

**EHS&L Document**

**Supplement to Applicant’s Environmental Report September 2024**

**Nature of Changes**

Item	Paragraph	Description	Justification
1.	Entire document	New document to supplement E06-24-001 with new environmental data collected since 2009.	Required submittal for NRC license amendments for AFM and TRISO based Fuel in SF enrichment increases.
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
List Below any Documents, including Forms & Operator Aids which must be issued concurrently with this document revision:			

This Document contains a total of 79 pages excluding the signature page.

**DOCUMENT REVIEW/APPROVAL/DELETION CHECKLIST**

All new and/or revised procedures shall be approved by the change author, cognizant manager(s) of areas affected by the changes, and by applicable manager(s) of any function that approved the previous revision of the document unless responsibility for such approval has been transferred to another organization. Also, the procedure shall be approved by manager(s) of functional organizations that provide technical reviews. Finally, Document Control shall verify that the required approvals have been properly obtained and that any documents that must be issued concurrently are ready to be issued.

Document Reviews			Document Approvals	
Purpose/Function of Review	Specify Reviewer(s) (Optional except for change author)	(Check all that apply)	Title of Approver	(Check all that Apply)
Document Control (Automatic)		<input checked="" type="checkbox"/>	Document Control (Automatic)	<input checked="" type="checkbox"/>
Change Author	BG Hanson	<input checked="" type="checkbox"/>	Author	<input checked="" type="checkbox"/>
Independent Technical Review	JB Perryman	<input checked="" type="checkbox"/>		
Operability Review(s)			Mgr, Richland Operations <sup>(1)</sup>	<input type="checkbox"/>
Conversion		<input type="checkbox"/>	Mgr, Uranium Conversion & Recovery Operations <sup>(1)</sup>	<input type="checkbox"/>
Recovery		<input type="checkbox"/>	Mgr, Ceramic Operations <sup>(1)</sup>	<input type="checkbox"/>
Ceramics		<input type="checkbox"/>	Mgr, Rods & Bundles <sup>(1)</sup>	<input type="checkbox"/>
Rods		<input type="checkbox"/>	Mgr, Component Fabrication <sup>(1)</sup>	<input type="checkbox"/>
Bundles		<input type="checkbox"/>	Mgr, Analytical Services <sup>(1)</sup>	<input type="checkbox"/>
Components		<input type="checkbox"/>	Mgr, Maintenance	<input type="checkbox"/>
Lab Review		<input type="checkbox"/>	Mgr, Ops Strategy & Supply Chain	<input type="checkbox"/>
Maintenance Review		<input type="checkbox"/>	Mgr, EHS&L <sup>(2)</sup>	<input checked="" type="checkbox"/>
Transportation		<input type="checkbox"/>	Mgr, Nuclear Safety	<input type="checkbox"/>
EHS&L Review(s)			Mgr, Safety	<input type="checkbox"/>
Criticality		<input type="checkbox"/>	Mgr, Security & Emergency Preparedness	<input type="checkbox"/>
Radiation Protection	C Weber	<input checked="" type="checkbox"/>	Mgr, Licensing & Compliance	<input type="checkbox"/>
Safety		<input type="checkbox"/>	Mgr, Mechanics Richland	<input type="checkbox"/>
Security/Emergency Prep.		<input type="checkbox"/>	Mgr, Plant Engineering & TS&M	<input type="checkbox"/>
Fire Safety		<input type="checkbox"/>	Mgr, Richland Site Quality	<input type="checkbox"/>
MC&A		<input type="checkbox"/>	Mgr, Purchasing	<input type="checkbox"/>
Transportation		<input type="checkbox"/>	Mgr, PP&CPC	<input type="checkbox"/>
Environmental		<input checked="" type="checkbox"/>	Mgr, Richland Site/Other	<input type="checkbox"/>
Mechanics Richland Review		<input type="checkbox"/>	Richland Records Management	<input type="checkbox"/>
Mechanics Lynchburg Review		<input type="checkbox"/>	Training & Employee Dev.	<input type="checkbox"/>
Plant Engineering Review		<input type="checkbox"/>		
Quality Review		<input type="checkbox"/>		
Purchasing Review		<input type="checkbox"/>		
PP&CPC Review		<input type="checkbox"/>		
Others:		<input type="checkbox"/>		
Document Control		<input type="checkbox"/>		
Training & Employee Dev.		<input type="checkbox"/>		

<sup>(1)</sup>Note: If approvals include 2 or more product center managers, the Operations manager can be substituted for the applicable product center managers.

<sup>(2)</sup>Note: The EHS&L manager can be substituted for the applicable EHS&L functional managers.

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<b>EHS&amp;L CHANGE IMPACT EVALUATION FORM</b>			
The scope and content of this document have been determined by EHS&L to not impact the safety disciplines checked below. Future revisions do not require review by those EHS&L component(s) unless the scope changes such that a previously excluded safety discipline may be impacted.			
<input type="checkbox"/> Criticality <input type="checkbox"/> Radiation Protection <input type="checkbox"/> Safety/Security <input type="checkbox"/> Emergency Preparedness <input type="checkbox"/> MC&A <input type="checkbox"/> Transportation <input type="checkbox"/> Environmental			
<b>DOCUMENT VERSION:</b>	<b>EHS&amp;L REVIEW COMPONENT:</b>	<b>EVALUATION DATE:</b>	<b>CHANGE EVALUATOR*:</b>
			<b>2<sup>ND</sup> PARTY APPROVAL*:</b>

The scope and content of this document have been determined by EHS&L to not directly impact the safe handling of licensed materials (enriched uranium). Future revisions to this document do not require the <b>10CFR 70.72</b> change evaluation unless the scope of the document changes such that it directly impacts the handling of licensed materials.			<input type="checkbox"/>
<b>DOCUMENT / ECN No**:</b>	<b>EVALUATION DATE:</b> <b>09/18/2024</b>	<b>CHANGE EVALUATOR:</b> <b>JB Perryman</b>	
Does the change potentially impact Criticality Alarm System (CAS) coverage?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
EVALUATION OF NRC PRE-APPROVAL:			
<b>IS NRC PRE-APPROVAL ( LICENSE AMENDMENT ) NEEDED?</b>			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
> Based on “YES” answer to any of five questions below. > Based on “NO” answer to all five questions below.			
1. Does the change create new types of accident sequences that, unless mitigated or prevented, would exceed the performance requirements of <b>10 CFR 70.61</b> (create high or intermediate consequence events) and that have not previously been described in Framatome’s ISA Summary?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
2. Does the change use new processes, technologies, or control systems for which Framatome has no prior experience?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
3. Does the change remove, without at least an equivalent replacement of the safety function an item relied on for safety ( <b>IROFS</b> ) that is listed in the ISA Summary?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
4. Does the change alter any item relied on for safety, listed in the ISA Summary, that is the sole item preventing or mitigating an accident sequence of high or intermediate consequences?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
5. Does the change qualify as a change specifically prohibited by NRC regulation, order or license condition?			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Evaluation of Actions Required <b>PRIOR TO OR CONCURRENT</b> with Change Implementation:			
6. Modification / Addition to CAS system or system coverage documentation			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
7. Acquire NRC pre-approval (LICENSE AMENDMENT)			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
8. Conduct/modify ISA			<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
9. Modify / update the following:	<input checked="" type="checkbox"/> None <input type="checkbox"/> Other	<input type="checkbox"/> ISA Database <input type="checkbox"/> Red-Line Drawings/P&ID	<input type="checkbox"/> NCSA <input type="checkbox"/> NCSP <input type="checkbox"/> RHA <input type="checkbox"/> ChHA <input type="checkbox"/> NCSS <input type="checkbox"/> PHA <input type="checkbox"/> FHA <input type="checkbox"/> Procedures
Evaluation of Actions Required <b>SUBSEQUENT TO</b> Change Implementation:			
10. Modify / update the following:	<input checked="" type="checkbox"/> None <input type="checkbox"/> Other	<input type="checkbox"/> ISA Database <input type="checkbox"/> AS-Built Drawings/P&ID	<input type="checkbox"/> NCSA <input type="checkbox"/> NCSP <input type="checkbox"/> RHA <input type="checkbox"/> ChHA <input type="checkbox"/> NCSS <input type="checkbox"/> PHA <input type="checkbox"/> FHA <input type="checkbox"/> Procedures
Justification Section for “YES” preceding Questions 1 – 8 or other for 9, 10:			

(\*) Only required if one or more of the boxes to exclude a particular safety discipline review is checked.

(\*\*) If this form exists as a part of a document, the document number is not required.

**SUPPLEMENTAL ENVIRONMENTAL REPORT FOR THE AMENDMENT OF SPECIAL NUCLEAR  
MATERIAL LICENSE NO. SNM-1227**

**Revision 0**

*Prepared for:*

United States Nuclear Regulatory Commission  
Office of Nuclear Material Safety and Safeguards  
Division of Fuel Management  
Fuel Cycle Licensing Branch

*Prepared by:*

Framatome Richland Fuel  
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September 2024

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### List of Abbreviations

ADU	ammonium diuranate
ALARA	as low as is reasonably achievable
Framatome	Framatome, 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 (Washington)	Kennewick, Pasco, and Richland
U	uranium
UF <sub>6</sub>	uranium hexafluoride
UF <sub>235</sub>	an isotope of uranium
UIC	underground injection control
UO <sub>2</sub>	uranium oxide
USFWS	United States Fish and Wildlife Service
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

## **1.0 Introduction**

### **1.1 Background**

This Supplement to the applicant's Environmental Report (ER) is being submitted by Framatome Inc. (Framatome) as required by 10 CFR 51.60 in support of the amendment of Special Nuclear Materials License SNM-1227 for Framatome's Richland, Washington nuclear fuel fabrication facility to increase the facility enrichment and to add the ability to fabricate TRIOS based nuclear fuel. An application for amendment of that license is being submitted concurrently with this Environmental Report in accordance with 10 CFR 70.38. The Environmental Report content incorporates requirements in 10 CFR 51.45 and guidance in NUREG 1520 as applicable to amendment of the license for an established operating facility. There are no land use changes associated with increasing site enrichment and fabricating TRISO based nuclear fuel. There will not be any construction activities that could create dust, increase noise in surrounding areas, nor will there be any impact on visual resources as no changes the exteriors of buildings will occur. The current license is valid until 2049 at this time the facility license will be renewed, or the facility will be decommissioned. It is anticipated that the new TRISO fuel process will be decommissioned when the rest of the facility is decommissioned.

The primary objective of this report is to present summary information and data to characterize the performance of the Richland site environmental management program and to demonstrate compliance with applicable NRC license conditions and applicable environmental laws and regulations. Summary effluent and environmental monitoring data for the years 2019-2023 are provided in Section 3.0, Analysis of Environmental Effects.

Framatome's Supplemental Environmental Report was prepared in accordance with NUREG 1748, Environmental Review Guidance for Licensing Actions Associated with the Office of Nuclear Material Safety and Safeguards (NMSS) Programs.

The contents of this Supplemental Environmental Report address the impacts to human health and the environment required to construct and operate the TRISO fuel fabrication process with enrichments of <10 wt. % U-235 and update information last provided by Framatome in its Environmental Report for the Renewal of Special Nuclear Material License No. SNM-1227 in 2006.

### **1.2 Prior Environmental Review**

In February 2009, the NRC issued an environmental assessment (EA) for the renewal of NRC License No. SNM-1227 for Framatome's Richland, Washington, FFF. This EA was prepared in accordance with NRC regulations as established in 10 CFR Part 51; applicable NRC guidance outlined in NUREG-1748, Environmental Review Guidance for Licensing Actions Associated with Nuclear Material Safety and Safeguards Programs, issued August 2003; and other relevant NEPA implementing regulations, including Council on Environmental Quality regulations in 40 CFR Parts 1500–1508. The NRC's 2009 EA was based, in part, on Framatome's application for the renewal of NRC License No. SNM-1227 and an associated ER provided by Framatome (AREVA 2006a). Based on the EA, the NRC concluded that the renewal of NRC License No. SNM-1227 involving the continued operation of the Framatome site in Richland, Washington, will not cause significant additional impact on the environment.

### 1.3 Scope and Approach for Environmental Supplement

This ER supplement was prepared pursuant to 10 CFR 51.45, Environmental Report, and NUREG-1748. This ER supplement examines potential changes in environmental impacts, including cumulative impacts, of operations at Framatome's Richland, Washington, facility that may result from the proposed new license amendment.

The baseline for this analysis is the NRC's 2009 EA, which is hereby incorporated by reference. The facility description and potential environmental impacts described in the NRC's 2009 EA would be essentially unchanged, except as noted in this ER supplement.

Due to the evolving nature of the facility's design, some of the documents referenced in this report are in their draft stage. As the design matures, these documents will be finalized. Framatome commits to monitoring these draft reports to ensure that their final versions do not invalidate any of this report's conclusions.

In accordance with 10 CFR 51.45(b)(1) and NUREG-1748, this ER supplement describes potential environmental consequences in proportion to their significance, focusing primarily on those environmental resource areas or issues that would be affected by the license renewal (LR) and providing a greater level of detail for them. In addition, a greater level of detail is provided in the analysis of the four criteria in 10 CFR 51.22(c)(11), described in Section 1.4.

### 1.4 Relevant NRC NEPA Requirements

In 10 CFR 51.22, Criterion for Categorical Exclusion; Identification of Licensing and Regulatory Actions Eligible for Categorical Exclusion or Otherwise Not Requiring Environmental Review, the NRC identifies licensing and regulatory actions that are eligible for categorical exclusion (CATEX). Specifically, 10 CFR 51.22(c)(11) states the following:

Issuance of amendments to licenses for fuel cycle plants and radioactive waste disposal sites and amendments to materials licenses identified in § 51.60(b)(1) that are administrative, organizational, or procedural in nature, or that result in a change in process operations or equipment, provided that:

- i. there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite,
- ii. there is no significant increase in individual or cumulative occupational radiation exposure,
- iii. there is no significant construction impact, and
- iv. there is no significant increase in the potential for or consequences from radiological accidents.
- v.

## 1.5 Report Organization

This ER supplement is organized in accordance with the guidance contained in NUREG-1748, Environmental Review Guidance for Licensing Actions Associated with Nuclear Material Safety and Safeguards Programs, dated August 2003.

Section 2, Facility Description and Overview of Operations, includes a discussion of the Category II FFF, proposed operation of the facility, and the alternatives, including the no-action alternative and siting alternatives.

Section 3, Description of Affected Environment, discusses the potential impacts of the proposed facility with respect to the four CATEX criteria in 10 CFR 51.22 (c)(11) discussed in Section 1.4.

Section 4, Environmental Impacts, analyzes a range of other environmental issues and factors for which potential impacts may differ from those analyzed in the 2009 NRC EA. This analysis is intended to inform a conclusion about whether the proposed new activities would alter the previously evaluated environmental impacts associated with the licensed operations, and whether there are any “special” or “extraordinary” circumstances present that would preclude the application of a CATEX.

Section 5, Mitigation Measures, discusses mitigation measures that could mitigate potential environmental impacts of the proposed action.

Section 6, Environmental Measurements and Monitoring Programs, discusses the environmental measurement and monitoring programs currently established for the HRR FFF.

Section 7, Summary of Environmental Consequences, summarizes the potential environmental consequences of the proposed action.

Section 8, List of References, and Section 10, List of Preparers, presents the references for, and preparers of, this ER supplement.

## 1.6 Purpose of Change

The Proposed Action is the amendment of Framatome’s SNM-1227 license to include TRISO fuel fabrication in the Specialty Fuels Building at an enrichment of <10 wt. % U-235.

This action is part of Framatome’s Advanced Reactor Fuel Program. Ultra Safe Nuclear Corporation (USNC) and Framatome have formed a joint venture (JV) to provide fourth-generation nuclear fuel for USNC Micro-Modular™ Reactor (MMR®) and other advanced reactor designs. The fuel supply will include commercial quantities of Tri-structural Isotropic (TRISO) particles and USNC’s proprietary Fully Ceramic Micro-encapsulated fuel.

The SNM-1227 license allows the operation of the Framatome Richland, WA Fuel fabrication facility. The primary licensed activity is the production of nuclear fuel for commercial light water cooled nuclear reactors.

The Proposed Action advocated by this supplemental Environmental Report is the amendment

of the Framatome SNM-1227 license to include specific new processes associated with manufacturing TRISO fuel at an enrichment < 10 wt. % U-235. This action would include the receipt, possession, processing, storage, and shipment of authorized special nuclear materials. Framatome proposes to utilize existing facilities in the specialty fuels building which will be decommissioned and renovated.

This Supplement to the Environmental Report is submitted in support of the continued operation of the Framatome Richland, Washington nuclear fuel fabrication facility at an increased enrichment for the general plant and the SF building at an even higher enrichment to support manufacturing of TRISO based fuel. A description of the significant characteristics of the facility is provided in Chapter 1, General Information, of the license amendment application being filed concurrently with this report. That description includes a general facility description; a summary of the major site features (buildings and facilities); a general process description of how special nuclear material (SNM) is utilized; an overview of raw materials, products, and wastes; and a description of the types and amounts of SNM authorized for the site.

The main material processing area is contained within an existing building (Specialty Fuels Building) including the removal of processing equipment that is no longer needed. The Specialty Fuels Building formerly contained processes to manufacture fuel pellets as well as a separate process area to recover uranium from contaminated solid wastes. The existing structure is physically separated from other process operations unrelated to the proposed action. There will not be any construction that will impact the types and mitigation of effluents and no fugitive dust will be created.

Framatome will utilize its dry conversion process for chemical conversion of  $UF_6$  to uranium dioxide powder for further processing into TRISO fuel. The dry conversion process that will be used to feed the TRISO fuel process is the same basic design that is currently used at the FFF. Equipment sizes will be modified based on criticality safety requirements. The process will be conservatively designed to support 19.75% U-235 enrichment even the enrichment for the new process will be less than 10% U-235.

The TRISO fuel fabrication process is composed of two-parts – first the fabrication of TRISO particles, and second, the fabrication of FCM fuel pellets containing those TRISO particles. The first step is to package uranium into spherical kernels using the sol-gel process. Uranium oxide is dissolved in nitric acid to make a broth solution of uranyl nitrate. This yellow solution is combined with an organic solution to create a uranium gelation broth used in the sol-gel process.

For the sol-gel process a liquid uranium broth is cooled to low temperatures and dispersed as droplets into an oil bath. The droplets undergo thermally activated reactions that solidify the droplets into the soft gel spheres, a few millimeters in diameter.

In order to convert the kernels to UCO, they are prepared for a high temperature furnace to calcine, convert, and sinter mixed uranium trioxide and carbon bearing particles from the sol-gel process to high density uranium oxy-carbide or other types of fuel kernels. Following proprietary recipes, the fuel kernels are coated with ceramic layers by injecting gases into a hot fluidized chamber which can reach temperatures up to 1700°C. The gases react to deposit chemicals onto the spheres. TRISO particle layers are coated with a series of engineered ceramic layers using chemical vapor deposition. The thickness, porosity, grain

size, and texture are strictly controlled to achieve the desired performance. SiC and graphite layers maintain their performance characteristics across the intended temperature and irradiation conditions.

The resulting TRISO particles are sorted using roller pins or screens. The rollers are slightly angled so that particles fall through with increasing size. Misshapen or non-spherical particles are sorted using an inclined vibratory plane.

TRISO particles are pressed into full ceramic microencapsulated (FCM) fuel pellets for use in advanced reactors. FCM fuel contains TRISO particles which contain the radioactive byproducts of fission within layered ceramic coatings and are fully encased within a fully dense silicon carbide matrix.

The process hazards analysis indicates radiological impacts to the worker, public, and the environment are well within regulatory limits and performance requirements of 10 CFR 70.61. The same process that will be used at the FFF has been tested at Pilot fuel manufacturing facility operated by Ultra Safe Nuclear Corporation in Oak Ridge, TN. The PFM facility uses the same production-scale modules for manufacturing TRISO coated particles and FCM fuel that will be used at the FFF. The PFM is a radiological facility capable of producing FCM for testing and qualification of multiple-kilogram quantities of TRISO particles.

The Items Relied on For Safety (IROFS), identified for each Intermediate and High Consequence event, are further defined in the ISA and process safety information documents.

The duration of construction for the new process is approximately 24 months.

The proposed action would continue for as long as the service is contracted. This timeline has not been specifically defined; however, the intent is for a long-term contract based on the USNC/Framatome Joint Venture. The proposed action is anticipated to be included in the scope of the next licensing renewal.

## 2.0 Facility Description and Overview of Operations

Under materials license SNM-1227 for the HRR FFF, Framatome is authorized to receive and possess nuclear materials to fabricate, assemble nuclear fuel components, and transfer special nuclear material under the provisions of 10 CFR Part 70, Domestic Licensing of Special Nuclear Material.

### 2.1 Physical Description

The site is a 320-acre parcel located inside the northern boundary of the City of Richland, Washington. The restricted area represents an approximate 53-acre fenced area that contains the site's uranium handling and processing facilities. The primary facilities consist of a main FFF plant, waste treatment facilities, raw material storage buildings, and office space.

The current and proposed facility functions listed below are provided for informational purposes and are not intended to be restrictive of future potential activities in those facilities.

- Uranium Hexafluoride (UF<sub>6</sub>) Cylinder Storage Facility: Receipt, handling, and storage of full-, empty-, and heel-quantity UF<sub>6</sub> cylinders, including weighing and assaying of cylinder contents.
- Dry Conversion Facility: Chemical conversion of UF<sub>6</sub> to uranium dioxide (UO<sub>2</sub>) powder and mechanical processing of the powder (powder preparation) for subsequent pellet pressing.
- UO<sub>2</sub> Building: Pressing of UO<sub>2</sub> powder into pellets and subsequent pellet sintering and grinding; loading of finished pellets into fuel rods and assembly of fuel rods and associated hardware into fuel bundles; loading of products (powder, pellets, fuel rods, assemblies) for shipment; recovery of uranium via the ammonium diuranate process; bulk UO<sub>2</sub> storage; analytical laboratory and UF<sub>6</sub> cylinder washing activities.
- Specialty Fuels Building: Formerly housing a neutron absorbing fuel line. This area will now house a future TRISO fuel line.
- Scrap Uranium Recovery Facility Building: Dissolution and solvent extraction processing of uranium fuel scrap for removal of contaminants; laboratory facilities for research and development activities in support of fuel fabrication and related functions.
- UF<sub>6</sub> Cylinder Recertification Facility: Testing and inspection for the recertification of UF<sub>6</sub> cylinders.
- Uranyl Nitrate Hexahydrate Drum Storage Warehouse: Storage of drums of uranyl nitrate solution for eventual uranium recovery processing.
- Warehouse 1. 2. 3. Facility: Materials receipt and storage; loading of containers of powder/pellet product into shipping containers; loading of containers into trucks; mechanical component operations.

- Fuel Storage Warehouse (Warehouse 4): Storage of uranium-bearing product or scrap; miscellaneous production support activities.
- Warehouse 5: Shipping container storage and set-up; miscellaneous product support and general storage activities.
- Uranium Storage Warehouse (Warehouse 6): Storage of uranium powder and pellet product material and uranium fuel scrap in closed containers; miscellaneous production support activities.
- Operations Scrap Warehouse (Warehouse 7): Storage of containers of uranium fuel feed stock, product, and scrap.
- Waste Storage Facility: Storage of containers (drums/boxes) of radioactively contaminated wastes awaiting offsite disposal.
- Lagoon Uranium Recovery/Solids Processing Facility: Formerly used for processing of waste liquids and sludges/solids; powder blending operations; miscellaneous production support activities. Future use will be for waste volume reduction and packaging.
- Ammonia Recovery Facility: Recovery of ammonium hydroxide and uranium from liquid process effluents; temporary tank accumulation of liquid process effluents.
- Modular Extraction Recovery Facility: Sorting and recovery of uranium from contaminated solid wastes.
- Fuel Services Building (Building 9): Miscellaneous production support activities, including computer operations; fuel bundle defabrication activities.
- Shipping Container Refurbishment Facility: Maintenance, cleaning, and painting of product shipping containers; mechanical fabrication activities.
- Product Development Test Facility: Hydraulic, heat transfer, and mechanical/seismic testing of fuel assemblies.
- Machine Shop: Mechanical component operations.
- Maintenance Shop: Maintenance craft shops and offices.
- North Tank Farm: Tank storage of liquid chemical feed and product materials (hydrofluoric acid, anhydrous and aqua ammonia, sodium hydroxide, nitric acid, nitrogen).
- Carpenter Shop: Carpentry/painting activities.
- Chemical Storage Warehouse: Storage of containerized chemicals.
- Acid/Oxidizer Storage Warehouse: Storage of containerized chemicals.
- Office Buildings 1 through 6, 7, and 8: Office/Administrative functions.
- Central Guard Station/Emergency Operations Center: Security and emergency response operations.
- HALEU FFF Conversion and Metallization Process Building (proposed): Converts HALEU  $UF_6$  to  $UO_2$  powder (Urania),  $UO_2$  powder to uranium tetrafluoride ( $UF_4$ ), and

UF<sub>4</sub> to uranium metal.

- TRISO Process Building (proposed): Converts Urania into a uranyl nitrate solution, into gel spheres, and then into fuel kernels; processing the fuel kernels through coating, overcoating, fuel form pressing, and high temperature carbonization.
- HALEU FFF Tank Farm (proposed): Tank storage of liquid chemical feed and product materials (hydrofluoric acid, anhydrous and aqua ammonia, sodium hydroxide, nitric acid, nitrogen).
- UF<sub>6</sub> Storage Pad (proposed): Receipt, handling, and storage of full-, empty-, and heel-quantity UF<sub>6</sub> cylinders, including weighing and assaying of cylinder contents.

## **2.2 Stormwater Management**

Stormwater discharges from the current HRR FFF are regulated under the Underground Injection Control Well Registration, which meets the requirements of the Washington State Department of Ecology. Additionally, National Pollutant Discharge Elimination System requirements are administered through the City of Richland, Washington, with whom the HRR FFF has a discharge permit.

No natural surface water bodies or wetlands are within the property boundary or adjacent to the HRR FFF site.

The stormwater runoff on the HRR FFF site is controlled by a dry well system that moves stormwater underground. Dry wells are typically lined with perforating casing to allow for infiltration into the native soil (AGI 2017). Fifty dry wells are distributed across the HRR FFF site to manage the stormwater. Framatome anticipates application of a similar system for the potential new development.

Best management practices (BMPs) and programs for the management of spills and leaks are in place at the HRR FFF to avoid contaminants being picked up by stormwater and moved underground through the dry wells. Programs at the HRR FFF include active containment, such as spill containment basins and double containment tanks, as well as employee reporting programs and regular inspections.

## **2.3 Detailed Description of Alternatives**

This section of the ER supplement identifies and describes the no-action alternative, the proposed action, and any reasonable alternatives. The technical design requirements for the proposed action are discussed in the previous sections of Chapter 2. This section of the ER supplement also discusses any potential options for the proposed action.

### **2.3.1 No-Action Alternative**

Failure of the NRC to approve the license amendment request could deprive Framatome's joint venture partner of the TRISO fuel needed for its advanced reactors. The development of advanced reactors is being supported by the Department of Energy and is a national priority. If Framatome does not have approval for this amendment, then the national priorities regarding reduction in greenhouse gases related to climate change will be negatively impacted. The operation of the Framatome facility has produced no significant adverse effects on the local environment. The conduct of this work at another licensed facility would have no net positive effect on the environment.

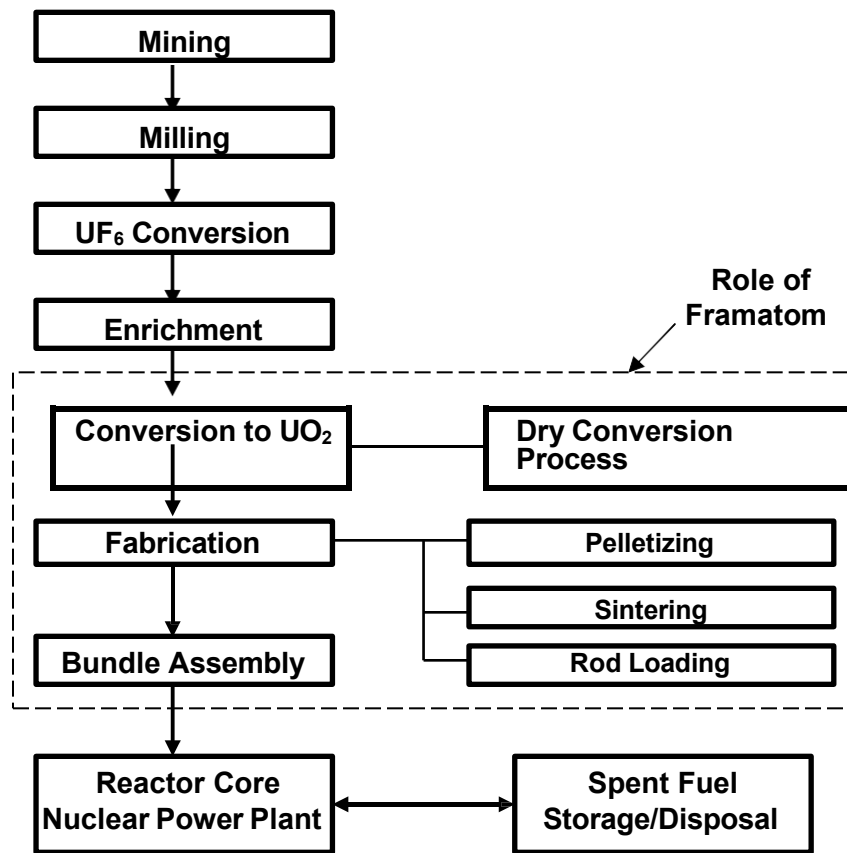
### **2.3.2 Proposed Action**

The proposed action is to amend Framatome's SNM-1227 license to manufacture TRISO fuel at enrichments <10 wt. % U-235. This action would include the receipt, possession, processing, storage, and shipment of authorized special nuclear materials. Current operations at the Framatome Fuel Fabrication Facility are described below.

## **2.4 Description of Current Operations**

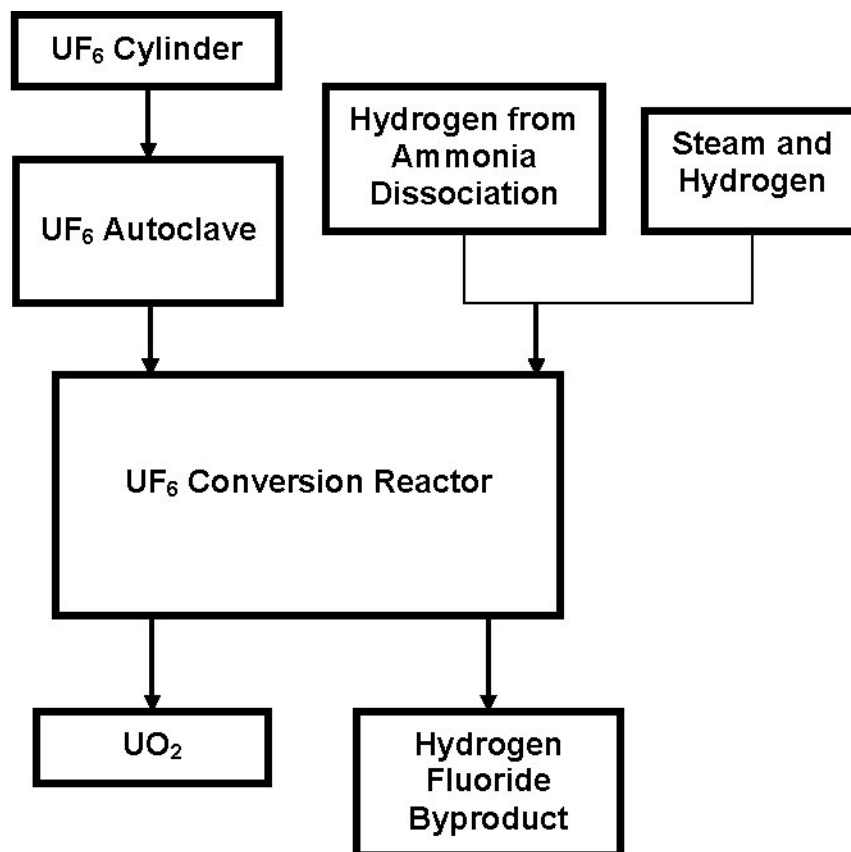
### **2.4.1 Current Facility Use**

The primary function of the Framatome 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 1. The role of Framatome 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 1 Role of Framatome in the Nuclear Fuel Cycle**

The primary uranium feed material is uranium hexafluoride (UF<sub>6</sub>), which is received in 76-cm [30-in]-diameter steel “30B” cylinders. Each cylinder contains about 2,200 kg [4,850 lb.] of UF<sub>6</sub>, 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<sub>6</sub> gas is converted into solid uranium oxide (UO<sub>2</sub>) using a dry chemical conversion process. A process flow diagram of the Framatome dry conversion process is shown in Figure 2. In the dry conversion process, UF<sub>6</sub> gas is reacted directly with a hydrogen-nitrogen-steam atmosphere in a fluidized bed to form UO<sub>2</sub> powder. A rotary calciner removes residual fluoride from the UO<sub>2</sub> 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<sub>2</sub> then undergoes physical conditioning (pulverization into a powder), and the powder is pressed into pellets in the UO<sub>2</sub> Building. The pressed pellets are sintered, ground to the necessary size as required by the customer, loaded into zirconium cladding, and sealed with end caps to make a fuel rod.



**Figure 2: Process Flow Diagram of Framatome Operations**

Fuel rods are then combined with appropriate fuel bundle hardware to produce finished nuclear fuel assemblies. Finished fuel assemblies 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 Framatome facility.

Various ancillary operations at the Framatome 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 Framatome generates. The amount of radioactive and hazardous waste Framatome generates is detailed in Section 2.3.

The Dry Conversion Process Facility includes three conversion lines. 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 Framatome depending on the needs of the customer. For these processes, the final product is not always finished fuel assemblies, but instead may be  $\text{UO}_2$  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.

Blended low-enriched uranium (BLEU) may be received from offsite as  $\text{UO}_2$  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. Subsequent fuel production steps (e.g., rod loading and bundle assembly) occur within the  $\text{UO}_2$  Building.

Scrap processing uses a wet-chemistry ammonium diuranate (ADU) conversion process in the  $\text{UO}_2$  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  $\text{UO}_2$  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.  $\text{UO}_2$  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  $\text{UF}_6$ -derived powder produced in the Dry Conversion Facility, as previously discussed.

Secondary feeds for the plant may 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 Framatome 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.

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 440,340 L/yr. [116,326 gal/yr.] over the 2018–2023 time periods, ranging from approximately 605,590 L [160,000 gal] in 2023 to approximately 375,400 L [99,190 gal] in 2020.

The proposed new process will use additional non-radiological chemicals to support the production of TRISO fuel. These chemicals include: Hexamethylenetetramine (HMTA), silicon oil, SOR-C (silicon oil solvent), urea, Sorbitan Oleate, and MTS (methytrichlorosilane).

#### **2.4.2 Reasonable Alternatives**

The alternative of not amending the SNM-1227 license to include TRISO fuel fabrication at enrichments < 10 wt. % U-235 will result in the work having to be conducted elsewhere, which provides no environmental benefit. Additionally, for this work to be conducted at another site, it is likely that a significant environmental impact might be incurred due to construction and start-up activities, since other currently available licensable facilities are limited.

#### **2.4.3 Cumulative effects**

The addition of TRISO fuel fabrication to the Framatome, Richland WA, Fuel Fabrication facility in the Specialty Fuel Building will have minimal cumulative impacts on the environment. New construction is not needed and the TRISO fuel fabrication is replacing other fuel fabrication processes that occurred in the Specialty Fuels Building in which their environmental impacts have been previously considered.

### **2.5 Comparison of the Predicted Environmental Impacts**

The addition of TRISO fuel fabrication to the Framatome, Richland WA, Fuel Fabrication facility in the Specialty Fuel Building will have minimal impacts on the environment. New construction is not needed and the TRISO fuel fabrication is replacing other fuel fabrication processes that occurred in the Specialty Fuels Building in which its environmental impacts have been previously considered.

### 3.0 Affected Environment

#### 3.1 Land Use

Richland was 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 three 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.

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 (2017) and Benton County (2022) 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. Framatome, 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. Framatome is one of the largest private employers in the City of Richland.

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 Framatome land use is consistent with this definition as it manufactures fuel assemblies and intermediate fuel components at this location.

In addition, Framatome leases a portion of its land for agricultural use.

Land in the vicinity of Framatome 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 2,000 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 Framatome 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 Framatome (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 Framatome. 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. More than one route exists to commute to Framatome. 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 Framatome is Horn Rapids Road and Stevens Drive. Traffic studies show an increase in the average weekday count between 2016 and 2020, as seen in the following table:

**Table 1: Studies of Horn Rapids Road West of Stevens Drive**

Direction	Month / Year	Average <sup>(1)</sup> Weekday Count
Eastbound	2016	1031
Westbound	2016	987
Eastbound	2020	1222
Westbound	2020	1249

Another crossroad of significance near Framatome 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 2004 and 2020 show a significant increase in the road’s usage, as noted in Table 4.

**Table 2: Studies of Kingsgate Way North of SR 240**

Direction	Month/Year	Average Weekday Count
Northbound	2020	3930

Southbound	2020	1943
Northbound	May 2004	1449
Southbound	May 2004	990

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 Framatome and the Hanford Site, and to downtown destinations. This interchange is also exhibiting substantial growth as noted in the Citywide Transportation Plan.

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 Report is specifically on the environmental affect. Detailed descriptions of the safety aspects appear in the facility license application.

One percent of hazardous material shipments involves shipment of radioactive materials as perf the World Nuclear Association. Transports to and from Framatome involve a significantly smaller percentage of this amount. Framatome 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.

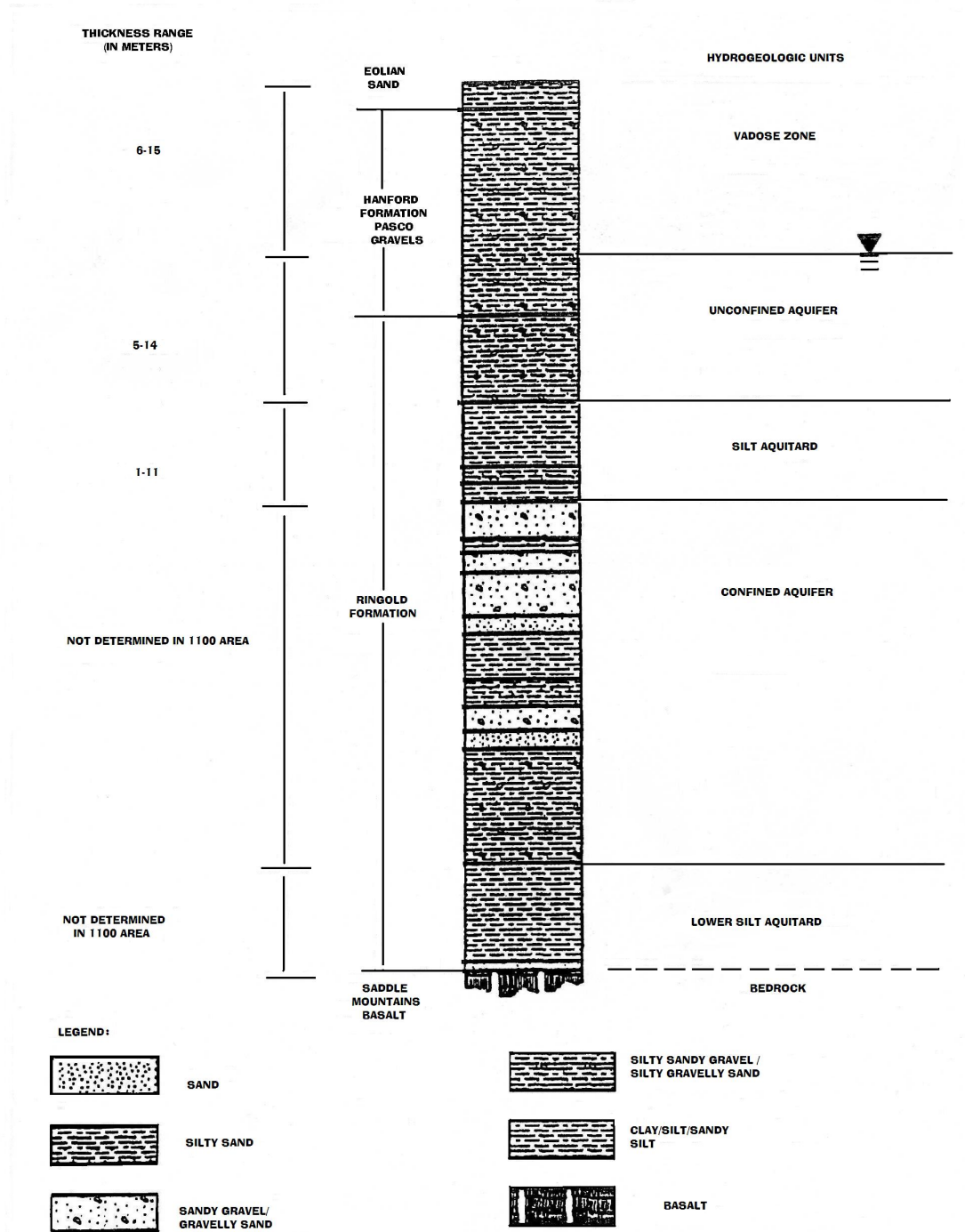
### **3.3 Geology and Soils**

#### **3.3.1 Geology**

(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. 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. 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. A hydrostratigraphic section for the Hanford Site, located in the affected area of Framatome, is shown in Figure 3.

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.



**Figure 3: Generalized Hydrostratigraphic Section of the DOE 1100 area, Located in the Vicinity and Typical of the Affected Area of Framatome**

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 Framatome site. The Horn Rapids Landfill, located immediately north and across the street from the Framatome site, was originally a sand and gravel pit.

Framatome 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. Framatome 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].

Framatome is not regrading or constructing any new buildings for the addition of the new process. Therefore, there is no impact on the subterranean environment. Additionally, there are no impacts from operations of the new process.

### **3.3.2 Seismology**

The Hanford Site lies in an area of relatively low seismic activity. Figure 4 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.

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. 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.

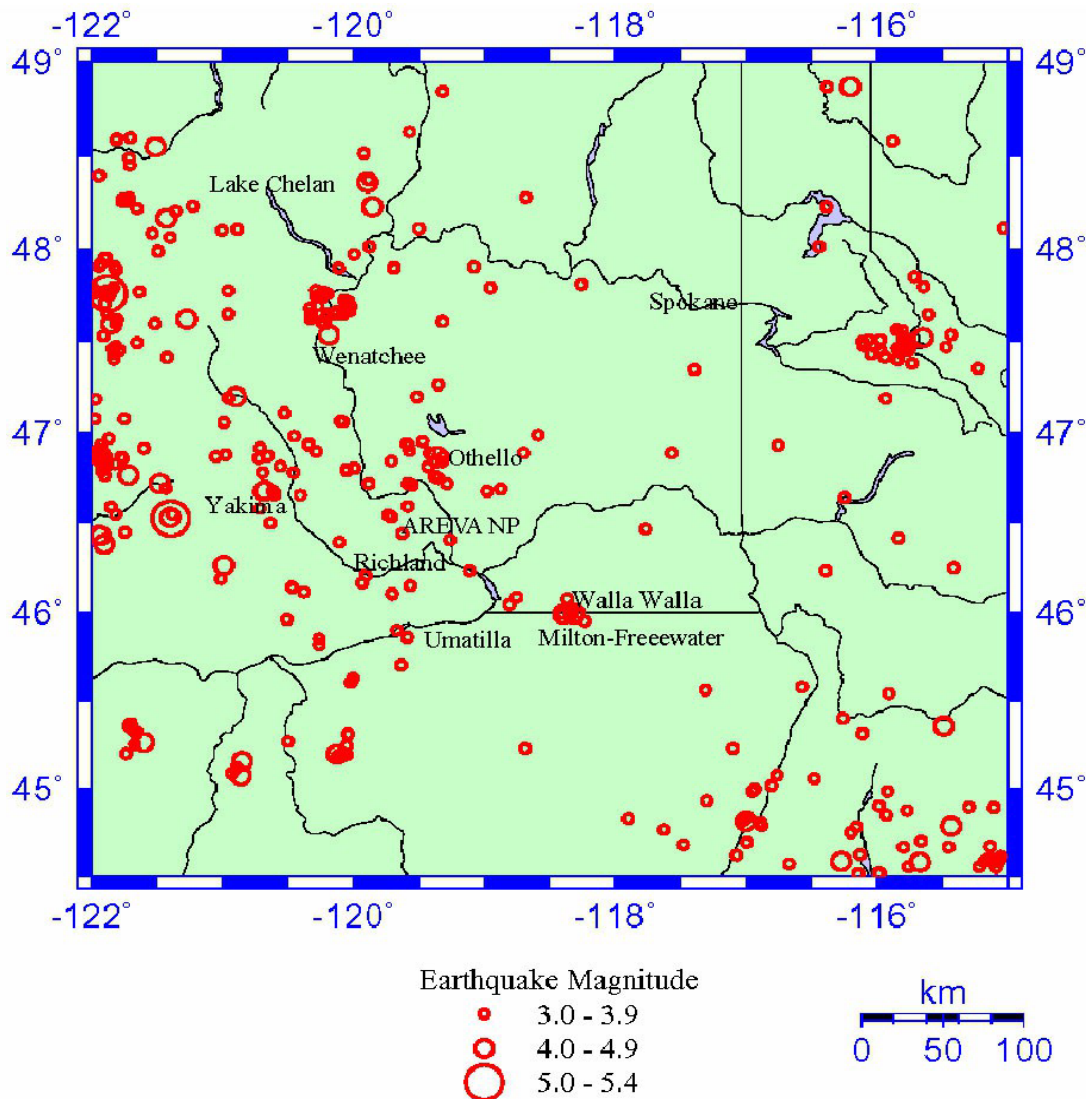
For the Rattlesnake-Wallula alignment, which passes along the southwest boundary of the Hanford Site, the NRC estimated a maximum Richter magnitude of 6.5; for Gable Mountain, an east-west structure that passes through the northern portion of the Hanford Site, a maximum Richter magnitude of 5.0 was estimated. 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. NRC concluded the actual magnitude of this event was smaller than estimated previously.

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 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). These estimates are in approximate agreement with the results of national seismic hazard maps the U.S. Geological Survey produced.

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.

According to the Final Environmental Impact Statement for the Tank Waste Remediation System at the adjacent Hanford Site, two types of volcanic activity have impacted the Pasco Basin (in which the Framatome 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.

The cascade-style diacritic volcanism would be related to the Cascade Mountain Range, located more than 97 km [60 mi] west of the Framatome site. The eruption of Mount St. Helens in 1980 was an example of such a volcanic event. Although a major eruption, impact to the Framatome 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.



**Figure 4: Historical Seismicity of the Columbia Plateau and Surrounding Areas**

### 3.3.3 Water Resources

#### 3.3.3.1 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 Framatome 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<sup>3</sup>/s [2,200,000 ft<sup>3</sup>/s] and has a normal operating water level range between 102.1 and 103.6 m [335 and 340 ft].

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<sup>3</sup>/s [118,700 ft<sup>3</sup>/s] and the median daily flow was 2,679 m<sup>3</sup>/s [94,600 ft<sup>3</sup>/s] (U.S. Geological Survey, 2005). By 2024, as reported by USGS, the mean daily flow was 106,000 ft<sup>3</sup>/s based on 64 years of data. The maximum historical flood on record for the Columbia River occurred June 7, 1894, with an estimated peak discharge of 21,011 m<sup>3</sup>/s [742,000 ft<sup>3</sup>/s] along the Hanford Reach (Neitzel, 2004). The Framatome 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.

#### 3.3.3.2 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 Framatome 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 Framatome 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 hydrostratigraphic column for the DOE 1100 area in the vicinity of Framatome is shown in Figure 3. 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.

### 3.3.3.3 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 Framatome site. The wetlands closest to the Framatome 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 Framatome site.

## 3.4 Ecological Resources

### 3.4.1 Terrestrial Biota

The facility is located within the Columbia Plateau Ecoregion. The vegetation community is a desert steppe dominated by sagebrush (*Artemisia tridentate*), rubber rabbit brush (*Ericameria nauseosa*) and antelope bitterbrush (*Purshia tridentate*) with an understory dominated by cheatgrass (*Bromus tectorum*) and Sandberg’s bluegrass (*Poa sandbergii*). Additional native species found in this biome include greasewood (*Sarcobatus vermiculatus*), hopsage (*Grayia spinosa*), and buckwheat (*Fallopia convolvulus*) (Upland Vegetation of the Hanford Site, USDOE, 2017). 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.

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 Framatome 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.

Resident birds include meadowlarks (*Sturnella neglecta*) and horned larks (*Eremophila alpestris*). The loggerhead shrike (*Lanius ludovicianus*), game birds such as the California quail (*Callipepla californica*), ringed-neck pheasant (*Phasianus colchicus*), and the mourning dove (*Zenaidura 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*).

Riverine habitat along the Columbia River is used extensively by mallards (*Anas platyrhynchos*), Canada geese (*Branta canadensis*), and other waterfowl for wintering, and the island habitats for nesting. Great blue herons (*Ardea herodias*), great egrets (*Ardea alba*), black-crowned night-herons (*Nycticorax nycticorax*), and other water-related birds have also been noted using the river corridor and islands. Double-crested cormorants (*Phalacrocorax auritus*), American white pelicans (*Pelecanus erythrorhynchos*), and several species of gulls and terns also use these areas (Hanford Reach National Monument, USFWS).

### 3.4.2 Aquatic Biota

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 Framatome drainage basin, so it is not affected by groundwater drainage from Framatome (the site or the new process).

Diatoms, golden or yellow-brown algae, green algae, blue-green algae, red algae, and dinoflagellates are the dominant 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.

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 Northern Pikeminnow are also present.

### 3.4.3 Threatened and Endangered Species

The National Marine Fisheries Service 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 Coho Salmon [*Oncorhynchus kisutch*].

There are seven federally listed species and one federal candidate species in Benton County, Washington. These include the gray wolf (*Canus lupus*, endangered), North American wolverine (*Gulo gulo luscus*, threatened), yellow-billed cuckoo (*Coccyzus americanus*, threatened), Northwestern pond turtle (*Actinemys marmorata*, proposed threatened), bull trout (*Salvelinus confluentas*, threatened), Umtanum desert buckwheat (*Eriogonum codium*, threatened), and the candidate Monarch butterfly (*Danus plaxippus*). (USFWS 2024a, IPaC – Benton County list).

### **3.4.4 Meteorology, Climatology, and Air Quality**

#### **3.4.4.1 Meteorology and Climatology**

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 summer temperature of 23.4 °C [74.2 °F] occurs in June-August, and the average winter temperature of 1 °C [33.8 °F] occurs in December-February. The temperature falls below freezing an average of 107 days per year. The record high and low temperatures are 47.8 °C [118 °F] and -30.6 °C [-23 °F], respectively. The basin is within the rain shadow of the Cascade Mountains, and the average annual precipitation is 17.3 cm [6.8 in]. Rainfall is more frequent in the winter months, averaging 6.6 cm [2.6 in] December - February and 0.5 cm [1 in] June - August. of 2.5 cm [1.0 in] or more occur twice each month in December and January on average. Winter snowfall averages 30.7 cm (12.1 in). (Hanford Site Climate Data Summary 2024, USDOE).

Climatological data are collected offsite and at several meteorological stations located on the Hanford site within 16 km [10 mi] of Framatome. 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 Framatome. Based on a study detailed in an earlier license renewal (Siemens Power Corporation, 2000), scientists from PNNL ( a neighbor of Framatome) project a low occurrence of tornadoes (0.4 per year) in the Columbia Basin within 161 km [100 miles] of Framatome’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.

#### **3.4.4.2 Air Quality**

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 Framatome. The effluents may contain radiological and non-radiological chemical constituents. Framatome 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.” Framatome provided its annual stack radioactive discharge

data. NRC also considered routinely reported data (shown below).

**Table 3: Framatome Inc. Gaseous Effluent Reports**

Gaseous Effluents					
Year	6-Month	Alpha (µCi)	Beta (µCi)	Flow (m <sup>3</sup> )	MEI dose (mrem)
2019	January – June	<a href="#">2.20E+00</a>	<a href="#">2.41E+01</a>	<a href="#">1.82E+09</a>	<a href="#">2.34E-05</a>
	July - December	<a href="#">1.94E+00</a>	<a href="#">1.99E+01</a>	<a href="#">1.81E+09</a>	<a href="#">2.06E-05</a>
2020	January – June	<a href="#">1.82E+00</a>	<a href="#">1.99E+01</a>	<a href="#">1.93E+09</a>	<a href="#">1.70E-05</a>
	July – December*	<a href="#">1.99E+00</a>	<a href="#">1.59E+01</a>	<a href="#">2.05E+09</a>	<a href="#">1.64E-05</a>
2021	January – June	<a href="#">2.10E+00</a>	<a href="#">9.88E+00</a>	<a href="#">2.03+09</a>	<a href="#">1.81E-05</a>
	July - December	<a href="#">2.25E+00</a>	<a href="#">8.01E+00</a>	<a href="#">2.06E+09</a>	<a href="#">1.83E-05</a>
2022	January – June	<a href="#">1.26E+00</a>	<a href="#">7.64E+00</a>	<a href="#">1.84E+09</a>	<a href="#">1.49E-05</a>
	July - December	<a href="#">1.45E+00</a>	<a href="#">1.05E+01</a>	<a href="#">1.86E+09</a>	<a href="#">1.40E-05</a>
2023	January – June	<a href="#">1.25E+00</a>	<a href="#">7.98E+00</a>	<a href="#">1.95E+09</a>	<a href="#">9.32E-06</a>
	July - December	<a href="#">1.65E+00</a>	<a href="#">7.15E+00</a>	<a href="#">1.97E+09</a>	<a href="#">1.32E-05</a>

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<sub>10</sub> standards. PM<sub>10</sub> is defined as particulate matter smaller than 10 µm [3.9 × 10<sup>-4</sup> in]. The Universal Transverse Mercator coordinates identifying the non-attainment area are given in 40 CFR 81.348. The Framatome site is outside the non-attainment area.

Framatome 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 Framatome shall be less than 90.7 metric tons [MT] (100 short tons [ST]). While Framatome’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 Framatome 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).

There are no class I designated areas (e.g., national parks, national wilderness areas, national monuments, national seashores or other areas of a special regional nature) in the vicinity of the Framatome site that could be impacted by construction or operation of the new process.

**Table 4: Fluoride Measurements from 2019 through 2023**  
 (corrected results from blank subtraction and peak adjustment to minimize acetate interference; no correction for positive glycolate interference).

	Quarterly Sampling			Ambient Air Station #8 F, ug/m <sup>3</sup>
<a href="#">2019</a>	<a href="#">1</a>	<a href="#">0.074</a>	<a href="#">0.076</a>	<a href="#">0.079</a>
<a href="#">2019</a>	<a href="#">2</a>	<a href="#">0.071</a>	<a href="#">0.072</a>	<a href="#">0.071</a>
<a href="#">2019</a>	<a href="#">1</a>	<a href="#">0.103</a>	<a href="#">0.102</a>	<a href="#">0.102</a>
<a href="#">2019</a>	<a href="#">2</a>	<a href="#">0.097</a>	<a href="#">0.102</a>	<a href="#">0.100</a>
<a href="#">2020</a>	<a href="#">1</a>	<a href="#">0.015</a>	<a href="#">0.017</a>	<a href="#">0.011</a>
<a href="#">2020</a>	<a href="#">2</a>	<a href="#">0.018</a>	<a href="#">0.021</a>	<a href="#">0.019</a>
<a href="#">2020</a>	<a href="#">1</a>	<a href="#">0.103</a>	<a href="#">0.102</a>	<a href="#">0.102</a>
<a href="#">2020</a>	<a href="#">2</a>	<a href="#">0.097</a>	<a href="#">0.102</a>	<a href="#">0.100</a>
<a href="#">2021</a>	<a href="#">1</a>	<a href="#">0.021</a>	<a href="#">0.070</a>	<a href="#">0.017</a>
<a href="#">2021</a>	<a href="#">2</a>	<a href="#">0.025</a>	<a href="#">0.019</a>	<a href="#">0.073</a>
<a href="#">2021</a>	<a href="#">1</a>	<a href="#">0.038</a>	<a href="#">0.032</a>	<a href="#">0.027</a>
<a href="#">2021</a>	<a href="#">2</a>	<a href="#">0.032</a>	<a href="#">0.038</a>	<a href="#">0.038</a>
<a href="#">2022</a>	<a href="#">1</a>	<a href="#">0.048</a>	<a href="#">0.035</a>	<a href="#">0.034</a>
<a href="#">2022</a>	<a href="#">2</a>	<a href="#">0.054</a>	<a href="#">0.058</a>	<a href="#">0.055</a>
<a href="#">2022</a>	<a href="#">3</a>	<a href="#">0.032</a>	<a href="#">0.030</a>	<a href="#">0.038</a>
<a href="#">2022</a>	<a href="#">4</a>	<a href="#">0.067</a>	<a href="#">0.070</a>	<a href="#">0.063</a>
<a href="#">2023</a>	<a href="#">1</a>	<a href="#">0.111</a>	<a href="#">0.043</a>	<a href="#">0.039</a>
<a href="#">2023</a>	<a href="#">2</a>	<a href="#">0.050</a>	<a href="#">0.049</a>	<a href="#">0.052</a>
<a href="#">2023</a>	<a href="#">3</a>	<a href="#">0.052</a>	<a href="#">0.058</a>	<a href="#">0.057</a>
<a href="#">2023</a>	<a href="#">4</a>	<a href="#">0.070</a>	<a href="#">0.072</a>	<a href="#">0.067</a>

### 3.5 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. Framatome 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 Framatome 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 Framatome 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.

### **3.6 Historic and Cultural Resources**

A cultural resources assessment of Framatome's Richland fuel fabrication facility conducted in Framatome's behalf by Historical Research Associates, Inc. (HRA) of Spokane, WA. The assessment was provided as a voluntary action by Framatome in support of the NRC's finalization of its Environmental Assessment (EA) relative to the renewal of the Richland facility's special nuclear materials license (Lic. No. SNM-1227). The assessment specifically addresses compliance with Section 106 of the National Historic Preservation Act of 1996, as amended, and implemented by 36 CFR Part 800, Protection of Historic Properties.

The field survey portion of the assessment was conducted over February 12-13, 2009. Prior to this, HRA had notified both the State of Washington Department of Archaeology and Historic Preservation and the pertinent Native American parties (Confederated Tribes and Bands of the Yakama Indian Nation and the Confederated Tribes of the Umatilla Indian Reservation), inviting their input and participation in the assessment. A representative of the Yakama participated in the pre-field meeting and initial site walk-over on February 12.

As set forth in Section 6.0, Conclusions and Recommendations, of the report, the assessment did not identify archaeological resources that may be eligible for inclusion in the National Register of Historic Places (NRHP) and further concluded that the site has a "low probability for prehistoric, ethnographic period, historic Indian, and Euroamerican resources that may be eligible for inclusion in the NRHP." Under separate cover, Framatome has also conveyed this report to the State of Washington Department of Archaeology and Historic Preservation and the Confederated Tribes and Bands of the Yakama Indian Nation and the Confederated Tribes of the Umatilla Indian Reservation. Via that correspondence Framatome has affirmed its commitment to act on the two recommendations of the study, namely that Framatome will initiate a historical evaluation of its buildings once the site reaches its 50 year anniversary and secondly, that Framatome will establish protocols on how to proceed if archaeological deposits and/or human remains are inadvertently discovered during construction in any portion of the Area of Potential Effects.

### 3.6.1 Visual/Scenic Resources

An analysis of the scenic/visual resources of Framatome 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 Framatome 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 Framatome, 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. The Hanford Highway extends southeast and northwest on the south side of Framatome. 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.”

### 3.7 Demography and Socioeconomic

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 Framatome 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.

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 the NRC. The 1990, 2000, and 2006, and 2021 data comes from the U.S. Census Bureau. The percentage change from the previous census period is provided in parentheses.

<b>Unit</b>	<b>1960</b>	<b>1970</b>	<b>1980</b>	<b>1990</b>	<b>2000</b>	<b>2006</b>	<b>2021</b>
Washington State				4,866,692	5,894,121 (+21.1%)	6,393,798 (+8.5%)	7,739,000 (+21%)
Benton County	62,070	67,540 (+8.8%)	109,440 (+62.0%)	112,560 (+2.8%)	142,475 (+26.6%)	159,436 (+11.9%)	210,025 (+32%)

Franklin County	23,342	25,816 (+10.6%)	35,025 (+35.7%)	37,473 (+6.7%)	49,347 (+31.7%)	66,570 (+34.9%)	98,268 (+48%)
Richland				32,315	38,708 (+19.8%)	44,668 (+15.4%)	61,929 (+39%)
Kennewick				42,155	54,693 (+29.7%)	62,276 (+13.9%)	84,488 (+36%)
Pasco				20,377	32,066 (+57.4%)	49,927 (+55.7%)	78,871 (+58%)
West Richland				3,962	8,385 (+112%)	10,199 (+21.6%)	16,951 (+66%)
Tri Cities (total)				98,769	133,852 (+35.5%)	167,070 (+24.8%)	311,469 (+86%)

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 1990–2021. 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 33.2 percent based on 2020 estimates, while the comparable number for Franklin County was 61.3 percent (U.S. Census Bureau, 2020). For the State of Washington, the minority population was 34.9 percent based on 2020 estimates. According to the most recent available data (U.S. Census Bureau, 2020), the median household income in Richland, Pasco, and Kennewick was \$89,283; \$75,316; and \$70,429, respectively. The state median income was \$90,325. The percentages of persons living below the 2020 poverty levels in Richland, Pasco, and Kennewick totaled 7.5, 13.1, 13.7, respectively. The percentage at the state level was 10.0. Therefore, the Richland percentage was lower than the state percentage, while both Pasco and Kennewick exceeded it. Based on the 2020 census and projected to 2004, the median household income for the entirety of the United States was \$75,149 and 11.5 percent of individuals were living below the poverty level (U.S. Census Bureau, 2020).

According to data from the U.S. Census Bureau, the State of Washington had 3,314,390 housing units. In 2020, there were 83,273 housing units in Benton County and 31,041 units in Franklin County. The unemployment rate in Benton County was 5.4% in December 2023. For Franklin County in the unemployment rate was 6.6% in December 2021. For the Tri-Cities MSA, the December 2023 indicated a labor force of 151,100 persons, with 142,300 employed and 8,900 unemployed (a 5.9 percent unemployment rate). For comparison purposes, the state unemployment rate in December 2023 was 4.4 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 13,831 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.

In recent years, major employers in Richland and the Tri-Cities MSA included PNNL and several large contractors working on related environmental cleanup activities. Other major Richland

employers in included Framatome, the Richland School District, Energy Northwest, government, private companies, retailers, and health care providers.

### **3.8 Public and Occupational Health**

Framatome 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. 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.].

Risks to occupational health and safety include exposure to industrial hazards, hazardous materials, and radioactive materials. Industrial hazards for the Framatome 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 6 contains the maximum TEDE for the last 5 years. The NRC occupational dose limit for any exposure category is 50 mSv [5 rem]

**Table 6: Maximum Doses for 2019–2023**

Year	<u>Maximum Deep Dose Equivalent in mSv [rem]</u>	<u>Maximum Committed Effective Dose Equivalent in mSv [rem]</u>	<u>Maximum Total Effective Dose Equivalent in mSv [rem]</u>
<u>2019</u>	<u>2.74 [0.274]</u>	<u>4.17 [0.417]</u>	<u>5.56 [0.556]</u>
<u>2020</u>	<u>2.71 [0.271]</u>	<u>4.12 [0.412]</u>	<u>5.86 [0.586]</u>
<u>2021</u>	<u>2.87 [0.287]</u>	<u>4.26 [0.426]</u>	<u>5.34 [0.534]</u>
<u>2022</u>	<u>3.76 [0.376]</u>	<u>4.80 [0.480]</u>	<u>6.06 [0.606]</u>
<u>2023</u>	<u>2.22 [0.222]</u>	<u>4.23 [0.423]</u>	<u>6.40 [0.640]</u>

Framatome 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 Framatome is 3.2 incidents per 200,000 worker-hours (U.S. Department of Labor, 2022). [The injury rate for Framatome averaged over the last 5 years is 0.75.](#) There have been no work-related fatalities over the course of the Framatome site’s operating history.

There have been no formally commissioned health effects studies specific to the Framatome 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. No evidence exists to indicate that plant operations adversely impact the health of its workforce relative to radiological, chemical, or physical agents.

### 3.9 Waste Management

#### 3.9.1 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 Framatome 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 2019 to 2023.

Year	Amount (kg†) for Uranium Pellet and Uranium Powder Dissolvers	Amount (kg†) for the <u>ELO</u> or <u>SURF</u> Building Dissolver
2019	<u>40,189</u>	<u>10,131</u>
2020	<u>51,929</u>	<u>4,904</u>
2021	<u>34,538</u>	<u>22,807</u>
2022	<u>47,140</u>	<u>23,755</u>
2023	<u>74,371</u>	<u>10,326</u>
Permit Limit	400,000	90,000

Table 7 are the values that have been reported to the BCAA on the annual NOx reports.

Year	Amount (kg†) of Nitrogen Oxide per Amount (kg†) of UO <sub>2</sub> for Uranium Pellet Dissolver	Amount (kg†) of Nitrogen Oxide per Amount (kg†) of UO <sub>2</sub> for Uranium Powder Dissolver	Amount (kg†) of Nitrogen Oxide per Amount (kg†) of UO <sub>2</sub> for Engineering Laboratory Operations Building Dissolver	Total Combined Nitrogen Oxide Emissions (metric ton‡)
2019	<u>0.035</u>	<u>0.040</u>	<u>0.071</u>	<u>2.23</u>
2020	<u>0.021</u>	<u>0.050</u>	<u>0.071</u>	<u>2.02</u>
2021	<u>0.031</u>	<u>0.045</u>	<u>0.018</u>	<u>1.83</u>
2022	<u>0.026</u>	<u>0.038</u>	<u>0.027</u>	<u>2.11</u>
2023	<u>0.036</u>	<u>0.038</u>	<u>0.032</u>	<u>3.06</u>

Permit limit	<a href="#">0.36 lb NOx/KG UO2 Dissolved</a>	<a href="#">89.07</a>
Table 8 values are the result of the annual NOx sampling.		

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<sub>6</sub> meets the radiological limits for commercial grade UF<sub>6</sub> as specified in ASTM Standard C–996. Similarly, most non-UF<sub>6</sub> uranium-bearing scrap feeds meet commercial-grade radiological limits specified in ASTM Standard C–1334). BLEU-bearing powder feed meets the reprocessed uranium specifications of ASTM C– 1334. Uranium fuel products must meet radiological criteria, including isotopic purity limits that Framatome customers impose.

### 3.9.2 Waste Management

Framatome 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 [station](#) is located immediately south of the plant site. Small volumes of some liquid wastes are containerized for treatment/disposal at appropriate offsite facilities. Framatome possess an industrial wastewater discharge permit from the City of Richland that authorizes the discharge of radioactive and 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 Framatome 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:

- [-pH limit of 5-10](#)
- [Maximum gallons per day 258,000](#)
- [Fluoride limit, four day average, 1250 lbs](#)
- [Nitrate limit, four day average, 1300 lbs](#)

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.

Framatome 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.

If these sites reach their capacity prior to securing expanded capacity or prior to emergence of replacement LLRW disposal options, Framatome 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<sup>3</sup> [93 ft<sup>3</sup>] B-25 waste boxes.

Framatome has sufficient capacity within its currently fenced restricted area to accommodate all of the noncombustible LLRW that would accumulate over the full 40-year license 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.

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.

## **4.0 Environmental Impacts**

### **4.1 Land Use Impacts**

Land use on-site is not anticipated to change significantly in the near future if Framatome’s SNM-1227 license is amended. All major operations will continue to be conducted within the Framatome’s Richland WA fuel fabrication facility. The proposed license amendment will not impact land use at the Facility.

Off-site land use will not be affected by continued licensed operation or the license amendment. Emissions, both chemical and radiological, to air and water have been shown to have an insignificant effect on local air and water quality. The NRC concluded in the license renewal EA that impacts due to land use are small. The impacts of the amendment are also small.

The alternative to license amendment would not impact land usage at the Framatome Richland fuel fabrication facility. However, because the work would have to be conducted elsewhere, not amending the license would likely require land use impacts at another site resulting from construction and start-up activities, since other currently available licensable facilities are limited.

### **4.2 Transportation Impacts**

The replacement of previous processes within the Specialty Fuels building with the addition of a TRISO fuel manufacturing capability will not have any significant traffic impact. The incremental impact of the proposed action will not significantly increase the current level of traffic due to personnel vehicles or material transport. Transportation routes will not change for operation of the proposed new process. The quantities and types of materials will not significantly change and there will be no additional entrances for construction. NRC staff, in the license renewal EA found that a small environmental effect may result, as bounded in the previous studies. The impacts of the amendment are also small.

The alternative to the SNM-1227 license amendment would result in the transportation of authorized SNM to an alternative site which could result in some impacts to transportation routes.

### **4.3 Geology and Soil Impacts**

The license amendment will not negatively impact the geology or seismology of the Framatome Richland, WA site. No major land use changes are planned based on the amendment.

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 Framatome’s fenced exclusion area remain essentially unchanged and undeveloped throughout its past (approximate 40 years) ownership. Framatome discovered evidence of past disturbances of the land (fill material found) during the drilling of the site’s monitoring wells. The immediate area surrounding Framatome 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 Framatome'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. Framatome 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. The NRC concluded in the license renewal EA that 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, Framatome 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 Framatome continues to monitor the groundwater quality on a semi-annual basis for fluoride, nitrate, uranium, Tc-99, and pH. The NRC concluded in the license renewal EA that projects the cumulative geology and soil impacts are small. The impacts of the amendment are also small.

The alternative of not amending the SNM-1227 license is to manufacture the TRISO fuel at a different location which could result in potential impacts to geology and soil from construction, since other currently available licensed facilities are limited.

#### **4.4 Water Resources Impacts**

Due to the operations and controls already established at the Framatome Richland, WA the impact of the additional TRISO fuel manufacturing process in the Specialty Fuels Building is minimal. There is no additional runoff since no new buildings are being constructed. The proposed process will not generate any new chemical or radiological attributes with the potential to enter surface waterways. Liquid effluent sampling or treatment will not require any changes to support the TRISO fuel fabrication process. The NRC concluded in the license renewal EA that the impacts on water resources are small. The impacts of the

amendment are also small (see discussion below).

#### 4.5 Surface Water Quality

There are no bodies of surface water adjacent to or in the immediate vicinity of the Richland plant, the closest such body being the Columbia River located approximately 1.5 miles to the east. As such, there is negligible potential for the plant to directly impact surface water via direct releases (effluents, spills, etc.). The site however can indirectly impact surface water via its industrial wastewater discharge to the City of Richland publicly owned treatment works (POTW), which in turn discharges via a permitted outfall to the Columbia River.

Discharges of radioactive materials to the POTW (into sanitary sewerage) are regulated under 10 CFR 20.2003. This regulation limits radionuclide discharges to sewer to the monthly average concentrations listed in Table 3 of Appendix B to 10 CFR Part 20 and the total quantity of all radionuclides combined (excluding tritium and carbon-14) to one curie. The Richland effluent to sewer is continuously sampled via a composite sampler located immediately upstream of the point of discharge to the city sewer. The samples are analyzed for uranium (daily composites) and technetium-99 (Tc-99; weekly composites) for comparison to pertinent modified 10 CFR 20.2003 limits. Results of this monitoring program are provided in Table 10 and document consistent compliance with applicable radioactivity discharge limits. The measured effluent concentrations are further diluted by a factor of [approximately fifty](#) within the Richland sewer system.

As an additional check on the radiological impact of the plant's discards to sewer, sludge from the City of Richland sewage treatment plant is sampled on a [quarterly](#) basis for uranium as a condition of the NRC site license. The license limit requiring investigation and follow-up action is  $1 \text{ Bq/g U [27 pCi/g U]}$  in a single sample or  $0.925 \text{ Bq/g U [25 pCi/g U]}$  as a 6-month running average. Measured levels of uranium in the sludge remain consistently below these limits, with the single highest [quarterly](#) samples for each of the calendar years [2018-2023](#) ranging from  $0.023 \text{ Bq/g U [0.62 pCi/g U]}$  (April 2018) to  $0.114 \text{ Bq/g U [3.07 pCi/g U]}$  (January 2020).

Increasing plant enrichment and adding a TRISO based fuel production line in the SF building as described in the LAR will not result in significant increases in the radiological impact of the plant's discards to sewer. The anticipated specific activity is estimated to be 1.4X greater than the current site average specific activity.

Discharges of non-radioactive chemicals and constituents are regulated by an industrial wastewater discharge permit, which in February 2006 transitioned from the State of Washington Department of Ecology to the City of Richland. Parameters monitored on a routine basis include fluorides, nitrates, ammonia, suspended solids, pH, and flow. The samples are derived via the same composite effluent sampling station utilized for the monitoring of radioactive constituents. The effluent normally complies with limits imposed under the wastewater discharge permit. Exceedances are very infrequent and typically of very limited duration (one to a few days). All data are routinely reported to the state and city.

Completion of processing of the legacy liquids and sludges in the site's now closed surface impoundment system, a campaign conducted over the 1996-2004 time period, has positively impacted the site's sewer liquid effluent. Levels of uranium in the effluent, albeit historically very low (see Table 1), are now typically non-detectable in the daily composite samples ( $<0.05 \text{ ppm}$  or  $<8\text{E-}08 \text{ mCi/ml}$ ). Secondly, completion of the lagoon inventory processing has allowed for full realization of the fluoride reclamation/recycling benefits conveyed by the plant's Dry Conversion Facility, whereby fluorides are reclaimed as hydrofluoric acid. The current plant

liquid effluent fully complies with a fluoride discharge limit in the city permit (1,250 lbs/day, four day average) that is 50 percent lower than the limit formerly imposed under the state waste discharge permit. The increases in plant enrichment and adding a TRISO based fuel line in the SF building will not significantly impact this effluent. The elimination of legacy lagoon inventory processing has reduced the sewerage effluent volume by approximately 15,000 gallons per day.

#### **4.5.1 Groundwater Quality**

Groundwater contamination in the shallow unconfined aquifer below the Richland facility is attributed to historic 1970's-era releases from the site's former surface impoundment system. By the early 1980's the impoundments were double-lined with inter-liner leachate detection/collection capability and not implicated in further environmental releases. More recently (1996-2006), the impoundment system has been removed from service under a Washington Department of Ecology (Ecology)-regulated cleanup/closure action. Under that action the impoundments were emptied of their inventory, physically dismantled, and soil was remediated (removed and disposed of) to uranium, fluoride, and nitrate soil cleanup limits derived per Ecology's Model Toxics Control Act (MTCA; WAC 173-340).

With respect to uranium, the Ecology soil cleanup limit was 12.1 mg/kg (ppm), or approximately 29 pCi/g for uranium at a U-235 enrichment of 3.5%. This limit was conservatively calculated per Ecology criteria to be protective of groundwater down to the EPA drinking water limit for uranium of 30 ppb (also the MTCA groundwater cleanup limit for uranium). In reality, for large segments of the former surface impoundment area, soil removal proceeded well beyond that required to meet the uranium cleanup limit as necessitated to meet very conservative fluoride cleanup limits (the MTCA fluoride soil cleanup level is derived to achieve a MTCA groundwater limit for fluoride that is less than 25% of the EPA primary drinking water limit for fluoride).

Removal of the surface impoundment system and remediation of associated soil contamination have eliminated the most significant potential threat to groundwater at the Richland Site. Other hazardous materials managed in forms and quantities that could impact groundwater in the event of an inadvertent release are primarily confined within closed systems within buildings, in tank systems provided with double containment, or in piping systems readily observable and/or subject to leak detection or periodic testing.

Framatome monitors the groundwater quality of its Richland site on a semi-annual basis in accordance with conditions in its current NRC license. Data from the NRC-required monitoring program are provided in Tables 2 through 9; monitoring well locations are depicted in Figure 5. Groundwater flow is generally north-northeast across the site as depicted by the groundwater potentiometric contours on Figure 5; as such, Wells GM-1 and GM-2 are monitored as upgradient wells.

Levels of uranium and Tc-99, while showing semi-annual variation, are generally stable or slightly declining; some of the wells exhibit radiological contamination levels at or near background levels. The levels are consistent with the movement and attenuation of historic contamination, with short term variations influenced by fluctuating groundwater elevation levels attributable to heavy seasonal upgradient agricultural irrigation. None of the data are considered indicative of recent or ongoing releases to groundwater.

Non-radiological chemical constituents monitored include fluoride [and](#) nitrate. Levels of non-radiological constituents are declining consistent with attenuation of historic contamination. As depicted in Tables 2 through 9, fluoride levels are consistent with background levels (Wells GM-6, GM-7, TW-6, TW-7, and TW-21) or, if still elevated, have attenuated to levels below the EPA fluoride drinking water limit of 4 mg/l (Wells GM-5 and GM-8). Nitrate was not subject to a groundwater cleanup limit under the Ecology MTCA cleanup action because groundwater entering the Framatome site contains nitrates well above drinking water limits (and Ecology cleanup limits) related to upgradient agricultural operations (use of nitrate-based fertilizers). Like the radiological constituents, groundwater contamination levels of the non-radiological constituents of concern are anticipated to decline further in the long term based on the significant soil remediation accomplished under the Ecology cleanup action.

It should be noted that groundwater is not utilized for any applications, potable or non-potable, on the Framatome site or on the immediately downgradient portions of the U.S. Department of Energy (USDOE) Hanford Nuclear Reservation. The USDOE, via its contractor [PNNL](#) monitors groundwater immediately downgradient of the Framatome site for uranium and TCE. Based on [the latest available data \(2013\)](#), levels of both constituents in the groundwater are lower than their respective EPA drinking water limits.

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.

There are no jurisdictional wetlands located on the Framatome site and none will be impacted by the Proposed Action.

#### **4.6 Ecological Resources Impacts**

The proposed license amendment will not result in significant land use changes at the Framatome FFF or adversely impact plant or animal communities. More specifically, there will be no impacts to state or federal listed threatened or endangered species habitats. There is no ground disturbance from the Proposed Action. The Framatome FFFs site does not provide a habitat for any of the concerned species and that normal operation does not cause an ecological impact. Therefore, the NRC staff concluded in its EA for the license renewal that direct impacts on the ecology are small.

Framatome considered the impact of 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, Framatome 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, Framatome 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 Framatome's liquid effluents would impact the endangered fish.

Also, the staff evaluated the considered cumulative ecological effects in the affected region in

the license renewal EA. 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. Therefore, the issuance of the license amendment would not result in additional cumulative effects on the affected ecology. The NRC concluded in the license renewal EA that the impacts on ecological resources are small. The impacts of the amendment are also small.

The alternative of not amending the SNM-1227 license to include the TRISO fuel fabrication process will result in the work having to be conducted elsewhere, resulting in potential impacts to ecological resources from construction at another location, since other currently available licensable facilities are limited.

#### 4.7 Air Quality Impacts

The proposed license amendment will not result in significant air quality impacts at the Framatome FFF.

The potential for operations at the Richland site to impact the surrounding environs with respect to radiological air quality is primarily limited to point sources, i.e., its radioactive process emissions stacks. Lack of handling of unencapsulated or non-containerized licensed materials in unventilated or outdoor environments has precluded fugitive emissions from being a viable source of adverse environmental impacts. (Special control and monitoring provisions associated with the recently completed surface impoundment remediation project are discussed later.) The Richland site's radioactive process stacks are high efficiency particulate absolute (HEPA)-filtered and continuously sampled for radioactive emissions as a condition of its NRC license, as well as in conjunction with the site's State of Washington Radioactive Air Emissions License. The final HEPA filters in the final filter banks are DOS tested biennially and are changed out if the efficiency drops below 99.95% or if the filter has been installed for 10-years in a dry system or at 5-years in a system that has a scrubber.

Results of the radioactive stack emissions sampling are reported to the NRC on a biannual basis as required by 10 CFR 70.59; the data are summarized in Table 10. The data reveal very low emissions. [The highest six-month uranium-based emissions total \(all stacks combined\) for the CY 2019-2023 period was 2.25 µCi alpha radiation \(second half 2021\).](#) These data form the basis for demonstration of consistent compliance with the modified airborne radioactivity limits in 10 CFR 20 Appendix B, Table 2. Increasing Enrichment and adding a TRISO based fuel production line as described in the LAR is not expected to significantly increase the combined dose from all stacks. There will be no changes to our radioactive emissions monitoring program. [The maximum specific activity of the new enriched uranium is estimated to be 3.94 times greater than the current site average specific activity.](#)

[Specific activity for 10% is estimated by summing the maximum inclusions from an estimated ASTM specification for such an enrichment: U232 at 1E-10 grams per gram total U; U234 at 1.30E-02 grams per gram of U235; U236 at 2.50E-04 grams per gram total U; U235 at 1E-01 grams per gram total U; and the remainder U238. This yields a specific activity of 8.619-06 Ci/g.](#)

Current site-specific activity is estimated using UF<sub>6</sub> receipt data for 2021 (the most recent available) which contains inclusions of U232 at 1E-10 grams per gram total U; U234 at 8.19E-03 grams per gram of U235; U236 at 3.71E-05 grams per gram total U. U235 content was calculated at the nominal site average enrichment of 3.5%, with the remainder U238. This yields a specific activity of 2.187E-06 Ci/g. The ratio of the maximum to the current specific activity is 3.94; this bounds the maximum possible increase in emission on a per-mass basis. A more likely scenario might be that 25 percent of site product is increased to 10%, yielding a specific activity of 3.795 Ci/g, 1.74 times the current average.

Taking 2.25 µCi as the maximum 6-month U emission, the anticipated releases based on this increase would not exceed 18 µCi per year (in the case of all sitewide output converted to the new enrichment) but more probably would not exceed 8 µCi per period (in the case of one-quarter of all output being converted).

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 MEI from Richland site radioactive stack emissions (ignoring radon) for CYs 2019-2023 ranged from 9.32E-06 to 2.34E-05 mrem/yr, indicating negligible impacts from radioactive point source emissions.

The most recent Framatome semi-annual effluent monitoring report dated February 28, 2024, reported the public dose due to air emissions was calculated to be 1.32E-05 mrem. If this result was doubled to estimate the full year, it is approximately 0.0003% of the NRC constraint value of 10 mrem. If this was conservatively increased by a factor of four (the ratio of maximum anticipated to the current average specific activities), the public dose due to air emissions would increase to approximately 0.001% of the NRC constraint value. Similarly, the highest reported calculated public dose due to air emissions in past five years was 2.34E-5 mrem during the first half of 2019. If this result was doubled to estimate the full year, it is approximately 0.0005% of the NRC constraint value. If this was conservatively increased by a factor of four, the highest calculated public dose due to air emissions in the past five years would increase to less than 0.002 % of the NRC constraint value.

The highest annual public DDE from environmental dosimetry at the controlled area boundary during 2023 was approximately 22 mrem. This quantity is unlikely to be affected by an increase in enrichment.

Non-radiological chemical quality of the site's gaseous effluents as well as of the surrounding environs is regulated by the state, in conjunction with the local air pollution control authority. With the exception of oxides of nitrogen (NO<sub>x</sub>) emissions related to the plant's utilization of nitric acid in its powder and pellet dissolvers, the Richland facility has limited potential for significant non-radiological chemical airborne effluents. NO<sub>x</sub> emissions are limited via a Synthetic Minor Order administered by the local Benton Clean Air Agency (BCAA). The Order imposes limits on the annual throughputs of uranium through the dissolvers as well as on the amount of NO<sub>x</sub> emitted per quantity of uranium oxide dissolved. Emissions are measured via required stack emissions tests, results of which are reported to the BCAA. The plant has consistently complied with all aspects of the synthetic minor order since its inception in 1995.

Although not required by state or local regulation, fluoride emissions are measured on stacks ventilating processes containing, or potentially containing, fluorides, most notably the K-62 stack servicing the Dry Conversion Facility (DCF). The DCF is the site of all the plant's gaseous UF<sub>6</sub>

to UO<sub>2</sub> conversion operations. The off-gas sampling for fluorides on affected stacks is conducted in parallel with the radionuclide stack sampling; samples are collected and analyzed weekly. Fluoride emissions are low, with annual combined site totals ranging from 5.7 to 19.4 kgs for CYs 2019-2023.

The State of Washington regulates fluorides in the environs by means of two standards - an ambient air standard and a standard for fluoride in vegetation (forage). Monitoring to assess compliance with these limits is a condition of the site's current NRC license. Data from these monitoring activities for CY's 2019-2023 are provided in Table 11 and indicate consistent compliance with state environmental limits. Sampling locations are depicted in Figure 6.

Based on the results of this date, the small direct and short-term environmental impact is 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. As was stated in the license renewal application, the waste processor does not manage hazardous materials in quantities that pose hazards to Framatome under normal or off-normal conditions. The NRC staff in the license renewal EA concluded the indirect and cumulative environmental impacts are small. The impacts of the amendment are also small.

The alternative of not amending the SNM-1227 license to include the TRISO fuel fabrication process will result in the work having to be conducted elsewhere, resulting in potential impacts to air quality from construction at another location, since other currently available licensable facilities are limited.

#### **4.8 Noise Impacts**

Although Framatome 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. Framatome 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. The addition of the TRISO fuel manufacturing process at the Framatome FFF will not significantly impact the noise from the facility and the impact would be small. The noisiest equipment at the Oak Ridge facility is the CVI furnace with an average noise level of 73 db. Most of the sound generated by this equipment will be attenuated by the existing Specialty Fuels Building.

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 and the addition of the proposed process 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 Framatome should not have a significant impact on the environment. The NRC Staff considered this a small impact in the license renewal EA. The impacts of the amendment are also small.

The alternative of not amending the SNM-1227 license to include the TRISO fuel fabrication process will result in the work having to be conducted elsewhere, resulting in potential noise impacts from construction at another location, since other currently available licensable facilities are limited.

#### **4.9 Historic and Cultural Impacts**

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 Framatome’s site and are not affected by plant activities.

The conclusion of the cultural resources survey report that was performed for the site was that the assessment did not identify archaeological resources that may be eligible for inclusion in the National Register of Historic Places (NRHP) and further concluded that the site has a "low probability for prehistoric, ethnographic period, historic Indian, and Euroamerican resources that may be eligible for inclusion in the NRHP."

Since Framatome does not propose any changes to the site footprint or new building for this amendment request there are no impacts associated with this resource and the direct, indirect, short-term, long-term and cumulative impact as small.

Under the alternative to license amendment, a new facility would likely have to be constructed at an alternative location, since other currently available licensable facilities are limited. The presence of historic and cultural resources at an alternative site would have to be evaluated and, if present, could be potentially impacted.

#### **4.10 Visual/Scenic Resources Impacts**

The Framatome site is a relatively flat and essentially featureless plain. There is no proposed construction activities for this license amendment and therefore the visual/scenic impacts from construction or operation based on the license amendment are small. No new scenic designated areas have been identified since the license renewal. The NRC staff previously concluded in its license renewal EA that it does not anticipate any changes in the region’s scenic quality due to continued operations at Framatome and therefore finds no direct or short-term visual/scenic impacts and that impact for this resource is small. The impacts of the amendment are also small.

Under the alternative to license amendment, a new facility would likely have to be constructed at an alternative location, since other currently available licensable facilities are limited. The presence of visual/scenic resources at an alternative site would have to be evaluated and, if present, could be potentially impacted.

#### 4.11 Socioeconomic Impacts

Socioeconomic factors for the locale: economy; employment levels; population growth; housing units/vacancy rates; available educational services; and health care.

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 Framatome helps address this need. It has approximately 575 employees that reside within the Tri-Cities region. While its operations support the nuclear industry, Framatome does not depend on Hanford. Furthermore, Framatome is a major business and is listed as one of Richland's 25 Largest Employers (City of Richland, 2004). The issuance of this license amendment would add additional work to the Framatome Richland, WA, Fuel fabrication facility. The NRC staff concluded in its EA for the license renewal that Framatome is a significant economic source for Richland and the Tri-Cities region. The impact on employment for the proposed new process based on the license amendment request is approximately 20 staff.

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. The Tri-Cities region anticipates continued growth in its population. Based on Richland School District's strategic plan for 2022-2025, the school system has sufficient resources and reserves to educate its students. 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. The NRC concluded in its license renewal EA that the affected region provides sufficient socioeconomic infrastructure. NRC also concluded that Framatome'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 concluded in its license renewal EA that it considers the potential indirect impacts to be small. Since the increase of employment due to the addition of this new process is minimal, the socioeconomic impacts continue 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.

#### 4.12 Environmental Justice

The Framatome facility is located with the Horn Rapids Industrial Park and therefore there are no residences adjacent to or in the immediate vicinity of the plant. The nearest residences are about 1.5 miles to the southwest in the city of Richland, Framatome, in accordance with the NRC’s Environmental Justice Strategy and Executive Order 12898 (EXO 1994), has evaluated whether any of its programs, policies and activities have disproportionately high and adverse effects on low-income and minority populations.

##### 4.12.1 Local Minority and Low-Income Population Information

The local minority and low-income populations in Benton County and demographic characterizations are shown in Table 9. The total minority population in the county represents 33.2% of the total population. The percentage of the population living in Poverty in Benton County is 10.9%

Review of the above socioeconomic data and land use information demonstrates that no disproportionate adverse economic impact to the minorities or low-income population in the will occur from this license amendment.

**Table 9: Demographics in Benton County, WA (US Census 2023)**

White alone, %	89.3
Black or African American alone %	1.8
American Indian and Alaska Native alone,%	1.5
Asian Alone, %	3.5
Native Hawaiian and other pacific islander alone, %	0.3
Two or more races, %	3.5
Hispanic or Latino, %	24.9
White alone, not Hispanic or Latino, %	66.8

##### 4.12.2 Evaluation of Disproportional Impacts

Any impacts to the communities surrounding the Framatome would most likely be the result of hazardous and/or radioactive air emissions or accidents. No significant adverse human health or environmental impacts have been identified by Framatome as being associated with its activities based on either the entire facility or this license amendment request. In addition, Framatome facilities are designed with extensive safeguards to prevent accidents, and should an accident occur, no acute health impacts would be expected to result. Because the area surrounding the Facility is predominately non-minority and is not low-income, significant adverse human health or environmental impacts, if any, would not disproportionately affect minority or low-income populations.

#### 4.13 Public and Occupational Health Impacts

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. No significant changes are expected to public and occupational health impacts based on the addition of the TRISO fuel fabrication process with an enrichment of < 10 wt.% U-235.

The Richland site, by virtue of its process controls, bulk chemical storage practices, and effluent controls, poses a low threat to the terrestrial environment. The most significant threat to the terrestrial environment within the site restricted area has traditionally been the surface impoundment system. Over the period of 1996-September 2006, this system has been emptied of its inventory and dismantled, followed by remediation of soil contamination. The Framatome-owned land area outside the fenced exclusion area remains essentially unchanged and undeveloped. The quarter section of Framatome land west of the plant continues to be leased for agricultural purposes. Environmental monitoring activities provide no indication of deposition of plant contamination in the immediately surrounding environs. This includes monitoring for uranium in soil and, as previously discussed, fluorides in forage. Results of both of these monitoring activities are provided in Table 11. Sampling station locations are depicted in Figure 6.

Potential public health impacts could occur if materials released from Framatome 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 Framatome to ensure that potential releases to the environment are within federal and state regulations and are maintained ALARA.

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 Framatome. 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 Framatome facility. Direct irradiation is measured by monitoring gamma radiation levels at the Framatome 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 [2019–2023 ranged from 0.101 Bq \[2.75 pCi\] to 0.269 Bq \[7.28 pCi\] alpha radiation](#). These data show consistent compliance with the modified airborne radioactivity limits in 10 CFR Part 20, Appendix B Table 2. From [2019 through 2023](#), the largest monthly average concentration of uranium in groundwater was less than [0.016 Bq/ml \[4.24  \$\times 10^{-7}\$   \$\mu\$ Ci/ml\]](#) {the 10 CFR Part 20 regulatory limit is 0.148 Bq/ml [ $4 \times 10^{-6}$   $\mu$ Ci/ml]}, the largest monthly average concentration of Tc-99 was [less than 0.71 Bq/ml \[1.92  \$\times 10^{-5}\$   \$\mu\$ Ci/ml\]](#) {the regulatory limit is 22 Bq/ml [ $6 \times 10^{-4}$   $\mu$ Ci/ml]}, and the largest total annual radioactive discharge was less [than 2.7  \$\times 10^{10}\$  Bq \[0.73 Ci\]](#) {the regulatory limit is  $3.7 \times 10^{10}$  Bq [1 Ci]}. Calculated annual radiological doses to the public from Framatome operations from [2019–2023](#) ranged from [3.0  \$\times 10^{-4}\$  to 4.0  \$\times 10^{-3}\$  mSv \[0.03 to 0.4 mrem\]](#). [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 Framatome site radioactive stack emissions (not including radon) for calendar years 2019–2023 ranged from [1.64  \$\times 10^{-6}\$  to 1.2  \$\times 10^{-4}\$  mSv/yr \[1.64  \$\times 10^{-4}\$  to 1.2  \$\times 10^{-2}\$  mrem/yr\]](#). The calculated doses are 0.1 percent or less than the 10 CFR Part 20 limit.

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), a small fraction of the 10 mrem/yr [0.1 mSv/yr] limit to the general public.

As discussed in this ER [supplement](#), the Richland site is managing its operations within applicable regulatory and license-imposed effluent limits and environmental standards. Furthermore, the removal of the surface impoundment system and remediation of associated soil contamination has significantly reduced the plant's potential impacts to surface water, groundwater, and the terrestrial environment. Continuation of the plant's integrated system of process and effluent controls, backed by effluent and environmental monitoring, will provide continued assurance of acceptable environmental impacts going forward. Therefore, the radiological impacts from the proposed license amendment are small.

Postulated accidents are described in Integrated Safety Analyses summary. While Framatome recognizes the potential for these types of accidents, the probability of any of them occurring is low due to engineered safety factors incorporated into the process design. Framatome process designs incorporate sufficient safety controls to ensure that any accident sequence (radiological or chemical) resulting in high or intermediate consequences meet the performance requirements specified in 10 CFR Part 70.61.

Based on the review of potential accidents, actual environmental releases, and the comprehensive safety programs in place to prevent and minimize the effect of accidents,

the probability and potential consequences of any reasonably foreseen significant site-related accident with off-site consequences for the proposed license amendment are estimated to be low. The NRC staff in its EA for the license renewal concluded that the radiological environmental impacts were small for the entire facility. The impacts of the amendment are also small.

Under the alternative to license amendment, a new facility would likely have to be constructed at an alternative location, since other currently available licensable facilities are limited. The radiological environmental impacts at an alternative site would have to be evaluated and, if present, could be potentially impacted.

#### **4.14 Waste Management**

NRC staff evaluated the waste management environmental impacts associated with storage and/or transportation of Framatome’s low-level radioactive and hazardous wastes as part of the license renewal review. Framatome’s waste management program will not change for implementation of the new process as requested in the license amendment. The NRC Staff considered in their license renewal 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 Framatome. 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. Framatome does not anticipate any loss of these services. The maximum timeline of 50 years provides sufficient disposal coverage for the proposed license renewal period. With this scenario, NRC staff found small direct, short-term, and long-term impacts for the license renewal.

Through routine operations, Framatome does generate waste liquid effluents. Framatome 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. Framatome 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. There are no anticipated changes due to the addition of the new process and the impacts of the amendment are also small.

Under the alternative to license amendment, a new facility would likely have to be constructed at an alternative location, since other currently available licensable facilities are limited. The

waste management environmental impacts at an alternative site would have to be evaluated and, if present, could be potentially impacted.

#### 4.15 Construction

No new building construction will be needed for the addition of the TRISO fuel manufacturing capability in the Specialty fuels building. Construction will consist of the removal of existing equipment and the installation of new equipment for the TRISO process addition. Equipment will be transported via flatbed, or other standard delivery type truck on the main roadways and access points to the site. Oversized deliveries are not anticipated, and construction materials will be delivered to the site via existing access points and gates. Deliveries will be grouped **as much as possible to reduce material transport requirements.**

The construction area supporting the Proposed Action is within an industrial environment (i.e., immediate surrounding facilities are industrial in nature). The expected environmental noise generation would be attributed to cranes, forklifts and trucks. These types of activities are currently performed at the Framatome site on an as-needed basis. The expected use of construction equipment would be intermittent and is expected to last a few months. Construction activities will occur within the current Specialty fuel building. The Framatome facility is located in an industrial park with no permanent residents.

Airborne effluents from construction activities will be typical of industrial settings (e.g., operation of a diesel vehicle). Groundwater is not expected to be impacted by either construction or normal process activities. Groundwater measurements are obtained from groundwater monitoring wells and are documented on monitoring reports that are reviewed during periodic inspections.

Additional on-site fuel storage for construction equipment is not anticipated due to the small scope of the Proposed Action and duration of construction vehicle use; if fuel storage is necessary, secondary containment will be utilized. Furthermore, the site has a Spill Prevention, Control and Countermeasures Plan (SPCC) that will account for activities associated with the construction and operation of the TRISO fuel fabrication process. Any spills or releases, during construction or operation, will be controlled and mitigated in accordance with site plans and procedures.

The chemicals utilized within the Specialty fuels building are contained within a diked area. Applicable deliveries will occur directly to the Specialty Fuels building or be hard piped from the site's bulk chemical storage. There are no anticipated accident scenarios in which groundwater would be impacted.

Additional radiological sources are not expected from the Proposed Action during construction and operation. The construction and operation impacts are monitored by a robust and comprehensive routine radiological surveillance program which includes ambient air sampling, dosimeters, and surface water.

Under the alternative to license amendment, a new facility would likely have to be constructed at an alternative location, since other currently available licensable facilities are limited. The environmental impacts of construction at an alternative site would have to be evaluated and, if

present, could be potentially impacted.

#### **4.16 Cumulative Environmental Impact**

The City of Richland designates the Industrial Park's land use, where the Framatome fuel fabrication facility is located, 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.

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 Framatome's application, they note that the waste processor does not manage hazardous materials in quantities that pose hazards to Framatome 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.

No cumulative impact to the environment from the construction and operation of the Proposed Action in combination with the above identified projects is anticipated. There are no other known projects in progress or forecasted in the resource area.

Under the alternative to license amendment, a new facility would likely have to be constructed at an alternative location, since other currently available licensable facilities are limited. The environmental impacts of a facility at an alternative site would have to be evaluated and, if present, could be potentially impacted.

### **5.0 Mitigation Measures**

Mitigation measures are designed into all process operations and evaluated prior to implementation. Framatome strives to control all emissions at the source and to the degree possible to mitigate uncontrolled releases. Framatome's goal is to maintain occupational and public exposure to radioactive material to "As Low As is Reasonably Achievable" (ALARA). The ALARA goal is detailed in Section 4.12 (Public and Occupational Health Impacts) and Chapter 4 of the facilities license application.

Framatome recognizes the potential for accidents (radiological and non-radiological) such as those postulated in the integrated safety analysis summary. The probability of the accident scenarios occurring is low due to engineered safety factors incorporated into the process designs.

Furthermore, the operational mitigation to reduce the impact to the public incorporates safety factors into the design of radiological material related process equipment. Framatome emissions are reduced by the use of effluent control equipment, which minimizes the amount of air contaminants that reach the environment.

No disproportionate impacts are expected to occur; therefore, no additional mitigative measures

are anticipated other than those Framatome currently has proposed associated with the Proposed Action.

## 6.0 Environmental Measurements

The Framatome environmental monitoring program is a comprehensive program that encompasses on-site and off-site environmental surveillance (see Section 4.0). Environmental media monitoring includes air, soil, vegetation, and groundwater. Figure 5 (Monitoring Wells and Groundwater Flow Contours) and Figure 6 (Environmental sampling stations) shows the locations where samples of these media type are taken.

Framatome 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, Framatome has an on-going program to keep radiological exposures and effluent levels As Low as Reasonably Achievable (ALARA). In addition to ALARA, Framatome has a change control program in which reviewers evaluate changes in the facility's operations for potential environmental, health, and safety impacts.

Framatome 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 Framatome monitoring program appears in the license application. Environmental monitoring results for each sample type are presented in tables 1-11. Table 12 lists the current Environmental Licenses and Permits held by Framatome.

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. Framatome 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, Framatome would be required to prepare and implement a plan to determine whether fluoride-induced damage has occurred. If damage is found, Framatome 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 sewerage limits. The plant's combined liquid effluent is proportionately sampled for uranium and measured for flow at the Framatome 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 quarterly 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 quarterly samples for each of the calendar years 2018–2023 ranging from [0.023 Bq/g U \[0.62 pCi/g U\] \(April 2018\)](#) to [0.114 Bq/g U \[3.07 pCi/g U\] \(January 2020\)](#).

Framatome monitors the groundwater quality of its Richland site on a semi-annual basis in accordance with conditions in its current NRC license. Radiological constituents include uranium and Tc-99, non-radiological chemical constituents monitored include fluoride and nitrate.

Framatome also maintains a terrestrial monitoring program in which staff monitors soil (quarterly for uranium) and forage (monthly for fluorides throughout the growing season). Results of both of these monitoring activities are provided in Tables 10-21.

## **7.0 Summary of Environmental Consequences**

### **7.1 Adverse Impacts**

Section 4.0 of this report comprehensively describes the direct and indirect environmental impacts of the Framatome's operation, and the environmental justice related impacts. The data indicate that Framatome's conduct of licensed activities has, and is expected to continue to have, no significant adverse impact on the people, air, land, water, flora, and fauna surrounding the Framatome Richland, WA, fuel fabrication Facility.

The potential for significant adverse impacts is considered only for the "No License Amendment" action, because not amending the license would likely require land use impacts at another site resulting from construction and start-up activities, since the work would have to be conducted elsewhere and currently available licensable facilities are limited. The potential significant adverse impacts from this scenario are:

1. Land Use - The proposed license amendment and the activities that have occurred since 2006 have not and will not result in significant adverse impacts to land use. Not amending the license would likely require land use impacts at another site resulting from construction and start-up.
2. Transportation - The proposed license amendment and the activities that have occurred since 2006 have not and will not result in significant adverse impacts to transportation routes. The alternative to amending the license would result in the transportation of authorized special nuclear materials to an alternative site which could potentially result in new impacts to transportation routes.
3. Geology and Soils -The proposed license amendment and the activities that have occurred since 2006 have not and will not result in significant adverse impacts to geology and soils. Manufacturing the TRISO fuel elsewhere could result in potential impacts to geology and soils from new construction, since other currently available licensable facilities are limited.
4. Water Resources - The proposed license amendment and the activities that have occurred since 2006 have not and will not result in significant adverse impacts to water resources. The construction and operation of a new licensable facility could potentially result in new impacts to water resources.
5. Ecological Resources - The proposed license amendment and the activities that have occurred since 2006 have not and will not result in significant adverse impacts to ecological resources. Manufacturing TRISO fuel elsewhere could result in potential impacts to ecological resources from new construction.
6. Air Quality - The proposed license amendment and the activities that have occurred since 2006 have not and will not result in significant adverse impacts to air quality.
7. Noise - The proposed license amendment and the activities that have occurred since 2006 have not and will not result in significant adverse impacts to noise. The alternative to license amendment is likely to increase noise levels at an alternative site as a result of construction and operation of a new facility.
8. Historic and Cultural Resources - The proposed license amendment and the activities that have occurred since 2006 have not and will not result in significant adverse impacts to historic and cultural resources. Under the alternative to license amendment, a new facility would likely have to be constructed at an alternative location, since other currently available licensable facilities are limited. The presence of historic and cultural resources at an alternative site would have to be evaluated and, if present, could be potentially impacted.
9. Visual/Scenic Resources - The proposed license amendment and the activities that have occurred since 2006 have not and will not result in significant adverse impacts to visual and scenic resources. The alternative of no license amendment could potentially

impact visual and scenic resources at an alternative site depending on the specific site characteristics.

10. Socioeconomic - Under the "No Amendment Alternative," the potential additional jobs from adding the TRISO fuel fabrication will not occur with would negatively impact to local area.
11. Environmental Justice - The socioeconomic data and land use information provided in this report demonstrate that no disproportionate adverse economic impact to the minorities or low-income population in the ROI will occur from this license amendment. If the construction and operation of a new facility is relocated to a new site, then there is a potential for environmental justice impacts associated with a new site.
12. Public and Occupational Health Impacts- The proposed license amendment and the activities that have occurred since 2006 have not and will not result in significant adverse impacts to public and occupational health. Framatome conducts a robust and comprehensive monitoring program in as outlined in Section 6.0 of this report. All results of the monitoring program comply with or are below acceptable standards.
13. Waste Management - The amendment of the license would not significantly increase the quantities or types of waste generated at the Framatome Richland, WA fuel fabrication Facility. The alternative to license amendment would not decrease the volume of waste generated and would only shift the generation of waste to an alternative facility.

## 7.2 Beneficial Impacts

The beneficial impacts of Framatome's licensed activities are:

The average per capita income in Benton, County Washington in 2023 was \$39,668. The average Framatome 2023 salary is \$104,7292, which greatly exceeds the local per capita income. This demonstrates Framatome's' positive influence on the socioeconomics of Benton County.

1. The average per capita income in Benton, County Washington in 2023 was \$39,668. The average Framatome 2023 salary is \$104,7292 which greatly exceeds the local per capita income. This demonstrates Framatome's positive influence on the socioeconomics of Benton County.
2. Furthermore, Framatome provides [approximately 0.4%](#) of the regional employment within the local area. The number of people living below the poverty level in Benton County is 10.9%.
3. Nuclear fuel production for the commercial nuclear power industry; and,

4. Supporting the nuclear fuel processing objectives of the U.S. Government.

**Table 10:Radioactive Discharges to Sewer**

Year	Annual Avg. Soluble U Concentration, mCi/ml	Annual Avg. Insoluble U Concentration, mCi/ml	Highest Monthly Avg. U Concentration, mCi/ml	Annual Avg. Tc-99 Concentration, mCi/ml	Highest Monthly Avg. Tc-99 Concentration, mCi/ml	Total Annual Radioactive Discharge, Ci
2019	1.32 E-07	1.14 E-07	2.97 E-07	2.95 E-07	5.00E-07	0.0415
2020	6.09 E-08	6.78 E-08	2.62 E-07	1.09 E-07	1.10 E-07	0.108
2021	1.13 E-07	4.70 E-08	3.39 E-07	6.44 E-06	1.14 E-05	0.508
2022	1.16 E-07	3.81 E-08	2.20 E-07	1.07 E-06	1.38 E-07	0.159
2023	5.34 E-08	3.02 E-08	1.19 E-07	1.88 E-07	2.16 E-07	0.033
Limit*			4.0 E-06		6.0 E-04	1.0

\* 10 CFR 20.2003/10 CFR 20 Appendix B, Table 3 (modified for ICRP 66/68).

**Table 11: Data for Test Well GM-1**

Year	Uranium ug/L	Fluoride mg/L	NO <sub>3</sub> as N mg/L	pH
2019-1	4	0.1	22	7.33
2019-2	5	0.3	24	7.60
2020-1	5	0.1	23	7.74
2020-2	5	0.3	24	7.10
2021-1	7	0.2	21	7.83
2021-2	6	0.2	23	7.81
2022-1	5	0.5	19	7.80
2022-2	6	0.3	20	7.08
2023-1	6	0.2	21	7.15
2023-2	6	0.2	22	7.20

**Table 12 Data for Test Well GM-2**

Year	Uranium ug/L	Fluoride mg/L	NO <sub>3</sub> as N mg/L	pH
2019-1	5	0.1	25	7.13
2019-2	7	0.2	27	7.14
2020-1	5	0.1	29	7.17
2020-2	5	0.2	31	6.85
2021-1	7	0.2	32	7.00
2021-2	6	0.2	35	7.10
2022-1	6	0.1	32	7.10
2022-2	7	0.1	29	7.44
2023-1	8	0.1	30	7.42
2023-2	9	0.1	27	7.35

**Table 13: Data for Test Well GM-5**

Year	Uranium ug/L	Fluoride mg/L	NO <sub>3</sub> as N mg/L	pH
2019-1	14	1.6	26	7.18
2019-2	12	1.6	24	7.04
2020-1	10	1.7	25	7.00
2020-2	10	1.6	24	6.90
2021-1	12	1.6	25	6.98
2021-2	10	1.3	26	7.01
2022-1	16	1.8	22	7.05
2022-2	22	2.1	20	7.55
2023-1	17	1.6	21	7.36
2023-2	17	1.5	22	7.22

**Table 14: Data for Test Well GM-6**

Year	Uranium ug/L	Fluoride mg/L	NO <sub>3</sub> as N mg/L	pH
2019-1	11	0.8	34	7.26
2019-2	17	0.1	32	7.18
2020-1	12	0.7	30	7.17
2020-2	11	0.6	31	6.86
2021-1	12	0.7	31	7.03
2021-2	11	0.6	31	7.13
2022-1	9	0.6	30	7.12
2022-2	11	0.5	31	7.68
2023-1	9	0.5	30	7.58
2023-2	10	0.5	31	7.41

**Table 15: Data for Test Well GM-7**

Year	Uranium ug/L	Fluoride mg/L	NO <sub>3</sub> as N mg/L	pH
2019-1	18	0.9	31	7.19
2019-2	29	1.1	32	6.98
2020-1	20	0.9	31	6.97
2020-2	16	0.5	32	6.99
2021-1	19	0.5	31	7.05
2021-2	20	0.7	31	7.03
2022-1	10	0.8	31	7.06
2022-2	14	0.7	32	7.64
2023-1	11	0.8	32	7.33
2023-2	13	2.4	31	7.36

**Table 16: Data for Test Well GM-8**

Year	Uranium ug/L	Fluoride mg/L	NO <sub>3</sub> as N mg/L	pH
2019-1	23	2.4	23	7.11
2019-2	23	2.7	23	7.00
2020-1	18	3	27	6.94
2020-2	20	3	27	6.90
2021-1	24	3.3	28	6.95
2021-2	20	3.1	28	7.02
2022-1	22	3.6	30	7.01
2022-2	29	3	24	7.48
2023-1	26	2.7	25	7.32
2023-2	26	2.9	26	7.11

**Table 17 Data for Test Well GM-10**

Year	Uranium ug/L	Fluoride mg/L	NO <sub>3</sub> as N mg/L	pH
2019-1	17	2.1	24	7.08
2019-2	13	2	24	7.00
2020-1	12	1	40	6.82
2020-2	13	2	38	6.87
2021-1	15	2	29	7.00
2021-2	19	2.3	31	6.97
2022-1	18	2.5	29	7.05
2022-2	24	2.7	19	7.52
2023-1	22	2.3	24	7.37
2023-2	19	2.4	24	7.25

**Table 18 Data for Test Well GM-12**

Year	Uranium ug/L	Fluoride mg/L	NO <sub>3</sub> as N mg/L	pH
2019-1	23	2.2	29	7.10
2019-2	26	2.2	30	6.94
2020-1	24	1.7	30	6.99
2020-2	20	2.3	33	6.80
2021-1	23	2.5	32	6.94
2021-2	17	2.5	32	6.95
2022-1	19	2.5	33	6.90
2022-2	25	2.4	31	6.90
2023-1	23	2.2	30	7.28
2023-2	24	2.2	30	7.05

**Table 19: Stack Radioactive Discharges**

Year (total)	U, mCi a
2019	<a href="#">4.14E+00</a>
2020	<a href="#">3.81E+00</a>
2021	<a href="#">4.35E+00</a>
2022	<a href="#">2.71E+00</a>
2023	<a href="#">2.90E+00</a>

**Table 20: [Environmental Sampling Data](#)  
Quarterly Soil Sampling Results, Uranium pCi/g**

<b>Data Period</b>	<b>Soil Station No.1</b>	<b>Soil Station No.2</b>
2019 - 1	1.06	1.66
2019 - 2	1.10	1.01
2019 - 3	1.48	1.08
2019- 4	0.55	0.61
2020 - 1	0.92	0.85
2020 - 2	0.73	0.94
2020 - 3	1.10	1.01
2020 - 4	0.55	0.61
2021 - 1	0.90	0.99
2021 - 2	1.16	1.05
2021 - 3	0.80	1.49
2021 - 4	0.73	0.69
2022 - 1	1.01	0.90
2022 - 2	1.30	1.05
2022 - 3	0.98	1.02
2022 - 4	2.08	1.39
2023 - 1	1.08	1.07
2023 - 2	1.32	0.88
2023 - 3	1.34	1.33
2023 - 4	1.53	1.58

**Table 21: Forage Monthly Grab Sample Data**

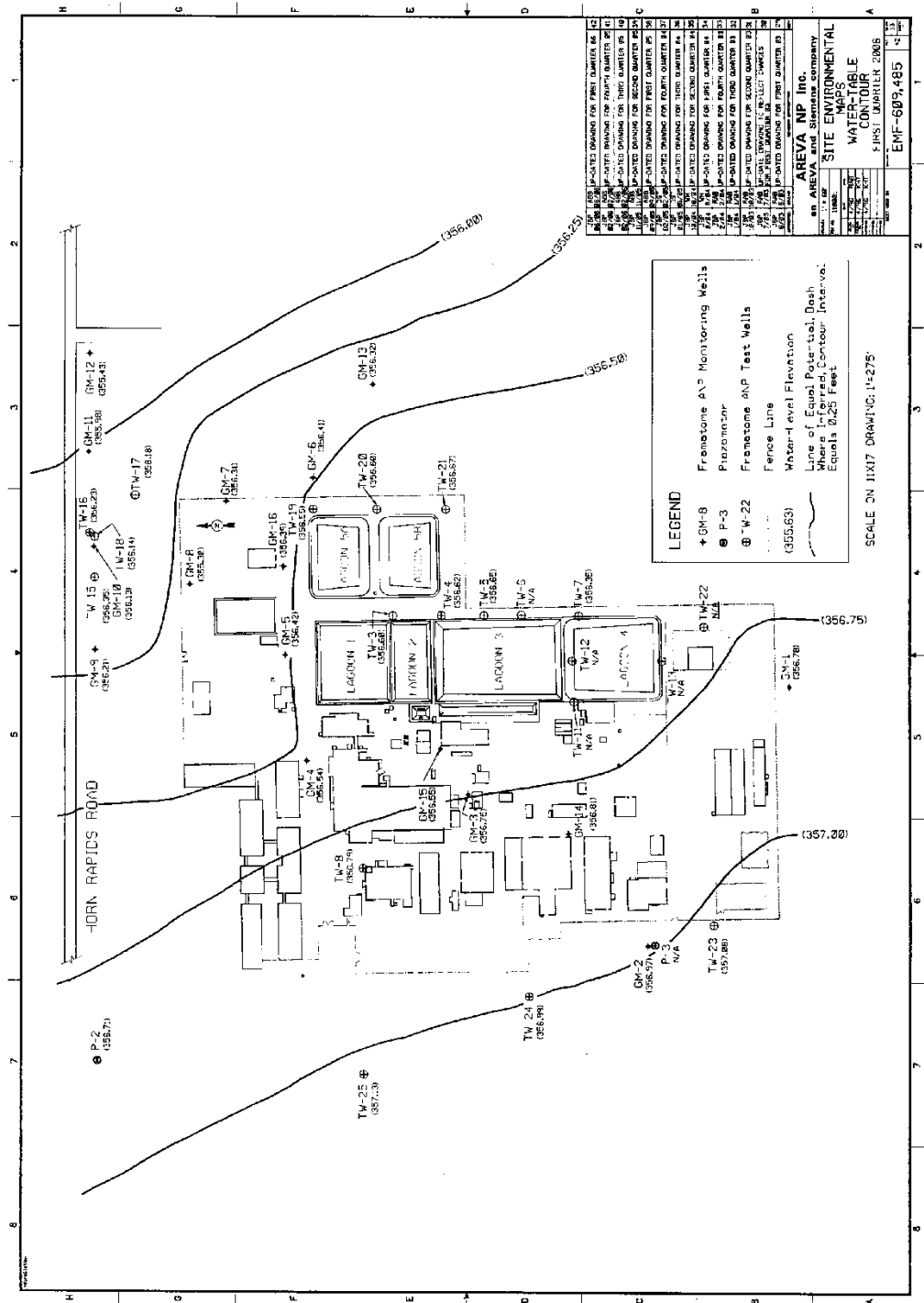
<b>Forage Monthly Grab Sample (April – September), Fluoride ugF/g</b>			
<b>Date</b>	<b>Forage Station #5</b>	<b>Forage Station #6</b>	<b>Forage Station #7</b>
Apr - 19	1.2	1.7	1.2
May - 19	1.5	2.3	2.0
Jun - 19	2.6	1.3	4.0
Jul - 19	2.3	3.1	0.8
Aug - 19	2.4	4.0	1.0
Sep - 19	2.5	1.1	0.9
Apr - 20	1.0	0.9	0.9
May - 20	0.9	0.9	0.4
Jun - 20	1.1	1.3	0.8
Jul - 20	2.3	3.1	0.8
Aug - 20	2.4	4.0	1.0
Sep - 20	2.5	1.1	0.9
Apr - 21	1.0	2.2	0.5
May - 21	0.9	0.8	0.6
Jun - 21	4.3	1.2	0.6
Jul - 21	0.9	0.7	0.6
Aug - 21	0.7	0.6	0.5
Sep - 21	0.6	1.0	0.6
Apr - 22	0.7	0.7	0.6
May - 22	0.4	0.4	0.4
Jun - 22	0.3	0.3	0.3
Jul - 22	0.2	0.2	0.2
Aug - 22	0.2	0.3	0.2
Sep - 22	0.3	0.3	0.2
Apr - 23	0.5	0.4	0.2
May - 23	0.6	0.5	0.5
Jun - 23	0.4	0.9	0.2
Jul - 23	0.2	0.2	0.2
Aug - 23	0.8	0.4	0.3
Sep - 23	0.8	0.3	0.3

**Table 22: Environmental Licenses and Permits**

License/ Permit	Issuer	Description
NRC Site Operating License (No. SNM1227)	U.S. Nuclear Regulatory Commission	This major license from the U.S. Nuclear Regulatory Commission is the primary license under which Framatome Inc. (Framatome) operates its fuel fabrication facility. The license establishes the allowable quantities of special nuclear material (enriched uranium) that Framatome is authorized to acquire, possess, and process and establishes the safety and environmental requirements (license conditions) under which the licensed activities are performed.
State of Washington Radioactive Materials License (No. WN-1062-1)	WA State Department of Health	This license authorizes Framatome to possess specific radioactive materials, primarily source material (natural and depleted uranium) and sealed sources. For each material the license authorizes specific uses and also imposes conditions related to monitoring and accountability.
Washington State Radionuclide Air Emissions License (License No. AIR 02-907)	WA State Department of Health	This license describes, authorizes, and places operating conditions and limitations on each of Framatome’s radioactive process offgas stacks.
Richland Industrial Wastewater Discharge Permit CR-IU008	City of Richland	This industrial wastewater discharge permit authorizes the discharge of wastewater from Framatome plant processes to the City of Richland sewer system. The permit sets effluent limits for a list of chemical constituents and total discharge volume and establishes the monitoring and reporting requirements to assure compliance.
Generator Site Use Permit: Commercial Low-Level Radioactive Waste Disposal Site, Richland, WA (Permit No. G-1032)	WA State Department of Ecology	This use permit authorizes Framatome to dispose of specified wastes from its fuel fabrication facilities at the State of Washington Hanford commercial low-level radioactive waste disposal site.

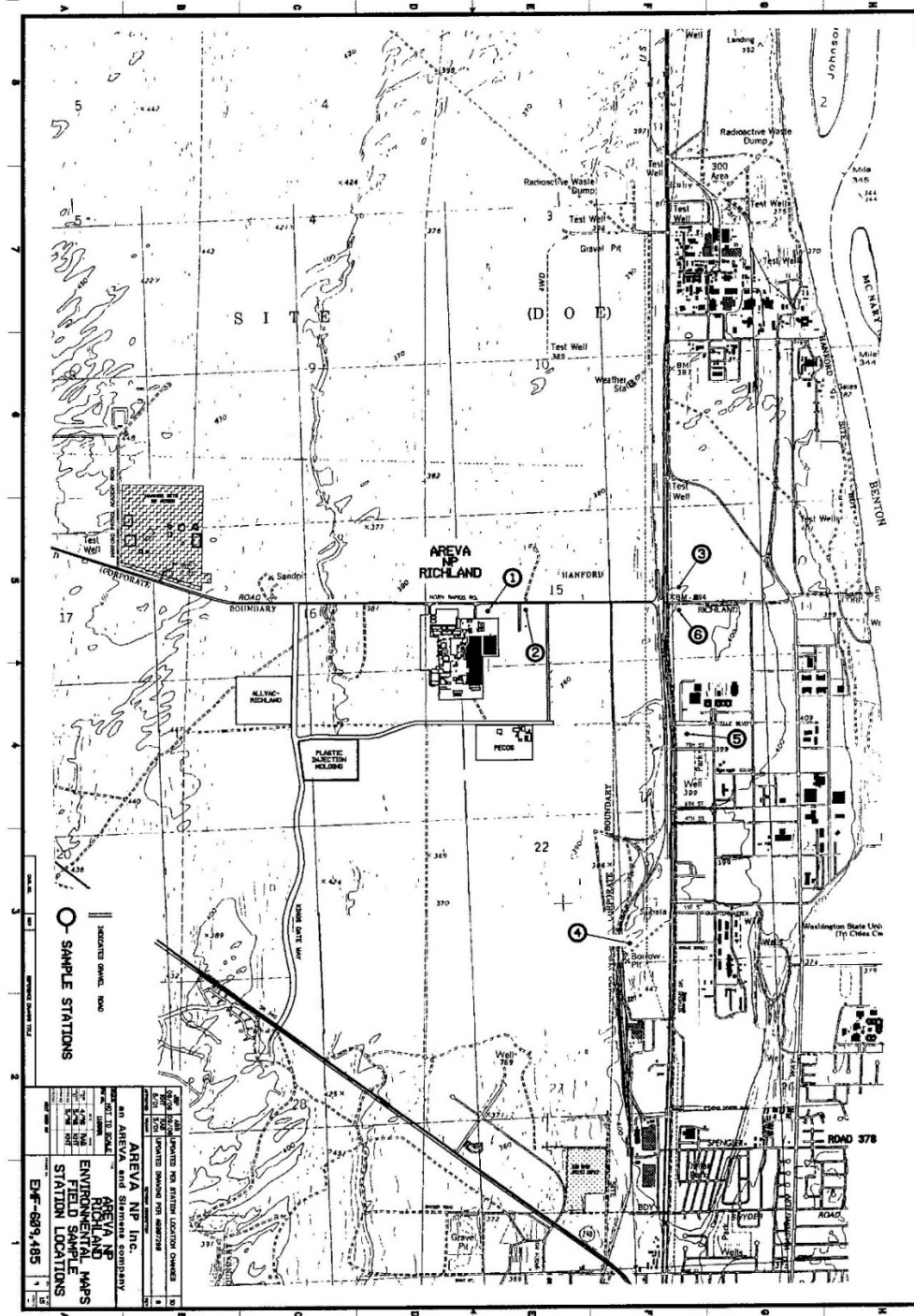
Incinerator Operating Permit	Benton Clean Air Authority	This permit provides local air pollution control authority authorization for Framatome to operate its combustible waste incinerator.
Oxides of Nitrogen Synthetic Minor Order (Order 95-05)	Benton Clean Air Authority	This order authorizes oxides of nitrogen (NO <sub>x</sub> ) airborne emissions in annual amounts less than 100 tons without the need for a Title 5 Air Operating Permit. The Order limits annual throughput in Framatome’s pellet and powder dissolvers, limits feed rate to the SWUR incinerator, and imposes emissions testing and reporting requirements.
Hazardous Materials Certificate of Registration (Reg. No. 060706 551 0430)	U.S. Department of Transportation	This DOT registration authorizes Framatome’s activities related to the shipping and receipt of specified quantities of hazardous materials/wastes.
Generator Site Access Permit (0110 000 024)	Utah Radiation Control Board	This permit allows Framatome to ship radioactive wastes to radioactive waste disposal facilities in Utah, e.g., Energy Solutions.

Figure 5: Monitoring Wells and Groundwater Flow Contours



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Figure 6: Environmental Sampling Stations



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**End of Document**