE into cooperative
21 planning with the local governments where possible, but also allows DOE to fulfill its Federal
22 missions. To make the CLUP a viable planning tool, DOE has proposed a SPAB that would
23 provide a forum for local governments to discuss their planning intentions and how Hanford might
24 fit in as a regional complex. The DOE's NEPA process suggests that EISs which establish land-
25 use plans be reviewed by the NEPA Compliance Officer for revisions on a five-year schedule. As
26 an advisory board, the SPAB would be able to tackle such issues as:

- 27
28 C The extreme sensitivity of the LIGO facilities to noise and vibration created by other
29 activities on the Hanford Site even though such activities may be at large distances
30 from LIGO.
31
32 C The Energy Northwest lease to continue WNP-2 for power production and also allow
33 for economic reuse of WNP 1 and 4.
34
35 C The 200 Areas where contaminated areas are also important wildlife habitat.
36
37 C How economic development should be coordinated, and where PILT payments fit into
38 the economic health of the region.
39

40 **F2.1.21 Public Involvement**

41
42 The DOE received 65 letters and testimonies related to the public involvement process for
43 the Revised Draft HRA-EIS. Specifically, these included comments on the “opportunity to
44 comment” (33), comments on the multiple public hearings (15), and comments on the quality of
45 the document and the work that went into preparing the document (24). A summary of the
46 comments received under this category is provided below. (Total Public Involvement = 65).
47 RE012, RE013, RE028, RL003, RL006, RL043, RL052, RL054, RL103, RL153, RL154, RL166,
48 RL178, RL179, RL185, RL200, RL204, RL205, RL206, RL225, RL228, RL230, RL234, RL270,
49 RL273, RL281, RL290, RL291, RL292, RL304, RL314, RL318, RL319, RL322, RL328, RL341,
50 RL342, RL344, RL345, RL349, RL355, RL361, RL381, RL443, RL445, RLM001, RTM012,
51 RTP001, RTP002, RTP004, RTP005, RTP006, RTP008, RTP010, RTR004, RTR006, RTR011,
52 RTR012, RTR013, RTR014, RTS009, RTS011, RTS015

53
54 **“Opportunity to Comment.”** Commenters thanked DOE for the opportunity to review and
55 comment on the document. All but one commenter was appreciative of the comment process,

1 including the consideration DOE was giving to the comments received, and for listening to the
2 public on this topic. One commenter was discouraged, citing the perception that the decision
3 had already been made.
4

5 **DOE's Response:** The Federal regulations for NEPA, 40 CFR 1500-1508, require DOE to make
6 an EIS available to the public for review and comment. The DOE has considered all comments
7 received on the Revised Draft HRA-EIS, and has made changes to its Preferred Alternative in the
8 Final HCP EIS based on public comments received.
9

10 **Multiple Public Hearings.** Commenters were appreciative of DOE holding public hearings both
11 in Richland, and outside of the Tri-Cities. One commenter pointed out that a hearing is required
12 by NEPA regulations. Commenters in Portland complimented the DOE for going outside
13 Washington State to listen to Oregon residents' concerns regarding "this profound and very
14 important issue." A Mattawa resident cited his appreciation for the DOE going to the location
15 where the issues are closest to the people. One Richland commenter said it was "refreshing" for
16 the DOE to listen.
17

18 **DOE's Response:** The Federal regulations for NEPA, 40 CFR 1503, require DOE to solicit
19 comments from those persons or organizations who may be interested or affected by the
20 decision.
21

22 **Document Quality/Preparation:** Commenters were complimentary about the quality of the
23 document and the amount of work that went into preparing the document. Citations included: "a
24 lot of progress has been made," "It was a tremendous amount of work. It took years to
25 accomplish," "give the DOE congratulations," "good work," "well researched and
26 comprehensive," "excellent research and enormous staff work," "good job of reaching out to the
27 community," "extensive and excellent qualitative evaluation and comparison," "thoughtful and
28 comprehensive," and "high quality assessment." These comments were directed at DOE and
29 the nine cooperating agencies who prepared the document. Commenters also were pleased that
30 DOE was addressing the land-use issue.
31

32 **DOE's Response:** A first draft of the HRA-EIS was published for public review in August 1996.
33 In response to comments received on that first draft, DOE worked with the cooperating agencies
34 and consulting Tribal governments to establish a framework for the environmental analyses and
35 the proposed CLUP policies and implementing procedures presented in this Final HCP EIS.
36 Substantial agreement was reached among the cooperating agencies and consulting Tribal
37 governments on the development of land-use designations, and on the format for determining the
38 potential environmental impacts associated with the land uses proposed in this EIS.
39

40 **F2.1.22 Salmon**

41
42 Several letters commented that the salmon need protection. Fifty-two letters were
43 received, all supporting protection of salmon and salmon habitat, supporting salmon recovery
44 efforts, and expressing concern for the dwindling salmon population, the health of the salmon and
45 the people who eat them, and restoration of the salmon runs. Some recommended that we do
46 everything in our power to protect and preserve the salmon and other anadromous fish. (Salmon
47 total = 52). RE005, RE015, RE017, RE021, RL003, RL014, RL025, RL044, RL063, RL069,
48 RL118, RL122, RL146, RL151, RL156, RL162, RL182, RL194, RL209, RL212, RL222, RL223,
49 RL246, RL251, RL261, RL266, RL268, RL284, RL299, RL321, RL324, RL338, RL347, RL356,
50 RL363, RL378, RLR001, RTP004, RTP007, RTP008, RTP012, RTR014, RTR018, RTS007,
51 RTS008, RTS009, RTS010, RTS012, RTS017, RTS018, RTS019, RTS021
52

53 **DOE's Response:** The Hanford Site is home to some of the region's most unique natural
54 resources. In two years, the salmon will be the only endangered species on the Hanford Site.
55 (The Bald Eagle and the Peregrine Falcon have increased in population enough to be taken off

1 the Endangered Species List.) Salmon prime habitat is in the Columbia River in the Wahluke
2 Slope and along the Hanford Reach. The concern for the erosion of the White Bluffs into the river
3 is the silting of the gravel beds where the salmon spawn. This was a significant factor behind the
4 decision to disallow farming as a land use on the Wahluke Slope in the DOE's Preferred
5 Alternative in the Final HCP EIS.
6

7 **F2.1.23 Hanford Reach**

8

9 More than 100 letters were received supporting protection of the Hanford Reach. Most
10 letters cited the critical salmon spawning habitat, as well as the eagles and other wildlife that eat
11 the salmon. Some feel that the future of the entire Northwest depends on the cleanliness of the
12 river. Concern was expressed for the erosion of the White Bluffs, and the effects of orchard
13 growth on the spawning habitat. Although all commenters supported protection of the Reach,
14 three opposed Federal control to achieve that end. One commenter stated that DOE is
15 responsible for contaminating the Reach. (Total Hanford Reach = 109). RE002, RE013, RE015,
16 RE018, RE028, RL031, RL032, RL041, RL042, RL043, RL048, RL052, RL059, RL063, RL074,
17 RL084, RL114, RL116, RL117, RL132, RL133, RL142, RL146, RL154, RL160, RL162, RL177,
18 RL179, RL188, RL191, RL209, RL212, RL214, RL219, RL221, RL235, RL237, RL240, RL241,
19 RL244, RL251, RL262, RL265, RL266, RL268, RL272, RL278, RL281, RL284, RL288, RL291,
20 RL296, RL299, RL303, RL324, RL342, RL344, RL363, RL364, RL366, RL369, RL440, RL448,
21 RL449, RL450, RL451, RLR001, RLR004, RLR006, RTM006, RTM009, RTP001, RTP002,
22 RTP005, RTP006, RTP007, RTP008, RTP011, RTP012, RTR002, RTR004, RTR005, RTR006,
23 RTR008, RTR010, RTR011, RTR013, RTR014, RTR015, RTR016, RTR018, RTR020, RTR022,
24 RTR024, RTR026, RTS001, RTS003, RTS004, RTS007, RTS009, RTS010, RTS011, RTS012,
25 RTS013, RTS016, RTS017, RTS018, RTS019, RTS020
26

27 **DOE's Response:** The Hanford Reach is a valuable national resource, abundant in natural
28 beauty and home to a large biologically diverse wildlife. It is because of the intrinsic value of this
29 free-flowing section of the Columbia River and the area surrounding it that DOE has included the
30 Hanford Reach in the area placed under USFWS management as an overlay wildlife refuge.
31

32 **F2.1.24 Tribal Rights**

33

34 Several of the commenters expressed their concern that Tribal rights be honored
35 by DOE. Ten of the twenty-one commenters held firm that all Tribal rights must be supported.
36 Many of the letters also expressed support for the protection of cultural and religious sites from
37 disturbance. One commenter noted that Tribal rights would be protected by local control. One
38 commenter recommended working with the Yakama Indian Nation. One commenter supported
39 modifications to Alternative One to accommodate the needs of the Tribes. One commenter
40 noted that the land need not be given back to farmers since the land was originally stolen from the
41 Wanapum, Yakama, and Nez Perce. One commenter wished DOE had considered an option to
42 deed stewardship back to the Tribes. (Total Tribal Rights = 21). RE023, RL044, RL155, RL159,
43 RL168, RL267, RL291, RL292, RL293, RL354, RL356, RL358, RTP001, RTP002, RTP009,
44 RTP011, RTP013, RTS004, RTS006, RTS011, RTS013
45

46 **DOE's Response:** Tribal governments and DOE agree that the Tribal governments' treaty-
47 reserved right of taking fish at all "usual and accustomed" places applies to the Hanford Reach of
48 the Columbia River where it passes through Hanford, and that treaty rights are inalienable rights
49 exercised by tribal members.
50

51 Nevertheless, Tribal governments and DOE disagree over the applicability to the Hanford Site of
52 Tribal members, treaty-reserved rights to hunt, gather plants, and pasture livestock. Both the
53 Tribal governments and DOE can point to legal justification for their positions in this dispute. As
54 this dispute could take years to resolve, the Tribal governments who worked as consulting
55 agencies and DOE decided not to delay completion and implementation of a comprehensive

1 land-use plan for the Hanford Site while awaiting the resolution of this dispute. Instead, the Tribes
2 and DOE have gone ahead with the land-use planning process while reserving all rights to assert
3 their respective positions regarding treaty rights. Neither the existence of this EIS nor any portion
4 of its contents is intended to have any influence over the resolution of the treaty rights dispute.
5 There are too many instances where DOE and the Tribal governments agree that actions need to
6 be taken to protect Tribal interests where arguing over the legal bases of those interests would be
7 counterproductive to both parties.

8 9 **F2.1.25 Wild and Scenic River**

10 Of all the commenters addressing a Wild and Scenic River designation for the Columbia
11 River flowing through the Hanford Reach, 37 were in favor of the designation and 6 were
12 opposed. Some of the commenters noted that the designation must be made without delay, and
13 several noted that the river and riverbanks must be protected at all costs. Those opposed cited
14 that such a designation gives no assurance that the area would be managed to meet existing and
15 future local needs, such as water rights. (Total Wild and Scenic = 43). RL119, RL131, RL133,
16 RL134, RL147, RL168, RL182, RL185, RL204, RL206, RL230, RL235, RL240, RL241, RL248,
17 RL268, RL286, RL287, RL289, RL314, RL320, RL321, RL326, RL352, RL356, RL360, RL366,
18 RL440, RLR001, RLR003, RLR004, RTM015, RTP002, RTP003, RTP004, RTR019, RTS001,
19 RTS007, RTS008, RTS016, RTS017, RTS019, RTS024

20
21
22 **DOE's Response:** The *Wild and Scenic River Act of 1968*, as amended, protects selected
23 national rivers possessing outstanding scenic, recreational, geological, fish and wildlife, historical,
24 cultural, and other similar values. These rivers are to be preserved in a free flowing condition to
25 protect water quality and for other vital national conservation purposes. The Columbia River,
26 along the Hanford Reach, is a 52-mile-long, free-flowing section which is irreplaceable spawning
27 ground for salmon and other anadromous fish. This area, including the banks of the Columbia
28 River, exhibits a unique diversity of plant and animal life, and DOE is committed to protecting the
29 environment along this stretch of the river. However, the designation of the Hanford Reach
30 portion of the Columbia River as a Wild and Scenic River is not within DOE's authority. Public
31 Law 100-605, passed by Congress on November 4, 1988, authorizes a comprehensive study of
32 the Hanford Reach of the Columbia River to identify the outstanding features of the Hanford
33 Reach and its immediate environment, and to examine alternatives for their preservation. The
34 Secretary of the Interior has affirmed the addition of the Hanford Reach to the National Wild and
35 Scenic Rivers System and is waiting for Congressional action to implement the decision.

36 37 **F2.1.26 Habitat**

38
39 More than 70 commenters addressed wildlife habitat. Sixty-nine of the letters were in
40 favor of setting aside land for conservation and preservation of habitat, noting that the wildlife
41 needs our protection. Many of the commenters noted that the number of native species, plants,
42 animals, and native plant communities at Hanford; and the diversity and scale of the ecosystem
43 is unique in this area. Many of the commenters mentioned the valuable shrub-steppe habitat,
44 which is home to many species, including the sage sparrow, desert butterflies, and species of
45 snakes, other reptiles, and amphibians. It was noted that at least two new plants to science have
46 been discovered on the Hanford Site. Concern for the well-being of wildlife, plants, wildflowers,
47 and fish habitat was expressed. Some emphasized the need for large areas of land for the
48 wildlife, noting that if the land is fragmented, the wildlife cannot survive. Three commenters did
49 not support wildlife habitat, noting that it is only weeds, and that DOE should not support wildlife
50 over children's education. One of the opposing commenters noted that it is possible for wildlife to
51 coexist with farming and development. (Total Habitat = 72). RE006, RE012, RE015, RE017,
52 RE020, RE023, RL007, RL008, RL013, RL029, RL032, RL038, RL056, RL059, RL060, RL061,
53 RL063, RL067, RL070, RL086, RL087, RL103, RL114, RL123, RL139, RL146, RL158, RL161,
54 RL163, RL164, RL165, RL168, RL171, RL175, RL178, RL179, RL222, RL227, RL238, RL256,
55 RL257, RL261, RL267, RL268, RL272, RL276, RL278, RL288, RL291, RL314, RL326, RL338,

1 RL379, RL445, RL452, RLP001, RLR006, RTM002, RTM007, RTM009, RTP001, RTP007,
2 RTP008, RTP009, RTP011, RTP013, RTP014, RTR002, RTR023, RTS014, RTS017, RTS018
3

4 **DOE's Response:** The DOE recognizes the unique shrub-steppe ecosystem on the Hanford
5 Site, and the abundance of plant and animal life that flourish in the natural state of this area. It is
6 because of the need to protect the environment (meeting DOE's policy as a Natural Resource
7 Trustee), that acreage for preservation is considered a high priority. Many of the plants and
8 animals on the Hanford Site need large expanses of land to survive. The DOE's Preferred
9 Alternative in the Final HCP-EIS protects and preserves the environment by placing a large
10 portion of the Hanford Site under management of the USFWS as an overlay wildlife refuge.
11

12 **F2.1.27 Wahluke Slope**

13

14 The Wahluke Slope was the topic for many commenters. A total of 63 commenters cited
15 concerns regarding the Wahluke Slope. More than half (59 percent) were against any farming on
16 the Wahluke Slope. Ten supported farming for the area, particularly its suitability for irrigated
17 production. Seventeen commenters supported an impartial study of all of the potential uses of
18 the Wahluke Slope. (Total Wahluke Slope = 63). RE012, RE029, RL117, RL121, RL131, RL160,
19 RL161, RL163, RL179, RL204, RL221, RL222, RL250, RL268, RL283, RL288, RL297, RL298,
20 RL301, RL305, RL308, RL324, RL329, RL332, RL333, RL335, RL336, RL337, RL347, RL350,
21 RL351, RL352, RL363, RL441, RL447, RL450, RLM001, RTM005, RTM010, RTM011, RTM012,
22 RTM013, RTM014, RTM015, RTM020, RTP005, RTP006, RTP007, RTP008, RTR002, RTR006,
23 RTR009, RTR013, RTR014, RTS001, RTS002, RTS003, RTS007, RTS010, RTS011, RTS012,
24 RTS017, RTS021
25

26 **DOE's Response:** The DOE's Preferred Alternative in the Final HCP EIS would preclude
27 agricultural activities on the Hanford Site. The DOE has placed the entire Wahluke Slope under
28 the management of the USFWS as an overlay wildlife refuge, as the WDFW, the USFWS, and
29 the U.S. EPA support the designation of the entire Wahluke Slope for Preservation. The WDFW,
30 the USFWS, and DOE have recognized that the White Bluffs overlooking the Columbia River are
31 fragile and have been sloughing off into the Columbia River, in part due to irrigation runoff. Also,
32 the Wahluke Slope is the last remaining large and healthy shrub steppe ecosystem in the Pacific
33 Northwest, and the Hanford Reach is the last free-flowing section of the Columbia River. In
34 recognition of the fragility of the White Bluffs and the important ecological and cultural resources
35 of the Wahluke Slope and the Hanford Reach, DOE has, in its Preferred Alternative in the Final
36 HCP EIS, designated the entire Wahluke Slope for Preservation as an overlay wildlife refuge.
37

38 The DOE believes that further studies of the potential uses of the Wahluke Slope are not
39 warranted. The DOE believes that adequate studies have already been conducted to assess the
40 potential impacts of alternative uses of the Wahluke Slope. Potential environmental, cultural, and
41 socioeconomic impacts of alternative uses of the Wahluke Slope were assessed. Further
42 studies would essentially duplicate analyses already conducted for the Draft and Revised Draft
43 HRA-EIS and studies conducted by the National Park Service in support of the 1994 Hanford
44 Reach Environmental Impact Statement for the Comprehensive River Conservation Study
45 (referred to as the Hanford Reach EIS) and the ensuing 1996 DOI ROD. The Hanford Reach EIS
46 and ROD were Congressionally mandated to assess the outstanding features of the Hanford
47 Reach and its environs, including environmental and cultural values, and to examine alternatives
48 for preserving those values. The ROD concluded that, in order to protect the White Bluffs and
49 the cultural and ecological resources of the Wahluke Slope, the entire Wahluke Slope should be
50 managed as a wildlife refuge by the USFWS.
51

52 The DOE concurred in the 1994 DOI Hanford Reach EIS. Management of the Wahluke Slope for
53 Preservation as an overlay wildlife refuge under the Preferred Alternative is consistent with that
54 concurrence. The 1996 ROD for the Hanford Reach EIS precludes DOE from managing the
55 Wahluke Slope in a manner that would any adverse impacts on the values for which the Wahluke

1 Slope is under consideration for National Wildlife Refuge status.

2
3 **F2.1.28 Split Record of Decision**

4
5 Many commenters supported a split ROD to expedite the designation of a wildlife refuge
6 (i.e., without waiting for the cleanup to be completed). One hundred and eighty-six commenters
7 wrote concerning this issue. A few commented that they wanted the separate decision no later
8 than December 1999. (Total Split ROD = 186). RE002, RE003, RE009, RE010, RE019, RE021,
9 RE026, RL005, RL006, RL007, RL008, RL009, RL010, RL013, RL014, RL015, RL016, RL017,
10 RL018, RL019, RL022, RL023, RL027, RL033, RL034, RL035, RL037, RL041, RL042, RL048,
11 RL049, RL051, RL052, RL053, RL055, RL057, RL064, RL065, RL066, RL068, RL069, RL074,
12 RL076, RL078, RL079, RL080, RL081, RL082, RL083, RL084, RL085, RL087, RL089, RL092,
13 RL093, RL095, RL096, RL099, RL100, RL101, RL102, RL103, RL104, RL105, RL107, RL109,
14 RL112, RL115, RL125, RL127, RL128, RL129, RL130, RL132, RL133, RL134, RL135, RL136,
15 RL138, RL139, RL140, RL148, RL149, RL150, RL151, RL154, RL158, RL160, RL165, RL167,
16 RL172, RL174, RL177, RL179, RL184, RL185, RL187, RL189, RL191, RL192, RL193, RL194,
17 RL203, RL204, RL206, RL207, RL211, RL213, RL215, RL216, RL220, RL222, RL223, RL224,
18 RL225, RL228, RL230, RL231, RL236, RL239, RL242, RL243, RL245, RL246, RL247, RL249,
19 RL252, RL253, RL254, RL255, RL256, RL257, RL261, RL262, RL266, RL267, RL268, RL271,
20 RL273, RL274, RL275, RL276, RL277, RL280, RL281, RL282, RL294, RL309, RL312, RL314,
21 RL315, RL316, RL320, RL323, RL340, RL342, RL360, RL363, RL365, RL368, RL369, RL371,
22 RL376, RL377, RL378, RL379, RL380, RL382, RL448, RL450, RLR005, RLR006, RLS002,
23 RLS005, RTP004, RTP006, RTP008, RTP012, RTR005, RTR006, RTR008, RTR012, RTS014,
24 RTS018, RTS019, RTS020.

25
26 **DOE Response:** While the scope of the Final HCP-EIS covers land-use planning for the entire
27 Hanford Site, it defers the evaluation of impacts associated with individual remedial actions to Tri-
28 Party Agreement documents. The ROD for this Final HCP-EIS is scheduled to be published in
29 November 1999; therefore, no “separate” ROD needs to be published in order to expedite the
30 implementation of the Hanford Comprehensive Land-Use Plan.
31
32
33

DOE/EIS-0222-F



Final
Hanford Comprehensive Land-Use Plan
Environmental Impact Statements
September 1999

Because Web documents (due to HTML coding, etc.) are fundamentally different from printed documents, this internet version of the Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS) should not be considered the official Administrative Record document. The official record document is available for review and copying at the U.S. Department of Energy's (DOE's) local and Headquarters public reading rooms and DOE's Tri-Party Agreement Public Information Repositories:

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Cover Sheet

Lead Federal Agency: U.S. Department of Energy (DOE)

Cooperating Agencies: U.S. Department of the Interior (Bureau of Land Management, Bureau of Reclamation, and U.S. Fish and Wildlife Service); Benton, Franklin, and Grant counties; and the City of Richland, Washington

Consulting Tribal Governments: Nez Perce Tribe Department of Environmental Restoration and Waste Management and the Confederated Tribes of the Umatilla Indian Reservation

Title: *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS), Hanford Site, Richland, Washington

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For general information on DOE's *National Environmental Policy Act of 1969* (NEPA) process, call 1-800-472-2756 to leave a message, or contact: Carol Borgstrom, Director, Office of NEPA Policy and Assistance (EH-42), U.S. Department of Energy, 1000 Independence Avenue SW, Washington, D.C. 20585, (202) 586-4600.

Abstract: The DOE prepared this *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement* (HCP EIS) to evaluate the potential environmental impacts associated with implementing a comprehensive land-use plan for the Hanford Site for at least the next 50 years. With the exception of the required No-Action Alternative, each of the six alternatives presented represents a Tribal, Federal, state, or local agency's Preferred Alternative. Each alternative is presented separately. The DOE's Preferred Alternative anticipates multiple uses of the Hanford Site, including: consolidating Waste Management operations in the Central Plateau, allowing industrial development in the eastern and southern portions of the Site, increasing recreational access to the Columbia River, and expanding the Saddle Mountain National Wildlife Refuge to include all of the Wahluke Slope and ALE (managed by the U.S. Fish and Wildlife Service).

The Hanford Site occupies 1,517 square kilometers (km²) (586 square miles [mi²]) in southeastern Washington. Today, the Hanford Site has diverse missions associated with environmental restoration, Waste Management, and Science and Technology. These missions have resulted in the growing need for a comprehensive, long-term approach to planning and development for the Site.

Public Comments: The Final EIS is a revision of the *Revised Draft Hanford Remedial Action Environmental Impact Statement and Comprehensive Land-Use Plan* (HRA-EIS) published in April 1999 and responds to comments received in writing and at public hearings. The Final EIS is being transmitted to commenting agencies and individuals, made available to the public, and filed with the Environmental Protection Agency (EPA). A DOE decision on proposed actions will not be made earlier than 30 days after EPA issues a public notice of availability for the Final EIS. The DOE will issue a Record of Decision (ROD) published in the *Federal Register*.

Foreword⁽¹⁾

Objective of the EIS

This Final HCP EIS was prepared by the Department of Energy (DOE) and its nine cooperating and consulting agencies to develop a comprehensive land-use plan (CLUP) for the Hanford Site. The DOE will use the Final HCP EIS as a basis for a Record of Decision (ROD) on a CLUP for the Hanford Site. While development of the CLUP will be complete with release of the HCP EIS ROD, full implementation of the CLUP is expected to take at least 50 years.

Implementation of the CLUP will begin a more detailed planning process for land-use and facility-use decisions at the Hanford Site. The DOE will use the CLUP to screen proposals. Eventually, management of Hanford Site areas will move toward the CLUP land-use goals. This CLUP process could take more than 50 years to fully achieve the land-use goals.

The final CLUP will consist of the following:

A Final Land-Use Map, depicting the desired future patterns of land use on the Hanford Site. This map will be one of the alternative land-use maps presented in the EIS, or a map that combines features of several of the alternatives maps such as the new Preferred Alternative based on public comment.

Land-Use Definitions, describing the purpose, intent, and principal use(s) of each land-use designation on the final CLUP map.

Land-Use Policies, directing land-use actions. These policies will help to ensure that individual actions of successive managers collectively advance the adopted CLUP map, goals, and objectives over time.

Land-Use Implementing Procedures, including:

- Administrative procedures for reviewing and approving requests for use of Hanford Site lands.
- A Site Planning Advisory Board (SPAB), consisting of representatives from DOE, the cooperating agencies with land-use authority, and the affected Tribes, to evaluate and

make recommendations on development proposals and land-use requests. It is anticipated that some requested activities will be permitted under the plan, but that others will need to be modified or required to incorporate mitigation to reduce potential impacts.

- New or revised "area" and "resource" management plans for the Site aligned and coordinated with the new land-use maps, policies and procedures of the adopted CLUP.

Integration of the CLUP

The process described above would be integrated with existing DOE land-use review procedures (e.g., the Draft *Biological Resources Management Plan* and the Draft *Cultural Resources Management Plan*). The final CLUP map, policies, and implementing procedures would be integrated with and addressed at the threshold decision points of all authorizations, operational plans, and actions, including contracts and budget proposals that directly or indirectly affect land use so that they would not create unintentional conflicts with the CLUP, or fail to advance CLUP objectives where the opportunity and ability to do so exists.

The DOE would have the final approval of all land-use decisions taking place on the Hanford Site while under DOE responsibility. The DOE Richland Operations Office would coordinate review of Hanford land development and land-use requests and determine, with input from the SPAB, whether a request represents an *allowable use*, *special use*, or whether the request would require an *amendment* to the CLUP.

Cooperating Agencies and Consulting Tribal Governments

The nine cooperating agencies and consulting Tribal governments that participated in the preparation of this Final HCP EIS are the U.S. Department of the Interior (Bureau of Land Management [BLM], Bureau of Reclamation [BoR], and the U.S. Fish and Wildlife Service [USFWS]); the City of Richland, Washington; Benton, Franklin, and Grant counties; the Nez Perce Tribe, Department of Environmental Restoration and Waste Management; and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR).

The HCP EIS Alternatives

Six land-use alternatives (including the No-Action) were developed by the nine Cooperating Agencies and Consulting Tribal Governments using common land-use designations and definitions. With the exception of the No-Action Alternative, each of the six alternatives presented represents a Tribal, Federal, state, or local agency's Preferred Alternative.

No-Action Alternative. This alternative, developed by DOE in compliance with the *National Environmental Policy Act of 1969* (NEPA), presents the current status of land use at the Hanford Site and represents no change from current land-management processes or intergovernmental relationships with the cooperating agencies. Specific land-use decisions for Hanford would continue to be made under the NEPA process and the Tri-Party Agreement, based on the current *Hanford Strategic Plan* (Mission Plan) and on a project-by-project basis.

DOE's Preferred Alternative. DOE's Preferred Alternative anticipates multiple uses of the Hanford Site, including anticipated future DOE missions, non-DOE Federal missions, and other public and private-sector land uses. The DOE Preferred Alternative would do the following:

- *For the cleanup mission* Consolidate Waste Management operations on 50.1 km² (20 mi²) in the Central Plateau of the Site.
- *For the economic development mission* Allow industrial development in the eastern and southern portions of Hanford and increase recreational access to the Columbia River.
- *For the Natural Resource Trustee mission* Expand the existing Saddle Mountain National Wildlife Refuge to include all of the Wahluke Slope (North Slope) of the Site, consistent with the 1994 Hanford Reach EIS and 1996 Hanford Reach ROD; place the Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE Reserve) under USFWS management by permit so it may be included in the overlay wildlife refuge, add McGee Ranch to the overlay wildlife refuge; and ensure that, where practicable, withdrawn BLM lands are clean enough to support BLM's multiple-use mandate.

Alternative One (Natural Resource Trustee). The USFWS's alternative emphasizes a Federal stewardship role for managing the natural resources at Hanford. This alternative considers these resources in a regional context, and would expand the existing Saddle Mountain National Wildlife Refuge to include all of the Wahluke Slope (North Slope), the Riverlands, McGee Ranch, and the ALE Reserve (e.g., all of the Hanford lands north and east of the Columbia River and west of State Highways 24 and 240). The vision of Alternative One is to conserve the Hanford Site shrub-steppe ecosystem and protect the Hanford Reach of the Columbia River.

Alternative Two (Nez Perce Tribe, Environmental Restoration and Waste Management Department). This Nez Perce alternative calls for preservation of natural and cultural resources and traditional Tribal use at the Site. Future DOE missions would be constrained to the Central Plateau, 300 Area, and 400 Area. Both this alternative and Alternative Four (developed by the CTUIR) reflect Tribal visions and views of Tribal members' treaty rights and traditional Tribal uses of Hanford lands. The Tribes and DOE have "agreed to disagree" on the interpretation of treaty rights on Hanford lands in the interest of moving the EIS process forward. Each party reserves the right to assert its respective interpretation of treaty rights at Hanford.

Alternative Three (Cities and Counties). This local governments' alternative is based on the individual planning efforts of local agencies and organizations including Benton County, Franklin County, Grant County, and the City of Richland. Alternative Three recognizes the potential that land use at the Hanford Site has in relation to economic development. Alternative Three would allow dryland (non-irrigated) agricultural and grazing activities, and irrigated agriculture on the Hanford Site. The land-use designations contained in Alternative Three were developed consistent with local availability of infrastructure, nearness of urban areas, soils capabilities, and current use patterns.

Alternative Four (Confederated Tribes of the Umatilla Indian Reservation, CTUIR). This CTUIR alternative calls for preservation of natural resources and areas of religious importance to the CTUIR as well as traditional Tribal use at the Site. Both this alternative and Alternative Two (developed by the Nez Perce Tribe, Environmental Restoration and Waste Management

Department) reflect Tribal visions and views of Tribal members' treaty rights and traditional Tribal uses of Hanford lands. The Tribes and DOE have "agreed to disagree" on the interpretation of treaty rights on Hanford lands in the interest of moving the EIS process forward. Each party reserves the right to assert its respective interpretation of treaty rights at Hanford.

Public Comment

The DOE received more than 400 comment letters, 30 E-mails, and 86 transcript comments from four public hearings on the Revised Draft HRA-EIS. The DOE also accepted a binder with 922 endorsements for the Wild and Scenic River (with the inclusion of a Wahluke Wildlife Refuge) that were collected for the Department of the Interior's Hanford Reach EIS in 1994. More than 200 request forms for farmland on the Wahluke Slope (also generated for the Hanford Reach EIS in 1994) were accepted in the same spirit. Each of these signature-gathering efforts were assigned only one comment number. Based on the public comment received, the following changes have been made to the DOE's Preferred Alternative:

- All Conservation (Mining and Grazing) has been changed to Conservation (Mining).
- The National Wildlife Refuge designation (from Alternative One) has been extended to include the ALE Reserve, the Riverlands, and McGee Ranch; and all river islands not in Benton County. The Preferred Alternative clarifies that the refuge will be an overlay wildlife refuge (without a transfer of title from DOE), and that DOE retains the right to mine the ALE insert for cover materials.
- A railroad right-of-way through the Riverlands portion of the proposed Refuge will be given status as a preexisting condition and included in the proposed USFWS permit to manage the Refuge.
- The White Bluffs town-site (from Alternatives One and Three) has been added to the Preferred Alternative map as Low-Intensity Recreation to serve as the White Bluffs Memorial.
- The Low-Intensity Recreation dots (comfort stations) along the river which could eventually serve as anchor points for a river trail from Richland to Vernita Bridge have been moved to ensure that they have both river and road access.
- A High-Intensity Recreation triangle (from Alternative Three) has been added to the Preferred Alternative map near Horn Rapids Park on the Yakima River

In addition to changes made to the Preferred Alternative, and the identifying of Alternative One as the environmentally preferable alternative, many other changes were made to the document updating items, refining analyses, and correcting errors. Each change in the Final EIS from the Revised Draft EIS is identified by vertical line on the outside margin of the page such as the one that accompanies this paragraph.

Preamble

In response to public comment, the U.S. Department of Energy (DOE) has changed the name of this environmental impact statement (EIS) from the *Hanford Remedial Action Environmental Impact Statement and Comprehensive Land-Use Plan* (HRA-EIS) to the **Hanford Comprehensive Land-Use Plan EIS (HCP EIS)**. In the Notice of Intent in 1992, establishing future land uses was listed as one of the HRA-EIS objectives. Since that time, various considerations have led to this Final HCP EIS in which future land use is now the EIS's main objective. To reflect this reduction in scope from the 1996 Draft HRA-EIS, DOE solicited comments on the proposed name change (as well as the contents), and in response to comments has changed the name to the HCP EIS .

Originally, this EIS was intended to provide an environmental review under the *National Environmental Policy Act of 1969* (NEPA) for all aspects of the developing Hanford Environmental Restoration Project. The document, however, no longer directly considers remediation issues. Instead, remediation issues are now integrated into specific Tri-Party Agreement remediation decision documents. Remediation decisions are made by the U.S. Environmental Protection Agency and the State of Washington, as lead regulatory agencies, and DOE as lead implementing agency. The DOE does expect that the EIS process will assist Hanford remediation efforts by determining reasonably foreseeable land uses and establishing land-use decision-making processes to ensure the viability of any future institutional control that might be required.

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- 1 Vertical lines in the margins like these to the right indicate where changes have been made since the publication of the Revised Draft HRA-EIS in April, 1999.

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Acronyms and Initialisms

ac	acres
AEA	<i>Atomic Energy Act</i>
AEC	Atomic Energy Commission
ALE	Fitzner/Eberhardt Arid Lands Ecology Reserve
AMP	area management plan
ATG	Allied Technology Group
BLM	Bureau of Land Management
BoR	Bureau of Reclamation
BPA	Bonneville Power Administration
BRMA	B Reactor Museum Association
BRMaP	Biological Resources Management Plan

BRMiS	Biological Resources Mitigation Strategy Plan
CAA	<i>Clean Air Act of 1970</i>
CAAA	<i>Clean Air Act Amendments of 1990</i>
CBC	Columbia Basin College
CBRP	Columbia Basin Reclamation Project
CCP	Comprehensive Conservation Plan
CEQ	Council on Environmental Quality
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
CFR	<i>Code of Federal Regulations</i>
CLUP	comprehensive land-use plan
CRADA	Cooperative Research & Development Agreement
CRMP	Cultural Resources Management Plan
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
D&D	decontamination and decommissioning
DCGL	derived concentration guide level
DOE	U.S. Department of Energy
DOH	Department of Health (State of Washington)
DOI	U.S. Department of the Interior
DSTs	double-shell tanks
DWS	drinking water standard
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
EM	Environmental Management
EMSL	Environmental Molecular Sciences Laboratory
Energy Northwest	formerly known as the Washington Public Power Supply System (WPPSS)
EPA	U.S. Environmental Protection Agency
EPZ	emergency planning zone
ERDF	Environmental Restoration Disposal Facility
ERWM	(Nez Perce Tribe) Environmental Restoration and Waste Management (Program)
ESU	Evolutionary Significant Units
EUZ	exclusive-use zone
FFCA	<i>Federal Facilities Compliance Act of 1992</i>

FFTF	Fast Flux Test Facility
FLEFA	<i>Federal Land Exchange Facilitation Act of 1988</i>
FLPMA	<i>Federal Land Policy and Management Act of 1976</i>
RI/FS	remedial investigation/feasibility study
FONSI	finding of no significant impact
Working Group	Future Site Uses Working Group
GIS	Geographic Information System
GMA	<i>Growth Management Act</i>
GSA	General Services Administration
ha	hectares
HAB	Hanford Advisory Board
HAMMER	Hazardous Materials Management and Emergency Response
HAP	hazardous air pollutants
HCP EIS	<i>Hanford Comprehensive Land-Use Plan Environmental Impact Statement (formerly named the Hanford Remedial Action Environmental Impact Statement and Comprehensive Land-Use Plan [HRA-EIS])</i>
HCRL	Hanford Cultural Resources Laboratory
HEHF	Hanford Environmental Health Foundation
HGIS	Hanford Geographic Information System (database)
HMS	Hanford Meteorological Station
I&I	irreversible and irretrievable
ICBEMP	Interior Columbia Basin Ecosystem Management Project
ILCR	incremental lifetime cancer rate
INEEL	Idaho National Engineering and Environmental Laboratory
km ²	square kilometers
LIGO	Laser Interferometer Gravitational-Wave Observatory
LLW	low-level waste
MCL	maximum contamination level
MEI	maximally exposed individual
mi ²	square miles
MMI	Modified Mercalli Intensity
MOA	Memorandum of Agreement
MTCA	<i>Model Toxics Control Act of 1989</i>
MOX	mixed oxide
NAAQS	National Ambient Air Quality Standards

NARM	naturally occurring and accelerator-produced radioactive materials
NCO	NEPA Compliance Officer
NCP	National Contingency Plan
NEPA	<i>National Environmental Policy Act of 1969</i>
NERP	National Environmental Research Park
NOA	Notice of Availability
NOI	Notice of Intent
NPA	<i>Northwest Power Act</i>
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPPC	Northwest Power Planning Council
NPS	U.S. National Park Service
NWR	National Wildlife Refuge
ORP	Office of River Protection (formerly Tank Waste Remediation System [TWRS])
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PFP	Plutonium Finishing Plant
PNNL	Pacific Northwest National Laboratory
PSD	Prevention of Significant Deterioration
PUD	Public Utility District
PUREX	Plutonium-Uranium Extraction
R&D	research and development
RCRA	<i>Resource Conservation and Recovery Act of 1976</i>
RCW	<i>Revised Code of Washington</i>
REO	Real Estate Officer
RL	(U.S. Department of Energy) Richland Operations Office
RMP	resource management plan
ROD	Record of Decision
SALDS	state-approved land disposal structure
SARA	<i>Superfund Amendments and Reauthorization Act of 1986</i>
SDWA	<i>Safe Drinking Water Act of 1974</i>
SEPA	<i>State Environmental Policy Act of 1971</i>
SHPO	State Historic Preservation Office
SMB	Site Management Board

SPAB	Site Planning Advisory Board
SRS	Savannah River Site
SSTs	single-shell tanks
TAP	toxic air pollutants
THPO	Tribal Historic Preservation Officer
TPA	Tri-Party Agreement
TRIDEC	Tri-City Industrial Development Council
TSCA	<i>Toxic Substances Control Act of 1976</i>
TSD	treatment, storage and disposal
TSP	total suspended particulates
TWRS	Tank Waste Remediation System (now known as the Office of River Protection [ORP])
UBC	Uniform Building Code
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
WAC	<i>Washington Administrative Code</i>
WCAA	<i>Washington Clean Air Act of 1991</i>
WDFW	Washington Department of Fish and Wildlife
WIDS	Waste Information Data System (database)
WNP-2	Washington Nuclear Plant Number 2
WSU-TC	Washington State University - Tri-Cities

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Attn: Jim Blanchard

U.S. Department of Interior - Bureau of Land Management

Attn: Joe Bussing

Attn: Jim Fisher

Attn: Jake Jakobosky

Attn: Cliff Ligons

Attn: Eric Stone

U.S. Department of Interior - U.S. Fish and Wildlife Service

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Attn: Jeff Haas
Attn: Abby Kucera
Attn: Mike Marxen
Attn: William Shake, Regional Director

U.S. Department of Justice

Environmental and Natural Resources Division
Attn: William Cohen, Chief, General Litigation Section

U.S. Department of Labor

Office of Standards, Regulation, and Variances
Mine Safety and Health Administration
Attn: Cherie Hutchison

U.S. Department of Transportation

Federal Highway Administration, Western Resource Center, Portland
Attn: Carl Armbrister, Director of Planning and Program Development

U.S. Department of Transportation

Office of Transportation Policy
Attn: Camille Mittleholtz, Environmental Team Leader

U.S. Environmental Protection Agency

Office of Federal Activities
Attn: William Dickerson, Director, NEPA Compliance Division
Attn: Marguerite Duffy, NEPA Compliance Division (staff level contact)

U.S. Environmental Protection Agency

Attn: Chuck Clarke, Region 10 Administrator
Attn: Larry Gadbois
Attn: Doug Sherwood
Attn: Randy Smith
Attn: Doug Woodfill

U.S. Environmental Protection Agency - Region 10

Office of Ecosystems and Communities
Attn: Richard B. Parkin (ECO-088), Manager, Geographic Implementation Unit

U.S. Geological Survey

Attn: Velvie Stockdale

U.S. Information Center for Environmental Management

Attn: Andrea Gralak

Wanapum

Attn: Lenora Selatsee-Buck

Washington Department of Fish and Wildlife

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Attn: John Carleton
Attn: Ted Clausing
Attn: Jay McConnaughey
Attn: Neil Rickard

Washington State Department of Agriculture

Attn: Jim Jesernig

Washington State Department of Ecology

Environmental Review Section
Attn: Barbara Ritchie, NEPA Coordinator

Washington State Department of Ecology

Attn: Geoff Tallent
Attn: Tom Tebb
Attn: Max Power
Attn: Dan Silver

Washington State Department of Health

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Washington State Department of Natural Resources

Attn: Mark Sheehan, Washington Natural Heritage Program

Washington State Department of Transportation

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Washington State Historic Preservation Office

Attn: Allyson Brooks

Yakama Indian Nation

Attn: Barbara Harper
Attn: Russell Jim
Attn: Lewis Malatara
Attn: Jerry Meninick
Attn: Rory Snowarrow Flintknife

INTEREST GROUPS:

American Rivers

Attn: Margaret Bowman

American Wildlands

Attn: Rob Ament, Executive Director

Central Washington Building and Construction Trades Council

Attn: Richard Berglund

Attn: Jim Worthington

Citizens for Environmental Justice, Inc.

Attn: Mildred McClain

Clean Water Action Project

Attn: Paul Schwartz, National Campaigns Director

Columbia River Conservation League

Attn: Jeb Baldi

Attn: Richard Steele

Columbia River United

Attn: Greg deBruler

Attn: Cyndy deBruler

Energy Communities Alliance

Attn: Seth Kirshenber, Executive Director

Environmental Defense Fund, Inc.

National Headquarters

Attn: Fred Krupp, Executive Director

Environmental Defense Institute

Attn: Chuck Broschious, Executive Director

Environmental Management Advisory Board (EMAB)

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Attn: Jim Melillo, Executive Director

Greenpeace

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Government Accountability Project

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Member: Todd Martin, Hanford Education Action League
Member: Wayne Martin, Pacific Northwest National Laboratory
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Member: Margery Swint, Benton-Franklin Public Health
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National Congress of American Indians

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National Water Resources Association

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National Wildlife Federation

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Natural Resources Defense Council, Inc.

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Plutonium Challenge

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Rocky Mountain Elk Foundation

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Washington Environmental Council

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Attn: Gene Schreckhise

Bechtel Hanford, Inc.

Environmental Resource Center

Attn: G.E. Fitzgibbon

READING ROOMS/PUBLIC LIBRARIES:

U.S. Department of Energy - Freedom of Information Reading Room

Washington, D.C.

Gonzaga University (Tri-Party Information Repository)

Foley Center

Attn: Connie Scappelli

Hanford Technical Library

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Library of Congress

Attn: Mark Holt

Mid-Columbia Library

Attn: Sue Lang

Office of Scientific and Technical Information

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Portland State University - Branford Price Millar Library

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