U.S. NUCLEAR REGULATORY COMMISSION

OFFICE OF FEDERAL AND STATE MATERIALS AND ENVIRONMENTAL MANAGEMENT PROGRAMS

DIVISION OF WASTE MANAGEMENT AND ENVIRONMENTAL PROTECTION

ENVIRONMENTAL ASSESSMENT FOR THE RENEWAL OF U.S. NUCLEAR REGULATORY COMMISSION LICENSE NO. SNM–1227 FOR AREVA NP, INC. RICHLAND FUEL FABRICATION FACILITY

DOCKET NO. 70-1257

February 2009

TABLE OF CONTENTS

Page

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF TABLES

APPENDICES

ACRONYMS/ABBREVIATIONS

ADU	ammonium diuranate
ALARA	as low as is reasonably achievable
AREVA NP	AREVA NP, Inc.
BLEU	blended low-enriched uranium
Bq	becquerel
CEDE	committed effective dose equivalent
CFR	Code of Federal Regulations
cm	centimeter
dB	decibel
dBA	A-weighted sound level
DDE	deep dose equivalent
DOE	United States Department of Energy
DOT	United States Department of Transportation
EDNA	environmental designation for noise abatement
FEMA	Federal Emergency Management Agency
ft	feet
g	gram
ha	hectares
km	kilometer
LLRW	low-level radioactive waste
mi	mile
MMI	Modified Mercalli Intensity
MT	metric ton
MSA	metropolitan statistical area
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRC	United States Nuclear Regulatory Commission
pCi	picocurie
PNNL	Pacific Northwest National Laboratory
POTW	Publicly Owned Treatment Works
SHPO	State Historic Preservation Office
ST	short ton
TEDE	total effective dose equivalent
Tri-Cities	Kennewick, Pasco, and Richland (Washington)
U	uranium
UF_6	uranium hexafluoride
UF_{235}	an isotope of uranium
UIC	underground injection control
UO_2	uranium oxide
USFWS	United States Fish and Wildlife Service
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

ENVIRONMENTAL ASSESSMENT FOR THE RENEWAL OF U.S. NUCLEAR REGULATORY COMMISSION LICENSE NO. SNM–1227 FOR AREVA NP, INC. RICHLAND FUEL FABRICATION FACILITY

1.0 INTRODUCTION

1.1 Background

By letter dated October 24, 2006 (AREVA NP, 2006a), AREVA NP, Inc. (AREVA NP) submitted an application (AREVA NP, 2006b) to the U.S. Nuclear Regulatory Commission (NRC) to renew materials license SNM–1227 for the Richland Fuel Fabrication Facility located in Richland, Washington. Under SNM–1227, AREVA NP is authorized to receive and possess nuclear materials at the Richland facility to fabricate and assemble nuclear fuel components under the provisions of 10 CFR Part 70, Domestic Licensing of Special Nuclear Material. AREVA NP has conducted operations at the site since 1969 and is currently operating under a license that was last renewed in 2001 for a 5-year period. AREVA NP filed the current renewal application more than 30 days prior to the license expiration date of November 30, 2006. In accordance with 10 CFR 70.38, the existing license will not expire until NRC makes a final determination on the renewal application. AREVA NP requests that NRC renews its license for a term of 40 years in accordance with SECY–06–0186 (NRC, 2006).

This Environmental Assessment was prepared in accordance with: NRC regulations listed in 10 CFR Part 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions; applicable NRC guidance outlined in NUREG–1748, Environmental Review Guidance for Licensing Actions Associated with Nuclear Material Safety and Safeguards Programs (NRC, 2003); and other relevant National Environmental Policy Act (NEPA)-implementing regulations, including Council on Environmental Quality regulations (40 CFR Parts 1500–1508). NRC is also conducting a detailed safety review of the AREVA NP request for license renewal. The results will be documented in a separate Safety Evaluation Report.

AREVA NP submitted a Supplement to the Environmental Report (AREVA NP, 2006c) as part of its renewal application. Other information contained in this report is referenced within the text and listed in Section 8.0.

1.2 Need for the Proposed Action

The AREVA NP facility is one of several facilities that fabricate fuel assemblies for commercial light-water-cooled nuclear reactors. Production of the fuel assemblies should continue at a rate that meets the anticipated steady or increasing demand for electricity generated by these nuclear power reactors. AREVA NP plans to continue to be a major supplier of this type of fuel through the use of the AREVA NP facility should NRC renew the license.

1.3 The Proposed Action

AREVA NP has submitted an amendment for license renewal that would allow the fuel fabrication facility located in Richland, Washington, to continue operations for an additional 40 years. The current license authorizes AREVA NP to receive, possess, use, and transfer special nuclear material at the AREVA NP facility in accordance with the requirements of 10 CFR Part 70. Under the Proposed Action, there will be no substantial changes to facilities or

operations. In addition, no major upgrades or refurbishment activities are planned in connection with the amendment. Should AREVA NP decide to revise its operations, the revisions would be addressed through a license amendment request, and NRC staff would conduct further safety and environmental reviews at that time.

1.4 No-Action Alternative

The No-Action Alternative is for AREVA NP to cease manufacturing nuclear fuel at the Richland facility because of a denied license renewal. If NRC does not renew license SNM–1227, licensed activities at the AREVA NP facility would cease and decommissioning activities would begin.

1.5 Renewal for a 5-Year Term Alternative

As an alternative to the 40-year license renewal, NRC staff considered the environmental impacts of a 5-year license renewal period. Staff chose this term since it is representative of past licensing actions for a fuel fabrication facility. However, NRC staff did not address the 5-year alternative throughout the environmental assessment since the discussion and the results are the same as the 40-year license renewal period, with one exception. The exception involves the transportation environmental impact. The details can be reviewed in Chapter 4.2.

2.0 DESCRIPTION OF SITE AND ACTIVITIES

2.1 Site Description

AREVA NP owns the 131-ha [320-acre] parcel just inside the northern boundary of the City of Richland. Richland is located in the southeastern portion of Washington and is approximately 180 km [110 mi] west of the Idaho-Washington border, 295 km [180 mi] south of the Canadian border, and 369 km [225 mi] east of the Pacific Ocean. As shown in Figure 1, the AREVA NP site is bordered on the north by the U.S. Department of Energy's (DOE) Hanford Site. Horn Rapids Road separates AREVA NP from the Hanford Site. AREVA NP's coordinates are 46° 21' north latitude and 119° 18' west longitude. The uranium handling and processing facilities are located within a restricted 21.5-ha [53-acre] fenced area. AREVA NP maintains a buffer of undeveloped, disturbed land between the facility and the rest of North Richland to the east and south. The undeveloped land on the site is semi-arid sage steppe. AREVA NP leases land to the west for agricultural purposes.

The AREVA NP site is part of a 2,500-ha [6,100-acre] parcel of land known as the Horn Rapids Triangle (Figure 1). The U.S. Government acquired this land in 1942 as part of the Hanford Site, and subsequently annexed the land to the City of Richland in 1967. The triangular tract is bounded on the north by Horn Rapids Road, on the south by the Horn Rapids Irrigation Ditch, on the east by a strip of DOE land designated as the 1100 Area that was transferred to the City of Richland, and on the southeast by the Port of Benton Skypark and Richland airport. State Route 240, the Hanford Highway, appears on the diagonal of the Triangle.

The AREVA NP site is approximately 114 m [373 ft] above mean sea level. The site does not contain any surface water bodies or wetlands. A dry well system handles the storm water runoff. AREVA NP has approximately 50 dry wells serving the site. The closest surface water bodies are the Columbia River, located approximately 2.4 km [1.5 mi] east of the site, and the Yakima River, located approximately 4.1 km [2.5 mi] southwest of the site. At their closest

points to AREVA NP, the nominal elevations of the Columbia and Yakima Rivers are approximately 105 and 113 m [350 and 370 ft] above mean sea level, respectively. Groundwater flow is generally to the northeast toward the Columbia River. The Yakima River is approximately 4 to 5.7 km [2.5 to 3.5 mi] up gradient of AREVA NP. The Columbia River is approximately 2.9 km [1.8 mi] down gradient of the site. The AREVA NP site lies within a remnant channel of the Columbia River, is not within the Yakima River basin, and is not subject to flooding from the Yakima River. The site is subject to flooding from the Columbia River when there is excessive rain or very rapid snow melt upstream. However, the presence of numerous dams on the river limits the impact of most floods.

Water for AREVA NP operations is obtained from the Richland water system. Wastewater is discharged to the City of Richland sewers to the publicly owned treatment works facility. AREVA NP continuously monitors their discharge per 10 CFR Part 20. After receiving treatment with all the other discharges processed by the City, the subsequent waters are discharged into the Columbia River.

AREVA NP site has a Seismic Zone 2B of the Uniform Building Code designation (AREVA NP, 2006b). Uniform Building Code Zone 2B indicates an association with known crustal faults and requires buildings to withstand horizontal peak bedrock acceleration of 0.20 g or 0.2 times the acceleration due to gravity (Iowa Department of Natural Resources Geological Survey, 2007).

There are no threatened and endangered species known to occur on the AREVA NP's property (Lockhaven, 1992). Similarly, the National Marine Fisheries Service (Yeager, 2008) did not identify any threatened or endangered fish species on AREVA NP's site. The Service did identify species in the affected area (discussed in Section 3.7).

AREVA NP's land and buildings does not appear on the National Register of Historic Places. The site has been previously disturbed by construction and agricultural activities, as evidenced in aerial images. However, the initial licensee did not conduct a survey of the land for historical and cultural interest prior to beginning construction in the late 1960's.

In the 1970s through the 1990s, facility operation caused contaminated water to migrate from the site's former surface impoundment system constructed on the eastern part of the facility. The impoundments were double-lined by the early 1980s and were not implicated in further environmental releases (AREVA NP, 2006c). Prior to the fix, water lost from the impoundments entered the unconfined aquifer system (the uppermost, unprotected portion of the aquifer), resulting in a plume extending northeast offsite onto the Hanford site, with concentrations of nitrate, fluoride, and sulfate in the plume that were above the Federal Drinking Water Standard (Veenstra, 1986). This plume was likely contained within the upper (unconfined) aquifer because prevailing groundwater flow is generally from the lower to upper aquifers. This is based on quarterly piezometer and observation borehole observations from 1991 through 1999 which consistently indicated hydraulic heads that were at least 2 m [6 ft] higher in the lower (confined) aquifer than in the upper aquifer (Siemens Power Corporation, 2000). Under a Washington Department of Ecology-regulated clean-up/closure action from 1996 through 2006, AREVA NP removed the surface impoundments from service by emptying its inventory and physically dismantling it. AREVA NP removed the affected soil and disposed of it to achieve remediation goals. The surface impoundments remain as unused open facilities (AREVA NP, 2006c), available for future facility expansion.

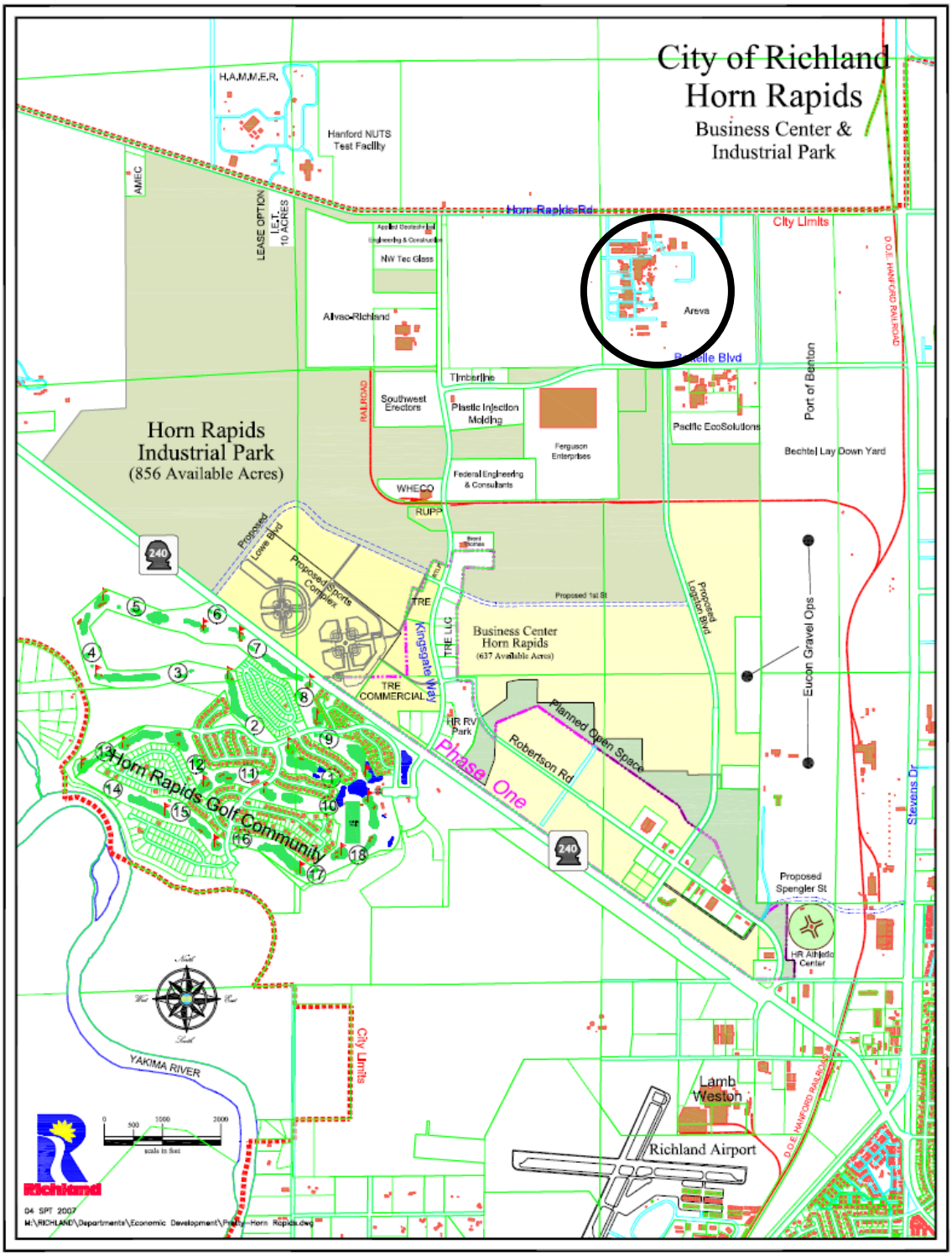

Figure 1. Map of the Horn Rapids Triangle in the City of Richland

2.2 Current Facility Use

The primary function of the AREVA NP facility is to fabricate nuclear fuel assemblies containing low-enrichment (i.e., low concentrations of fissionable U-235) uranium oxide fuel for use in commercial light-water-cooled nuclear power reactors. The Richland Fuel Fabrication Facility also produces intermediate fuel components. Fuel fabrication is one part of the nuclear fuel cycle, as depicted in Figure 2. The role of AREVA NP in the nuclear fuel cycle is outlined by the dashed box. The primary facilities consist of a main fuel fabrication plant, waste treatment facilities, raw material storage buildings, and office space.

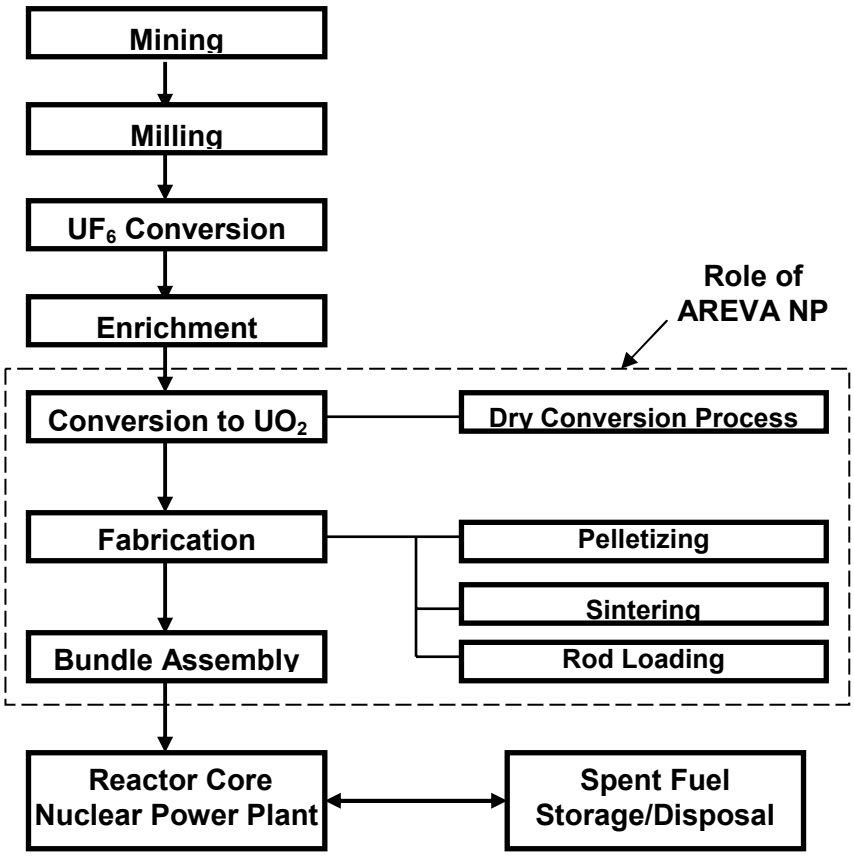

Figure 2. Role of AREVA NP in the Nuclear Fuel Cycle

The primary uranium feed material is uranium hexafluoride (UF_6), which is received in 76-cm [30-in]-diameter steel "30B" cylinders. Each cylinder contains about 2,200 kg [4,850 lb] of UF_6, which yields about 1,500 kg [3,300 lb] of uranium. Production of nuclear fuel assemblies begins in the Dry Conversion Facility, where the UF_6 gas is converted into the solid uranium oxide (UO_2) using a dry chemical conversion process. A process flow diagram of the AREVA NP dry conversion process is shown in Figure 3. In the dry conversion process, UF_6 gas is reacted directly with a hydrogen-nitrogen-steam atmosphere in a fluidized bed to form UO_2 powder. A rotary calciner removes residual fluoride from the UO_2 powder. Off-gas from the hydrolysis

reactor and calciner are filtered to remove particulates and passed through a condenser where hydrogen fluoride and water are recovered as a liquid stream. Residual hydrogen fluoride in the off-gas is removed by contact with a caustic solution in a scrubber. The off-gas is exhausted through high-efficiency particulate absolute filters to the atmosphere. The UO_2 then undergoes physical conditioning (pulverization into a powder), and the powder is pressed into pellets in the UO_2 Building. The pressed pellets are sintered, ground to the necessary size as required by the customer, loaded into metal rods, and sealed with end caps to make a fuel rod.

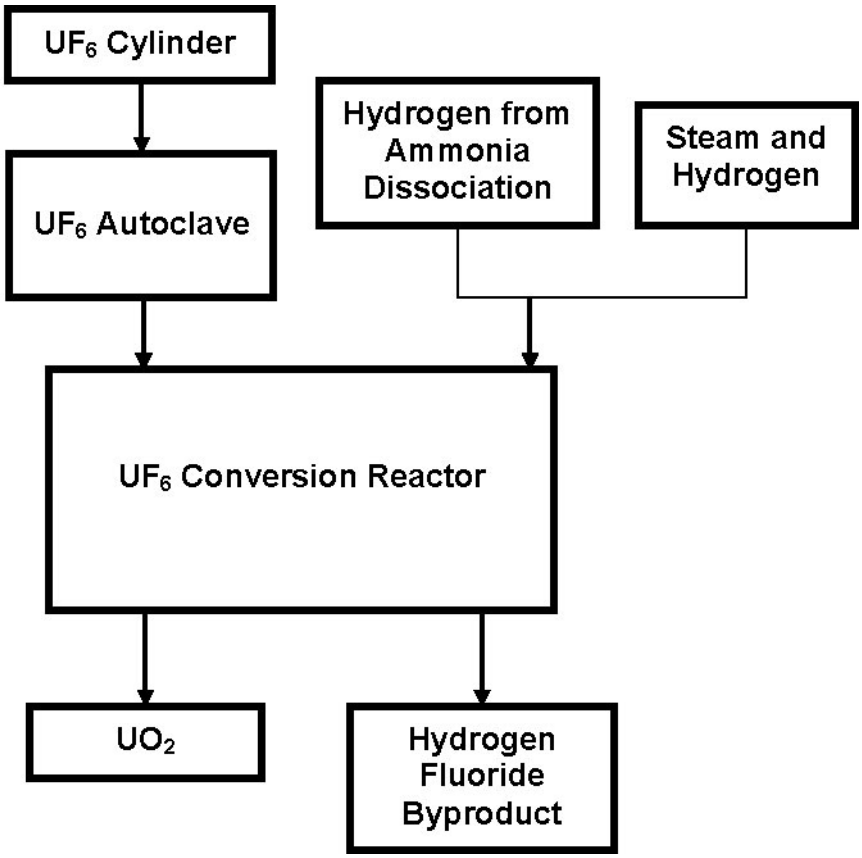

Figure 3. Process Flow Diagram for AREVA NP Operations

Fuel rods are then combined with appropriate fuel bundle hardware to produce finished nuclear fuel assemblies. Finished bundles are either stored onsite in interim storage or immediately shipped in NRC-approved containers to customers for subsequent use as fuel in commercial light-water-cooled nuclear power reactors. NRC regulations in 10 CFR Part 50, Domestic Licensing of Production and Utilization Facilities, and onsite inspection govern handling of the fuel assemblies at the NRC-licensed commercial reactors. NRC (10 CFR Part 70), the U.S. Department of Transportation (DOT), and State of Washington regulations govern shipments of nuclear materials to and from the AREVA NP facility.

Various ancillary operations at the AREVA NP facility support the dry conversion process and ceramic pellet fabrication, assembly, and distribution. These processes include oxidation, dissolution, chemical precipitation, cylinder recertification, cylinder washing, respirator cleaning, incineration, solvent extraction, waste treatment, mechanical operations, welding, metal fabrication, quality control testing, and shipping container painting. Some of these ancillary processes can potentially generate small quantities of radioactive and/or hazardous waste that

contribute to the overall quantities of the wastes that AREVA NP generates. The amount of radioactive and hazardous waste AREVA NP generates is detailed in Section 2.3.

The Dry Conversion Process Facility includes three conversion lines, which have been in operation for 11 years. AREVA NP currently supplies approximately 30 percent of the U.S. Commercial Fuel market. The facility was originally sized to meet up to 80 percent of the current U.S. demand. An increase in the production load can be accommodated in the existing facility. However, if replacement or expansion of the current Dry Conversion Process Facility is warranted, there is sufficient acreage available within the existing facility footprint.

In addition to the process described previously, other processes are used at AREVA NP depending on the needs of the customer. For these processes, the final product is not always finished fuel assemblies, but instead may be UO_2 powder, pellets, or finished fuel rods. These products are removed from the process at the appropriate point and loaded into licensed shipping containers for shipment to other NRC-licensed facilities.

Neutron absorber fuel, which uses pellets that contain gadolinium oxide (gadolinia), is produced in the Specialty Fuels Building. UO_2 powder produced onsite in the UO_2 Building or the Dry Conversion Facility, as previously discussed, is blended with gadolinia. The resulting blended powder is pressed into pellets, and the pellets are sintered, ground to size, and inspected. The finished pellets are transferred to rod loading or, in some cases, may be packaged for shipment offsite to other licensed fuel fabrication facilities. Blended low-enriched uranium (BLEU) is received from offsite as UO_2 powder in licensed shipping containers. The powder is downloaded into drums for interim storage. As needed, this BLEU powder is removed from storage and pressed into pellets; the pellets are sintered, ground to size, inspected, and placed in interim storage. These steps occur primarily within the BLEU addition to the UO_2 Building. Subsequent fuel production steps (e.g., rod loading and bundle assembly) occur within the traditional non-BLEU portions of the UO_2 Building.

Scrap processing uses a wet-chemistry ammonium diuranate (ADU) conversion process in the UO_2 Building to recover uranium from uranium-bearing scrap fuel (powder, pellets, or other uranium residues) that may be generated onsite or received from offsite facilities. The scrap fuel is dissolved in nitric acid in dissolvers located in the UO_2 or Engineering Laboratory Operations Buildings. The resultant uranyl nitrate solutions serve as feed to the ADU process, which uses water and ammonium hydroxide. In some cases, the uranyl nitrate may have been processed as an intermediate step through the solvent extraction process in the Engineering Laboratory Operations Building to remove gadolinium or other contaminants. UO_2 powder produced in the ADU process is placed into drums, transferred to the Dry Conversion Facility for powder preparation, and returned to drums. This drummed ADU-produced powder proceeds through the subsequent fuel fabrication steps in the same manner as UF_6-derived powder produced in the Dry Conversion Facility, as previously discussed.

Secondary feeds for the plant include BLEU powder, powder or pellets from other fuel cycle facilities, and various uranium-bearing scrap materials. The production, production support, and waste processing activities are supported by a number of non-radiological chemical materials, most notably bulk quantities of anhydrous and aqueous ammonia, nitric acid, nitrogen, and sodium hydroxide. A number of other non-radiological chemicals are utilized onsite in lesser quantities. Finished products of the plant containing licensed material include fuel assemblies, fuel rods, uranium oxide pellets, and uranium oxide powder.

Byproducts produced at the Richland plant include hydrofluoric acid recovered from the dry conversion process and ammonium hydroxide (aqueous ammonia) recovered from the ADU process. Recovered hydrofluoric acid is sold as a commercial chemical product. Recovered aqueous ammonia is recycled into the ADU process but may also be sold as a commercial chemical product. License authorizations exist for the release of these materials.

The most common non-radiological chemicals that support plant production at AREVA NP are anhydrous ammonia, aqueous ammonia, nitric acid, nitrogen, and sodium hydroxide. Anhydrous ammonia is dissociated to produce hydrogen, which is used in the plant as a reducing agent and cover gas. Aqueous ammonia, recovered from the liquid effluent from the ADU conversion line at the Ammonia Recovery Facility, is recycled into the ADU process as an active chemical agent. On rare occasions, anhydrous ammonia may be used to makeup aqueous ammonia for the ADU process. Nitric acid is utilized in the plant's uranium dissolvers. Nitrogen is used as an inert diluent, drying agent, or cover gas. Sodium hydroxide is used as an active chemical agent in the ammonia recovery process (AREVA NP, 2008).

Hydrofluoric acid is recovered by concurrently condensing water and hydrogen fluoride from the process off-gas from the dry conversion process. The ultra-pure hydrofluoric acid is sold to a commercial chemical company for ultimate industrial use. This activity is specifically authorized under the plant's NRC license and will continue. The hydrofluoric acid is approximately 45-percent strength, and the amount shipped averaged approximately 6.4 million L/yr [1.7 million gal/yr] over the 2003–2007 time periods, ranging from approximately 4.9 million L [1.3 million gal] in 2006 to approximately 7.6 million L [2.0 million gal] in 2005.

2.3 Wastes Generated

The processes generate liquid waste, solid waste and airborne effluents. Solid waste includes obsolete equipment and hardware, used ventilation filters, used personal protective equipment, waste treatment residues/filter cakes, demolition debris, and miscellaneous combustible waste.

The AREVA NP facility is classified as a synthetic minor source for non-radiological emissions and is regulated by a Synthetic Minor Order administered by the Benton Clean Air Authority. The goal is to ensure that annual nitrogen oxide emissions are under the 90.7 metric ton [100 short ton] threshold that would require the facility to obtain a Title V operating permit. The order imposes limits on the annual process throughputs of uranium through the three dissolvers and the amount of nitrogen oxides emitted per unit mass of uranium dissolved. The uranium dissolver records are required to be maintained on a 12-month rolling sum basis. Emissions are measured during required stack tests, and the results are reported to the Benton Clean Air Authority. Table 1 contains the uranium throughput data. Table 2 contains the amount of nitrogen oxide emitted per mass of uranium dissolved and the total nitrogen oxide emission estimates for the period 2003 to 2007.

Table 1. Twelve-Month Rolling Sum of Uranium Dioxide Throughput for AREVA NP, Inc.*

Year	Amount (kg†) for Uranium Pellet and Uranium Powder Dissolvers	Amount (kg†) for the Engineering Laboratory Operations Building Dissolver
2003	38,826	12,804
2004	72,406	6,559

2005	134,824	19,561
2006	141,015	22,716
2007	109,191	18,970
Permit Limit	400,000	90,000

*AREVA NP, Inc. "Response to Request for Additional Information (RAI) Regarding the Environmental Assessment for AREVA NP Inc. Richland Fuel Fabrication Facility License Renewal." License No. SNM–1227, Docket No. 70-1257 (TAC No. L31975). Richland, Washington: AREVA NP, Inc. April 18, 2008.
†To convert kilograms (kg) to pounds (lb), multiply by 2.2046

Table 2. Amount of Nitrogen Oxide Emitted Per Mass of Uranium Dioxide Dissolved and the Total Nitrogen Oxide Emission Estimates*

Year	Amount (kg†) of Nitrogen Oxide per Amount (kg†) of UO_2 for Uranium Pellet Dissolver	Amount (kg†) of Nitrogen Oxide per Amount (kg†) of UO_2 for Uranium Powder Dissolver	Amount (kg†) of Nitrogen Oxide per Amount (kg†) of UO_2 for Engineering Laboratory Operations Building Dissolver	Total Combined Nitrogen Oxide Emissions (metric ton‡)
2003	0.030	0.015	0.044	1.02
2004	0.045	0.022	0.073	2.94
2005	0.036	0.026	0.019	4.87
2006	0.047	0.017	0.048	3.45
2007	0.042	0.026	0.041	4.27
Permit limit	0.163			90.7

*AREVA NP, Inc. "Response to Request for Additional Information (RAI) Regarding the Environmental Assessment for AREVA NP Inc. Richland Fuel Fabrication Facility License Renewal." License No. SNM–1227, Docket No. 70-1257 (TAC No. L31975). Richland, Washington: AREVA NP, Inc. April 18, 2008.
†To convert kilograms (kg) to pounds (lb), multiply by 2.2046
‡To convert metric ton to short ton, multiply by 1.1023

Levels of trace radioactive impurities or contaminants (fission products, transuranic elements) in products, byproducts, and wastes produced at the Richland plant are a function of the composition of plant feed materials and the processes applied to these materials. The license condition limits transuranics (i.e., elements with an atomic number greater than that of uranium) in feed materials to 50 Bq/g U [1,350 pCi/g U]. Although not a license condition, most feed UF_6 meets the radiological limits for commercial grade UF_6 as specified in ASTM Standard C–996 (ASTM International, 2004). Similarly, most non-UF_6 uranium-bearing scrap feeds meet commercial-grade radiological limits specified in ASTM Standard C–1334 (ASTM International, 2005). BLEU-bearing powder feed meets the reprocessed uranium specifications of ASTM C–1334 (ASTM International, 2005). Uranium fuel products must meet radiological criteria, including isotopic purity limits that AREVA NP customers impose.

2.4 Waste Management

AREVA NP generates liquid, solid, and gaseous wastes. Liquid process wastes are collected within the plant's wastewater treatment system. The system provides processes to treat/remove

certain constituents and characteristics (ammonia, uranium, particulates) and adjusts pH prior to combining the treated effluent with domestic sewage and other non-hazardous liquid effluents. After sampling and testing the combined liquid effluent for applicable radioactive and non-radioactive chemical constituents, it is discharged to the City of Richland sewer at a lift station. The lift is located immediately south of the plant site. Small volumes of some liquid wastes are containerized for treatment/disposal at appropriate offsite facilities (AREVA NP, 2006c). AREVA NP possess an industrial wastewater discharge permit from the City of Richland that authorizes the discharge of non-radioactive chemicals and constituents from the plant processes to the City of Richland Sewer System (Richland Industrial Wastewater Discharge Permit CR-IU008). This permit allows AREVA NP to discharge pollutants to the City of Richland's publicly owned treatment works and requires compliance with chemical constituent limits, total discharge volumes, and monitoring and reporting requirements. Some of the effluent limits are:

- An upper pH limit of 10
- Biochemical Oxygen Demand shall be a maximum discharge of 360 kg/day [801 lbs/day] and a monthly average limit of 181 kg/day [400 lbs/day].
- The flow limit for AREVA NP is 757,082 liters [200,000 gallons] daily average and a daily maximum of 1,514,165 liters per day [400,000 gallons per day].

Gaseous effluents are monitored weekly to comply with the concentration and public dose limits established in 10 CFR 20. Regulated solid wastes are typically containerized for shipment offsite to an appropriate low-level radioactive waste (LLRW) disposal site. Certain combustible wastes are burned in the onsite solid waste uranium recovery incinerator (AREVA NP, 2006c).

AREVA NP has no expectation of losing access to either of its currently available LLRW disposal sites (the Northwest Compact Site located at Hanford or the Energy Solutions Site located in Clive, Utah). Under current operation conditions, the Hanford and Utah sites have predicted operating lifetimes of approximately 50 and 25 years, respectively, without benefit of expansion. The site in Clive, Utah, is licensed by the State of Utah until 2013 (Energy Solutions, 2008).

If these sites reach their capacity prior to securing expanded capacity or prior to emergence of replacement LLRW disposal options, AREVA NP would investigate/undertake the following:

- Increase decontamination efforts to allow for the possible free release of some materials and equipment currently sent for burial;

- Increase volume reduction activities beyond those currently pursued;

- Dismantle high-efficiency particulate absolute filters to allow incineration of wooden frames and onsite compaction of filter media; and

- Increase long-term storage of wastes, primarily in 2.6 m^3 [93 ft^3] B–25 waste boxes (AREVA NP, 2008).

AREVA NP has sufficient capacity within its currently fenced restricted area to accommodate all of the noncombustible LLRW that would accumulate over the full 40-year renewal term. Additional storage pad areas could be readily provided. If deemed necessary, covered storage and enhanced inspection protocols would be considered to detect/prevent any unacceptable degree of container deterioration due to aging or prolonged exposure to the elements. The site already has a waste tracking database in place that tracks the contents and locations of all its

waste containers. This database would continue to support day-to-day plant operations as well as decommissioning cost estimates (AREVA NP, 2008).

The site facilities discharge airborne effluents to the atmosphere via a number of process stacks. All process stacks exhausting air that may contain significant concentrations of radioactive materials as listed in 10 CFR Part 20 have high-efficiency particulate absolute filtration and are continuously sampled for radioactive particulates. Several stacks emit chemical contaminants (i.e. oxides of nitrogen, hydrogen fluoride). These are equipped with appropriate liquid scrubbers.

2.5 Monitoring Programs

AREVA NP evaluates potential health and environmental impacts and monitors compliance with applicable federal and state regulations through its effluent and environmental monitoring programs. Gaseous, liquid, and solid effluents produced from NRC-licensed activities may contain radiological and/or non-radiological contaminants. Items monitored in the effluent streams include radiological material, such as uranium, and non-radiological materials, such as ammonia and hydrofluoric gas. Also AREVA NP has an on-going program to keep radiological exposures and effluent levels As Low As Reasonably Achievable (ALARA). In addition to ALARA, AREVA NP has a change control program in which reviewers evaluate changes in the facility's operations for potential environmental, health, and safety impacts.

AREVA NP operates a comprehensive environmental monitoring program that collects air, groundwater, surface water, sediment, soil, and vegetation samples and tests them for radiological content. Mitigation plans are included when effluents exceed established limits. This program is part of the NRC license requirements for the facility (License No. SNM–1227). Collection frequency and action levels differ for the various sample types. Responses to results in excess of certain thresholds require re-sampling, investigation, corrective action, and notification of the responsible regulatory agency, if required. A detailed description of the AREVA NP monitoring program appears in the license application (AREVA NP, 2006b). Environmental monitoring results for each sample type are presented in the environmental report (AREVA NP, 2006c).

Air samples are analyzed for non-radiological and radiological contaminants. Radiological contaminant monitoring at the point of emission is performed continuously during licensed material production. Non-radiological stack monitoring is conducted to detect the amount of fluoride released because of the affect it has on vegetation and livestock. Air samples are continuously collected. AREVA NP evaluates the data and reports the findings on a quarterly basis. Fluoride emissions occur as the result of the conversion process in which UF_6 becomes UO_2. Ambient action levels for fluoride for Washington are located at WAC 173-481-110 (Washington State Department of Ecology, 1989). Monitoring to assess compliance is an NRC license condition and is conducted at two offsite sampling locations. If the action level was exceeded, AREVA NP would be required to prepare and implement a plan to determine whether fluoride-induced damage has occurred. If damage is found, AREVA NP would then determine the cause of the damage and take corrective action to prevent further damage.

Water samples are analyzed for non-radioactive and radioactive contaminants. Wastewaters contaminated with or subject to contamination with radioactive materials are managed, as appropriate, within the plant's process wastewater management system. After any necessary treatment, process wastewaters are combined with plant sanitary sewage and non-contaminated cooling water streams for discharge to the City of Richland sewer system. The

process wastewater management system provides treatment required to assure compliance with 10 CFR Part 20 radiological sewering limits. The plant's combined liquid effluent is proportionately sampled for uranium and measured for flow at the AREVA NP plant effluent monitoring station prior to discharge to the city sewer. Appropriate grab samples are obtained on a short-term interim basis to cover instances when the proportional sampler is inoperable.

As an additional check on the radiological impact of the plant's discards to the sewer system, sludge from the City of Richland sewage treatment plant is sampled on a monthly basis for uranium as a condition of the NRC site license. The license limit requiring investigation and follow-up action is 1 Bq/g U [27 pCi/g U] in a single sample or 0.925 Bq/g U [25 pCi/g U] as a 6-month running average. Measured levels of uranium in the sludge remain consistently below these limits, with the single highest monthly samples for each of the calendar years 2000–2005 ranging from 0.15 Bq/g U [4.05 pCi/g U] (March 2005) to 0.2 Bq/g U [5.40 pCi/g U] (May 2004) (AREVA NP, 2006c).

AREVA NP monitors the groundwater quality of its Richland site on a quarterly basis in accordance with conditions in its current NRC license and Washington State Department of Ecology requirements. Non-radiological chemical constituents monitored include fluoride, nitrate, and ammonia. Trichloroethylene, although not monitored as a part of the NRC-required program, is monitored per the Washington State Department of Ecology program.

AREVA NP also maintains a terrestrial monitoring program in which staff monitors soil (quarterly for uranium) and forage (monthly for fluorides). Results of both of these monitoring activities are provided in the environmental report (AREVA NP, 2006c).

2.6 Anticipated Changes to Facilities over the 40-Year Licensing Period

Continuation of efficient and state-of-the-art production operations for another 40 years is expected to be accompanied by ongoing maintenance and, from time to time, major component replacements and/or process upgrades. These are future planned changes and would require an amendment to the license. Reasonable and foreseeable maintenance and upgrade activities may include, but not be limited to, the following (AREVA NP, 2008):

Maintenance Activities

- Dry conversion reactors — regular maintenance with replacement every 10–20 years, as needed;
- Sintering furnaces — regular maintenance, periodic heater replacement, rebricking every 10–15 years as needed;
- Process vessels, piping, pumps, and equipment — regular maintenance with replacement/upgrade as needed;
- Heating, ventilation, and air conditioning system equipment — regular maintenance, plus replacement every 10–20 years as needed;
- Electrical supply conductors and switchgear — replacement as needed;
- Control systems, instrumentation, and manufacturing execution systems and

software — regular maintenance and replacement/upgrades as needed or when obsolete;

- Utility system piping and support equipment — regular maintenance with replacement, as needed; and

- Ancillary and support facilities (roadways, offices, warehouses, security systems and buildings, maintenance shops, and waste treatment facilities, etc.) — regular maintenance and replacement/upgrades as needed.

Facility/Process Upgrades

- Potential capacity and/or process upgrades to chemical conversion, ceramics, rod loading, bundle assembly, uranium recovery, and waste treatment areas as dictated by customer demands and technology advancements;

- Additional construction of special nuclear material receipt and storage facilities as dictated by business demands;

- Potential process replacement to eliminate need for onsite storage of anhydrous ammonia; and

- Potential installation of liquid effluent denitration facility if dictated by uranium recovery throughput and sewer discharge permit limits.

The facility/process maintenance, upgrades, and replacements listed above have accompanied the first 40 years of Richland plant operations; however, similar expansions in plant capability and capacity as evidenced in the first 40 years are not anticipated over the requested license renewal period. Significant increases in facility airborne, liquid, or solid waste effluents are not expected to occur. Previous improvements realized over the last 10 years include transition from wet chemical conversion to the dry conversion technology, replacement of the surface impoundment system with a significantly smaller capacity tank-based system, reduction of stored LLRW inventory and reduction in LLRW generation rates, and enhanced utilization of recycling options. Because of the significant amount of land made available by the environmental remediation of the former surface impoundment area, expansion of the plant's restricted area footprint to accommodate new or expanded special nuclear material processing facilities is not anticipated (AREVA NP, 2008).

2.7 Decommissioning

NRC will require AREVA NP to decontaminate and decommission the AREVA NP facility when license SNM–1227 is terminated. At that point, AREVA NP will submit a detailed decommissioning plan to NRC that is consistent with applicable license termination criteria at the time of decommissioning. The NRC will review the decommissioning plan from a safety and environmental impact perspective.

3.0 AFFECTED ENVIRONMENT

3.1 Land Use

Richland originally incorporated in 1910. Its land use supported a small agricultural-based community. A shift occurred from farming of the land to manufacturing nuclear products in support of World War II wartime efforts with the creation of the Hanford Site. From this change, Richland's economy became nuclear-based and dependent upon the federal government. In the last two decades, changes occurred in the federal government's use and plans for the Hanford Site, with a focus turning to clean-up instead of continued operation. A potential loss of approximately 12,000 jobs exists (Strategic Plan, 2003).

To lessen their dependence on a single source provider and to create a diversified economy, Benton County and the City of Richland developed plans to attract nuclear and non-nuclear based companies to the region. The City of Richland (2004) and Benton County (2006) recently published comprehensive land use plans which demonstrate these efforts. In particular, the City owns several plots of land and is offering them for lease or sale. The Horn Rapids Industrial Park is one such tract of land. AREVA NP, PermaFix (treats low level radioactive and low level mixed wastes), Ferguson Enterprises (supports numerous industries with heating and cooling equipment, fire protection and geosynthetic products), and Allvac-Richland (melts and forms titanium ingots for future use in aerospace parts, military armor, surgical implants, etc.) are examples of companies located in the Park. AREVA NP is one of the largest private employers in the City of Richland (2004).

It is the responsibility of the City of Richland's Planning Department to establish the local zoning ordinance. The City designates the Park's land use for: light and heavy manufacturing, assembly, warehousing, and distribution; varied research and development; and sale of retail and wholesale products manufactured on-site. Also, the City of Richland permits farming of the land (growing of seasonal crops) in this zone. The AREVA NP land use is consistent with this definition as it manufactures fuel assemblies and intermediate fuel components at this location. In addition, AREVA NP leases a portion of its land for agricultural use.

Land in the vicinity of AREVA NP includes residential and agricultural use. In an 8-km [5-mi] radius (Benton County land), the use is primarily agricultural with urban and rural residential tracts located in the southwest. High density residential use exists in the southeast. Unoccupied desert is found in the northeast and northwest. There are also agricultural lands in the west. Approximately 28 ha [70 acres] of land are being farmed for alfalfa and grain in the east-southeast tract. Another field, measuring 26 ha [65 acres], lies in the southeast. Property directly west, south, and southwest of the plant is irrigated land that is used to grow crops such as potatoes, alfalfa, and corn. The Horn Rapids Golf Community near SR 240 opened in early 1994. It encompasses 338 ha [835 acres] with plans to include over 3,000 homes, a village center, school, golf course, and parks. Also nearby is the Horn Rapids RV Resort. The resort provides recreational vehicles with 225 hookup sites including water, sewer, propane, electrical, and other convenience services. The portion of Franklin County that lies within an 8-km [5-mi] radius of AREVA NP is primarily agricultural. The principal crops are alfalfa, grain, and potato.

Horn Rapids Road constitutes the northern boundary of the Richland city limits. Land north of AREVA NP (across Horn Rapids Road) is part of the U.S. Department of Energy (DOE) Hanford nuclear site. Land use for this site is done in accordance with the DOE "Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement" and its associated record of decision (September 1999). The decision encompasses a 50 year period (1999-2049). It

provides for anticipated DOE mission needs, includes economic development, and protects environmental resources.

The closest non-industrial block of land is approximately 1.3 km [0.8 mi] east of AREVA NP. In this region, the zoning ordinance specifies land use for science-related research and development facilities, testing facilities, and administrative/general office buildings. Pacific Northwest National Laboratory (PNNL) is increasing its long-term commitment to this location via the current construction of major facilities north and south of Horn Rapids Road.

3.2 Transportation

Transportation is critical to the economic vitality and health of every district. Therefore, it is important that sufficient capacity exists to meet that demand which continues to increase within Richland and its surrounding communities. This becomes evident in the transportation studies conducted by the City of Richland (Citywide Transportation Plan, 2004). More than one route exists to commute to AREVA NP. For the purposes of this discussion, the most reasonable transit routes selected for further discussion are: Horn Rapids Road; Stevens Drive; SR 240; Kingsgate Way; George Washington Way; and I-182.

The nearest crossroad to AREVA NP is Horn Rapids Road and Stevens Drive. Traffic studies show a threefold increase in the average weekday count between July 1996 and July 1999. The morning and evening peak rush hour counts also increase, but at a lesser rate than the average weekday count, as seen in the following table:

Table 3. Studies of Horn Rapids Road West of Stevens Drive

Direction	Month/Year	Average (1) Weekday Count	AM Peak Hour(2)	PM Peak Hour(3)
Eastbound	July 1996	589	139	318
Westbound	July 1996	580	306	131
Eastbound	July 1999	1785	230	421
Westbound	July 1999	1705	554	196

(1) Average Weekday Count represents a 24 hour count period, averaging 2 or more weekday counts.
(2) AM Peak Hour is the highest hour count during the AM hours of 2 or more weekdays.
(3) PM Peak Hour is the highest hour count during the PM hours of 2 or more weekdays.

Another crossroad of significance near AREVA NP is Kingsgate Way and SR 240. This route can provide an alternate entranceway to the site for either routine travel or road closures. Traffic studies between 1996 and 2004 show a significant increase in the road's usage, as noted in Table 4.

Table 4. Studies of Kingsgate Way North of SR 240

Direction	Month/Year	Average Weekday Count	AM Peak Hour	PM Peak Hour
Northbound	July 1996	101	74	15
Southbound	July 1996	92	12	62
Northbound	May 2004	1449	386	135
Southbound	May 2004	990	99	187

Another notable intersection is SR 240 Bypass and Stevens Drive. Officials note within the Citywide Transportation Plan that this location "will experience significant operational problems by 2020." Furthermore, the officials forecast that this intersection "… will fail, even with minor improvements (i.e. signal improvements, turn lanes, etc.). Improvements that are more substantial will be required for the corridor to function at acceptable levels of service, based on the mobility standards recommended in the [WSDOT] Highway System Plan."

The next route considered is George Washington Way. It is a major road that parallels Stevens Drive. This road is significant for several reasons: it is a major road, providing North-South transit; it connects several residential communities; it can be used as an alternate to Stevens Drive to reroute traffic due to an accident or for a City planned road closure (i.e. the City would issue a road closure permit to move hazardous materials, thereby diverting traffic onto George Washington Way); and it is readily accessible from SR 240 and I-182. The City continues to monitor the capacity of George Washington Way at its various intersections. While usage of this road is high, the volume of traffic varies in each of the intersections studied.

The last notable road is I-182. Many of the daily commuting trips on I-182 originate within the Tri-Cities and South Richland residential communities. Based on traffic studies, the I-182-George Washington Interchange has considerable demand. This interchange provides transit to the north end of Richland, such as AREVA NP and the Hanford Site, and to downtown destinations. This interchange is also exhibiting substantial growth as noted in the Citywide Transportation Plan. Officials forecast significant capacity constraints by 2020 if improvements are not made.

Another transportation consideration is the physical movement of goods and the affect the materials movement may have on the public. While safety is of great concern, the focus in the Environmental Assessment is specifically on the environmental affect. Detailed descriptions of the safety aspects appear in the compendium Safety Evaluation Report.

About 300 million hazardous material shipments occur nationwide each year (DOT, 1998). One percent of this total involves shipment of radioactive materials. Transports to and from AREVA NP involve a significantly smaller percentage of this amount. AREVA NP relies on a private carrier for transportation of its nuclear products. The carrier ensures compliance with requirements for packaging, labeling, placarding, driver qualifications, routing, and emergency preparedness.

DOE and DOT regulate the shipment of hazardous materials (i.e. DOT Hazardous Material Regulations, 49 CFR 106–180; Federal Motor Carrier Safety Regulations, 49 CFR 390–397). NRC regulates the Packaging and Transportation of Radioactive Material (10 CFR Part 71). States maintain regulations consistent with the DOT. State and tribal governments have primary responsibility for the health and welfare of their citizens and, therefore, have an interest in ensuring the safety of hazardous materials shipments within their boundaries. Some states maintain specialized emergency response units capable of responding to radioactive material incidents in support of local authorities.

Many agencies are involved with emergencies and accidents involving hazardous materials, such as Federal Emergency Management Agency (FEMA). FEMA is responsible for the federal government's emergency response activities. The activities are coordinated through a Federal Radiological Emergency Response Plan. FEMA also provided assistance and evaluated state and local preparedness for radiological emergencies. DOT established requirements for

reporting transportation accidents involving radioactive materials and has a comprehensive training program on handling emergencies involving radioactive materials shipments. Carriers are required to notify the National Response Center of all releases of hazardous substances that exceed reportable quantities or levels of concern. Certain transportation incidents involving hazardous materials must also be reported to the National Response Center immediately, including those where

- A person is killed,
- A person receives injuries that require hospitalization,
- Property damage exceeds $50,000,
- Radioactive materials are released, or
- Major roads are closed.

Private-sector shippers must provide emergency response information on shipping papers, including a 24-hour emergency telephone number. Shippers have overall responsibility for providing adequate technical assistance for emergency response. Carriers are required to provide emergency planning, emergency response assistance, liability coverage, and site clean-up and restoration.

3.3 Demography and Socioeconomics

The City of Richland is located in Benton County, with Franklin County adjacent to the east. The general locale is known as the Tri-Cities Metropolitan Statistical Area (MSA) within the south-central part of the state where the Snake and Yakima Rivers join the Columbia River. In addition to Richland, the other cities in the Tri-Cities MSA include: Kennewick (also in Benton County), about 16 km [10 mi] southeast of the AREVA NP facility; Pasco (in Franklin County), located about 11 km [7 mi] southeast of the facility; and West Richland (Benton County), about 8 km [5 mi] southwest of the facility (AREVA NP, 2006b).

Population trends in Washington State, Benton and Franklin Counties, and each of the cities in the Tri-Cities MSA are shown in Table 5. The source for the 1960, 1970, and 1980 data was NRC (1995). The 1990, 2000, and 2006 data comes from the U.S. Census Bureau (2007). The Forecasting Division of the State Office of Financial Management is the source of the forecasts for 2025 (State of Washington, 2007). The 2025 forecasts account for projections in annual birth and death rates, migration patterns, and longer expected lifetimes (State of Washington, 2007). The percentage change from the previous census period is provided in parentheses.

Table 5. Population Growth Data

Unit	1960	1970	1980	1990	2000	2006 (Estimated)	2025 (Projected)
Washington State				4,866,692	5,894,121 (+21.1%)	6,393,798 (+8.5%)	8,000,000 (+25%)
Benton County	62,070	67,540 (+8.8%)	109,440 (+62.0%)	112,560 (+2.8%)	142,475 (+26.6%)	159,436 (+11.9%)	190,000 (+19%)
Franklin County	23,342	25,816 (+10.6%)	35,025 (+35.7%)	37,473 (+6.7%)	49,347 (+31.7%)	66,570 (+34.9%)	100,000 (+50%)
Richland				32,315	38,708 (+19.8%)	44,668 (+15.4%)	
Kennewick				42,155	54,693 (+29.7%)	62,276 (+13.9%)	

Pasco				20,377	32,066 (+57.4%)	49,927 (+55.7%)	
West Richland				3,962	8,385 (+112%)	10,199 (+21.6%)	
Tri Cities (total)				98,769	133,852 (+35.5%)	167,070 (+24.8%)	

Summarizing the data in presented in Table 5:

- The percentage of population increase in both Franklin and Benton Counties exceeded the state population increase from 1990–2000.
- The largest growth rate for both counties occurred from 1970–1980.
- Since 1980, the percentage growth rate in Franklin County (including Pasco) is considerably greater than Benton County.
- Franklin County is projected to grow faster than Benton County and the State of Washington.
- The population growth in the Tri-Cities MSA since 1990 is considerably greater than that of the state.

The minority (nonwhite) population of Benton County was 6.6 percent based on 2005 estimates, while the comparable number for Franklin County was 6.4 percent (U.S. Census Bureau, 2007). For the State of Washington, the minority population was 15 percent based on 2005 estimates. According to the most recent available data (U.S. Census Bureau, 2007), the median household income in Richland, Pasco, and Kennewick was $53,092; $34,540; and $41,213, respectively. The state median income was $45,776. Richland is considerably above the state median income level, while the other two cities are below. The percentages of persons living below the 1999 poverty levels in Richland, Pasco, and Kennewick totaled 8.2, 23.3, and 12.9, respectively. The percentage at the state level was 10.6. Therefore the Richland percentage was lower than the state percentage, while both Pasco and Kennewick exceeded it. The Pasco percentage was considerably higher than that for the state.

Based on the 2000 census and projected to 2004, the median household income for the entirety of the United States was $44,334 and 12.7 percent of individuals were living below the poverty level (U.S. Census Bureau, 2007). For the State of Washington, the 2004 median household income was $48,438 (109.3 percent of the median for the entire United States) and 11.6 percent of individuals in Washington were living below the poverty line. Comparable 2004 median household incomes were $52,922 (109.3 percent of the state median) for Benton County and $42,029 (86.8 percent of the state median) for Franklin County. The percentage of persons living below the poverty level in 2004 in Benton County was 10.7, while in Franklin County it was 15.2. The Benton County percentage was below the state percentage, while the Franklin County percentage was higher.

According to data from the U.S. Census Bureau, the State of Washington had 2,651,645 housing units. In 2005, there were 61,410 housing units in Benton County and 20,433 units in Franklin County. For the cities of Richland, Pasco, and Kennewick, the numbers of housing units in 2000 (the latest data available) were: 16,458; 10,341; and 22,043, respectively. The related vacancy rates in 2000 were: 5.5; 7.0; and 5.7 percent, respectively.

The State Employment Situation Report information for November 2007 will be used as a final indicator of the economic strength of the Tri-Cities MSA (State of Washington, 2007). The labor force in Benton County in November 2007 totaled 88,370 persons, with 84,010 employed and 4,360 unemployed (an unemployment rate of 4.9 percent). For Franklin County in the same month, the labor force totaled 30,770 persons, with 28,510 employed and 2,260 unemployed

(an unemployment rate of 7.4 percent). For the Tri-Cities MSA, the November 2007 data indicated a labor force of 119,140 persons, with 112,520 employed and 6,620 unemployed (a 5.6 percent unemployment rate). For comparison purposes, the state unemployment rate in November 2007 was 4.6 percent.

Education is an important socioeconomic factor. The Richland School District includes the cities of Richland and West Richland. From recent records, the District has approximately 10,500 students enrolled in its 9 elementary, 3 middle, and 3 high schools. Higher education is locally available from the Columbia Basin College and Washington State University Tri-Cities. According to the District's Financial Report (2008), "the Richland School District is on solid financial ground with revenues equaling expenditures and a 4% cash reserve in place. The District maintains a 1% contingency fund to cover unexpected expenses that arise during the school year."

In recent years, major employers in Richland and the Tri-Cities MSA included PNNL and several large contractors working on related environmental cleanup activities (City of Richland, 2004). Other major Richland employers in 2004 included the Richland School District, Energy Northwest, government, private companies, retailers, and 3 major health care providers.

3.4 Climatology, Meteorology, and Air Quality

The Pasco Basin of the Columbia Plateau has a semi-arid climate. It is greatly influenced by the Pacific Ocean and the Cascade Mountain Range to the west and other mountain ranges to the north and east (Neitzel, 2004). Winter and summer temperatures vary. The average maximum temperature of 35 °C [95 °F] occurs in July, and the average minimum temperature of -7 °C [20 °F] occurs in January. The temperature falls below freezing an average of about 100 days per year. The record high and low temperatures are 46 °C [115 °F] and - 33 °C [- 27 °F], respectively. The basin is within the rain shadow of the Cascade Mountains, and the average annual precipitation is 16.3 cm [6.4 in]. Rainfall is more frequent in the winter months, averaging about 2.5 cm [1.0 in] per month in November, December, and January and about 0.5 cm [0.2 in] in July and August. Snowfalls of 2.5 cm [1.0 in] or more occur twice each month in December and January on average (Siemens Power Corporation, 2000).

Climatological data are collected onsite and at two meteorological stations located within 4.8 km [3 mi] of AREVA NP. Wind rose readings generated from these stations indicate that the prevailing wind is from the southwest. Secondary direction frequency maxima are from the northwest and southeast along the axis of the Columbia River. The lowest frequencies are seen in the east and northeast directions.

Severe weather in the Columbia Basin consists of wind, thunderstorms, and occasionally a tornado. Wind speeds in excess of 80 km/h [50 mph] occur annually, with recorded speeds of 97 km/h [60 mph] happening every other year. Richland experiences approximately a dozen thunderstorms each year. Local meteorologists have not recorded any tornadoes within 32 km [20 mi] of AREVA NP. Based on a study detailed in an earlier license renewal (Siemens Power Corporation, 2000), scientists from PNNL (a neighbor of AREVA NP) project a low occurrence of tornadoes (0.4 per year) in the Columbia Basin within 161 km [100 miles] of AREVA NP's site. Scientists also cite a 95 percent probability that the wind speed would not exceed 270 km/h [168 mph] for any given tornado.

Several authorities and regulations address air quality. Applicable air pollution control regulations and reporting include: 40 CFR Part 50, National Primary and Secondary Ambient

Air Quality Standards; 40 CFR Part 61, National Emissions Standards for Hazardous Air Pollutants; 10 CFR Part 20, Standards for Protection Against Radiation; and 10 CFR 70.59 Effluent Monitoring Reporting Requirements. The U.S. Environmental Protection Agency delegates the oversight of their regulations to the Benton Clean Air Authority for the region under consideration.

Effects on air quality can result from gaseous effluents released from AREVA NP. The effluents may contain radiological and non-radiological chemical constituents. AREVA NP complies with NRC regulation 10 CFR 70.59, which requires "submittal of reports specifying the quantity of each of the principal radionuclides released to unrestricted areas in [its] effluents during the previous six months of operation." AREVA NP provided its annual stack radioactive discharge data (AREVA, 2006c). NRC also considered routinely reported data (shown below).

Table 6. AREVA NP Inc. Gaseous Effluent Reports

Gaseous Effluents			Mixed Fission and Activation Products		
Year	**6-Month**	**Quantity (µCiα)**	**Flow (m^3)**	**Quantity (µCiβ)**	**Flow (m^3)**
2003	January-June	4.71	1.75E+09	0.12	5.03E+07
	July-December	2.00	1.81 E+09	0.20	5.42 E+07
2004	January-June	1.46	2.36 E+08	0.34	5.14 E+07
	July-*December	1.29	1.46 E+08	0.00	5.23 E+07
2005	January-June	1.66	1.76 E+09	0.00	5.13 E+07
	July-December	4.49	1.85 E+09	0.00	5.23 E+07
2006	January-June	2.68	1.84 E+09	0.27	5.41 E+07
	July-December	2.82	1.85 E+09	0.00	5.21 E+07
2007	January-June	2.88	1.87 E+09	0.00	5.21 E+07
	July-December	1.75	1.80 E+09	0.06	2.53 E+07

* Radionuclide included in this period : R-220 Quantity (µCiβ) 5.24 E+06 in Flow ($m^{3)}$1.74 E+08
AREVA NP, Inc Reports to NRC, License No. SNM–1227, Docket No. 70-1257 (TAC No. L31975).
Richland, Washington: AREVA NP, Inc. (2008)

The National Ambient Air Quality Standards (NAAQS) specify the acceptable air concentration thresholds for six common non-radiological pollutants: nitrogen oxides, ozone, sulfur oxides, carbon monoxide, lead, and particulate matter. Compliance is determined individually for each pollutant, and the area is classified as in attainment when concentration levels comply with NAAQS standards. The pollutant concentration levels in Benton County are in attainment for all pollutants except particulate matter. Portions of Benton County are not in compliance with the 24-hour PM_{10} standards. PM_{10} is defined as particulate matter smaller than 10 µm

[3.9×10^{-4} in]. The Universal Transverse Mercator coordinates identifying the non-attainment area are given in 40 CFR 81.348. The AREVA NP site is outside the non-attainment area.

AREVA NP possesses an Order 95-05 administered by the Benton Clean Air Authority that sets the operational and emission limitations for its non-radiological air effluents. The annual nitrogen oxide (NOx) emission for AREVA NP shall be less than 90.7 metric tons [MT] (100 short tons [ST]). While AREVA NP's NOx emissions vary (minimum 1.13 ST [1.03 MT] - maximum 5.37 ST [4.87 MT]) each year, all of the readings are significantly below the established threshold.

In addition to NAAQS criteria pollutants, NRC requires AREVA NP to monitor fluoride emissions as a condition of the NRC license. The NRC standard for compliance of 0.5 micrograms/cubic meter was established by the State of Washington (WAC 173-481-110, Washington Administrative Code, ambient air quality and environmental standards for fluorides, Department of Ecology). AREVA NP made a process change in April 2004, switching from ion specific electrode to ion chromatography as the analytical method for evaluating fluoride levels in ambient air samples. AREVA NP provided the results in its report (AREVA NP, April 2008). While the data is within the established limits, it appears to rise dramatically after AREVA NP made its process change. Based on questions from NRC staff, AREVA NP subsequently supplied additional information, which is shown in Table 7 (AREVA NP, August 2008).

Table 7. Fluoride Measurements from 2004 through 2008
(corrected results from blank subtraction and peak adjustment to minimize acetate interference; no correction for positive glycolate interference).

Year	Qtr.	Ambient Air Station #3 F, µgm/m^3	Ambient Air Station #4 F, µg/m^3
2004	3	0.12	0.08
2005	3	0.13	0.10
2006	1	0.03	0.06
2006	2	0.07	0.15
2006	3	0.26	0.20
2006	4	0.36	0.17
2007	1	0.05	0.05
2007	2	0.12	0.21
2007	3	0.24	0.40
2007	4	0.24	0.06
2008	1	0.03	0.06
2008	2	0.23	0.33
Limit		0.5	0.5

3.5 Hydrology

3.5.1 Surface Water

The primary surface water body in the affected area is the Columbia River, while the Yakima River has a smaller probability of being affected because of its location. The Columbia River is down-gradient from the site approximately 2.4 km [1.5 mi] to the east, and the Yakima River is located up-gradient from the site approximately 4.0 km [2.5 mi] to the

southwest. Groundwater flow is from the Yakima River to the Columbia River, and the Yakima River joins the Columbia River approximately 16 km [10 mi] south of the AREVA NP site.

The Priest Rapids Dam is located on the Columbia River approximately 80 km [50 mi] northwest (upstream) of the facility, and the McNary Dam (operation of which largely controls water levels in the Columbia River downstream of Richland, Washington) is approximately 45 km [28 mi] south (downstream) of the facility. The McNary Dam is designed to pass a design flood of 62,300 m^3/s [2,200,000 ft^3/s] and has a normal operating water level range between 102.1 and 103.6 m [335 and 340 ft]. From October 21, 1987, through December 25, 2007, the mean water level was 103.4 m [339.3 ft] measured at Clover Island at Kennewick, Washington, with a minimum and maximum of 102.2 and 104.6 m [335.5 and 343.2 ft] over this period. For comparison, water levels varied by approximately 8 m [26 ft] downstream of the Priest Rapids Dam from March 26, 1992, through December 25, 2007.

From October 1, 1917, through December 25, 2007, the mean daily flow of the Columbia River below the Priest Rapids Dam was 3,361 m^3/s [118,700 ft^3/s] and the median daily flow was 2,679 m^3/s [94,600 ft^3/s] (U.S. Geological Survey, 2005). The maximum historical flood on record for the Columbia River occurred June 7, 1894, with an estimated peak discharge of 21,011 m^3/s [742,000 ft^3/s] along the Hanford Reach (Neitzel, 2004). The AREVA NP site, which is 9 m [30 ft] above the normal Columbia River elevation, was not affected by this flood and does not lie within the 100-year floodplain.

3.5.2 Groundwater

Several regional aquifers exist in the affected area, with the topmost aquifer unconfined and lower aquifers confined. For the purposes of simplicity, the lower confined aquifers will be considered to be a single confined aquifer. Regional groundwater flow in the area between the Yakima and Columbia Rivers is strongly affected by water levels in the rivers, with flow from the Yakima River, at a normal elevation of 113 m [370 ft], to the Columbia River, at a normal elevation of 107 m [350 ft]. The average water table elevation at the AREVA NP site is approximately 108.7 m [356.5 ft] so that the depth to groundwater is approximately 5 m [17 ft]. Water levels have risen approximately 1.2 m [4 ft] from the late 1970s and early 1980s. Recharge to groundwater is estimated to be less than 2.5 mm/yr [0.1 in/yr] in areas with undisturbed native vegetation (Vaccaro and Olsen, 2007) such as the areas immediately north, east, and south of the AREVA NP site. Vaccaro and Olsen (2007) estimate that irrigation-induced recharge may be as much as 254 mm/yr [10 in/yr] in local areas west, south, and southeast of the site.

A general hydrostatigraphic column for the DOE 1100 area in the vicinity of AREVA NP is shown in Figure 4. The unconsolidated units above bedrock consist of the Hanford Formation (Pasco gravels) overlying the Ringold Formation. Basalt comprises the uppermost bedrock aquifer. Drill logs from the northern edge of the site indicate that Pasco gravels and eolian sand deposits are approximately 5.5 m [18 ft] thick, underlain by 13 m [43 ft] of sands and gravels of the Ringold formation. Below the sand and gravel layer is a layer described as an impervious silt and clay layer between 6 and 12 m [20 and 40 ft] thick (Veenstra, 1986), forming an aquitard between the upper (unconfined) and lower (confined) Ringold aquifers. Below the upper aquitard lies approximately 30 m [100 ft] of sand and gravel in the lower Ringold Formation. The upper aquitard is thought to be laterally continuous, but the aquifers may merge near the Yakima and Columbia Rivers (Siemens Power Corporation, 2000). The lower aquifer is separated from the underlying aquifer by another aquitard, also between 6 and 12 m [20 and

40 ft] of silt and clay (Veenstra, 1986). This configuration of permeable soil between layers of impervious soil suggests that water that falls on the ground will travel to the Columbia River through groundwater in the unconfined aquifer without entering the confined aquifer.

3.5.3 Floodplains and Wetlands

The Clean Water Act gives the U.S. Army Corps of Engineers jurisdiction to protect and regulate wetlands that are classified as "waters of the United States." As depicted on the Department of the Interior Wetland Inventory Map, naturally occurring wetlands do not exist onsite (U.S. Fish and Wildlife Service, 2007a). According to the U.S. Fish and Wildlife Service, the National Wetlands Inventory noted one man-made, ponded, excavated feature. This feature was formerly used for facility operations but has since been drained and remediated. Therefore, there are no wetlands on the AREVA NP site. The wetlands closest to the AREVA NP site are located along the Yakima River at a distance of 4.0 km [2.5 mi]. The only other wetland in the affected area occurs below the confluence of the Yakima and Columbia Rivers approximately 16 km [10 mi] south of the AREVA NP site.

3.6 Geology and Seismology

3.6.1 Geology and Soils

(Portions of the following description on geology and seismology come verbatim from Pacific Northwest Laboratory's Hanford Site National Environmental Policy Act Characterization," PNNL-6415 Rev 18, dated September 2007)

The affected environment includes the southwestern margin of the Pasco Basin, one of several structural basins within the Columbia Plateau/Basin. The Pasco Basin is bounded by a monocline on the east and anticlinal ridges on the north, west, and south (DOE, 1986). The Pasco Basin beneath the affected area contains layers of unconsolidated poorly and well-graded sands and gravels of the Ringold {3.4–8.5 million years [Ma] ago} and Hanford (~13 ka–3.4 Ma) Formations. The Ringold Formation is overlain by approximately a 9-m [30-ft] silt layer interbedded with sandy layers that create an aquitard separating the upper unconfined and lower confined aquifers (NRC, 1995). Suspected fill material was encountered during the drilling of monitoring wells at the site. Some of these fill materials were found to extend 6 to 7 m [20 to 24 ft] below land surface and into the water table (Siemens Power Corporation, 2000). A hydrostratigraphic section for the Hanford Site, located in the affected area of AREVA NP, is shown in Figure 4 (NRC, 1995).

The physiographic province of the Columbia Basin consists of thick sequences of Miocene age (17–8.5 Ma) flood basalts with a maximum thickness of 4,877 m [16,000 ft] in the Pasco Basin. These flood basalts originated from vents and fissures east of Pasco in the southeast corner of Washington and cover 36 percent of the state (Washington State Department of Natural Resources, 2001). The basalts of the Columbia Basin have been deformed to create ridges and chains of hills and buttes within the Pasco Basin (Siemens Power Corporation, 2000).

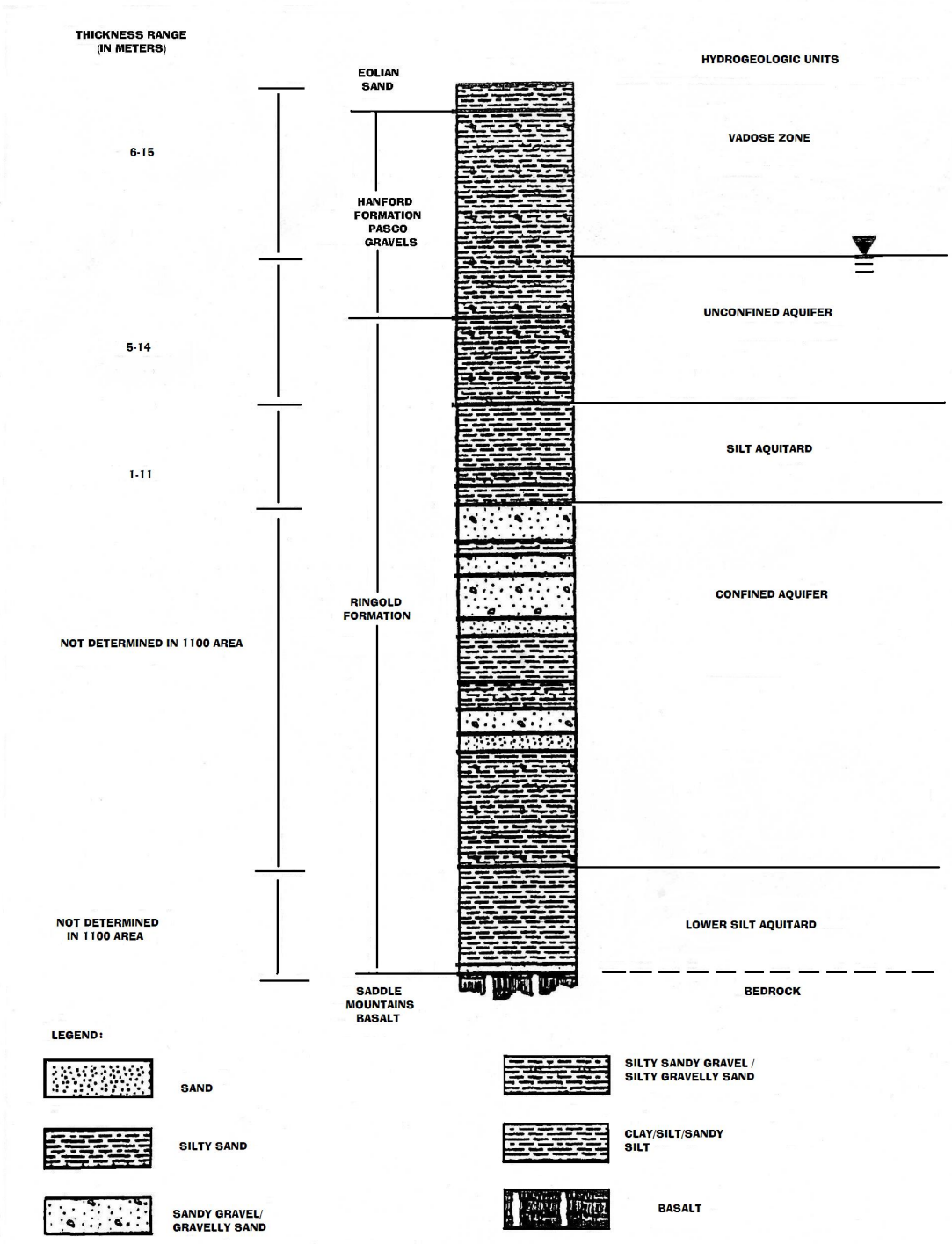

Figure 4. Generalized Hydrostratigraphic Section of the DOE 1100 area, Located in the Vicinity and Typical of the Affected Area of AREVA NP (NRC, 1995)

The Ringold and Hanford formations are good sources of sand and gravel for the construction industry. Two sand and gravel pits on the Hanford Site are located within 3 km [2 mi] of the AREVA NP site. The Horn Rapids Landfill, located immediately north and across the street from the AREVA NP site, was originally a sand and gravel pit.

AREVA NP does not use groundwater for any purpose on its site. In the past, groundwater contamination occurred in the shallow unconfined aquifer due to a release from the site's past surface impoundment system. The licensee removed the impoundment system and cleaned the area to levels established under the Ecology Model Toxics Control Act (WAC 173-340).

Storm water run-off can also impact groundwater quality. AREVA NP possesses 50 distributed storm water wells that control surface storm water run-off. Washington State's Department of Ecology regulates groundwater quality through its Underground Injection Control (UIC) Program [173-218 WAC]. Due to a change in the State's requirements, owners of UIC wells (50 or fewer) constructed before February 2006 must complete a well assessment to determine if any of the existing UIC wells are a high threat to ground water. Also, they must register their wells by February 2011. AREVA NP will complete the registration by 2009.

3.6.2 Seismology

The Hanford Site lies in an area of relatively low seismic activity. Figure 5 (DOE, 2004) shows the locations of known earthquakes that occurred in the Columbia Plateau between 1850 and 2000 with a Modified Mercalli Intensity (MMI) of V or more and at Richter magnitude 3.0 or more. The largest earthquake occurred 1872 in the eastern Washington area. It had an MMI of IX and an estimated magnitude of 7.0. Its location has been variously estimated from Wenatchee to British Columbia. The largest known earthquake in the Columbia Plateau occurred in 1936 near Milton-Freewater, Oregon. This earthquake had a Richter magnitude of approximately 6.0 and a maximum MMI of VII and was followed by a number of aftershocks indicating a northeast-trending fault plane. Other earthquakes with Richter magnitudes greater than or equal to 5 occurred along the boundaries of the Columbia Plateau in a cluster near Lake Chelan. This occurred in 1872, extending into the northern Cascade Range in northern Idaho and Washington and along the boundary between the western Columbia Plateau and the Cascade Range. Three MMI VI earthquakes have occurred within the Columbia Plateau, including one event in the Milton-Freewater, Oregon, region in 1921; one near Yakima, Washington, in 1892; and one near Umatilla, Oregon, in 1893. In the central portion of the Columbia Plateau, the largest earthquakes near the Hanford Site are two earthquakes that occurred in 1918 and 1973. These two events were magnitude 4.4 and intensity V and were located north of the Hanford Site near Othello (DOE, 2004).

In addition, earthquake swarms of small magnitudes that are not associated with mapped faults occur on and around the Hanford Site. The region north and east of the Hanford Site is a region of concentrated earthquake swarm activity, but earthquake swarms have also occurred in several locations within the Hanford Site. The frequency of earthquakes in a swarm tends to gradually increase and decay with no one outstanding large event within the sequence. Roughly 90 percent of the earthquakes in swarms have Richter magnitudes of 2 or less. These earthquake swarms generally occur at shallow depths, with 75 percent of the events located at depths less than 4 km [2.5 mi]. Each earthquake swarm typically lasts several weeks to months, consists of several to 100 or more earthquakes, and has locations clustered in an area 5 to 10 km [3 to 6.2 mi] in lateral dimension (DOE, 2004).

Estimates for the earthquake potential of structures and zones in the central Columbia Plateau were developed during the licensing of nuclear power plants at the Hanford Site. In reviewing the operating license application for the Washington Public Power Supply System (now Energy Northwest) Columbia Generating Station (formerly WNP–2), NRC concluded that four earthquake sources should be considered for seismic design: the Rattlesnake-Wallula alignment, Gable Mountain, a floating earthquake in the tectonic province, and a swarm area (NRC, 1982).

For the Rattlesnake-Wallula alignment, which passes along the southwest boundary of the Hanford Site, the NRC estimated a maximum Richter magnitude of 6.5; for Gable Mountain, an east-west structure that passes through the northern portion of the Hanford Site, a maximum Richter magnitude of 5.0 was estimated. These estimates were based upon the inferred sense of slip, the fault length, and the fault area. The floating earthquake for the tectonic province was developed from the largest event located in the Columbia Plateau, the Richter magnitude 5.75 Milton-Freewater earthquake. The maximum swarm earthquake for the purpose of Columbia Generating Station seismic design was a Richter magnitude 4.0 event, based on the maximum swarm earthquake in 1973 (DOE, 2004). NRC concluded the actual magnitude of this event was smaller than estimated previously (NRC, 1982).

Probabilistic seismic hazard analyses have been used to determine the seismic ground motions expected from multiple earthquake sources, and these are used to design or evaluate facilities on the Hanford Site. A recent Hanford Site-specific hazard analysis (Tallman, 1996) estimated that 0.10 g (1 g is the acceleration of gravity) horizontal acceleration would be experienced on average every 500 years (or with a 10-percent chance every 50 years). This study also estimated that 0.2 g would be experienced on average every 2,500 years (or with a 2-percent chance in 50 years) (DOE, 2004). These estimates are in approximate agreement with the results of national seismic hazard maps the U.S. Geological Survey produced (Frankel, 2000).

PNNL and the University of Washington operate a 40-station seismic monitoring network in eastern Washington, which has been used to determine the locations and magnitudes of earthquakes since 1969. In addition, PNNL operates a network of five strong-motion accelerometers near Hanford facilities to measure ground motion levels from larger earthquakes (Hartshorn, 2001).

According to the Final Environmental Impact Statement for the Tank Waste Remediation System at the adjacent Hanford Site (DOE, 1996), two types of volcanic activity have impacted the Pasco Basin (in which the AREVA NP site is located) in the past (i.e., basaltic flood volcanism and cascade-style diacritic volcanism to the west). The basaltic volcanism has been latent for the past 8 million years and appears unlikely to resume because of changes in the plate tectonic regime of the region (AREVA NP, 2008).

The cascade-style diacritic volcanism would be related to the Cascade Mountain Range, located more than 97 km [60 mi] west of the AREVA NP site. The eruption of Mount St. Helens in 1980 was an example of such a volcanic event. Although a major eruption, impact to the AREVA NP site was limited to ash fall. The Washington Department of Health, in its scoping comments relative to the environmental impact statement for the Northwest Compact Commercial Low-Level Radioactive Waste Disposal Site (also located on the Hanford Site) concludes that “known active and dormant volcanoes present a minor threat because of their distance from the facility.” Ash fall was the only postulated impact (AREVA NP, 2008).

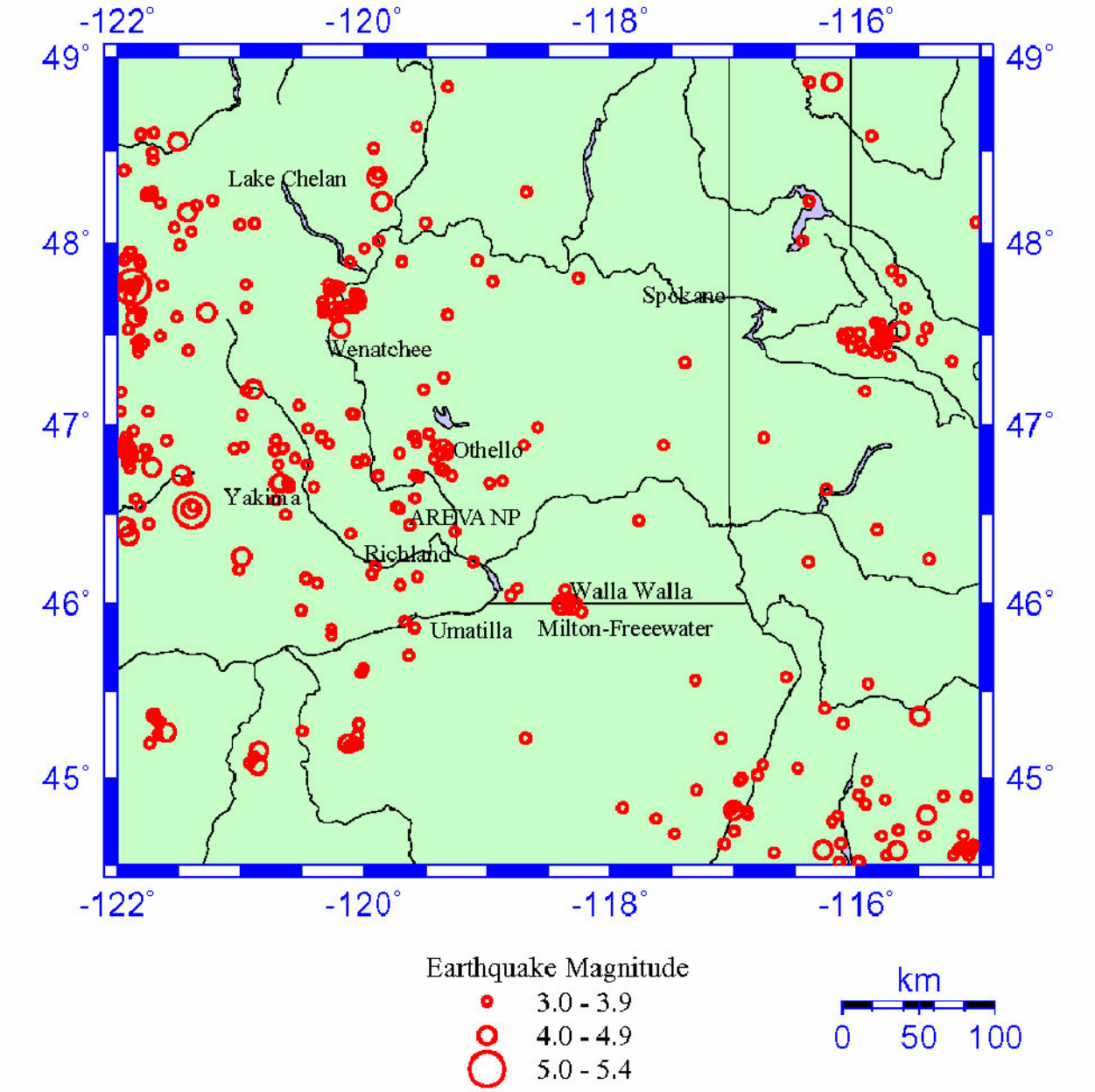

Figure 5. Historical Seismicity of the Columbia Plateau and Surrounding Areas

3.7 Ecology

3.7.1 Terrestrial

The facility is located within the Columbia Plateau Ecoregion (Washington Bio Diversity Project, 2007). The vegetation community is a desert steppe dominated by sagebrush [*Artemisia tridentate*] and antelope bitterbrush [*Purshia tridentate*] (Lockhaven, 1992). Additional native species found in this biome include greasewood [*Sarcobatus vermiculatus*], hopsage [*Grayia spinosa*], and buckwheat [*Fallopia convolvulus*]. The local vegetation has been disturbed over the years from homesteading, fire, and grazing, leaving areas exposed to wind erosion and

dune formation. As a result, Russian thistle [*Salsola kali*], mustard [*Sisymbrium altissimum*], and rabbitbrush [*Crysothampius nauseous*] encroach upon the native vegetation. Approximately 82 mammal species have been documented within the Columbia Plateau region (Washington Bio Diversity Project, 2007). Pocket mice [*Perognathus parvis*] and deermice [*Peromyscus maniculatus*] are common in the site vicinity. Jackrabbits [*Lepus californicos*] and coyotes [*Canis latrans*] are also relatively common. Mule deer [*Odocoileus hemionus*] forage upon cheatgrass shoots and on leaves and twigs of bitterbrush (Lockhaven, 1992).

Approximately 27 different types of reptiles and amphibians are reported to exist within the region (Washington Bio Diversity Project, 2007). However, amphibian species are relatively rare at the AREVA NP site because of their moisture requirements. Reptiles are more abundant than amphibians because they are physiologically adapted to the semi-arid desert environment. The most abundant reptile in the site vicinity is the side-blotched lizard [*Uta stansburiana*]. Gopher snakes [*Pituophis melanoleucus*] and the Pacific rattlesnake [*Crotalus irridus*] are occasionally observed (Lockhaven, 1992).

Resident birds include meadowlarks [*Sturnella neglecta]* and horned larks [*Eremophila alpestris*]. The loggerhead shrike [*Lanius ludovicianus*], game birds such as the chukar partridge [*Alectoris chukar*], quail [*Callipepla californica*], ringed-neck pheasant [*Phasianus colchicus*], and the mourning dove [*Zewnaida macroura*] can also be found. Birds of prey use the area for seasonal hunting, including the marsh hawk [*Circus cyanius*], the golden eagle [*Aquila chrysaetos*], Swainson's hawk [*Buteo swainsoni*], and the burrowing owl [*Athene cunicularis*]. There are occasional sightings of the bald eagle [*Haliaeetus leucocephalus*].

Waterfowl are prevalent on the Columbia River. Pairs of Canada geese reside on the Columbia River islands and produce roughly 700 goslings annually. Approximately 6,000 nesting pairs of California [*Larus californicus*] and ring-billed [*Larus delawarensis*] gulls produce 10,000 to 20,000 young annually (Lockhaven, 1992).

3.7.2 Aquatic

The Columbia River and the Yakima River support diverse communities of plankton, benthic invertebrates, fish, and other communities. However, the Yakima River does not reside in the AREVA NP drainage basin, so it is not affected by groundwater drainage from AREVA NP.

Diatoms, golden or yellow-brown algae, green algae, blue-green algae, red algae, and dinoflagellates are the dominate phytoplankton species. Macrophytes and zooplankton are sparse in the Columbia River because of the strong currents, rocky bottom, and frequently fluctuating water levels. Benthic organisms are found either attached to or closely associated with the substrate. All major freshwater benthic species are represented in the Columbia River, including insect larvae, limpets, snails, sponges, and crayfish (Lockhaven, 1992).

Forty-four species of fish have been identified in the Columbia River in the site vicinity. Of these, the Chinook salmon, sockeye salmon, coho salmon, and steelhead trout use the river as a migration route to and from upstream spawning areas and are of the greatest economic importance. Shad may also spawn in the Hanford Reach. Other fish of importance to sport fishermen are the whitefish, sturgeon, smallmouth bass, crappie, catfish, walleye, and perch. Large populations of rough fish including carp, shiners, suckers, and squawfish are also present (Lockhaven, 1992).

3.7.3 Threatened and Endangered Species

The National Marine Fisheries Service (Yeager, 2008) identified two endangered classes of fish that use the Columbia River in the affected area. The first class includes all naturally spawned populations of Chinook salmon [*Oncorhynchus tshawytscha*] in all river reaches accessible to Chinook salmon (from the Columbia River in Oregon upstream to the Chief Joseph Dam in Washington). It also includes spring-run Chinook spawned at artificial propagation programs in the Winthrop National Fish Hatchery and the Twisp River, Chewuch River, Methow Composite, Chiwawa River, and White River hatchery programs. The second class includes all naturally spawned steelhead [*Anadromous O. mykiss*] populations below natural and man-made impassable barriers in streams in the Columbia River Basin upstream from the Yakima River, Washington, to the U.S.-Canada. Populations from six artificial propagation programs are also included: the Wenatchee River, Wells Hatchery (in the Methow and Okanogan Rivers), Winthrop National Fish Hatchery, Omak Creek, and the Ringold steelhead hatchery programs. Threatened species include the Chum Salmon [*Oncorhynchus keta*] and the Coho Salmon [*Oncorhynchus kisutch*].

Within Benton County there is one federally listed endangered species, (the pygmy rabbit [*Brachylagus idahoensis*] — Columbia Basin distinct population segment) and two listed threatened species (bull trout [*Salvelinus confluentus*] — Columbia River distinct population segment and Ute ladies'-tresses [*Spiranthes diluvialis*] a plant). Two candidate species (yellow-billed cuckoo [*Coccyzus americanus*] and Umtanum desert buckwheat [*Eriogonum codium*] a plant) are listed in Benton County (U.S. Fish and Wildlife Service, 2007b). State-listed endangered and threatened species are shown in Appendices 1 and 2.

3.8 Noise

Noise levels, especially unwanted sound, can degrade the quality of life. Discomfort or annoyance results with noise that is repetitive, long in duration, and/or approaches high levels particularly during the ordinance noise reduction hours (for Richland it is 10 p.m. to 7 a.m.). There are two factors that determine the impact of noise: intensity (loudness), measured in decibels (dBA); and time exposure, measured in hours and minutes. The zoning ordinance stipulates the environmental designation for noise abatement (EDNA) classification for a particular location. The EDNA value represents the maximum permissible noise level set for a particular class. AREVA NP maintains a Class C (industrial) EDNA. With certain exceptions (i.e. limited allowable time excursions and exemptions as established by Washington Department of Ecology), the maximum daytime permissible noise level between AREVA NP and a residential neighbor is 60 dBA. The maximum daytime level between two industrial neighbors is 70 dBA. The historical daytime noise levels, as measured by AREVA NP at their fence line, range from 40 to 55 dBA. For comparative purposes, bird calls have been measured at 44 dBA and typical conversations measure 60 dBA. A likely contributor to outdoor noise at this type of facility would be the heating, ventilation, and air conditioning equipment.

3.9 Historic and Cultural Resources

For centuries, native Indian tribes and settlers resided on the banks of the Yakima and Columbia Rivers, drawing on the region's diverse plant and animal resources for subsistence. A search on the National Register of Historic Places database confirmed 32 prehistoric and historic listings within Benton and Franklin Counties (National Register of Historic Places, 2007a). The Hanford Island Archeological site, located outside but near the AREVA NP facility, consists of prehistoric and historic Wanapum Indian campsites, fishing areas, and burial sites.

The Confederate Tribes of the Yakama Indian Nation have acquired the Waniwasha Indian Cemetery, located about 5.6 km [3.5 mi] southwest of the AREVA NP site (within the Horn Rapids Triangle) for preservation (NRC, 1995).

AREVA NP's property has not undergone a formal historic and/or cultural survey. However, several environmental impact studies have been completed and recognized historical/cultural resources of significance have been identified in the proximity of AREVA NP and are summarized here (all distances reported are relative to AREVA NP):

- There is an historical Indian fishing ground on the Yakima River about 8 km [5 mi] to the west. The 49-ha [120-acre] Arid Lands Ecology Reserve starts approximately 10 km [6 mi] in the west and extends westward along the northern slope of Rattlesnake Mountain. It can be found on the Hanford Site. It is maintained in near pristine condition. Hanford is north of AREVA NP (Jersey Nuclear Company, 1970);

- The Whitman Mission historical site is located roughly 70 km [44 mi] in the southeast. The Ginkgo Petrified Forest National Natural Landmark is approximately 80 km [50 mi] to the northwest. The State Advisory Council on Historical Preservation nominated two additional sites - Columbia Park Island is approximately 13 km [8 mi] in the southeast and Sacagawea State Park is roughly 27 km [17 mi] in the southeast. There are archeological sites along the Snake River and the west bank of the Columbia River starting in North Richland and reaching beyond the Hanford 300 Area. A 12,950-ha [32,000-acre] Fish and Wildlife Refuge is in the northwest corner of the Hanford Site. Pre-WWII homesteads exist in the Horn Rapids Triangle, then evidenced only by a few remaining scrub trees (Exxon Nuclear Company, 1974);

- Archeological districts and sites exist along the Columbia River's Hanford Reach. There is the historically designated Hanford B-reactor. The Waniwasha Indian Cemetery overlooks the Yakima River within the Horn Rapids Triangle (Siemens Power Corporation, 1994, 2000).

Three categories of cultural sites exist at the adjacent Hanford Site. The first category contains prehistoric sites representing Native American cultures and societies. The next category identifies historic era sites, which generally must be at least 50 years old, although it considers items and structures built in support of the Hanford Site's defense mission during World War II and the Cold War Era. The last category covers traditional cultural sites that are important to the heritage of contemporary Native American communities. The Hanford Site contains a rich diversity of known cultural sites in all three categories (DOE, 1996).

NRC received a non-concurrence from the State Archaeologist (Whitlam, September 2008) during the final consultation and review of the Draft Environmental Assessment (NRC, August 2008). The Archaeologist expressed concern with the lands not having a survey in the past and that a high potential existed for significant cultural properties in this area as described above. To resolve the non-concurrence, AREVA NP voluntarily offered to perform the following actions: AREVA NP hired a Washington State Historic Preservation Office approved consultant to perform a historic/cultural literature search; the consultant also performed a pedestrian review of the 50 acre site for cultural/historical interests; AREVA NP invited the local tribe's participation in the process; and AREVA NP will distribute the recommendations received from the consultant to all interested parties once completed (AREVA NP, December 2008).

3.10 Scenic/Visual Resources

An analysis of the scenic/visual resources of AREVA NP was not conducted prior to construction of the existing facility and has not been conducted since construction. The major landscape feature that is located within the affected area of AREVA NP is the Columbia River, which flows through the northern part of the Hanford Site and then turns south. A portion of the Columbia River that passes through the Hanford Site is called the Hanford Reach. The Hanford Reach Protection and Management Program Interim Action Plan (Benton County Planning Department, 1998) outlines guidelines for facilities along the Hanford Reach (such as designing buildings to be "visually subordinate" whereby buildings and/or other structures are shielded from view or blended into the existing landscape as much as possible). Hanford Reach is located within the affected area of AREVA NP, extending north and south to the east of the site. The report states that the Hanford Reach "is in good condition, with many miles of 'ideal' landscapes, broken only occasionally by power lines and other infrastructure."

The scenic impacts of the Hanford Highway have also been assessed as part of the Hanford Environmental Impact Statement (DOE, 2004). The Hanford Highway extends southeast and northwest on the south side of AREVA NP. SR 240 provides public access through the southwestern portion of the Hanford Site. Views along this highway include the open lands of EDNA in the foreground to the west … "are expansive due to the flat terrain and the predominantly short, treeless vegetation cover."

3.11 Public and Occupational Health

AREVA NP manufactures fuel assemblies and intermediate fuel components for the nuclear power industry. Its operations may also be classified as a chemical production plant with similarly noted hazards. While comparatively minor, the possibility exists for release of low levels of radioactive materials (primarily uranium). For accident conditions, the hazard may involve releasing higher concentrations of materials over relatively short periods of time. The following section briefly describes the radiation levels in the affected area and the corresponding occupational health factors. There is also information on occupational injury rates.

For a U.S. resident, the average annual estimated total effective dose equivalent (TEDE) from natural background and anthropogenic radiation sources is about 3.6 mSv [360 mrem] but varies by location and elevation (DOE, 2000). The source of this dose includes cosmic radiation, radionuclides generated by interactions between the atmosphere and cosmic radiations (cosmogenic radionuclides), radiation sources in the earth (terrestrial sources), naturally occurring radionuclides in the air (inhaled), and naturally occurring radionuclides that exist in the body. The average natural background radiation level in the State of Washington is 2.4 mSv/yr [240 mrem/yr]. The average natural background and anthropogenic radiation level in Southeastern Washington is higher at 6.3 mSv/yr [630 mrem/yr] (DOE, 2000).

Risks to occupational health and safety include exposure to industrial hazards, hazardous materials, and radioactive materials. Industrial hazards for the AREVA NP facility are typical for similar industrial facilities and include exposure to chemicals and accidents ranging from minor cuts to industrial machinery accidents.

Radiation doses include both doses from radioactivity inside the body and doses from radioactivity external to the body. Internal doses from ingestion of radioactive materials are generally calculated from an airborne radioactivity measuring system. For monitored individuals, airborne concentrations (expressed in terms of derived air concentration) in the work

area are multiplied by stay times (in hours) and by the appropriate factor for respiratory protection, if respirators were used. Airborne concentrations may be multiplied by correction factors which may be based upon representative sampling studies, bioassay studies, and particle size corrections. In lieu of air sampling, internal doses may be calculated from bioassay results. Generally bioassay results are only used for evaluating incidents.

External radiation doses are measured using dosimeters that are issued to workers who have a potential to receive external radiation doses. Thermoluminescent dosimeters provide results for monitored individuals to determine their Deep Dose Equivalent (DDE) and shallow Dose Equivalent. These thermoluminescent dosimeters are accredited by the National Voluntary Laboratory Accreditation Program.

The calculated CEDE and the measured DDE are added to derive the TEDE. Table 8 contains the maximum TEDE for the last 5 years (AREVA NP, 2008). The NRC occupational dose limit for any exposure category is 50 mSv [5 rem]

Table 8. Maximum Doses for 2003–2007

Year	Maximum Deep Dose Equivalent in mSv [rem]	Maximum Committed Effective Dose Equivalent in mSv [rem]	Maximum Total Effective Dose Equivalent in mSv [rem]
2003	8.0 [0.800]	8.6 [0.860]	10.79 [1.079]
2004	4.91 [0.491]	12.35 [1.235]	15.96 [1.596]
2005	5.03 [0.503]	10.16 [1.016]	13.6 [1.360]
2006	4.27 [0.427]	15.93 [1.593]	17.41 [1.741]
2007	4.77 [0.477]	12.09 [1.209]	13.98 [1.398]

AREVA NP compiles information on workplace total recordable incident rates and lost-time incident rates. Total recordable incidents are work-related deaths, illnesses, or injuries resulting in loss of consciousness, restriction of work or motion, transfer to another job, or required medical treatment beyond first aid. A lost-time incident is a recordable incident that results in one or more days away from work, days of restricted work activity, or both, for affected employees. Fatalities are the number of occupationally related deaths. The incident rate includes both the number of Occupational Safety and Health Administration recordable injuries and illnesses and the total number of man-hours worked. The incident rate is used for measuring and comparing work injuries, illnesses, and accidents within and between industries. The U.S. Department of Labor Bureau of Labor Statistics reported that the incident rate for manufacturing facilities such as AREVA NP is 6.0 incidents per 200,000 worker-hours (U.S. Department of Labor, 2007). Injury rates for AREVA NP are provided in Table 9 for the past 5 years. There have been no work-related fatalities over the course of the AREVA NP site's operating history.

There have been no formally commissioned health effects studies specific to the AREVA NP operations. However, since their inception, plant activities have been accompanied by a comprehensive radiation protection program and industrial hygiene surveillance activities. These programs have provided workplace environmental monitoring, bioassay testing (radiological), engineering controls, personal protective equipment, and respiratory protection (as required) to assure that exposures to radiological, chemical, and physical hazards are maintained well below applicable regulatory limits. Radiological exposures are further controlled

under a formal ALARA program. These workplace evaluation/control programs are supplemented by a medical surveillance and testing program that includes medical history tracking, vision, testing, audiometry, physical exams, and blood and urine testing.

Table 9. Injury Rates (Incidents Per 200,000 Worker-Hours) for 2003–2007		
Year	**Occupational Safety and Health Administration Total Recordable Incident Rate (12-Month Trend)**	**Occupational Safety and Health Administration Lost Time Incident Rate (12-Month Trend)**
2003	2.64	1.56
2004	1.59	0.58
2005	2.39	1.75
2006	1.68	0.84
2007	2.57	1.28

No evidence exists to indicate that plant operations adversely impact the health of its workforce relative to radiological, chemical, or physical agents (AREVA NP, 2008).

4.0 ENVIRONMENTAL IMPACTS

The staff reviewed the applicant's environmental report, collected information from local, regional, state, and federal government agencies and evaluated the environmental impacts for the various resources on the affected environment. The staff applied the guidelines outlined in NUREG-1748 (NRC, 2003) in their evaluation. In accordance with this guidance, the staff evaluated the direct, indirect, cumulative, short-term and long-term effects that each resource may encounter from the proposed action. The staff qualified the effects in terms of small, moderate, or large. NRC applies the same qualitative measurements in its environmental impact assessments for nuclear power plants (10 CFR 51). The definitions are as follows:

- SMALL – environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- MODERATE – environmental effects are sufficient to alter noticeably, but not to destabilize important attributes of the resource.
- LARGE – environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

4.1 Land Use

Under the terms of the renewal, AREVA NP will continue its current fuel fabrication processes on the Horn Rapids Road site. The proposed action will not change AREVA NP's land use. Land use will remain consistent with the City's current zoning ordinance. Therefore, continued operations will not cause a direct or short-term impact on land use. NRC staff considers that each of these effects may result in small environmental impacts.

Section 2.6 of this assessment provides a listing of the anticipated long-term changes to AVERA NP's facilities. NRC staff considers the listing of maintenance activities and facility/process upgrades to be consistent with a facility that operates for this period of time. Staff does not consider that any of the proposed changes would lead to significant long-term or indirect environmental effects, such as an increase in airborne or liquid effluents that would affect the designated land use. Furthermore, if the applicant chooses to expand its operations beyond the

approved license, NRC will then re-evaluate the environmental conditions when the licensee submits an application for a license amendment.

The staff also considered other long-term/indirect effects that may result from an additional 40 years worth of operations. For example, the City plans on furthering the development of the Industrial Park. The parcels will maintain the same zoning ordinance that exists today. With continued use of the land, this may cause effects on other environmental resources. More details are given in the specific environmental resource within this chapter. Two examples are summarized here:

- Continued use of the land for production of nuclear fuel components may result in positive benefits to the region's socioeconomics and may offset potential job reductions at Hanford.
- Impacts to the geology and soils are possible as a result of chemical spills and leaks. Spills and leaks occur at every chemical processing plant. To lessen the impact, AREVA NP has administrative and procedural controls, such as training and environmental monitoring programs in-place.

Therefore, NRC staff considers each of these long-term and indirect impacts to be small.

Based on the City of Richland's future zoning plans, land use at this site will remain industrial-agricultural based, regardless of the site's tenant. Upon consideration of the proposed action, NRC staff cannot foresee any change from continued operations that would alter noticeably or destabilize the land use. AREVA NP continues to maintain acceptable controls on its operations (i.e. cleaned and closed the site's former surface impoundment system to prevent contamination of the land and its groundwaters). Therefore staff considers that the cumulative environmental impact will remain small for this resource.

The No Action Alternative could impact land use. Although it is AREVA NP's stated intention to continue production for the next 40 years, a change may occur. In the event that AREVA NP chooses to stop its operations and vacate the property, NRC would require environmental remediation of the site. In the short-term, land use would support the decommissioning activities. After completion of decommissioning, the lands would become available for use by a new industrial tenant. Future environmental land use impacts would depend on the new tenant.

4.2 Transportation

The City of Richland recently made several transportation flow improvements in the vicinity of AREVA NP, such as widening of Stevens Road and the addition of signal lights. Currently, the largest traffic flow on the nearby roadways is seen in the late afternoon rush hour. The pattern is strongly influenced by traffic flowing from the Hanford Site. The City of Richland considers that its local roads have ample capacity to handle the short-term traffic volume. For roadways further removed in distance from AREVA NP such as I-182, the traffic volumes are considerably higher since Richland serves as a pass-through community for many of these commuters. In the short-term, traffic volumes may slow during the peak hour commute in certain locations. The associated impacts are currently deemed acceptable by the local officials. NRC staff considers the short-term impacts of the license renewal as small.

Based on projected population growth estimates and anticipated development of residential communities and commercial lands, NRC staff considers the long-term impact of transportation as small to moderate. As described in the Richland Transportation Plan, local officials consider that several key intersections of SR 240 Bypass Highway within Richland may experience significant capacity problems by 2020. Officials plan to minimize traffic impacts on residential neighborhoods by promoting regional circulation. To minimize traffic impacts, the City will route

principal and minor arterials around, rather than through neighborhoods and communities. One method to achieve this plan is to limit city street access thereby lessening the demands for north-south travel on parallel city streets. In addition, officials are considering the upgrade of SR 240 to a freeway status between I-182 and Stevens Drive. Another roadway of concern involves two interchanges on I-182. To reduce future traffic volume conditions, the City of Richland is currently performing a preliminary design and environmental study to construct a bridge over the Yakima River at Duportail Street location.

NRC staff considers the direct environmental impact of transportation as small. The proposed action would not add substantial AREVA NP traffic to the local roadways. Small increases in traffic volumes may result from continued residential growth. Also, accidents may impact the flow of traffic as vehicles divert onto alternate roads. If a commute route closes due to an accident during the peak hour transit, local officials estimate a quick recovery (the commuter may experience a 15-20 minute increase in travel time during the peak hour travel). Several roads can handle the temporary diversions.

Indirect effects from transportation can result from occasional events, such as pre-arranged road closures. NRC staff considers this impact as small. During the closure, the City of Richland issues a permit to approve movement of hazardous materials between certain locations, i.e. from AREVA NP to the Hanford Site. The transfer would occur in the evening hours with little or no impact to the local community. Other small indirect effects may result from increased vehicle noise due to residential and other business growth in the region. NRC staff considers this a small effect based on employment projections. The largest employer in the Richland region is the Hanford Site. According to the local officials, traffic from the Hanford Site will significantly lessen over the next 30 years as changes occur in the Department of Energy's use of Hanford. However, the City anticipates a gain in the Horn Rapids Industrial Park. Based on this scenario, the regional traffic load would remain relatively constant.

Cumulative impacts from transportation may result from the increased demand on local roads due to residential growth and further development of the industrial sector. This may result in a small to moderate impact. In consultations with local officials and the licensee, industry and the regional government collaboratively plan Richland's future transportation system. AREVA NP participates in regional planning activities through a Commercial and Industry Committee. The Committee discusses local concerns and identifies solutions which include the recent upgrades to Stevens Drive, the addition of turning lanes and signal lights, and the installation of sound barriers on SR 240 Bypass. These actions should improve transportation flow and reduce noise level impacts. Therefore NRC considers that the proactive and collaborative planning efforts will keep the cumulative impacts small.

The above paragraphs address the environmental impacts associated with system capacity. The following section considers the impacts caused as a result of transporting products into and away from AREVA NP's site. Although the number of future radioactive shipments is expected to rise nationwide, the number of shipments to and from AREVA NP is not expected to increase significantly. In addition, the annual number of hazardous material shipments involving AREVA NP would continue to be very small in comparison to the total number of hazardous material shipments that occur nationwide. Furthermore, contractors transport AREVA NP materials in approved shipping containers and tanks. DOT and NRC previously considered the environmental and radiation safety effects for performing these operations. As long as the material shipments conform to the established protocols and procedures, NRC staff finds a small environmental effect may result, as bounded in the previous studies.

The No-Action Alternative could impact transportation. In the short-term, decommissioning activities could result in increased vehicle movements due to demolition activities. The long-term environmental impact of transportation would depend on the use of the site.

NRC staff anticipates small impacts from the Renewal for a 5-Year Term Alternative. The impacts are similar to those presented in the short-term and direct assessments noted above.

4.3 Socioeconomics

NRC staff considered each of the following socioeconomic factors for the locale: economy; employment levels; population growth; housing units/vacancy rates; available educational services; and health care. Staff grouped the direct, short-term, long-term, and cumulative effect considerations into one analysis based on similar outcomes. A separate analysis appears for the indirect effect.

One of the most important factors for the survival of a community is maintaining or augmenting its economic base. Richland's non-agricultural economy originated with and thrived from the wartime needs of the federal government's operations at the Hanford Nuclear Site. However, with Hanford's mission changing and significant decreases in its employment levels anticipated, officials seek other sources of employment, including diversification of its businesses to offset the inevitable loss of Hanford's high-paying nuclear jobs. Continued operations at AREVA NP address this need. It has approximately 700 employees that reside within the Tri-Cities region. While its operations support the nuclear industry, AREVA NP does not depend on Hanford. Furthermore, AREVA NP is a major business and is listed as one of *Richland's 25 Largest Employers* (City of Richland, 2004). With this distinction, the compounding effect of long-term job losses at Hanford and AREVA NP would likely cause a large economic impact upon the region and would probably destabilize the local economy. Therefore NRC staff considers AREVA NP as a significant economic source for Richland and the Tri-Cities region.

To support future employment, there are other socioeconomic factors for consideration. There must be a qualified source of applicants, along with available jobs, housing, and educational/health care services. As seen in Chapter 3 Table 5, the Tri-Cities region anticipates continued growth in its population. The region's growth will exceed percentage-wise, the growth projected for the entire State. Local and regional officials continue to diversify and attract businesses to the region. Richland also had one of the lowest unemployment rates in Washington. Between 2001 and 2004, Richland experienced record levels of new housing construction along with increases in its City sales tax receipts (City of Richland 2004). Based on Richland School District's data, the school system has sufficient resources and reserves to educate its students (Richland School District, 2008). Richland is also uniquely positioned to augment its educational system with funds (i.e. grants and scholarships) through the Richland Education Foundation. The Foundation provides modest grants to teachers, schools, and other district representatives to create new and innovative ways to motivate students. There are also annual competitive scholarships available for high school students. Furthermore, the region has recently undergone a growth in its health care system. Three health care providers, Kadlec Hospital, Lourdes Counseling Center, and Eberline Services appear on *Richland's 25 Largest Employers* listing. Kadlec considerably increased their employment levels and is in the early planning stage of a $40 million expansion of their downtown Richland campus. At the same time, Kadlec is working with Columbia Basin College and Washington State University Tri-Cities on developing a new health sciences training and education center on the local campus. Based on these positive findings, NRC staff considers that the affected region provides sufficient

socioeconomic infrastructure. Therefore NRC staff believes that AREVA NP's continued operations produce a small direct, short-term, long-term and cumulative impact.

Indirect effects from the proposed action may include increased traffic, greater demands on public transportation and health care, more congestion of the roads, greater noise, and potentially overcrowded schools as the population increases. The City has long-range plans that account for these impacts and has successfully implemented timely changes in its past. Based on the region's proactive strategic planning efforts, NRC staff considers the potential indirect impacts to be small.

The No-Action Alternative could result in an adverse socioeconomic impact by reducing the number of employed professional, scientific, management, and administrative staff positions. During the decommissioning phase, short-term transient construction labor pool will exist. However, until a replacement employer is found, the No-Action Alternative would cause a large impact on one of the major manufacturing labor pools in the region until a new work source is found.

4.4 Air Quality

Potential impacts on air quality for the affected environment can result from gaseous effluents released from AREVA NP. The effluents may contain radiological and non-radiological chemical constituents. The staff finds AREVA NP's radioactive emission readings well below the limit listed in 10 CFR 20.1101(d).

AREVA NP's NOx emissions vary from year to year, averaging 3.30 metric tons (3.64 short tons). This emission rate is significantly below the established threshold of 90.7 metric tons (100 short tons). In addition, the proposed action does not include any change to the facility or process that would increase the emission rate. With respect to National Ambient Air Quality Standard criteria pollutants, the staff considers that continued operations at AREVA NP will not result in a significant direct impact to air quality.

In addition to the National Ambient Air Quality Standard criteria pollutants, NRC requires AREVA NP to monitor its fluoride emissions as a condition of its license. The State of Washington establishes the regulatory limit and enforces its compliance. AREVA NP submitted the quarterly environmental sampling data for the years 2000 through 2005 with the license renewal application. While the results were below the established limit, NRC staff noted an unusual and possibly adverse trend at the same point in time that AREVA NP instituted an analytical process change. The change occurred in the second quarter of 2004. The readings showed an order of magnitude increase over the past values. AREVA NP did not make any additional changes in their process beyond the analytical method chosen. NRC staff requested further information from the licensee. In the reply, AREVA NP discussed the reason for the process change, the limitations of the analytical methods, and the corrective actions planned/taken (AREVA NP, August 2008). AREVA NP chose this analytical method for its greater precision and efficiency. However, the technique does have certain limitations, especially at the concentrations under analysis. Specifically, other chemical constituents contained in the sample may cause interference in the readings. With the knowledge of the interference, the technician could make the necessary adjustments and correct the data. Furthermore, AREVA NP confirmed the presence of the interference and is working with its vendor to establish an automated process. This process would provide the necessary correction factors in the analysis. In the event that the vendor cannot automate the change, AREVA NP stated that it will use their original analytical process. In the meantime, AREVA NP

submitted revised data for the quarterly reading reported from 2006 through 2008. NRC staff independently confirmed these statements and also consulted with State regulatory official. The State provided their assessment along with their review of the proposed license renewal (Ayres, October 2008). NRC staff finds the approach acceptable. Based on the assessment, NRC staff considers this a small direct and short-term environmental impact. Furthermore, if the readings continue to remain low and a suitable analytical process is consistently used, NRC staff finds the long-term environmental impact to be small.

Indirect and cumulative environmental impacts may result from the emissions (i.e. process stack, vehicular) released by other industrial companies located in the affected area. The nearest industrial neighbor is a low-level radioactive waste processing facility. Within AREVA NP's application, they note that the waste processor does not manage hazardous materials in quantities that pose hazards to AREVA NP under normal or off-normal conditions. In consultation with the State, NRC staff confirmed that the affected area's neighbors are in compliance with regulations. From this assessment, NRC staff considers the indirect and cumulative environmental impacts are small.

The No Action Alternative may degrade the air quality over the short-term and cause direct impacts to the affected area based on the high levels of demolition dust and exhaust from its vehicles. The long-term and cumulative impacts are unknown and will depend upon the next occupant.

4.5 Water Quality (Surface water, groundwater, and wetland bodies)

[NRC staff revised Section 4.5 based on the outcome of the consultation made with U.S. Fish and Wildlife Service (USFWS) staff (October 2008). USFWS agreed via e-mail with the changes (March 2009). NRC will request a formal concurrence from USFWS and append this record into the official project file.]

AREVA NP used a lagoon in its past operations. It has since been decommissioned. With its removal, the AREVA NP property no longer contains any surface water or wetland bodies. Consequently, there are no direct, indirect, short- or long-term environmental impacts to surface water or wetland bodies on site as a result of continued operations at this facility.

Beyond the site, the primary surface water within the affected area is the Columbia River. The river is approximately 2.4 km [1.5 mi] down-gradient from the site. To remain in compliance with regulations and permits, AREVA NP possesses and uses processes, procedures, and controls to minimize groundwater contamination (refer to groundwater quality discussion in the paragraph below). Therefore NRC staff does not anticipate any significant groundwater contaminant flow from the site to the Columbia River. However, the site's wastewater ultimately reaches and co-mingles with the river water. This results from the processing of wastewaters. AREVA NP processes their wastewater discharge (process wastewater, plant sanitary sewage, and cooling water streams) through the City of Richland's publicly owned sewage treatment facility (under permit number CR-IU004). Post treatment, the City discharges the flow into the receiving waters of the Columbia River.

CR-IU004 is a new permit, issued in 2006. Previously, the Washington State Department of Ecology held the waste discharge permit (ST3919), as authorized by the United States Environmental Protection Agency (the federal agency charged with regulating industrial users of publicly owned treatment works [POTW]). In 2006, the Department of Ecology granted regulatory authority to the City of Richland to pass local ordinances and issue their own

discharge permits. City officials state that the recent permit limits are conservative "due to the limited historical data available to both the City and [AREVA NP] regarding the performance of the new pretreatment system… This is necessary in order to be protective of both the POTW and the receiving water body. It is the City's policy to include those parameters with limits either in the City's Pretreatment Code or within the City's own NPDES permit. The City does recognize that the data provided by [AREVA NP] indicates that several of the metals which have limits assigned, appear to be orders of magnitude lower than the applied local limits."

To show compliance with the various permits and regulations, AREVA NP samples sludge from the sewage treatment plant. Per NRC regulations, this is done to ensure that uranium and technetium levels in the sludge remains below the NRC monthly average sewer release limits (10 CFR Part 20, Appendix B). There are similar analyses performed for other attributes listed in CR-IU004, such as flow, conventional loadings, and metals. Based on a review of AREVA NP's discharges to the sewer data, AREVA NP's monthly discharges are within the regulated limits. Furthermore, the wastewater treatment plant treats mainly domestic sewage. Only 7.9% of the flow comes from industrial sources of which AREVA NP contributes 17%. Overall, AREVA NP's discharge is 1.4% of all the wastewater volume treated by the City of Richland. Based on this analysis, NRC staff considers that continued operation of the AREVA NP facility has no discernible impact on the daily operation of the POTW and therefore, AREVA NP has a small direct, indirect, and short term impact on Columbia River water quality.

Storm-water runoff may potentially affect groundwater quality. AREVA NP handles storm-water runoff through the use of a dry well system. Dry wells are passive devices in which runoff eventually intermingles with the groundwater and may include other surface contaminants trapped in the runoff. The State regulates discharges to dry wells in its Underground Injection Control Program. From discussions with the State Department of Ecology, a new rule went into effect in February 2006 (i.e. provision of a schedule to complete registration and assessment of these wells). AREVA NP is addressing the change. In the meantime, the State allows the continued use of the wells. In order to maintain groundwater quality, AREVA NP continues with its programs and practices of managing spills and leaks. The programs include active containment (i.e. spill containment basins, double containment tanks) and employee reporting/inspection processes. Since changes in operations with respect to type and amount of effluent release are not anticipated under this license amendment, there will be no direct or indirect impacts to surface water as a result of continued operations at this facility. Therefore staff considers this a small effect.

Over the next 40 years, the City of Richland anticipates increased industrial activity in the Horn Rapids Industrial Park. Further industrial activity could potentially increase the amount of industrial effluent and runoff received by the sewage treatment plant. Since the type of effluents cannot be reasonably determined, the staff cannot assess the long-term or cumulative impacts.

The No-Action Alternative could impact water quality. In the short-term, decommissioning activities could increase levels of liquid effluent and the potential for spills. In the long-term, the impact would depend on the decontamination level achieved.

4.6 Geology and Soils

Environmental impacts considered for this resource include, but are not limited to, land stability (the occurrence of landslides), subsidence, and disruption of natural drainage. Lands outside of AREVA NP's fenced exclusion area remain essentially unchanged and undeveloped throughout its past (approximate 40 years) ownership. AREVA NP discovered evidence of past

disturbances of the land (fill material found) during the drilling of the site's monitoring wells. The immediate area surrounding AREVA NP is relatively flat with features typical of the region. Within the overall affected area, the land is considered stable and has been for some time. However, landslides occurred many centuries ago in areas with steep slopes on the nearby Hanford Site. Seismic activity appears low overall, but occurrences of earthquake swarms (small magnitudes) exist within the affected area. Volcanic activity is also possible but with limited impact anticipated on the site (primarily ash fallout). Natural drainage from storm water runoff occurs on the property through the use of a dry well system regulated by Washington State Department of Ecology. From these statements, NRC staff believes there is little direct, short-term, or long-term environmental impacts on this resource as a result of AREVA NP's continued operations and therefore considers the impacts as small.

An indirect impact on the soils may result from spills, leaks, and inadvertent discharges that flow uncontained into the ground. The impact is closely related to the extent of the release, sediment transport, and groundwater movement. AREVA NP minimizes the impact and possibility of accidental releases by confining hazardous materials in closed systems within the buildings, using double containment tanks when applicable, and through various other techniques such as the administration of frequent inspections and appropriate materials handling training. With proper attention and care, spills and leaks should be minimal. Furthermore, environmental monitoring of the forage and soil does not indicate contamination in the immediate surrounding environs. Therefore NRC staff considers that the resultant indirect releases to the soils would produce a small environmental impact.

Cumulative impacts can result from accidental releases of chemicals into the soils. This may cause degradation of the groundwater, diminish land fertility, and produce toxic sediment contamination. In its past, AREVA NP experienced groundwater contamination in the shallow unconfined aquifer due to a release from the site's former surface impoundment system. Washington State Department of Ecology regulated the clean-up and closure process, which included the emptying, dismantlement, and soil remediation tasks. The clean-up met or exceeded the established limits (29 pCi/g for uranium at a U-235 enrichment of 3.5%) of the Ecology Model Toxics Control Act (MTCA, WAC 173-340). In accordance with the NRC license condition and the State requirement, AREVA NP continues to monitor the groundwater quality on a quarterly basis for gross alpha, gross beta, fluoride, nitrate, ammonia and pH. From this example, NRC staff projects the cumulative geology and soil impacts to be small.

The No-Action Alternative may produce short-term impacts. Decommissioning activities may affect surficial geology from erosion. The main geological impacts experienced during decommissioning would result from the clean-up of contaminated soils and sediments. However, soils at the site must meet applicable radiological soil concentration limits before release for restricted or unrestricted use. The long-term geological impact would depend on the land use after license termination.

4.7 Ecology

NRC staff consulted with the various Federal and State officials on the effects that the proposed action may have on the ecology, including endangered and threatened species. Officials acknowledged that AREVA NP's site does not provide a habitat for any of the concerned species and that normal operation does not cause an ecological impact. Therefore NRC staff does not find any direct impacts on the ecology and considers this a small impact.

Next, NRC staff considered the impacts of AREVA NP's continued operations on the aquatic ecology. Marine Fisheries Service staff identified two endangered classes of fish that use the Columbia River in the affected area. The river is 1.5 miles to the east of the site. The site does not have any surface waters. Therefore a surficial pathway to the river does not exist. Furthermore, AREVA NP processes its wastewater discharge through the City of Richland's publicly owned sewage treatment facility and performs all of the necessary testing and monitoring to assure releases are within regulatory limits. Also, AREVA NP limits the spread of spills and leaks through a series of physical and administrative protocols (i.e. spill containment basins, double containment tanks, training, and inspections). With this considered, there is a low probability that AREVA NP's liquid effluents would impact the endangered fish.

NRC staff considered other short-term, long-term, indirect, and cumulative terrestrial effects that might occur within the proposed action's timeframe. The most reasonable and foreseeable ecological impact may involve future residential, commercial, or recreational land development within the affected region, beyond AREVA NP's land. Presently, AREVA NP does not have any plans for expansion. However, future expansion would probably take place in areas already disturbed. AREVA NP would submit a licensing amendment request for this action and NRC would evaluate its environmental impact. Based on this assessment and consultation with state and federal agencies, the environmental impacts to ecology are considered small.

Also, the staff considered cumulative ecological effects in the affected region. Staff focused on the ecological impacts associated with continued land use. Current occupants perform manufacturing, assembly, warehousing, and distribution activities on their sites. The City of Richland permits farming of the land (growing of seasonal crops) in this zone, as well. The characteristics of the Horn Rapids Industrial Park show that the land and its habitats have already been disturbed. Further development may result in potential habitat fragmentation or loss of biological diversity. Local officials will consider this effect in their future development decisions. However, at this time, AREVA NP does not have any plans for expansion of its operations or changes in its land use. Therefore, NRC staff considers that the renewal of AREVA NP's license would not result in additional cumulative effects on the affected ecology.

The No-Action Alternative would result in the expiration of AREVA NP's license and the decommissioning of its facility. This action may result in short-term environmental impacts such as increases in the noise levels due to the demolition activities or changes in air quality. In the long-term, the land would eventually become available for another's use or could remain unoccupied. Therefore, the ecological impact would depend on the final determination of the land.

4.8 Noise

Although AREVA NP maintains a heavy manufacturing facility designation (the City's zoning ordinance defines heavy manufacturing as "…typically having the potential of creating substantial noise..."), historical records and consultations with local officials confirm a low site boundary noise level during all of the facility's operating hours. AREVA NP conservatively measures the noise level at the fence line. This measurement would include the sounds emanated from the heating, ventilation, and air conditioning equipment which generate the loudest external noise. The site boundary is further removed from the fence line, providing additional buffering to the surrounding region. There are few buildings or structures for the noise to reflect off. The low noise level further attenuates before it travels to the property line. NRC staff considers the direct impact of noise as small.

NRC staff also considers the indirect impact of noise as small. Indirect noise from the facility could result from heavy trucks and other transportation vehicles servicing AREVA NP. NRC staff discussed the present and future impact of transportation noise with the City of Richland staff. City staff did not identify or project any significant vehicle noise impacts.

Cumulative impacts include noise associated with the surrounding facilities. The City designates the nearest industrial neighbor as an industrial/heavy manufacturing facility. From consultations with local officials, these noise levels are also low. Therefore continued site operations for this proposed action would not significantly produce any further cumulative impacts upon the industrial neighbor. Additionally, the approximate distance to the nearest non-industrial neighbors is: residential - 1.5 miles; school – 2 miles; golf course – 3.5 miles; and hospital – 5 miles. Given the low noise levels at the site and its dissipation with distance, the staff determines that the cumulative impact of noise from AREVA NP should not have a significant impact on the environment. Staff considers this a small impact.

NRC staff considers that the short- and long-term environmental impacts from noise are not different from the impacts discussed above. Based on this assessment, the impacts from noise do not produce a significant impact to the environment. NRC staff does not consider the noise level an audible intrusion.

The No-Action Alternative may cause short-term noise impacts. Increased noise from the decommissioning activities, such as building demolition, would occur. Long-term noise impacts are unknown and would depend on the future use of the site.

4.9 Historic and Cultural

Based on the staff's review, the proposed action will not disturb the land and will therefore not affect any potential historic or cultural resources. Resource locations identified during initial consultation with federal and state agencies and tribal entities are not in close proximity of AREVA NP's site and are not affected by plant activities. AREVA NP's property does not appear on the National Register's listing. Furthermore, the site does not have any National Historic Landmarks or other known historically significant resources. Potential historical and cultural impacts may occur during future construction if AREVA NP expands its operations and discovers historical and cultural artifacts during the expansion. However, almost the entire site has been previously disturbed so discovery of new historic or cultural resources is unlikely.

As noted in Chapter 3, AREVA NP voluntarily offered to have the site reviewed for historic and cultural resources by a Washington State Historic Preservation Office (SHPO)-approved consultant (AREVA NP, December 2008). The consultant performed the literature search and site pedestrian survey in February 2009. A representative from Confederated Tribes and Bands of Yakama Nation participated in the process. AREVA NP provided copies of the final report to all interested parties (AREVA NP, March 2009). After the SHPO reviewed the report, he contacted NRC by telephone. The SHPO found the report acceptable. He understood that NRC sent letters addressing the closure of the Section 106 consultation (Kock, March 2009). He remarked that he would follow-up with a letter acknowledging his concurrence with the NRC determination.

Since AREVA NP does not propose any changes to the site footprint or operating process in their request for license renewal, NRC staff does not find any impacts associated with this resource. Therefore NRC staff considers the direct, indirect, short-term, long-term and cumulative impact as small.

The No-Action Alternative would result in the expiration of AREVA NP's license and the decommissioning of its facility. In the event that AREVA NP discovers anything during decommissioning, they will limit historic/cultural resource impacts by following the protocol recommended by their consultant (AREVA NP, March 2009). In the long-term, the land would eventually become available for another's use or could remain unoccupied. Therefore, the full ecological impact would depend on the final determination of the land.

4.10 Scenic and Visual

AREVA NP describes the site as "a relatively flat and essentially featureless plain." The applicant does not propose any construction activities in their license renewal. The staff does not anticipate any changes in the region's scenic quality due to continued operations at AREVA NP and therefore finds no direct or short-term visual/scenic impacts. In the future, the applicant may choose to expand operations or upgrade the facilities. Any visual/scenic changes will need to conform to the Benton County Planning Department's guidelines outlined in the *Hanford Reach Protection and Management Program Interim Action Plan*. In addition, NRC staff would consider the environmental impacts of those changes as a condition of that license. With these considerations, NRC staff does not find any significant indirect, long-term, or cumulative effects and therefore identifies this resource as a small impact. The No-Action Alternative impact would depend upon the next occupant's construction plans and therefore, cannot be assessed.

4.11 Public and Occupational Health

This resource section describes the pathways by which radiological and non-radiological releases could transmit to the environment and the public. It also contains exposure estimates and a brief discussion of the environmental monitoring programs used to verify compliance.

Potential public health impacts could occur if materials released from AREVA NP enter the environment and are transported from the site through air or groundwater. The potential contaminants include small quantities of uranium and hydrofluoric acid from the Dry Conversion Process. An effluent monitoring program is in place at AREVA NP to ensure that potential releases to the environment are within federal and state regulations and are maintained ALARA (AREVA NP, 2006b).

Uranium may be transported through the environment in a variety of ways, and the public may be exposed from both internal and external pathways. Potential releases to the air may cause internal exposures directly through inhalation or indirectly through ingestion of crops and animal products that contact radioactive material in the air. External exposures can occur directly from a radioactive plume in water or soil or from particles deposited on the ground and other surfaces from an airborne plume. Potential liquid releases to groundwater may lead to internal exposures through drinking water or eating irrigated crops. External and/or internal exposures may also occur from recreational activities, including boating and swimming in surface waters that are contaminated.

Sources of radioactive liquid and airborne effluents are controlled and monitored at AREVA NP. The exposure pathways described here may be categorized into three general pathways that could affect the general public: direct irradiation; radioactive airborne effluents; and radioactive liquid effluents from the AREVA NP facility. Direct irradiation is measured by monitoring gamma radiation levels at the AREVA NP site boundary. Doses from airborne effluents are determined

by monitoring stack emissions for each individual stack and doses from liquid effluents are determined by measuring concentrations of uranium in groundwater at various locations on the site.

Results of direct irradiation monitoring demonstrate that radiation levels at the site boundary are indistinguishable from background radiation levels. Results of the Richland radioactive stack emissions monitoring are reported to the NRC biannually as 10 CFR 70.59 requires. The data reveal that the annual uranium-based emissions total (all stacks combined) for calendar years 2000–2005 ranged from 0.101 Bq [2.75 pCi] to 0.269 Bq [7.28 pCi] alpha radiation (AREVA NP, 2006c). These data show consistent compliance with the modified airborne radioactivity limits in 10 CFR Part 20, Appendix B Table 2. From 2000 through 2005, the largest monthly average concentration of uranium in groundwater was less than 0.016 Bq/ml [4.24×10^{-7} µCi/ml] {the 10 CFR Part 20 regulatory limit is 0.148 Bq/ml [4×10^{-6} µCi/ml]}, the largest monthly average concentration of Tc-99 was less than 0.71 Bq/ml [1.92×10^{-5} µCi/ml] {the regulatory limit is 22 Bq/ml [6×10^{-4} µCi/ml]}, and the largest total annual radioactive discharge was less than 2.7×10^{10} Bq [0.73 Ci] {the regulatory limit is 3.7×10^{10} Bq [1 Ci]} (AREVA NP, 2006c).

Calculated annual radiological doses to the public from AREVA NP operations from 1995–2005 ranged from 3.0×10^{-4} to 4.0×10^{-3} mSv [0.03 to 0.4 mrem] (AREVA NP, 2006b). This is approximately 4 percent of the 0.1 mSv [10 mrem] annual dose limit from 10 CFR 20.1101 from combined emissions of radioactive material. Dose impact to a member of the public is limited by the constraint limit in 10 CFR 20.1101(d) to 10 mrem per year. Calculated doses to the theoretical maximally exposed individual from the AREVA NP site radioactive stack emissions (not including radon) for calendar years 2000–2005 ranged from 1.64×10^{-6} to 1.2×10^{-4} mSv/yr [1.64×10^{-4} to 1.2×10^{-2} mrem/yr]. The calculated doses are 0.1 percent or less than the 10 CFR Part 20 limit (AREVA NP, 2006c).

The solids removal and soils remediation phases of the Richland site's surface impoundment closure project, conducted from July 2004 through September 2006, provided for potential airborne radioactive contamination via fugitive emissions. Removal activities were accompanied by dust control measures and worker exposure monitoring. As agreed upon with the Washington Department of Health, the entire inventory removal and environmental remediation phases of the surface impoundment closure project (2002–2006) were accompanied by continuous fence line ambient air monitoring for radioactivity at state-selected locations. Annual dose impacts to the theoretical maximally exposed individual calculated from this monitoring data were also low, ranging from 0.0028 to 0.0045 mSv/yr [0.28 to 0.45 mrem/yr] over the reported period (2002–2005) (AREVA NP, 2006c), a small fraction of the 10 mrem/yr [0.1 mSv/yr] limit to the general public.

Based on this information, NRC staff considers all of the environmental impacts to be small.

4.12 Waste Management

NRC staff evaluated the waste management environmental impacts associated with storage and/or transportation of AREVA NP's low-level radioactive and hazardous wastes. Staff considered in their review: long-term disposal; on-site storage; and the applicant's waste reduction strategies.

Currently, Northwest Compact (Hanford, Washington) and Energy Solutions (Clive, Utah) process the non-combustible low-level radioactive wastes generated by AREVA NP. Based on

use of the current disposal facilities and not considering future site expansions, the projected operating lifetimes are 50 years for Northwest Compact and 25 years for Energy Solutions. AREVA NP does not anticipate any loss of these services (AREVA NP, 2008). The maximum timeline of 50 years provides sufficient disposal coverage for the proposed license renewal period. With this scenario, NRC staff finds small direct, short-term, and long-term impacts for the proposed action.

However the possibility exists that the disposal facilities may not be available in the future, i.e. the facility becomes capacity constrained at an earlier date, expansion does not occur, or other disposal facilities are not available. If the service is lost, AREVA NP proposes several alternatives, such as storing the low-level waste on its Richland site within the fenced restricted area. With this decision, the environmental review would focus on the location and type of onsite storage being proposed (i.e. covered storage to lessen weatherization effects) and determine whether the applicant's current quality controls, inspection techniques, and tracking systems remain adequate. AREVA NP will also evaluate instituting enhanced waste reduction strategies to lessen the volume of wastes generated. As an example, AREVA NP may consider dismantling its HEPA filters to allow on-site incineration of the wooden frame followed by compaction/disposal of the filter. Or AREVA NP may consider reuse of materials and equipment by furthering its decontamination (AREVA NP, 2008). NRC staff considers that these actions may produce small direct, indirect, and cumulative impacts on the site, as follows. The zoning ordinance permits on-site storage, so this action is consistent with past, present, and future land use activities. Furthermore, the land has previously been disturbed so it is unlikely that historic or cultural resources will be found. On-site storage should lessen transportation and noise impacts (fewer trucks transporting materials from site to disposal) and may result in lower truck exhausts/improve air quality. However, additional storage facilities may produce a negative environmental effect on the scenic resource. AREVA NP is located within an industrial park that has many buildings on the various property lots. This area falls within the Hanford Reach Protection and Management Program Interim Action Plan (Benton County Planning Department, 1998); therefore AREVA NP would need to conform accordingly.

Through routine operations, AREVA NP does generate waste liquid effluents. AREVA NP recovers certain waste liquid effluents and either re-uses the component in its process line or sells it as a commercial product (i.e. hydrofluoric acid is recovered from the dry conversion process and is sold to a commercial chemical company for their use). Other liquid wastes designated for disposal are collected within the plant's wastewater treatment system, treated, combined with domestic sewage, sampled for radioactive and non-radioactive constituents, and then discharged with other non-hazardous liquid effluents. AREVA NP containerizes small volumes of certain liquid wastes for treatment and disposal at an offsite facility. Potential indirect effects from this waste management practice include changes in groundwater or soil quality due to releases of certain hazardous chemicals. Direct impacts from leaks or spills can affect runoff and eventually groundwater resources depending on the level of the accidental release. Direct impacts can occur by accidental releases during waste transportation. NRC staff evaluated each of these conditions within the various environmental resources discussed in this chapter and found the direct, indirect, short-/long-term, and cumulative impacts as small.

The No-Action Alternative could have short-term terrestrial impacts due to decommissioning activity impacts on other resource areas such as air, hydrology, and noise. Decommissioning activities could increase the amount of waste generated, especially if facility demolition occurs. The long-term impact would depend on use of the site after license termination and available options.

5.0 AGENCIES AND PERSONS CONSULTED

The NRC staff consulted with other agencies regarding the proposed action in accordance with NUREG–1748. These consultations are intended to (i) ensure that the requirements of the Endangered Species Act Section 7 and the National Historic Preservation Act Section 106 are met and (ii) provide the designated state liaison agency the opportunity to comment on the proposed action.

5.1 Washington State Department of Archaeology and Historic Preservation

On November 14, 2007, NRC staff sent a letter (Suber, 2007a) to A. Brooks to inform the Washington State Department of Archaeology and Historic Preservation of the license extension application and to solicit questions. On December 11, 2007, NRC Staff, and J. Durham (CNWRA) met with R. Whitlam (Washington State Department of Archeology and Historic Preservation) in Olympia, Washington, to inform the department of the license extension application and to solicit questions. During this meeting, it was learned that five tribes have land rights in the vicinity of AREVA NP. A DOE-Richland contact was identified who could provide contact information for each tribe. On March 10, 2008, NRC Staff sent a letter (Suber, 2008a) to R. Whitlam to request Geographical Information System maps that depict cultural and archeological sites in the area of potential effect for the AREVA NP review.

5.2 Washington State Department of Health, Office of Radiation Protection

On December 11, 2007, NRC staff, and J. Durham (CNWRA) met with Anine Grumbles (Washington State Department of Health-Olympia), John Martell (Washington State Department of Health-Richland), and Fred Adams (Washington State Department of Health-Richland) in Olympia, Washington, to inform the department of the license extension application and to solicit questions. During this meeting, it was learned that the Richland office has primary oversight responsibilities for the AREVA NP facility.

5.3 U.S. Fish and Wildlife Service (USFWS)

On November 14, 2007, NRC staff sent a letter (Suber, 2007b) to J. Gonzalez to inform the USFWS of the license extension application and to solicit questions. On December 12, 2007, J. Arce (NRC), G. Suber (NRC), and J. Durham (CNWRA) met with Jeff Krupka in Wenatchee, Washington, to inform the USFWS of the license extension application and to solicit questions. During this meeting it was learned that, in the opinion of the USFWS, there are very few endangered land species in the Richland area and that the nearby Hanford Site provides adequate habitat for those species. Because AREVA NP is not on the banks of the Columbia River, the USFWS does not feel that the AREVA NP facility poses a threat to endangered aquatic species. On January 22, 2008, NRC staff sent a letter (Suber, 2007) to J. Gonzalez to inform the USFWS of the license extension application and to request Geographical Information System maps that depict cultural and archeological sites in the area of potential effect.

5.4 Washington State Department of Fish and Wildlife

On December 12, 2007, NRC staff, and J. Durham (CNWRA) met with K. Bevis in Yakima, Washington, to inform the Washington State Department of Fish and Wildlife of the license extension application and to solicit questions. During this meeting it was learned that the views held by this Department are consistent with those of the USFWS.

5.5 City of Richland

On December 13, 2007, NRC staff, and J. Durham (CNWRA) met with William King, Gary Ballew, and Joseph Schiessl in Richland, Washington, to inform the City of Richland of the license extension application and to solicit questions. During this meeting, it was verified that the area within 1.6 km [1 mi] of the AREVA NP facility is currently zoned for industrial use and that there are no plans to change the zoning in the foreseeable future. It was also confirmed that the nearest residential area is about 2.4 km [1.5 mi] from the AREVA NP facility. Finally, construction of a research park area containing limited residential facilities within 1.6 km [1 mi] of the AREVA NP facility was discussed.

5.6 Washington State Department of Ecology

On December 14, 2007, NRC staff, and J. Durham (CNWRA) met with Jeff Ayres and Rick Bond in Richland, Washington, to inform the Washington State Department of Ecology of the license extension application and to solicit questions. During this meeting, it was learned that the department was very pleased with AREVA NP operations. Further, the AREVA NP actions to eliminate and remediate the lagoon area were highlighted as successful efforts to reduce the environmental impact of the AREVA NP facility.

5.7 DOE Richland Office

On December 14, 2007, NRC staff, and J. Durham (CNWRA) met with Annabelle Rodriguez in Richland, Washington, to solicit information from the DOE Richland Office about local tribes. At this meeting, contact and background information were obtained on each of the five Native American tribes that are affected by nuclear operations in the Richland area: the Yakama, Umatilla, Colville, Nez Perce, and Wanapum. Personnel at the DOE office were contacted because of an established relationship between DOE and the affected tribes.

5.8 National Oceanic and Atmospheric Administration–National Marine Fisheries Service

On January 22, 2008, NRC staff sent a letter (Suber, 2008b) to J. Yeager to inform the National Marine Fisheries Service of the license extension application and to request information regarding endangered or threatened species and critical habitat for the proposed license renewal. In a letter from J. Yeager dated February 4, 2008 (Yeager, 2008), the National Marine Fisheries Service identified those aquatic species that are endangered or threatened as discussed in Section 3.7.

5.9 Confederated Tribes and Bands of Yakama Nation

On February 6, 2008, NRC staff sent a letter (Suber, 2008c) to K. Valdez to initiate consultation for the license renewal application with the Confederated Tribes and Bands of Yakama Nation to identify any tribal historic sites or cultural resources within the AREVA NP site area. In a letter dated March 3, 2008, K. Valdez sent a letter (Valdez, 2008) requesting a hard copy of the AREVA NP license renewal application and requesting that the comment period be extended.

5.10 Squaxin Island Tribe

On January 24, 2008, NRC staff sent a letter (Suber, 2008d) to R. Foster to initiate consultation for the license renewal application with the Squaxin Island Tribe to identify any tribal historic sites or cultural resources within the AREVA NP site area. On February 5, 2008, R. Foster sent

a letter (Foster, 2008) to NRC indicating that the Squaxin Island Tribe had no interest in a consultation on the AREVA NP license renewal application.

5.11 Spokane Tribe of Indians

On January 24, 2008, NRC staff sent a letter (Suber, 2008e) to R. Abrahamson to initiate consultation for the license renewal application with the Spokane Tribe of Indians to identify any tribal historic sites or cultural resources within the AREVA NP site area.

5.12 Skykomish Tribe of Indians

On January 24, 2008, NRC staff sent a letter (Suber, 2008f) to C. Miller to initiate consultation for the license renewal application with the Skykomish Tribe of Indians to identify any tribal historic sites or cultural resources within the AREVA NP site area.

5.13 Makah Tribe

On January 24, 2008, NRC staff sent a letter (Suber, 2008g) to J. Boweshop to initiate consultation for the license renewal application with the Makah Tribe to identify any tribal historic sites or cultural resources within the AREVA NP site area.

5.14 Lummi Nation

On January 24, 2008, NRC staff sent a letter (Suber, 2008h) to L. Tso to initiate consultation for the license renewal application with the Lummi Nation to identify any tribal historic sites or cultural resources within the AREVA NP site area.

5.15 Confederated Tribes of the Colville Reservation

On January 24, 2008, NRC staff sent a letter (Suber, 2008i) to C. Pleasants to initiate consultation for the license renewal application with the Confederated Tribes of the Colville Reservation to identify tribal historic sites or cultural resources within the AREVA NP site area.

5.16 Nez Perce Tribe

On February 5, 2008, NRC staff sent a letter (Suber, 2008j) to G. Bohnee to initiate consultation for the license renewal application with the Nez Perce Tribe to identify any tribal historic sites or cultural resources within the AREVA NP site area.

5.17 Wanapum Tribe

On February 6, 2008, NRC staff sent a letter (Suber, 2008k) to C. Pleasants to initiate consultation for the license renewal application with the Wanapum Tribe to identify any tribal historic sites or cultural resources within the AREVA NP site area.

5.18 Confederated Tribes of the Umatilla Indian Reservation

On February 5, 2008, NRC staff sent a letter (Suber, 2008l) to T. Farrow to initiate consultation for the license renewal application with the Confederated Tribes of the Umatilla Indian Reservation to identify any tribal historic sites or cultural resources within the AREVA NP site area. On March 5, 2008, T. Farrow (Confederated Tribes of the Umatilla Indian Reservation)

sent a letter (Farrow, 2008) requesting clarification of the affected area and indicated that historic properties of traditional and religious interest were included in the affected area.

6.0 CONCLUSION

The NRC staff concludes that the renewal of license SNM–1227 involving the continued operation of the AREVA NP site in Richland, Washington, will not significantly impact the environment. The facility already exists, and no changes to the facility or its operation are associated with the license renewal. The Proposed Action can be considered a continuation of impacts and was evaluated based on impacts from past operations. Gaseous emissions and liquid effluents are within regulatory limits for non-radiological and radiological components. Public and occupation radiological dose exposures are below 10 CFR Part 20 regulatory limits.

7.0 LIST OF PREPARERS

U.S. Nuclear Regulatory Commission contributors
J. Arce, Project Manager, all sections

G. Kulesa, Senior Project Manager, environmental impacts

Center for Nuclear Waste Regulatory Analyses contributors
J. Durham, Principal Engineer, site description, meteorology, land use, radioactive air quality, noise, waste, scenic/visual, transportation, and monitoring

S. Stothoff, Principal Scientist, hydrology

D. Waiting, Research Technologist, geology, mineral resources, and seismology

B. Werling, Research Scientist, air quality

Subcontractors to the Center for Nuclear Waste Regulatory Analyses
L. Canter, Consultant, demography, socioeconomics, and cumulative impacts

P. Held, Consultant, archaeologist, historical and cultural resources

B. Strye, Consultant, environmental professional, wetlands and biota

8.0 REFERENCES

AREVA NP. “Submittal of License Renewal Application and Environmental Report for AREVA NP, Inc. Richland Fuel Fabrication Facility.” License No. SNM–1227. Docket No. 70-1257. Richland, Washington: AREVA NP, Inc. October 24, 2006a.

———. “License Renewal Application for AREVA NP, Inc. Richland Fuel Fabrication Facility.” Richland, Washington: AREVA NP, Inc. October 24, 2006b.

———. “Supplement to Applicant’s Environmental Report.” Richland, Washington: AREVA NP, Inc. October 24, 2006c.

———. “Response to Request for Additional Information (RAI) Regarding the Environmental Assessment for AREVA NP Inc. Richland Fuel Fabrication Facility License Renewal.” License No. SNM–1227, Docket No. 70-1257 (TAC L31975). Richland, Washington: AREVA NP, Inc. April 18, 2008

———. Email response from AREVA NP (Loren Maas) to NRC “FW: Response to Environmental Protection RAI No. 3.doc.” ML090410547. August, 2008

———. Email response from AREVA NP (Robert Link) to NRC “RE: FOLLOW-UP ON DISCUSSIONS WITH WA SHPO.” ML090360745. December, 2008

———. “Cultural Resources Assessment for the AREVA NP Inc. Richland Fuel Fabrication Facility; License No. SNM-1227.” Richland, Washington: AREVA NP, Inc. March 3, 2009

ASTM International. ASTM Standard C–1334, “Standard Specification for Uranium Oxides with a ^{235}U Content of Less Than 5% for Dissolution Prior to Conversion to Nuclear-Grade Uranium Dioxide.” West Conshohocken, Pennsylvania: ASTM International. 2005.

———. ASTM Standard C-996, “Standard Specification for Uranium Hexafluoride Enriched to Less Than 5% ^{235}U.” West Conshohocken, Pennsylvania: ASTM International. 2004.

Ayres, J. “Review of the Proposed License Renewal of AREVA NP Fuel Fabrication Facility, Richland, Washington.” Response letter to G. Suber, U.S. Nuclear Regulatory Commission. October 2008.

Benton County Planning Department. “Hanford Reach Protection and Management Program: Interim Action Plan.” AJ Fyall, ed. Washington, Counties of Benton, Franklin, and Grant; Prosser: Benton County Planning Department. 1998.

City of Richland. “City of Richland Comprehensive Plan.” Richland, Washington. 2004.

———. “Citywide Transportation Plan.” 2004.

DOE. “Final Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement.” DOE/EIS–0286F. Richland, Washington: DOE. 2004.

———. “Americans’ Average Radiation Exposure.” <http://www.osti.gov/bridge/servlets/purl/840668-JpLjtH/840668.PDF> Washington, DC: DOE, Office of Scientific and Technical Information. 2000.

———. “Final Hanford Comprehensive Land-Use Plan Environmental Impact Statements.” DOE/EIS–0222F. Richland, Washington: DOE. September 1999.

———. “Final Environmental Impact Statement for the Tank Waste Remediation System.” DOE/EIS–0189. Richland, Washington: DOE. 1996.

———. “Environmental Assessment, Reference Repository Location, Hanford Site, Washington.” DOE/RW–0070. Washington, DC: DOE. 1986.

DOT. “Hazardous Materials Shipments.” Washington, DC: DOT, Office of Hazardous Materials Safety, Research and Special Programs Administration. 1998.

Energy Solutions. “License Amendment.” Clive, Utah: Utah Department of Environmental Quality, Division of Radiation Control, Radioactive Material License. 2008.

Exxon Nuclear Company. “Final Environmental Statement Related to Operation of Mixed Oxide Fabrication Plant.” Docket No. 70-1257. Washington, DC: United States Atomic Energy Commission. 1974.

Farrow, T. “Proposed License Renewal Application for AREVA NP Inc., Richland, Washington: Initiatio of Section 106 Consultation.” Letter (March 5) to G.F. Suber, NRC. Pendleton, Oregon: Confederated Tribes of the Umatilla Indian Reservation, Department of Natural Resources. 2008.

Foster, R. “Proposed License Renewal Application, AREVA NP Inc., Richland, Washington, SNM–1227.” Shelton, Washington: Squaxin Island Tribe, Cultural Resources Department. 2008.

Frankel, A.D., C.S. Mueller, T.P. Barnhard, E.V. Leyendecker,R.L. Wesson, S.C. Harmsen, F.W. Klein, D.M. Perkins, N.C. Dickman, S.L. Hanson, and M.G. Hopper. *USGS National Seismic Hazard Maps: Earthquake Spectra.* Vol. 16, No. 1. pp. 1–19. 2000.

Hartshorn, D.C., S.P. Reidel, A.C. Rohay, and M.M. Valenta. “Annual Hanford Seismic Report for Fiscal Year 2001. “ PNNL–11557-19. Richland, Washington: PNNL. 2001. <http://www.pnl.gov/main/publications/external/technical_reports/pnnl-11557-19.pdf> (2 June 2008).

Iowa Department of Natural Resources Geological Survey. “Information and Explanation of UBC Seismic Zones.” <http://www.igsb.uiowa.edu/Browse/earthqua/UBC_INFO.htm> (20 December 2007).

Jersey Nuclear Company. ”Applicant’s Environmental Report—Uranium Oxide Fuel Plant.” Docket No. 70-1257. Washington, DC: United States Atomic Energy Commission. 1970.

Kock, A. “Letter of Intent Regarding Compliance with Section 106 of the National Historic Preservation Act with Respect to the Nuclear Regulatory Commission’s Environmental Assessment of the AREVA NP Richland Fuel Fabrication Facility.” a-Letter (March 4) to R.G. Whitlam, Department of Archaeology and Historic Preservation, Olympia, Washington. Washington, DC; b-Letter (March 4) to K Valdez, Confederated Tribes and Bands of the Yakama Nation, Toppenish, Washington; c-Letter (March 4) Confederated Tribes of the Umatilla Indian Reservation, Pendleton, Oregon: NRC. 2009.

Lockhaven, S.R. “Supplement to Applicant’s Environmental Report.” Richland, Washington: Siemens Power Corporation, Nuclear Division. August 26, 1992.

National Council on Radiation Protection and Measurements. “Exposure of the Population in the United States and Canada From Natural Background Radiation.” Report No. 094. Bethesda, Maryland: National Council on Radiation Protection and Measurements. 1987.

National Register of Historic Places. “Washington State.” <http://www.nationalregisterofhistoricplaces.com/WA/state.html> (21 December 2007a).

———. "Benton County, Washington." <http://www.nationalregisterofhistoricplaces.com/WA/Benton/state.html> (21 December 2007b).

Neitzel, D.A., ed. "Hanford Site National Environmental Policy Act (NEPA) Characterization." PNNL–6415. Rev. 16. Richland, Washington: PNNL. 2004.

NRC. "Expected New Nuclear Power Plant Applications." <http://www.nrc.gov/reactors/new-licensing/new-licensing-files/expected-new-rx-applications.pdf> (2 November 2007).

———. SECY–06–0186, "Increasing Licensing Terms for Certain Fuel Cycle Facilities." Washington, DC: NRC. August 24, 2006.

———. NUREG–1748, "Environmental Review Guidance for Licensing Actions Associated With NMSS Programs—Final Report." Washington, DC: NRC. August 2003.

———. "Environmental Assessment for Renewal of Special Nuclear Material License." SNM–1227. Docket 70-1257. Washington, DC: NRC. 1995.

———. "Draft Environmental Assessment for Renewal of U.S. Nuclear Regulatory Commisssion License No. SNM-1227 for AREVA NP, Inc. Richland Fuel Fabrication Facility." Docket 70-1257. Washington, DC: NRC. August 2008.

———-. NUREG–0894, "Draft Environmental Statement Related to the Construction of Skagit/Hanford Nuclear Project, Units 1 and 2." Docket Nos. STN 50-522 and STN 50-523. Washington, DC: NRC. 1982.

———-. Email from NRC (G. Kulesa) to USFWS (J. Krupka) "Comments on the AREVA facility." February 26, 2009.

Richland School District. "About RSD District Report Card." <http://www.rsd.edu/about/finance-report.html> (August 2008).

Siemens Power Corporation, Nuclear Division. "Supplement to Applicant's Environmental Report." EMF–14. Rev. 5. Richland, Washington. August 2000.

———. "Supplement to Applicant's Environmental Report." EMF–14, Rev. 4. Richland, Washington. July 1994.

State of Washington, Employment Security Commission. "Various Databases." <http://www.workforceexplorer.com/cgi/databrowsing/localAreaProfileQSResults> (22 December 2007).

———, Office of Financial Management. "2007 Forecast of the State Population—Forecasting Division and Other Databases for Benton and Franklin Counties." November 2007. <http://www.ofm.wa.gov/forecasting/> (21 December 2007).

Suber, G. "Request for Information Regarding the Environmental Assessment for the AREVA NP, Inc. Richland Fuel Fabrication Facility License Renewal (Docket Number 070-1257)." Letter (March 10) to R.G. Whitlam, Department of Archaeology and Historic Preservation, Olympia, Washington. Washington, DC: NRC. 2008a.

———. "Request for Information Regarding Endangered or Threatened Species and Critical Habitat for the Proposed License Renewal Application for AREVA NP, Inc. in Richland, Washington." Letter (January 24) to J. Yeager, National Marine Fisheries, Ellensburg, Washington. Washington, DC: NRC. 2008b.

———. "Initiation of Section 106 Consultation for the Proposed License Renewal Application for AREVA NP Inc., Richland, Washington." Letter (February 6) to K. Valdez, Tribal Historic Preservation Officer Confederated Tribes and Bands of Yakama Nation, Toppenish, Washington. Washington, DC: NRC. 2008c.

———. "Initiation of Section 106 Consultation for the Proposed License Renewal Application for AREVA NP Inc., Richland, Washington." Letter (January 24) to R. Foster, Tribal Historic Preservation Officer, Squaxin Island Tribe, Shelton, Washington. Washington, DC: NRC. 2008d.

———. "Initiation of Section 106 Consultation for the Proposed License Renewal Application for AREVA NP Inc., Richland, Washington." Letter (January 24) to R. Abrahamson, Jr., Tribal Preservation Officer, Spokane Tribe of Indians, Wellpinit, Washington. Washington, DC: NRC. 2008e.

———. "Initiation of Section 106 Consultation for the Proposed License Renewal Application for AREVA NP Inc., Richland, Washington." Letter (January 24) to C. Miller, Tribal Historic Preservation Officer, Skokomish Indian Tribe, Shelton, Washington. Washington, DC: NRC. 2008f.

———. "Initiation of Section 106 Consultation for the Proposed License Renewal Application for AREVA NP Inc., Richland, Washington." Letter (January 24) to J. Boweshop, Tribal Historic Preservation Officer, Makah Tribe, Neah Bay, Washington. Washington, DC: NRC. 2008g.

———. "Initiation of Section 106 Consultation for the Proposed License Renewal Application for AREVA NP Inc., Richland, Washington." Letter (January 24) to L. Tso, Tribal Historic Preservation Officer, Lummi Nation, Bellingham, Washington. Washington, DC: NRC. 2008h.

———. "Initiation of Section 106 Consultation for the Proposed License Renewal Application for AREVA NP Inc., Richland, Washington." Letter (January 24) to C. Pleasants, Confederated Tribes of the Colville Reservation, Nespelem, Washsington. Washington, DC: NRC. 2008i.

———. "Initiation of Section 106 Consultation for the Proposed License Renewal Application for AREVA NP Inc., Richland, Washington." Letter (February 5) to G. Bohnee, Nez Perce Tribe, Environmental Restoration/Waste Management Program, Lapwai, Idaho. Washington, DC: NRC. 2008j.

———. "Initiation of Section 106 Consultation for the Proposed License Renewal Application for AREVA NP Inc., Richland, Washington." Letter (February 6) to L. Buck, Wanapum, Ephrata, Washington. Washington, DC: NRC. 2008k.

———. "Initiation of Section 106 Consultation for the Proposed License Renewal Application for AREVA NP Inc., Richland, Washington." Letter (February 5) to T. Farrow, Confederated Tribes of the Umatilla Indian Reservation, Cultural Resources Protection Program, Pendelton, Oregon. Washington, DC: NRC. 2008l.

———. “License Renewal Application for AREVA NP Inc., Richland, Washington.” Letter (November 14) to A. Brooks, State Historical Preservation Officer, Office of Archeology and Historic Preservation, Olympia, Washington. Washington, DC: NRC. 2007a.

———. “Request for Information Regarding the Environmental Assessment for the AREVA NP, Inc. Richland Fuel Fabrication Facility License Renewal (Docket Number 070-1257).” Letter (November 14) to J. Gonzalez, U.S. Fish and Wildlife Service, Yakama, Washington. Washington, DC: NRC. 2007b.

———. “Request for Concurrence on the Finding of No Significant Impact for the Proposed License Renewal of AREVA NP Fuel Fabrication Facility, Richland, Washington.” Letter to T. Farrow, Confederated Tribes of the Umatilla Indian Reservation, Cultural Resources Protection Program, Pendelton, Oregon. Letter to K. Valdez, Tribal Historic Preservation Officer Confederated Tribes and Bands of Yakama Nation, Toppenish, Washington. Letter to R. Whitlam State Archaeologist, Office of Archaeology and Historic Preservation, Olympia, Washington. Washington, DC: NRC. September, 2008.

Tallman, A.M. “Probabilistic Seismic Hazard Analysis DOE Hanford Site, Washington.” WHC–SD–W236A–TI–002. Rev. 1. Richland, Washington: Westinghouse Hanford Company. 1996.

———. “Probabilistic Seismic Hazard Analysis DOE Hanford Site, Washington.” WHC–SD–W236A–TI–002. Richland, Washington: Westinghouse Hanford Company. 1994.

U.S. Census Bureau. “American Fact Finder and Other Databases.” <http://www.census.gov> 2007. (21 December 2007).

U.S. Department of Labor, Bureau of Labor Statistics. “Industry Injury and Illness Data: Charts 2006.” 2007. <http://www.bls.gov/iif/oshwc/osh/os/osch0035.pdf> (3 December 2007).

U.S. Fish and Wildlife Service. “Waters of the U.S.” <http://wetlandsfws.er.usgs.gov/imf/imf.jsp?site=NWI_CONUS> (19 December 2007a).

———. “Upper Columbia Fish and Wildlife Office.” <http://www.fws.gov/easternwashington/county> (19 December 2007b).

———. Email response from USFWS (J. Krupka) to NRC (G. Kulesa and J. Arce) “Comments on the AREVA EA.doc.” October 2008.

———. Email response from USFWS (J. Krupka) to NRC (G. Kulesa) “Re:Comments on the AREVA facility.” March 2009.

U.S. Geological Survey. “Earthquake Hazards Program; Quaternary Fault and Fold Information for Washington 1 degree × 2 degree Walla Walla Sheet.” 2005. <http//earthquake.usgs.gov/regional/qfaults/wa/wal.html> (14–15 November 2007).

Vaccaro, J.J. and T.D. Olsen. “Estimates of Ground-Water Recharge to the Yakima River Basin Aquifer System, Washington, for Predevelopment and Current Land Use and Land Cover Conditions.” U.S. Geological Survey Scientific Investigations Report 2007-5007. 2007.

Valdez, K. “Initiation of Section 106 Consultation for the Proposed License Renewal Application for the AREVA NP, Inc., Richland, Washington (License No. SNM–1227).” Toppenish, Washington: Confederated Tribes and Bands of the Yakama Nation. 2008.

Veenstra, R.C. “Groundwater Quality and Flow Characteristics in the Vicinity of the Exxon Nuclear Company, Inc. Fuel Fabrication Facility, Richland, Washington.” Kennewick, Washington: J–U–B Engineers, Inc. 1986.

Washington Bio Diversity Project. “Washington Ecoregions.” <http://www.biodiversity.wa.gov/ecoregions/index.html> (19 December 2007).

Washington State Department of Ecology. “Air Quality Rules and Regulations.” 1989. <http://www.ecy.wa.gov/programs/air/airhome.html> (3 December 2007).

Washington State Department of Natural Resources. “The Geology of Washington; Columbia Basin.” 2001. <http://www.dnr.wa.gov/geology/clumbia.htm> (12 November 2007).

Washington State Legislature. “WAC 173-481-110 Ambient action levels.”

Whitlam, R.G. “AREVA NP Inc., License Renewal.” Letter (November 26) to G.F. Suber, NRC. Olympia, Washington: State of Washington, Department of Archaeology and Historic Preservation. 2007.

———. “Re: AREVA NP Inc., License Renewal License #SNM-1227/Docket #70-1257 Log No: 121007-20-NRC” Letter (September 10) to G.F. Suber, NRC. Olympia, Washington: State of Washington, Department of Archaeology and Historic Preservation. 2008.

Yeager, J. “NMFS Species Request.” ML080520039. Richland, Washington: National Marine Fisheries Service. 2008.

Appendix 1. Washington State-Listed Endangered Species*		
Common Name	**Scientific Name**	**Animal Type**
Northern Leopard Frog	*Rana pipiens*	Amphibian
Oregon Spotted Frog	*Rana pretiosa*	Amphibian
American White Pelican	*Pelecanus erythrorhynchos*	Bird
Brown Pelican	*Pelecanus occidentalis*	Bird
Sandhill Crane	*Grus canadensis*	Bird
Snowy Plover	*Charadrius alexandrinus*	Bird
Upland Sandpiper	*Bartramia longicauda*	Bird
Spotted Owl	*Strix occidentalis*	Bird
Streaked Horned Lark	*Eremophila alpestris strigata*	Bird
Oregon Silverspot Butterfly	*Speyeria zerene hippolyta*	Butterfly/Moth
Mardon Skipper	*Polites mardon*	Butterfly/Moth
Taylor's Checkerspot	*Euphydryas editha taylori*	Butterfly/Moth
Pygmy Rabbit	*Brachylagus idahoensis*	Mammal
Gray Wolf	*Canis lupus*	Mammal
Grizzly Bear	*Ursus arctos*	Mammal
Fisher	*Martes pennanti*	Mammal
Sea Otter	*Enhydra lutris*	Mammal
Sea Otter	*Enhydra lutris lutris*	Mammal
Sei Whale	*Balaenoptera borealis*	Mammal
Fin Whale	*Balaenoptera physalus*	Mammal
Blue Whale	*Balaenoptera musculus*	Mammal
Humpback Whale	*Megaptera novaeangliae*	Mammal
Black Right Whale	*Balaena glacialis*	Mammal
Killer Whale	*Orcinus orca*	Mammal
Sperm Whale	*Physeter macrocephalus*	Mammal
Columbian White-Tailed Deer	*Odocoileus virginianus leucurus*	Mammal
Woodland Caribou	*Rangifer tarandus*	Mammal
Western Pond Turtle	*Clemmys marmorata*	Reptile
Leatherback Sea Turtle	*Dermochelys coriacea*	Reptile

*Washington Department of Fish and Wildlife. "Species of Concern." Updated October 23, 2007. <http://www.wdfw.wa.gov/wlm/diversty/soc/concern.htm> (15 January 2008).

Appendix 2 Washington State-Listed Threatened Species*		
Common Name	**Scientific Name**	**Animal Type**
Bald Eagle	*Haliaeetus leucocephalus*	Bird
Ferruginous Hawk	*Buteo regalis*	Bird
Sharp-Tailed Grouse	*Tympanuchus phasianellus*	Bird
Sage Grouse	*Centrocercus urophasianus*	Bird
Marbled Murrelet	*Brachyramphus marmoratus*	Bird
Western Gray Squirrel	*Sciurus griseus*	Mammal
Mazama (Western) Pocket Gopher	*Thomomys mazama*	Mammal
Shelton Pocket Gopher	*Thomomys mazama couchi*	Mammal
Oregon Pocket Gopher	*Thomomys mazama oregonus*	Mammal
Cathlamet Pocket Gopher	*Thomomys mazama louiei*	Mammal
Olympic Pocket Gopher	*Thomomys mazama melanops*	Mammal
Yelm Pocket Gopher	*Thomomys mazama yelmensis*	Mammal
Lynx	*Lynx canadensis*	Mammal
Steller Sea Lion	*Eumetopias jubatus*	Mammal
Green Sea Turtle	*Chelonia mydas*	Reptile
Loggerhead Sea Turtle	*Caretta caretta*	Reptile
*Washington Department of Fish and Wildlife. "Species of Concern." Updated October 23, 2007. <http://www.wdfw.wa.gov/wlm/diversty/soc/concern.htm> (15 January 2008).		