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DOE/EA-1135

Environmental Assessment
Offsite Thermal Treatment of Low-level Mixed Waste
May 1999

Metric Conversion Chart

If you know	Multiply by	To get
Length		
centimeters	0.39	inches
meters	3.28	feet
kilometers	0.54	nautical miles
kilometers	0.62	statute miles
Area		
square kilometers	0.39	square miles
Mass (weight)		
grams	0.035	ounces
kilograms	2.2	pounds
Volume		
liters	0.2624	gallons
cubic meters	35.32	cubic feet
cubic meters	1.308	cubic yards

Source: *CRC Handbook of Chemistry and Physics*, Robert C. Weast, Ph.D., 70th Ed., 1989-1990, CRC Press, Inc., Boca Raton, Florida.

Scientific Notation Conversion Chart

Multiplier	Equivalent
10^{-1}	0.1
10^{-2}	0.01
10^{-3}	0.001
10^{-4}	0.0001
10^{-5}	0.00001
10^{-6}	0.000001
10^{-7}	0.0000001
10^{-8}	0.00000001

Reader's Guide

The following information is provided to help the reader understand the technical data and format of this Environmental Assessment (EA). Listings of acronyms and abbreviations can be found following the Table of Contents.

Reference Citations

Throughout the text of this document, in-text reference citations are presented where information from the referenced document was used. These in-text reference citations are contained within parentheses and provide a brief identification of the referenced document. This brief identification corresponds to the complete reference citation located on the reference list in Section 9 of this document.

Translating Scientific Notation

Translating Scientific Notation

Example 1: 2.6E+06 = 2,600,000
Example 1 shows a positive power of six. To translate, move the decimal to the right six places adding zeros as necessary to achieve 2,600,000.

Example 2: 2.6E-07 = 0.00000026
Example 2 shows a negative power of seven. To translate, move the decimal to the left seven places adding zeros as necessary to achieve 0.00000026.

Scientific Notation

Scientific notation is used in this document to express very large or very small numbers. For example, the number one million could be written in scientific notation as 1.0E+06 or in traditional form as 1,000,000. Translating from scientific notation to the traditional number requires moving the decimal point either right or left from the number being multiplied by 10 to some power depending on the sign of the power (negative power move left or positive power move right).

Units of Measure

Unit Conversions

Unit Conversions

If you know	Multiply by	To get
	Length	
centimeters	0.39	inches
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	Volume	
liters	0.2624	gallons
cubic meters	35.32	cubic feet
cubic meters	1.308	cubic yards

The primary units of measure used in this EA are metric. However, the approximate equivalent in the U.S. Customary System of units can be obtained by using the appropriate conversion factor. For example, a distance presented as 10 meters is multiplied by 3.28 feet/meter (unit conversion factor) to obtain 32.8 or 33 feet.

Names and Symbols for Units of Measure

Names and Symbols for Units of Measure

Length

cm	centimeters
ft	foot
in.	inch
km	kilometer
m	meter
mi	mile

Area

ac	acre
km^2	square kilometer
mi^2	square mile
ft^2	square foot

Volume

cm^3	cubic centimeter
ft^3	cubic foot
gal	gallon
L	liter
m^3	cubic meter
ppb	parts per billion
ppm	parts per million
yd^3	cubic yard

Mass

kg	kilogram
mg	milligram
µg	microgram
lb	pound

Temperature

°C	degrees centigrade
°F	degrees Fahrenheit

Radioactivity Units

Units of Radioactivity

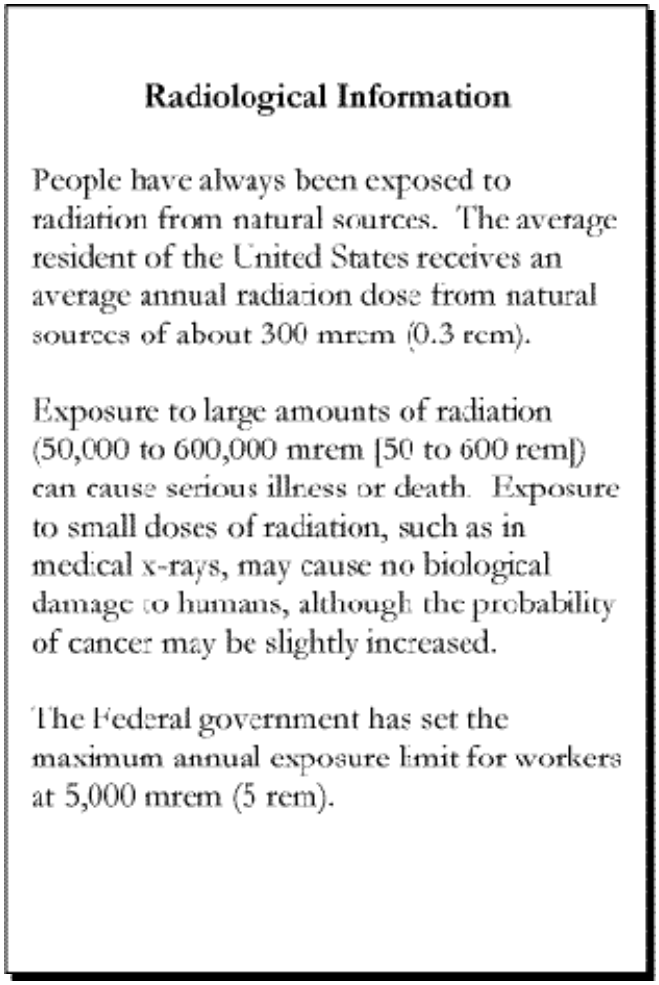
Units of Radioactivity

Symbol	Name
Ci	curie
mCi	millicurie (1.0E-03 Ci)

Radioactivity is presented in radioactivity units. The curie (Ci) is the basic unit used to describe an amount of radioactivity. Concentrations of radioactivity generally are expressed in terms of curies or fractions of curies per unit mass, volume, and area. One curie is equivalent to 37 billion disintegrations (radioactive transformations) per second. Disintegrations generally produce emissions of alpha or beta particles, gamma radiation, or combinations of these.

Radiation Dose Units

Radiological Information



Radiological Information

People have always been exposed to radiation from natural sources. The average resident of the United States receives an average annual radiation dose from natural sources of about 300 mrem (0.3 rem).

Exposure to large amounts of radiation (50,000 to 600,000 mrem [50 to 600 rem]) can cause serious illness or death. Exposure to small doses of radiation, such as in medical x-rays, may cause no biological damage to humans, although the probability of cancer may be slightly increased.

The Federal government has set the maximum annual exposure limit for workers at 5,000 mrem (5 rem).

Radioactivity is a broad term that refers to changes in the nuclei of atoms that release radiation. The radiation is an energetic ray or energetic particle. For ionizing radiation, the ray or particle has enough energy to cause changes in the chemical structure of the materials it strikes. These chemical structure changes are the mechanisms by which radiation can cause biological damage to humans. This means that a human body cell may be damaged if it comes into contact with the energy from a particle or ray released by radioactive decay.

Radiation comes from many sources, some natural and some human-made. People have always been exposed to natural or background radiation. Natural sources of radiation include the sun, and radioactive materials present in the earth's crust, building materials, and in the air, food, and water. Some sources of ionizing radiation have been created by people for various uses or as byproducts of these activities. These sources include nuclear power generation, medical diagnosis and treatment, and nuclear materials related to nuclear weapons. Radioactive waste can be harmful and thus requires isolation for up to hundreds or even thousands of years. Plutonium-contaminated waste will be radioactive for thousands of years. Radioactive cesium, on the other hand, virtually will be gone in 300 years.

The amount of energy deposited by radiation in a living organism is the true radiation dose. Radiation dose to humans usually is reported as effective dose equivalent, expressed in terms of millirem (mrem), which is one-thousandth of a rem. The rem is a measure of the biological effects of ionizing radiation on people. The rem is a relative measure that is used to compensate for observed differences in biological damage caused by equal energies of different nuclear emissions (alpha, beta, or gamma). An individual could be exposed to ionizing radiation externally (from a radioactive source outside the body) and internally (from ingesting or inhaling radioactive material). It is estimated that the average individual in the United States receives an annual dose of about 300 mrem (0.3 rem) from all natural sources of radiation. For perspective, a modern chest x-ray results in an approximate dose of 0.008 rem (8 mrem), while a diagnostic hip x-ray results in an approximate dose of 0.083 rem (83 mrem). The collective radiation dose to a population, which is calculated by adding the radioactive dose to each member of the population, is expressed in person-rem.

Risk of Radiation Exposure

Impacts from radiation exposure often are expressed using the concept of risk. The most important radiation-related risk is the potential for developing cancers that may eventually lead to a fatality. This delayed effect is measured in latent (future) cancer fatalities. The risk of a latent cancer fatality is estimated by converting radiation doses into possible numbers of cancer fatalities. For an entire exposed population group, the latent cancer fatality numerical value is the chance that someone in that group would develop an additional cancer fatality in the future because of the radiation exposure (i.e., a cancer fatality that otherwise would not occur).

Radiological risk evaluations often refer to the maximally exposed individual. This is the hypothetical member of the public or a worker who would receive the highest possible dose in a given situation under the conditions specified. As a practical matter, the maximally exposed individual likely would be a person working with radiological or hazardous materials.
The Federal government has set a maximum annual exposure limit for workers of 5,000 mrem (5 rem).

Environmental Assessment

Offsite Thermal Treatment of Low-level Mixed Waste

May 1999

SECTION 1
PURPOSE AND NEED FOR AGENCY ACTION

The U.S. Department of Energy (DOE), Richland Operations Office (RL) needs to demonstrate the economics and feasibility of offsite commercial treatment of contact-handled low-level

mixed waste (LLMW), containing polychlorinated biphenyls (PCBs) and other organics, to meet existing regulatory standards for eventual disposal.

1.1 BACKGROUND

Radioactive and hazardous waste is stored at DOE's Hanford Site located near Richland, Washington (Figure 1-1). The waste inventory includes contact-handled LLMW, which is made up of both low-level radioactive and hazardous constituents. Some of the Hanford Site LLMW contains organic constituents such as solvents and PCBs that require thermal treatment to meet regulatory standards for disposal. Thermal treatment by gasification and vitrification would also result in waste volume reduction and a highly stable form for disposal (Place 1993). If the demonstration of treatment is successful, the expected total amount of waste may be treated at the selected facility. Treatment of additional amounts of waste at the selected facility would be addressed in the Hanford Solid Waste Program Environmental Impact Statement or future National Environmental Policy Act (NEPA) reviews.

This Hanford Site waste was both generated at the Hanford Site and received from other Department of Defense/DOE sites. Contact-handled LLMW is stored in containers with surface radiation dose rates below 200 mrem/h. Approximately 810 m3 (1,059 yd3) of such waste has accumulated, and an additional estimated 4,310 m3 (5,637 yd3) is expected to be added by 2010 as a result of the Hanford Site cleanup, as shown in Table 1-1.

Figure 1-1: Hanford Site Map

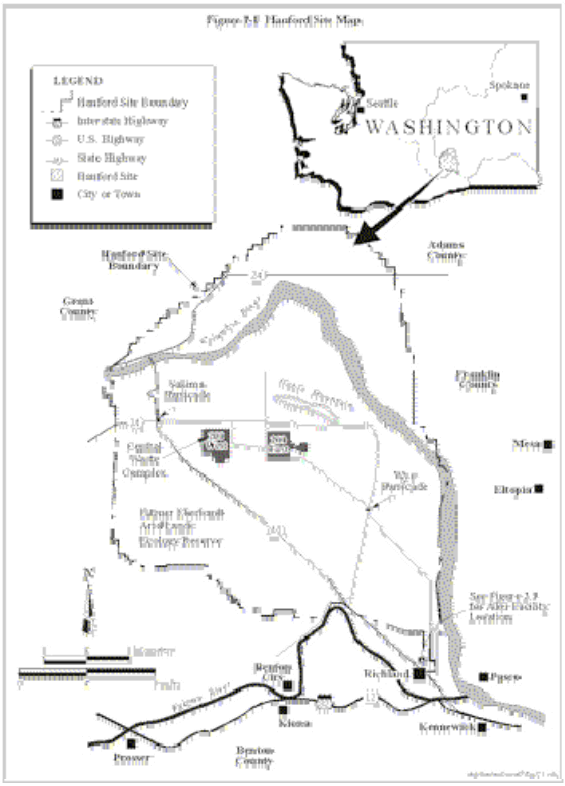


Table 1-1
Projected Accumulation of the Hanford Site Low-level Mixed Waste

Year	Waste Quantity (m^3)	Waste Quantity (yd^3)
1995[a]	810	1,059
1996	280	366
1997	325	425
1998	330	432
1999	310	405
2000	310	405
2001	300	392
2002	300	392
2003	310	405
2004	310	405
2005	310	405
2006	310	405
2007	305	399
2008	305	399
2009	305	399
Total	5,120	6,696

Notes:
a Accumulated as of 1995.
Source: RCRA Part B Application

Thermal treatment before disposal is required for some constituents of this Hanford Site LLMW under the Resource Conservation and Recovery Act of 1976 (RCRA) (42 United States Code [USC] 6901), State of Washington Administrative Code (WAC), Dangerous Waste Regulations (WAC 173-303), Washington State Hazardous Waste Management Act (WSHWMA) (Chapter 70.015, Revised Code of Washington [RCW]), and Toxic Substances Control Act (TSCA). Under RCRA land disposal restrictions (40 Code of Federal Regulations [CFR] 268.50), some LLMW is suitable for land disposal only after thermal treatment and/or stabilization.

Sending DOE waste to offsite treatment facilities is expected to cost much less than construction of a treatment facility at the Hanford Site, because DOE would pay only for offsite treatment and transportation, rather than the full cost of facility construction, operation, and decommissioning.

This is an interim action under the Hanford Solid Waste Program Environmental Impact Statement (DOE 1997).

1.2 SUPPORTING STUDIES

Several reports have been prepared to support the environmental analysis presented in this report. These reports include the following:

- Radiological Dose Assessment of Allied Technology Group (ATG) Low-level Mixed Waste Facility (MWF) (Leung 1996)
- ISCST3 Air Dispersion Modeling Results for the ATG Gasification and Vitrification Facility (Sculley 1996)
- RADTRAN 4 Modeling Results for Transport of LLMW from the Hanford Site 200 West Area to the ATG Gasification and Vitrification Facility (Deshler 1996)
- Low Level Mixed Waste Thermal Treatment Technical Basis Report (Place 1994)
- Emissions Data Summary for the PEAT TDR System Processing Contaminated Dunnage (Castellon and Taylor 1996a)
- Emissions Data Summary for the PEAT TDR System Processing Medical Waste (Castellon and Taylor 1996b)
- Emissions Data Summary for the PEAT TDR System Processing Ash Waste (Castellon and Taylor 1996c)
- Mixed Waste Facility RCRA/TSCA Permit Application (ATG 1998).
- ATG Low-Level Mixed Waste Thermal Treatment Accident Analysis Report (Jacobs 1998).
- Review of Special Effects of Internally Incorporated Radioactivity (IDIAS 1998).

The reports are available to review at the DOE Public Reading Room (Consolidated Information Center) at the Washington State University at Tri-Cities Campus, Richland, Washington.

SECTION 2
DESCRIPTION OF THE PROPOSED ACTION

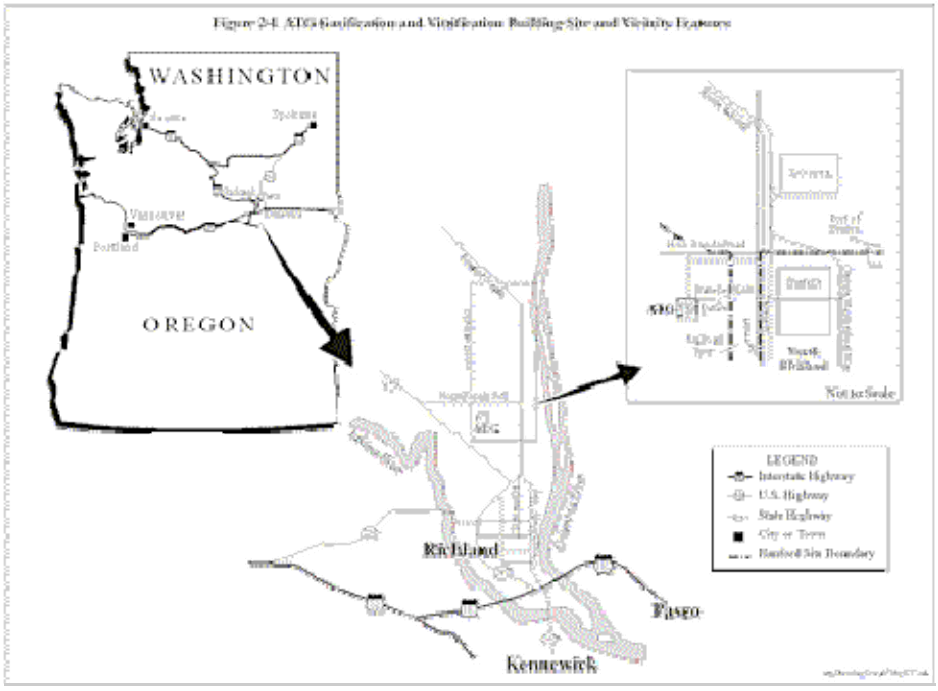
The proposed action is to transport up to 5,120 m3 (6,696 yd3) of contact-handled LLMW from the Hanford Site to the ATG gasification and vitrification building in Richland, Washington, for treatment (see Table 1-1), and return the treated waste to the Hanford Site for disposal. The waste (described in Place 1994) would be staged to the ATG gasification and vitrification

building over a 10-yr period. The building is on a 45-acre ATG site adjacent to ATG's licensed low-level waste processing facility at 2025 Battelle Boulevard, approximately 0.3 km (0.2 mi) south of Horn Rapids Road (Figure 2-1). The ATG gasification and vitrification building is located adjacent to the DOE Hanford Site boundary in an industrial area in the City of Richland. The effects of siting, construction, and overall operation of the MWF have been evaluated in a separate State Environmental Policy Act (SEPA) Environmental Impact Statement (EIS) (City of Richland 1998).

Impacts of ATG gasification and vitrification building operations are addressed in Section 5 of this document as they relate to the treatment of Hanford Site LLMW. Effects of siting, construction, and overall operation of the building were evaluated under the SEPA by the City of Richland Environmental Impact Statement (EIS) for Treatment of Low-Level Mixed Waste, February 1998 (City of Richland 1998).

The EIS became a final document on March 9, 1998. Construction of this facility is not within the scope of this Environmental Assessment (EA). The action is being undertaken as a private action in anticipation of future work for a variety of commercial and DOE contracts. ATG would proceed with the facility whether or not the Hanford Site LLMW is included. Treating the Hanford Site LLMW will require the use of no more than 25% of the capacity of the facility. Commercial waste and DOE waste from the Hanford Site would be kept separate by treating in separate campaigns.

Figure 2.1 ATG Gasification and Vitrification Building Site and Vicinity Features



After the Hanford Site LLMW is treated and a sufficient amount for a full shipment has accumulated, the residue from the treatment, a leach-resistant glass material, would be returned to the Hanford Site for storage and/or disposal as appropriate.

2.1 WASTE TRANSPORT

Untreated waste is, or will be, stored at the Hanford Site's 200 West Area, approximately 33 km (20 mi) northwest of the ATG gasification and vitrification building (Figure 2-2). The ATG gasification and vitrification building is located south of the existing ATG nonthermal treatment building (Figure 2-3).

The proposed ATG gasification and vitrification building and the nonthermal treatment building, along with covered waste storage buildings and other structures shown in Figure 2-3, comprise a mixed-waste treatment facility. Both waste to be gasified and vitrified in the ATG gasification and vitrification building and waste to be stabilized in the nonthermal treatment building will be stored in covered waste storage buildings. The planned location of the covered waste storage buildings is shown in Figure 2-3.

ATG would transport the waste to and from the facility by truck. Approximately 95% of the 32-km (20-mi) transport route would be on the Hanford Site. ATG's waste transport operations are required to meet all safety requirements of the U.S. Department of Transportation (DOT) and the WSHWMA. Treated waste would be returned to the 200 West Area for land disposal. The 200 West Area contains a RCRA-compliant radioactive mixed-waste land disposal facility consisting of 2 disposal trenches, each capable of accepting between 5,810 m3 and 21,407 m3 (7,600 yd3 and 28,000 yd3) of waste depending on the configuration of the waste received from ATG and other sources. The facility will be opened when the volume of accumulated waste justifies operation of the leachate collection system (WHC 1995).

All waste transport truck drivers would be required to be trained in proper waste handling, regulatory compliance, and spill emergency response procedures. ATG health and safety technicians would dispatch trucks, check safety equipment (e.g., lights, brakes, signals, tires), and ensure that vehicles are in compliance with applicable DOT regulations (e.g., 49 CFR 171, 172, 173, 177, 178). Health and safety technicians also would accompany trucks on all trips.

2.2 WASTE HANDLING

Waste handling would involve packaging or repackaging, loading, receiving and inspecting, assaying, and tracking.

Figure 2.2 ATG Gasification and Vitrification Proposed Site

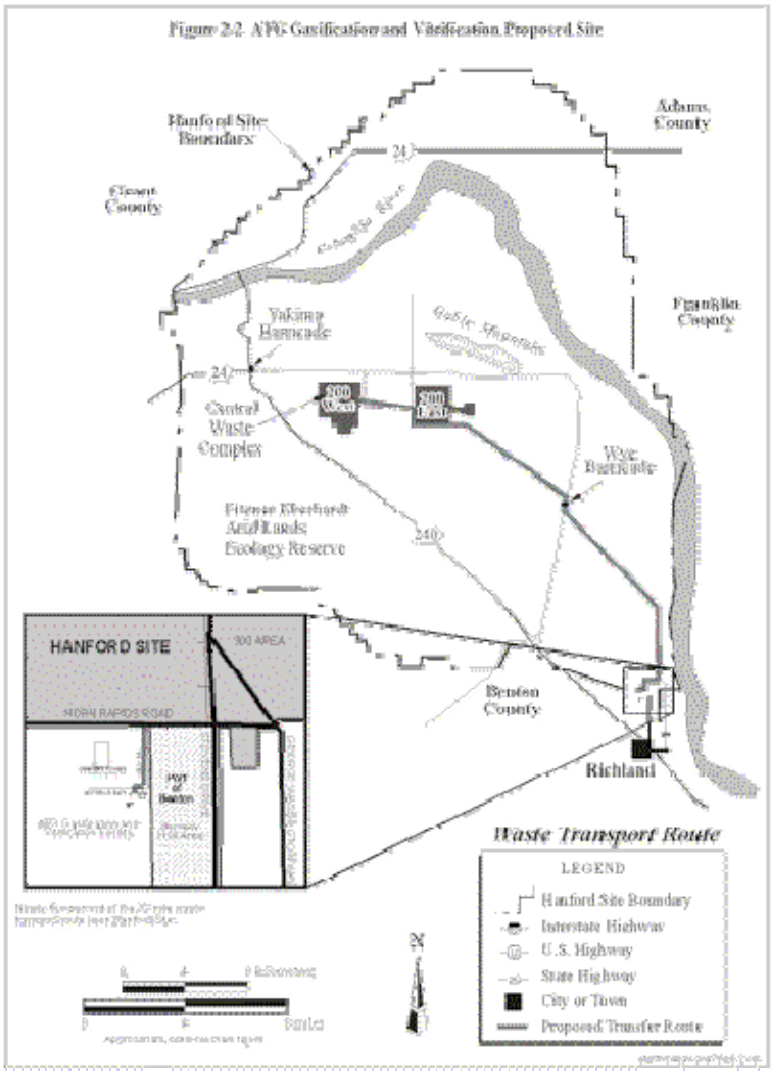
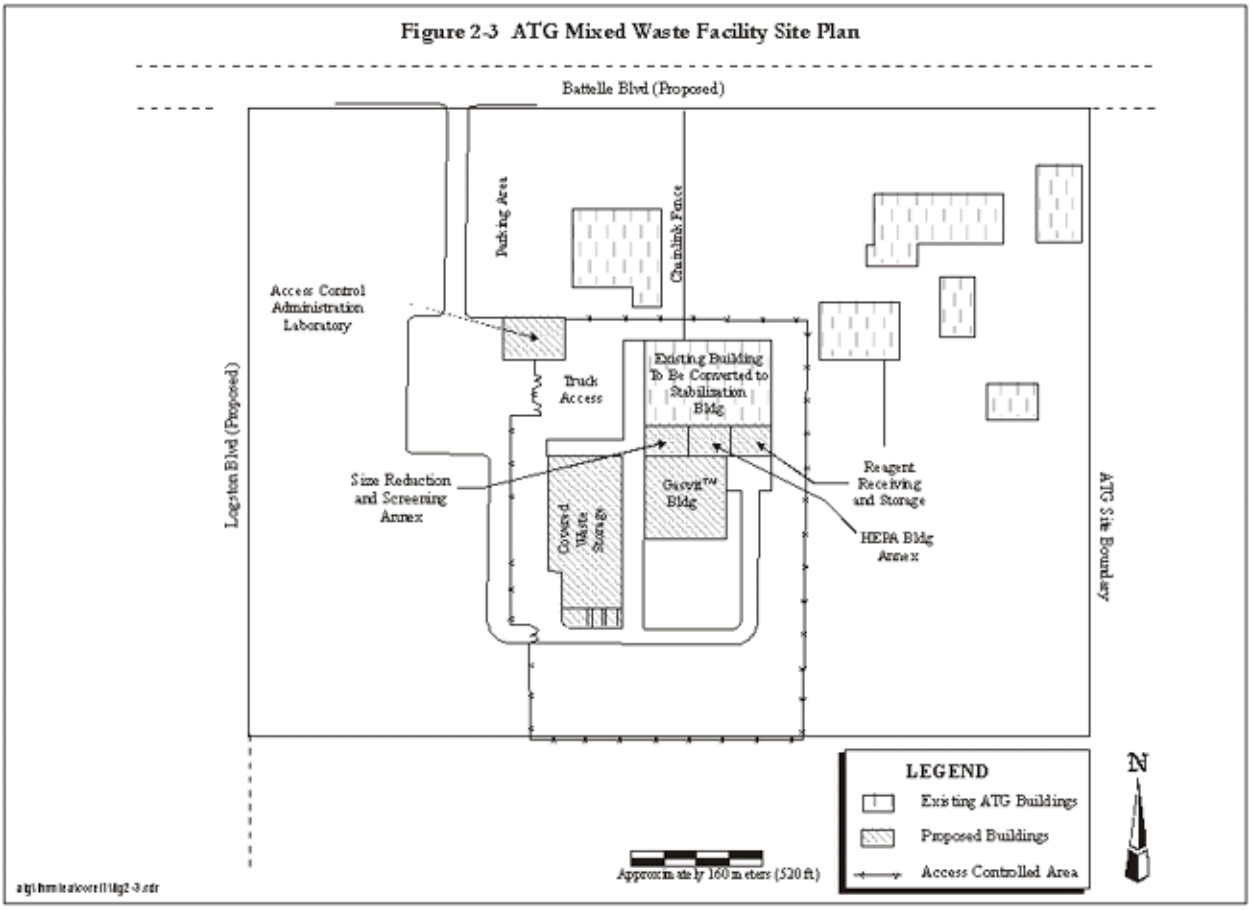


Figure 2.3 ATG Mixed Waste Facility Site Plan



2.2.1 Repackaging and Loading

The operator would load waste containers from temporary storage at 200 West Area onto ATG trucks. Some waste may need to be repackaged at the Hanford Site Central Waste Complex or T-Plant before being shipped to the ATG gasification and vitrification facility. ATG would be required to follow all DOE environmental, health, and safety requirements during the waste handling and loading operations. Waste containers also would be profiled and manifested according to all DOT, RCRA, and WSHWMA regulations governing transport of waste.

2.2.2 Receiving, Inspecting, and Assaying

ATG waste acceptance would follow procedures specified in an approved radioactive materials license (State of Washington, WN-I0393-1) and RCRA/TSCA final facility permit for the characterization of the waste's radioactive, chemical, and physical properties. Waste manifests would ensure that the waste does not exceed the limits permitted by ATG's permits and licenses. If the waste characterization shows higher levels of radioactive or hazardous constituents than permitted by the facility's permits and licenses, the waste would not be accepted but be returned to the generator (i.e., the Hanford Site). Facility inspectors also would confirm that the waste is suitable for treatment by gasification and vitrification. Each waste container would be labeled, bar-coded, and its properties logged into a computerized database. After treatment, waste containers would be reexamined and certified for transport back to the Hanford Site for disposal.

2.2.3 Waste Constituents

The incoming LLMW would contain hazardous constituents regulated by both RCRA and TSCA. RCRA waste to be accepted by the ATG facility would include both listed and characteristic waste. Some waste may qualify as TSCA waste because of the presence of PCBs.

2.2.4 Tracking

Waste units would be tracked throughout the ATG shipping and treatment activities with the help of automated data systems. Workers handling, receiving, inspecting, and assaying the waste would log the times, dates, and locations of each transaction and waste type, volume, and weight.

2.3 PRETREATMENT

Much of the waste would be pretreated before gasification and vitrification processing. Pretreatment processes for solids would include sorting and size-reducing the waste material as needed.

2.4 ATG GASIFICATION AND VITRIFICATION SYSTEM AND OPERATION

The function of the ATG gasification and vitrification system is to: 1) destroy toxic and nontoxic organics; 2) reduce the waste volume; and 3) vitrify the inert and radioactive residues from the destruction process. The system byproduct is a fuel gas, referred to as synthesis gas or 'syngas', that is treated and converted to a stabilized form, water and carbon dioxide, before being discharged to the atmosphere. The ATG gasification and vitrification system components include: 1) a feed system, 2) a direct-current (DC) arc plasma system, 3) a process chamber, 4) a three-stage syngas treatment and conversion system consisting of a filter, acid gas scrubbers, syngas converter, pre-filter bank, high-efficiency particulate air (HEPA) filter bank, and an activated carbon filter bank, and 5) an emission monitoring system consisting of a continuous activity monitor. A schematic diagram of the process is shown in Figure 2-4. System operations are described in the following sections. The equipment list and proposed layout of the ATG gasification and vitrification facility are shown in Figure 2-5.

2.4.1 System Description

The process would accomplish two distinct operations, gasification and vitrification, simultaneously. Organics in the waste would be gasified in the absence of oxygen (reducing environment) to produce a fuel gas called syngas.

Inert waste (metals and minerals) would be melted and incorporated into a leach-resistant vitrified product. Unlike a combustion process that produces heat, gasification and vitrification absorb heat (endothermic), and thus require an outside heat source. In the system to be employed by ATG, the outside source of heat would be produced by a DC arc plasma system. The heat from the arc would convert the organic waste into its constituent elements such as carbon, hydrogen, and chlorine. Steam then would be introduced into the chamber, allowing the

gasification reaction to take place. In some input waste, there would be sufficient water within the matrix, and thus no added steam would need to be added.

The plasma arc augmented by a joule heating system would provide the energy for vitrification. The heat would melt the inorganic material, and inorganic residues would be collected in the bottom of the process chamber and mixed with molten glass, which solidifies on cooling. The vitrified product is a highly leach-resistant and durable glass/rock material. Glass formers and fluxes (to maintain a low glass viscosity) would be introduced into the process chamber to create the glass chemistry.

Figure 2.4 Diagram of ATG Gasification and Vitrification System

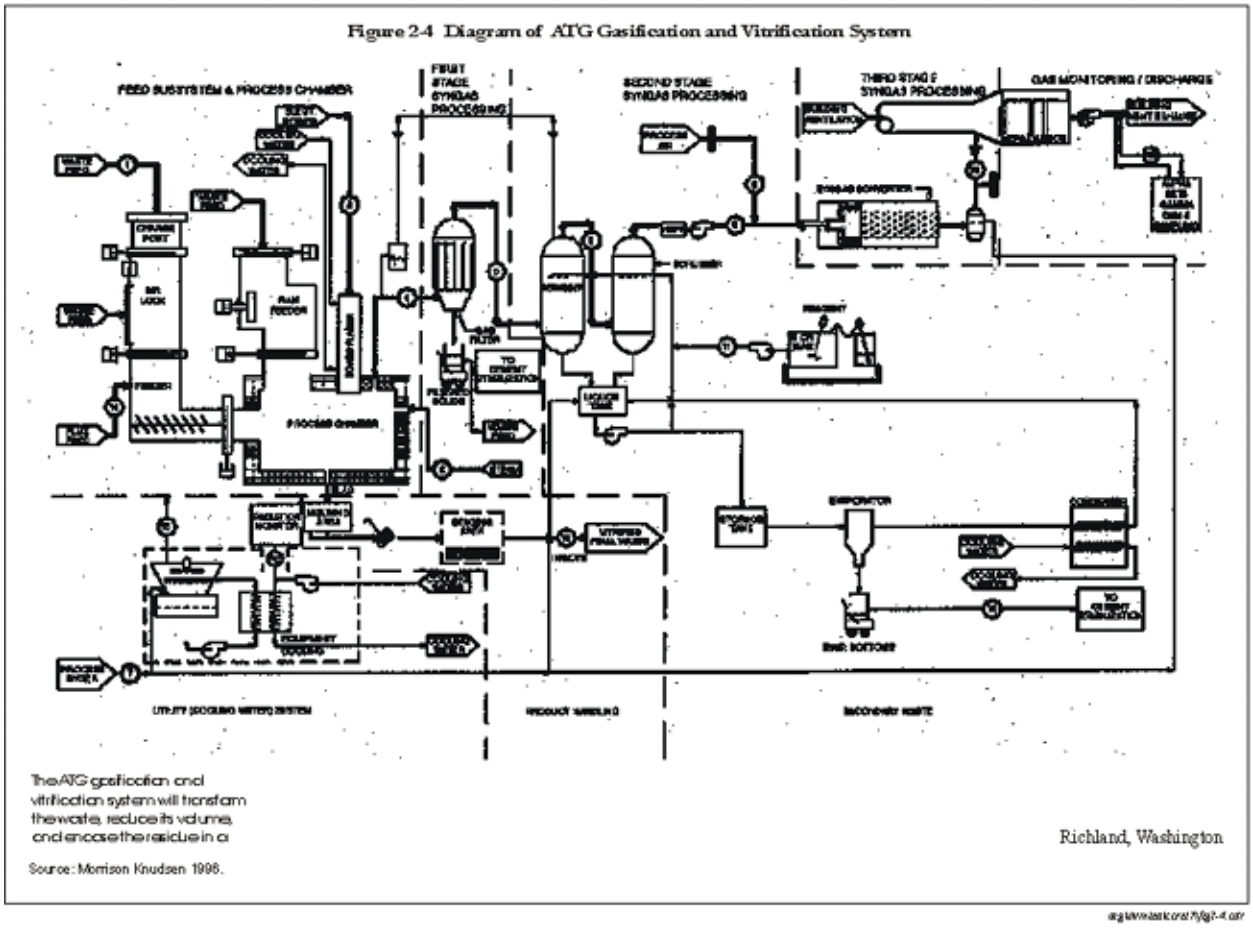


Figure 2.5 ATG Gasification and Vitrification Building Equipment Layout

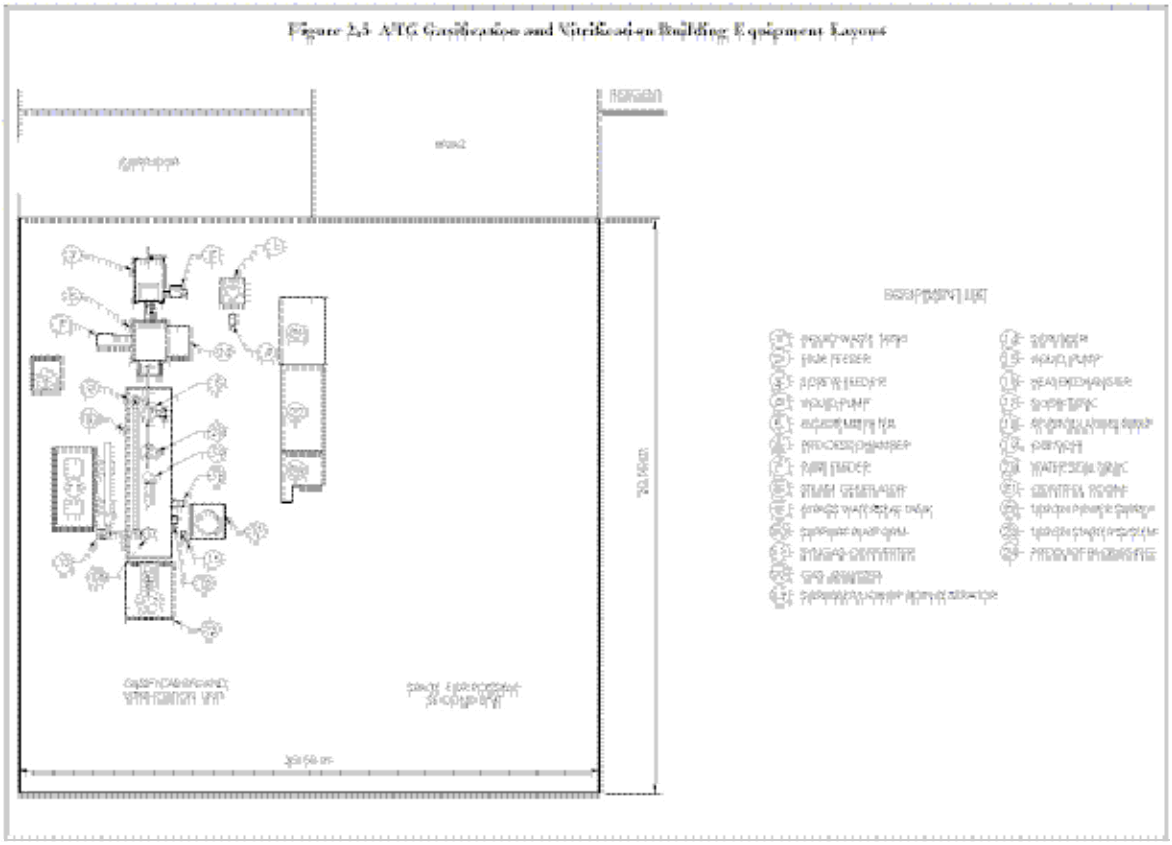


Figure 2.3 ATG Gasification and Vitrification Building Equipment Layout

The syngas byproduct discharged from the process chamber would be a mix of hydrogen, carbon monoxide, steam, acid gases, particulates, and low-temperature vaporized metals. This mixture would be discharged from the process chamber at temperatures between 427 and 1,000°C (800 and 1,832°F). The syngas would be treated and cleaned, converted to water and carbon dioxide, and released.

A three-stage process, described in the following section, would filter out nearly all of the syngas impurities, convert the purified gas into water and carbon dioxide, and refilter the gas before discharge. A first-stage filter would remove larger particulates. Two second-stage scrubbers, a high-efficiency mist eliminator and a HEPA filter bank would remove acid gases (such as chlorine and fluorine), nonvolatile or semi-volatile metals, and particulates not removed by the first-stage filter. In the third stage, the scrubber gas would be mixed with air and oxidized, converting the syngas to water and carbon dioxide. The water and carbon dioxide then would be filtered through a bank of prefilters, HEPA filters, and activated carbon filters. After carbon filtration, the gases would be discharged via the building stack with the building ventilation exhausts, and emission monitors would measure critical parameters stipulated in the facility permits.

To provide glass fluxing agents to aid in the vitrification process, certain chemicals would be added to the waste stream. These chemicals would vary according to the specific waste being treated. In general, the chemicals would be inorganics such as lime and soda ash. Also, a constant stream of nitrogen would flow into the process chamber, which would keep the chamber's atmosphere inert. As a means of treating LLMW, the ATG gasification and

vitrification process has several advantages over incineration. First, gasification and vitrification produces a glass-like product that is virtually impervious to leaching. Second, the ATG gasification and vitrification process requires no oxygen and reduces by-product gas volume by 80 to 90%, allowing for the use of smaller equipment with less waste in the system at any given time, thereby reducing the risk from a postulated accidental release scenario. The process chamber and byproduct gas treatment system is smaller, safer, and simpler to maintain than an incinerator. Third, the absence of oxygen in the byproduct gas nearly eliminates the possibility of formation of toxic chlorinated organics such as dioxins and furans.

Treatment of waste by an incineration process, by contrast, would occur in an oxygen-rich environment resulting in the combustion of the waste and the production of ash. Ash may require additional treatment to reduce leaching before it can be disposed of appropriately. Also, the oxygen-rich environment makes it possible for toxic chlorinated organics to form in the incinerator by-product gas, thereby requiring additional gas filtration steps.

2.4.2 Operations Description

Waste Acceptance. As required, all of the waste shipped to the ATG gasification and vitrification facility would have been characterized by the Hanford Site contractor according to the applicable DOT, RCRA/TSCA and WAC treatment codes. At the ATG gasification and vitrification facility, the waste character would be confirmed before the decision to accept the waste for treatment. Only waste meeting the requirements of ATG's radioactive license granted by the Washington State Department of Health, and ATG's TSCA, RCRA, and other required permits would be accepted for treatment.

Waste Feed Subsystem. On acceptance, solid waste would be sorted by compatible batches, loaded into mobile hoppers, and taken to the feed area where the hoppers would be emptied into the solids feeders. Solids would be fed into the unit either by use of a tapered auger to compress and form a plug, or by a ram feeder for solids that are not compressible. For auger feeding, the waste would be emptied into an airlock feeder unit above the auger. The feeder would convey the solids at a controlled rate into the ATG gasification and vitrification process chamber. Sludges and liquid waste would be pumped into the process chamber through a pipe. The feed subsystem would be equipped to prevent gases from escaping the process chamber by a double-lock hopper, which would maintain a seal between the process chamber and the room environment during feed cycles.

Plasma Arc. A DC plasma arc system on top of the process chamber would provide the low-volume, high-energy heat source needed for ATG gasification and vitrification. The plasma arc would transfer electrical energy to the molten bath in the process chamber to generate a continuous electric arc. The temperatures surrounding the arc would be in the range of 1,371 to 1,649°C (2,500 to 3,000°F), which is sufficient to produce the gasification reactions of steam with the toxic and nontoxic organic materials. The operating temperature within the range depends on the composition of the waste feed. The plasma arc, supplemented by a set of joule-heated electrodes, would provide the energy to vitrify inorganic waste.

The plasma arc for this thermal treatment system would require approximately 600 kW of power. The DC plasma arc system would be cooled by chilled water in a closed-loop system, and the plasma arc would be retracted and inserted into the process chamber by an automated mechanism. During an upset condition, such as accidental interruption of cooling water, the torch would be retracted automatically to a safe position. The plasma arc would contain a consumable graphite tip that is advanced from the top of the process chamber and can be replaced while the system is in operation.

Process Chamber. The ATG gasification and vitrification process chamber would be a refractory-lined cylinder with internal dimensions of approximately 6 ft in diameter and 6 ft high. Four types of inputs would enter the chamber and two major outputs would be discharged. The inputs would be: 1) waste, 2) glass-forming materials and fluxes, 3) steam, and 4) nitrogen gas. The process outputs would be molten glass/rock and metals and syngas. The 23-cm (9-in)-thick chamber refractory would insulate the vessel and contain the glass. The vessel would operate in a totally reducing (in the absence of oxygen) environment at a slight vacuum. The chamber would serve to perform the initial gasification of organics and vitrify the inorganic material. A thermal residence chamber at the outlet of the process chamber would complete the gasification reactions, provide turbulence for the gasification reactions, and provide additional residence time for the reactions.

Vitrified Product Packaging. Vitrified product from the ATG gasification and vitrification chamber would be drained through a special tap into a casting mold or a disposal container. The draining operation would be within a negative pressure enclosure that would exhaust to the process vent system. The molds or containers of vitrified waste then would be moved to a cooling and examination station. The Hanford Site waste feed would have an average bulk density of 347 kg/m3 (589 lb/yd3). Approximately 44% of this waste would be organic material, 40% minerals, and the remainder metals. The vitrified Hanford Site waste product would have a bulk density of approximately 2,650 kg/m3 (4,495 lb/yd3). Based on these values, the volume of the waste feed is estimated to be reduced by a factor of approximately nine to one. This means that the incoming Hanford Site waste quantity of 5,120 m3 (6,696 yd3) to be treated by ATG over a 10-yr period would be reduced to approximately 610 m3 (793 yd3) of vitrified product. This estimate takes into account a volume of additives averaging 25% of the feed mass for the purpose of maintaining the glass chemistry. In addition to the vitrified product, secondary waste from the syngas processing also must be considered.

First Stage Syngas Processing. The syngas exiting the process chamber would contain particulates including unreacted carbon, mineral particulates, and radioactive particulates, as well as acid gases and volatile metals. These materials would be removed primarily through the multi-stage treatment and conversion process. The first stage of this processing and conversion process would filter out larger particulates, which would be returned to the gasification and vitrification chamber to increase the vitrified waste capture and the conversion of carbon to carbon monoxide. Dry sorbents may be injected before filtering to scrub acid gases. The salts and particulates formed in the dry scrubbing operation subsequently would be removed and stabilized.

Second-Stage Syngas Processing. Because the first-stage processing unit would not remove all radioactive and nonradioactive volatile metals and acid gases, the gas would pass through two wet scrubber devices with a sorbent, such as caustic solution, to neutralize the acid gases. The salt solution generated from this neutralization then would be precipitated, and the sludge removed and stabilized. The volume of stabilized sludge from processing this Hanford Site waste is estimated to be approximately 520 m3 (680 yd3). The supernatant liquid from the scrubber bottom would be recycled and reused in the scrubbing process. Sorbent injection and scrubber liquid discharge lines would be equipped with devices to prevent syngas backflow. After scrubbing, the gas would flow through a high-efficiency mist eliminator and then to a HEPA filter bank. An induced fan in the second-stage syngas processing unit would provide the motive force for conveying the gas through the process chamber and the three-stage syngas processing train.

Third-Stage Syngas Processing. After undergoing second-stage processing, the carbon monoxide and hydrogen in the syngas would be converted to carbon dioxide and water through oxidation, and then filtered again as it is passed through HEPA and carbon filter banks.

Syngas Conversion. Syngas would be converted to carbon dioxide and water vapor in an insulated chamber filled with a heat-exchange media such as silica/alumina pebbles. The temperature of the media initially would be raised to approximately 400 to 927°C (750 to 1,700°F) by a natural-gas powered preheater. Once the media in the front of the chamber reaches this operating temperature, a mixture of syngas and air would be admitted. The heat of the media would cause the syngas and air to react, generating heat in the back of the chamber. Using a cycling technique referred to as regenerative conversion, a four-way valve automatically cycles the incoming air/syngas point of entry from the front to the back end of the chamber, thereby using heat stored in the converter heat-exchange media to maintain a continuous conversion process. If the syngas in the incoming gas mixture should drop below the required concentration, additional fuel from an exterior source (natural gas) would be injected automatically, ensuring that the heat-exchange media temperature is maintained within the required syngas operating range.

HEPA/Activated Carbon Filtration. The carbon dioxide and water vapor discharged from the converter would be cooled to approximately 121°C (250oF) by a water quench device and released to the building ventilation exhaust duct plenum. This duct would mix the vapor with the building ventilation air and direct the total flow through the final filter banks. These banks would consist of sets of prefilters, HEPA filters, and carbon filters. The prefilter and HEPA filter banks would provide a 99.97% efficiency for removal of particulates greater than 0.3 micron in size. The carbon filter bank would capture fugitive organics that may have escaped the previous treatment steps. Spent HEPA and charcoal filters would be replaced approximately once a year, compacted, and sent for disposal.

Emission Monitoring. The exhaust from the HEPA/charcoal filter banks would be discharged through the building stack. The stack would be equipped with continuous activity monitors to ensure compliance with radioactivity discharge criteria of the Washington State Department of Health (WSDOH).

2.4.3 Safety Features

The ATG gasification and vitrification system would include features to ensure that the process would shut down safely if a critical utility (i.e., electricity, service water, process/instrument air, steam or nitrogen) were to be interrupted or a key component fail. A description of these safety features is presented as follows.

Automatic Safe Shutdown. The ATG gasification and vitrification system would feature an automatic safe shutdown feature. A computerized control system connected to a series of sensors would shut the system down automatically should an undesirable process condition or key component failure be detected. The following actions would occur: 1) all waste feeders would stop and connections to the process chamber become isolated, and 2) plasma arc power would be cut off. The safe shutdown process is connected to the emergency power generator; therefore, safe shutdown would occur even with an electric power interruption.

Post Shut-Down Syngas Handling. Once a safe shutdown is initiated, feedstock would cease entering the chamber and power to the plasma arc would be cut off. The chamber's refractory walls and the molten bath, however, would contain sufficient thermal energy to gasify up to approximately 9 kg (20 lb) of the waste remaining in the chamber. Process calculations show that after the shutdown, gasification would continue for approximately 3 min. The system would continue to process the syngas produced as follows: 1) the syngas fan powered by an emergency power system would move the residual syngas through the treatment process, 2) the flow of syngas would ensure that the first-stage filter would perform its basic function, 3) the scrubber tank would possess sufficient reserve capacity to supply the water and sorbent needed to scrub the residual syngas, 4) the converter heat exchange media would have sufficient thermal energy to convert the residual syngas into carbon dioxide and water, and 5) the building ventilation fan, powered by an emergency power unit, would perform the normal HEPA/charcoal filtration and discharge of the converter effluent.

Emergency Power Supply. As indicated previously, safe shutdown components, such as the syngas fan, the scrubber pump, and building exhaust fans, would be connected to an emergency power system. This system would consist of a diesel- or natural-gas-powered generator and an uninterruptable unit that would supply power to critical system components should there be an accidental offsite power interruption.

Protection Against Pressure Surges. The system also would ensure safe shutdown in the event of a rapid or instantaneous pressure surge. Such a pressure surge could be caused by an inadvertent introduction of a high-energy feedstock into the process chamber or a premature oxidation of syngas in the low-temperature sections of the syngas treatment components, such as the scrubber. The latter event could occur as a result of an air inleakage combined with the presence of an ignition source such as a spark (a double-event scenario that is highly unlikely). To prevent such an event, both air inleakage prevention and spark arrest features would be included in the design. As an additional safety measure, rupture panels would be installed at the scrubber outlet in the HEPA banks. In the event of an air/syngas reaction, the pressure surge would cause the rupture panel to open, releasing pressure to the building. Any relieved gas would be captured by the building confinement system and filtered by the HEPA/charcoal filters before being released.

The pressure surge also will activate the safe shutdown, as discussed previously. Before restarting the system after any such shutdown, the rupture panels would be replaced.

Syngas Leakage. The process would operate at a negative pressure with respect to the room pressure. As an additional safety measure, sensors would be located outside the process lines to detect and alert the operators of any syngas leakage.

Water Spillage. The ATG gasification and vitrification system would be installed on a coated concrete floor with a 14 to 30-cm (6 to 12-in,)-high perimeter curbing to provide a secondary containment system in accordance with RCRA/TSCA standards. Also, metal catch pans will be placed under the equipment and tanks storing liquid waste. The curbed floor area and catch pans would have a sufficient capacity to meet the RCRA/TSCA secondary containment requirements for containing spills from liquid-containing equipment and storage tanks. The floor would be constructed with expansion joints to prevent cracking and would be coated with a chemical-resistant coating designed to prevent breakthrough of the most reactive chemical stored for a minimum of 3 h. Spills would be contained within the secondary containment floor and catch pans and directed by the sloped surface toward a low point. The catch pans should have a leak sensor and an alarm. In case of a spill, the plant operators would implement corrective measures to stop the leaks and contain and clean up the spilled substance.

2.5 EMPTY CONTAINER CLEANING

Empty containers would be rinsed with high-pressure lances and hydrolyzing devices, as specified in WAC 173-303-160. The empty containers would be placed upside down over a hydrolyzer in an airtight cubicle. The activated hydrolyzer would remove surface contamination both on the inside and outside of the containers. Rinsing agents or solvents may be added to the rinse fluid as needed.

The cleaned containers would be removed and compacted for disposal or sent intact to the Hanford Site for reuse. Contaminated liquids would be sent to a filtration unit. Filtered water would be reused and filter sludge sent to the ATG gasification and vitrification unit. Air withdrawn from the treatment cubicle would be passed through HEPA filters to remove airborne particulates, and the filters processed in the ATG gasification and vitrification unit.

2.6 CERTIFICATION AND SHIPPING

Certification and shipping consists of receipt, assay, certification, and loading of treated waste. Packaged waste from the treatment process would be examined, tagged, logged, recorded, and sent for assay and certification. Containers would be examined using radioassay devices to measure alpha, beta, and gamma radioactivity and would be classified in accordance with transportation, storage, and disposal criteria. The containers would be weighed and measured to determine waste density. Each container would be labeled, and its contents logged into a computerized database. After inspection, containers would be moved to a temporary storage area to await shipment.

2.7 WORKER HEALTH AND SAFETY

The entire ATG processing and handling area would be kept under slight negative atmospheric pressure to prevent the escape of radioactive particles. An induced draft fan system would withdraw air from the processing area at a constant rate. An intake filter would remove suspended particulates from incoming air. Air drawn from the confinement area would be passed through HEPA filters to remove particulates down to submicron size before atmospheric discharge. The processing area and any other areas where radioactivity might be encountered would be monitored to protect workers, general public health and safety, and the environment. Radioactive exposures would be prevented to the extent possible and would be maintained below established safety limits. Area radiological monitors would be located at workstations and in areas where radioactive material could accumulate. Also, monitors would be placed at air discharge points to continuously record the quality of air released.

2.8 SUPPORT SYSTEMS

The mechanical and utility systems would support the treatment operation. These systems would include ventilation, building heat, emergency power generation, and water. The electrical and control systems would support the treatment and mechanical operations. These systems would include a motor control center, control panel and room, electrical transformers, building lighting, communication systems, and electrical distribution systems.

2.9 TRANSPORTATION, STORAGE, AND DISPOSAL OF TREATED WASTE

All treated waste, including secondary waste, would be transported by truck from ATG's facility back to the Hanford Site's 200 West Area. On arrival, waste containers either would be temporarily stored at the Central Waste Complex or placed in the 200 Areas mixed-waste disposal trenches.

SECTION 3
ALTERNATIVES TO THE PROPOSED ACTION

3.1 NO-ACTION ALTERNATIVE

Under the no-action alternative, LLMW would continue to accumulate at the Hanford Site, pending future decisions. Also, life-cycle costs for the long-term storage of the untreated mixed waste are greater than life-cycle costs for near-term waste treatment and disposal. This alternative would; therefore, not support the purpose and need for the proposed action.

3.2 ALTERNATIVES NOT ANALYZED IN DETAIL

The following alternatives were considered in the process of identifying the preferred alternative (proposed action), but were not analyzed in detail in this document. The incinerator at the Umatilla Ordnance Depot, approximately 80 km (50 mi) from the Hanford Site, was not considered as a treatment option because the incinerator was not designed to treat radioactive waste, but for the destruction of chemical weapons.

3.2.1 Treatment at the Waste Experimental Reduction Facility, Idaho

Under this alternative, DOE would send the waste for treatment to the existing Waste Experimental Reduction Facility at Idaho National Engineering and Environmental Laboratory (INEEL), Idaho Falls, Idaho, approximately 800 km (500 mi) from the 200 West Area. The treated waste would be returned to the Hanford Site for eventual disposal. It is assumed that the Waste Experimental Reduction Facility would operate with an efficiency equal to the ATG gasification and vitrification facility of the proposed action, and that waste-handling procedures would be similar to the ATG facility.

Approximately 82% of the Hanford Site LLMW generated between 1993 and 1995 from onsite and offsite generators would not be treatable at INEEL's Waste Experimental Reduction Facility. This is because the facility's waste acceptance criteria precludes numerous items from being incinerated, such as TSCA waste and waste with more than 0.1 nCi/g of alpha-emitting radionuclides. This alternative would partially fulfill the purpose and need of the proposed action.

3.2.2 Lockheed Environmental Systems and Technology Company Proposal

This alternative would use a plasma arc melter, housed in Lockheed's existing Waste Treatment Facility near the center of INEEL, to process LLMW from the Hanford Site. The facility is presently being built, but would have to be modified and permitted (RCRA/TSCA) to accept the Hanford Site LLMW. Similar to the preferred alternative, the final waste form produced would be glass/slag.

This facility is approximately 800 km (500 mi) from the 200 West Area. The operational impact of this treatment is assumed to be similar to that of ATG.

3.2.3 Scientific Ecology Group Proposal

This proposed alternative was to treat the Hanford Site LLMW at a steam detoxification unit being built for other treatment purposes in an existing Scientific Ecology Group incineration building in Oak Ridge, Tennessee. The building is near the Clinch River and Grassy Creek, approximately 18 km (11 mi) southwest of the center of Oak Ridge. Final waste form would be microencapsulated ash and solid residual. This facility is approximately 3,700 km (2,300 mi) from the 200 West Area. The operational impact of this treatment is assumed to be similar to that of ATG.

3.2.4 Treatment at Hanford Site Facility

Extensive discussions have taken place concerning the economics and environmental impact of treatment at an onsite facility (either existing or to be built). No existing facilities onsite were found to be suitable. With respect to a new facility, it is expected the operational impact of treatment would be similar to that of ATG. However, an onsite facility dedicated to this waste stream would entail a higher capital cost per unit of waste to be treated.

SECTION 4
AFFECTED ENVIRONMENT

This section describes the socioeconomic, physical, and biological environment at the ATG gasification and vitrification facility site; the 200 West Area at the Hanford Site where waste is in temporary storage and where treated waste would be disposed of, and the proposed 33-km (20-mi) waste transport route. The purpose of this assessment is the identification of potential effects of the proposed action on this environment.

The Hanford Site Environmental Report for Calendar Year 1994 (PNNL 1995) and the Hanford Site NEPA Characterization (Cushing 1995) are hereby incorporated by reference. These documents describe the affected environment for the Hanford Site and are the principal sources of the selected information presented in this section. The affected environment at the ATG gasification and vitrification facility property is assumed to be similar to nearby areas at the Hanford Site that are described, because it is adjacent to the Hanford Site on the south and west. Information is supplemented where environmental conditions described in the referenced reports may not fully reflect conditions at the proposed ATG facility.

4.1 LOCATION OF THE PROPOSED ACTION

The ATG gasification and vitrification building would be located in the City of Richland on a 45-acre parcel of land south of Horn Rapids Road. The 200 West Area is located in the west central area of the Hanford Site. The transport route would extend from the 200 West Area along Route 3 to Route 4 South to Stevens Drive (within the Hanford Site boundary), from Stevens Drive to Horn Rapids Road (outside of the Hanford Site) to the proposed ATG site (Figure 2-2).

4.2 SOCIOECONOMIC ENVIRONMENT

On February 11, 1994, President Clinton issued Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations," which is intended to prevent disproportionate adverse environmental or economic impacts from federal policies or actions to minority and low-income populations. The following demographic information on ethnicity, race, and low-income communities in Benton and Franklin Counties is presented as a basis for an analysis of socioeconomic and environmental justice effects in Section 5.

At the time of the 1990 Census, the population of Benton County was estimated at 112,560 and the Franklin County population was 37,473 (Table 4-1). Whites made up over 91.4% of the Benton County total and 71.8% of the Franklin County total. Asians and Pacific Islanders constituted about 2% of the population in both counties and Native Americans less than 1%. The African American population in Benton County was less than 1%, and about 3.5% in Franklin County. From 1990 to 1994, the white percentage of the population in Benton County declined by 2% (U.S. Bureau of Census 1990; Office of Financial Management 1994). In Franklin County, the population classified as white decreased by 10% and the African American population decreased by less than 1%, while other races increased proportionately. From 1990 to 1994, the population of Hispanic origin increased by about 2% in Benton County and increased by about 8% in Franklin County.

Both the Council on Environmental Quality and the U.S. Environmental Protection Agency (EPA) identify low-income populations using annual statistical income thresholds from the Bureau of the Census Current Population Reports, Series P-60 on Income and Poverty. The 1990 Small Area Income and Poverty Estimate for Benton County, published by the Bureau of Census, indicates that 11% of the population was below the poverty level, and the estimate for Franklin County was 22.7%. In 1990, the Washington State's population was 4,741,003, with approximately 517,933, or 10.9% of the total population, below the poverty level (U.S. Bureau of Census 1990).

4.3 PHYSICAL ENVIRONMENT

Meteorological data representative of the ATG gasification and vitrification building site are collected at local airports (WeatherDisc Associates 1990a; 1990b; 1990c; and 1990d) and at various locations on the Hanford Site (Cushing 1995). Average daily temperature ranges vary from -3 to 5°C (26 to 41°F) in January and 15 to 33°C (60 to 92°F) in July. Annual precipitation averages about 7 in./yr, with about half of that between November and February. Winter snowfall averages about 10 in./yr, accounting for about 40% of the winter precipitation. Dense fog typically occurs on 24 d/yr, with most episodes during the fall and winter. Relative humidity averages about 75% during the winter and 35% during the summer.

Wind patterns in the Richland area are influenced by proximity to local topographic features, such as the Rattlesnake Hills and the Columbia River

Table 4-1
Population of Benton and Franklin Counties by Race and Ethnic Origin

Race or Ethnicity	Benton County				Franklin County			
	1990 Population	% of 1990 Total	1994 Population	% of 1994 Total	1990 Population	% of 1990 Total	1994 Population	% of 1994 Total
White	102,832	91.4	113,569	89.4	26,917	71.8	26,668	62.2
African American	1,085	0.96	1,400	1.1	1,310	3.5	1,312	3.1
American Indian, Eskimo, or Aleut	861	0.76	992	0.78	263	0.7	318	0.7
Asian or Pacific Islander	2,246	2.0	3,113	2.45	869	2.3	1,367	3.2
Others	5,536	4.9	7,926	6.3	8,114	21.7	13,235	30.8
TOTALS	**112,560**	**100.02**[a]	**127,000**	**100.03**	**37,473**	**100.0**	**42,900**	**100**
Hispanic Origin[b]	8,624	7.7	12,360	9.73	11,316	30.2	16,662	38.8

Notes:

[a] Totals may not equal 100% due to rounding.

[b] Hispanic Origin can be any race. It is not included in the percentage total.

Source: U.S. Bureau of Census 1990; Office of Financial Management 1994.

Winds at the Richland airport are predominantly from the south-southwest or the north-northwest. Wind speeds average 6 to 7 mph during the winter and 8 to 10 mph during the summer.

Poor dispersion conditions associated with low wind speeds and low-level temperature inversions are common in the Richland area (Cushing 1995). Ground-based inversions lasting 12 h or more occur frequently during fall, winter, and spring months. Ground-based inversions lasting over 24 h sometimes occur during winter months. Mixing layer heights of less than 250 m (820 ft) are common during both day and night hours in the winter and are common at night during the summer.

The federal CAA authorizes the EPA to establish national ambient air quality standards to protect public health and welfare. Federal ambient air quality standards have been adopted for six 'criteria pollutants': ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, inhalable particulate matter (PM10), and lead particles. Washington State also has established ambient air quality standards for these pollutants. The Washington ambient air quality standards generally are identical to the federal standards, except for more stringent state standards for sulfur dioxide. Washington State has adopted additional ambient air quality guidelines for various hazardous air pollutants not covered by federal ambient air quality standards.

Ambient air quality conditions are not monitored routinely in Benton or Franklin Counties, although special monitoring studies have been conducted at various times and locations. Benton and Franklin Counties are considered in compliance with federal ambient air quality standards. However, PM10 monitoring in Kennewick during 1993 identified two instances where PM10 concentrations exceeded the federal and state 24-h standards.

The U.S. Nuclear Regulatory Commission (NRC) concluded that four earthquake sources should be considered for seismic design: the Rattlesnake-Wallula alignment, Gable mountain, a floating earthquake in the tectonic province, and a swarm area (NRC 1982).

For the Rattlesnake-Wallula alignment, which passes along the southwest boundary of the Hanford Site, the NRC estimated a maximum magnitude quake of 6.5, and for Gable Mountain, an east-west structure that passes through the northern portion of the Hanford Site, a maximum magnitude quake of 5.0. These estimates were based on the inferred sense of slip, the fault length, and/or the fault area. The floating earthquake for the tectonic province was developed from the largest event located in the Columbia Plateau, the magnitude 5.75 Milton-Freewater earthquake. The maximum swarm earthquake for the Washington Public Power Supply System Project (WNP-2) seismic design was a magnitude 4.0 event, based on the maximum swarm earthquake in 1973 (NRC 1982).

The most recent probabilistic seismic hazard analysis calculated an annual probability of recurrence of a 0.2-g earthquake at 5.0E-04 (Geomatrix 1994).

The principal river systems within the project water resources region of influence include the Columbia and the Yakima, which are described as follows. Smaller surface streams include Rattlesnake Springs, Snively Springs, Cold Creek (ephemeral), Dry Creek (ephemeral), and an

intermittent stream about 0.8 km (0.5 mi) to the west of the ATG gasification and vitrification building. There are no wild or scenic river segments within the region of influence. The ATG gasification and vitrification building is not located within 500 ft of any perennial surface water body.

Ground water at the Hanford Site area is recharged by natural surface water bodies, by precipitation, and by artificial recharge, including constructed reservoirs, excess irrigation, canal seepage, deliberate augmentation, industrial discharges, and wastewater disposal. The hydrology of the 200 Areas is strongly influenced by the discharge of large quantities of wastewater to the ground over the last 50 yr, which has resulted in elevated water levels across most of the Hanford Site. Discharges of water to the ground have been reduced, resulting in decreases in the water table of up to 9 m (29.5 ft) in the 200 Areas.

The ground water hydrology near and beneath the ATG gasification and vitrification building is distinct from that of the 200 Areas. Ground water in the southeastern portion of the Hanford Site and in the vicinity of the ATG gasification and vitrification building is less affected by the Hanford Site operations than by agricultural irrigation cycles and growing seasons in and around Richland (Newcomer et al. 1992). The aquifers near the ATG gasification and vitrification building are recharged both naturally and artificially. Natural recharge is primarily from precipitation (PNNL 1997). Artificial recharge is primarily by the north Richland recharge basins and by irrigated farming in the North Richland area. Ground water depth at the ATG gasification and vitrification building is greater than 3 m (10 ft), based on well data (Ecology 1995). The ATG gasification and vitrification building is not over a 'sole source aquifer,' as defined in Section 1424 (e) of the Safe Drinking Water Act of 1974, and is not located in a ground water management area. No public or private domestic water supply wells are known to exist within 152.4 m (500 ft) of or downgradient of the ATG gasification and vitrification building.

There are no natural surface water bodies near the ATG gasification and vitrification building nor is it within designated 100-yr or 500-yr floodplains. The 200 Areas are not within the area of the probable maximum flood (DOE 1986). Portions of the 33-km (20-mi) proposed waste transport route, however, are within the 100-yr floodplain of the Yakima and the Columbia Rivers (DOE 1986).

4.4 ECOLOGY

4.4.1 Terrestrial Biota

Vegetation. Approximately 6% of the 1,450-km2 (560-mi2) Hanford Site is developed, and the balance of the site is undeveloped. The Hanford Site vegetation is characterized as a shrub-steppe ecosystem (Daubenmire 1970). Shrublands occupy the largest acreage at the Hanford Site, primarily sagebrush-dominated communities. Grass communities also are common at the Hanford Site, including cheatgrass, Sandberg's bluegrass, needle-and-thread grass, thickspike, bluebunch wheatgrass, bentgrass, meadow foxtail, lovegrasses, and reed canarygrass (Mazaika et al. 1996). Approximately 23 tree species are found at the Hanford Site, with black locust, Russian olive, cottonwood, mulberry, sycamore, and poplar being predominant species.

The Hanford Site also includes riparian habitat, such as sloughs, backwaters, shorelines, islands, and palustrine areas associated with the Columbia River floodplain. Emergent riparian (wetland) habitat occurs in association with the Columbia River and includes riffles, gravel bars, oxbow ponds, backwater sloughs, and cobble shorelines. The Hanford Site also includes a variety of unique habitats such as bluffs, dunes, and islands. For a complete list of species and a more complete description of habitat types, refer to the Hanford Site NEPA Site Characterization report (Cushing 1995).

The Hanford Site also includes 655 km2 (257 mi2) of land designated for research or wildlife refuges, including the Arid Lands Ecology Reserve, U.S. Fish and Wildlife Service Saddle Mountain National Wildlife Refuge, and the Washington State Department of Fish and Wildlife Wahluke Slope Wildlife Area (Cushing 1995).

The ATG gasification and vitrification building is located within an area of north Richland designated for heavy industrial uses. Some of the undeveloped land within the designated industrial area remains under cultivation. Vegetation on the ATG property includes shrubs and a variety of wild mustards and sagebrush plants sparsely scattered throughout the site. Site vegetation is dominated by nonnative weeds, including Russian thistle. *Wildlife.* Common bird species in the vicinity of the ATG gasification and vitrification facility include the western meadowlark, white-crowned sparrow, gull, black-billed magpie, American crow, and European starling. Canada geese, red-tailed hawk, and American kestrel are common, and are likely to occasionally feed in nearby grain fields (ATG 1995a). Approximately 240 terrestrial vertebrate species have been observed at the Hanford Site, including 40 mammal, 187 bird, 3 amphibian, and 9 reptile. Approximately 600 insect species also have been observed at the Hanford Site (Cushing 1995).

The Tri-Cities area is within a major waterfowl flyway and wintering area. Waterfowl use is concentrated along the Columbia River, with limited waterfowl presence at the 200 West Area and in the immediate vicinity of the ATG gasification and vitrification building property.

4.4.2 Aquatic Biota

The Hanford Site includes two types of natural aquatic habitats-the Columbia River and small spring-streams and seeps located mainly on the Arid Lands Ecology Reserve. These habitats include numerous species of phytoplankton, periphyton, macrophytes, zooplankton, benthic organisms, insects, and fish. Fish species common to the Columbia River include the Chinook salmon, sockeye salmon, coho salmon, and steelhead trout. Common waterfowl species include Canada goose, several species of ducks, and the coot. A complete species list for the Hanford Site can be found in the Hanford Site NEPA Characterization report (Cushing 1995).

Larger Hanford Site wetlands are found along its Columbia River border. The width of the wetlands varies but may include extensive stands of willows, grasses, various aquatic macrophytes, and other plants (Cushing 1995). Other wetlands areas within the region of influence are within the Saddle Mountain National Wildlife Refuge, Wahluke Wildlife Area, and the Arid Lands Ecology Reserve (Cushing 1995).

Because there is no surface water in the immediate vicinity of the ATG gasification and vitrification building, there are no aquatic species. However, the ATG facility is about 3 km (2 mi) west of the Columbia River and is in its region of influence. The ATG site elevation is about 10 m (30 ft) above the average surface elevation of the river along the Hanford Site reach.

4.4.3 Endangered and Threatened Species

No plants or mammals on the federal endangered species list are known to exist at the Hanford Site. Three bird species found at the Hanford Site, however, are on the federal list of threatened and endangered species. Also, several species of plants and animals found there are under state consideration for formal listing. Table 4-2 lists the threatened and endangered species inhabiting or potentially inhabiting the Hanford Site.

No threatened or endangered plant or animal species are known to exist or are suspected to be present on the ATG gasification and vitrification facility site. The absence of native vegetation and the industrial nature of the area render it an unlikely habitat for such species.

Table 4-2
Threatened and Endangered Species Inhabiting or Potentially Inhabiting the Hanford Site

Common Name	Scientific Name	Federal	State
Insects			
Oregon silverspot butterfly[a]	*Speyerra zerone*	T	T[b]
Plants			
Columbia milk-vetch	*Astragalus columbianus*		T
Columbia yellowcress	*Rorippa columbiae*		E[b]
Dwarf evening primrose	*Oenothera pygmaea*		T
Hoover's desert parsley	*Lomatium tuberosum*		T
Northern wormwood[a]	*Artemisia campestris borealis var. wormskioldii*		E
Birds			
Aleutian Canada goose[c]	*Branta canadensis leucopareia*	T	E
American white pelican	*Pelecanus erythrorhychos*		E
Bald eagle	*Haliaeetus leucocephalus*	T	T
Ferruginous hawk	*Buteo regalis*		T
Peregrine falcon[c]	*Falco peregrinus*	E	E

Sandhill crane[c]	*Grus canadensis*	E
Mammals		
Pygmy rabbit[a]	*Brachylagus idahoensis*	E

Notes:
[a] Likely not currently inhabiting the Hanford Site.
[b] T=Threatened; E=Endangered.
[c] Incidental occurrence.
Source: Cushing 1995.

4.5 CULTURAL RESOURCES

Information regarding local cultural resources can be found in the Hanford Site NEPA Characterization (Cushing 1995). Two hundred and eighty-three prehistoric sites have been found on the Hanford Site (Cushing 1995). Prehistoric archaeological sites common to the Hanford Site include remains of numerous pit house villages, various types of open campsites, cemeteries, spirit quest monuments (rock cairns), hunting camps, game drive complexes, and quarries in mountains and rocky bluffs (Rice 1968a; 1968b; 1980).

SECTION 5
ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

This section presents an analysis of potential environmental impacts of the proposed transport and treatment of 5,120 m^3 (6,696 yd^3) of Hanford Site LLMW. Treatment of LLMW from commercial facilities was beyond the scope of this EA. However, analysis was performed in the SEPA EIS for Treatment of LLMW with the MWF operating at full capacity versus the 25% capacity for the DOE waste stream. The SEPA EIS indicated insignificant impacts for the ATG MWF, which included both the nonthermal and thermal treatment facilities at the ATG facility.

Environmental concerns related to the proposed action include air emissions, storage and handling of hazardous chemicals and waste, transportation of hazardous waste, and accident risks.

Results of the environmental impacts depicted in this EA are different than the results shown in the SEPA EIS for Treatment of Low-Level Mixed Waste. This is because this EA analyzes only the Hanford Site waste, whereas the SEPA EIS analyzed siting and construction as well as treatment of commercial and DOE waste in addition to the Hanford Site waste. This EA uses the GENII computer model, the standard dose assessment used by DOE. The SEPA EIS used the Clean Air Act Assessment Package 1988 Personal Computer (CAP88-PC) program, the standard model used by the EPA.

5.1 FACILITY OPERATION AND WASTE TRANSPORT

In this section, the environmental impacts of air emissions, hazardous chemicals and waste, solid waste, and transportation have been analyzed using the conditions described in Section 4, Affected Environment. Potential impacts associated with ATG gasification and vitrification building operations and waste transport also have been evaluated in the following documents, with results incorporated into this section:

- ISCST3 Air Dispersion Modeling Results for the ATG Gasification and Vitrification Facility (Sculley 1996)
- RADTRAN 4 Modeling Results for Transport of LLMW from the Hanford Site 200 West Area to the ATG Gasification and Vitrification Facility (Deshler 1996)
- Radiological Dose and Risk Assessment for ATG Low-Level Mixed Waste Facility (Leung 1996)
- Thermal Treatment of Low-Level Mixed Waste Accident Analysis Report (Jacobs 1998).

5.1.1 Air Pollutant Emissions

Facility emissions estimates for impact analysis in this EA used two of the waste streams tested in the pilot facility tests by PEAT Inc.: medical facility waste (a mix of plastics, paper, food waste, and some laboratory chemicals), and simulated dunnage waste (a mix of wood, paper, plastic, and metal waste). The results of a peer review of mass flow rates is provided in Appendix A.

The pilot facility emission test results were reported primarily as stack concentrations of individual chemicals. Those stack concentrations were converted into standard emission factors based on the waste feed rate and stack gas flow rates for the individual pilot tests. The medical waste tests used a feed rate of 23 kg (50 lb)/hr. The simulated dunnage waste tests used a feed rate of 9 kg (20 lb)/hr. Emissions from the two waste streams are anticipated to be similar to typical Hanford Site waste streams. In cases where the same chemicals were detected during both the medical waste and dunnage waste tests, the highest of the two emission rate values was used for estimating emissions from the ATG gasification and vitrification building.

The pilot facility was equipped with less extensive gas treatment equipment than is proposed for the ATG gasification and vitrification building. The pilot facility included an acid gas scrubber system and a flare system as primary emission controls. The proposed ATG gasification and vitrification system includes a ceramic candle filter, acid gas scrubber, syngas converter, HEPA filters, and carbon filters. In addition, the ATG system would cool the exhaust gas from the syngas converter before the final filtration stage of HEPA filters and carbon filters. Consequently, vaporized metals detected in the flare exhaust from the pilot facility would be condensed to particulate form and trapped in filters at the ATG facility.

Emission rate data from the pilot facility tests were adjusted to be representative of expected emissions from the proposed ATG facility. The HEPA and carbon filters are expected to provide an additional 99% removal of particulate matter and metals, while the carbon filters are expected to further reduce organic compound emissions by 50% (Leung 1996).

5.1.2 Potential Ambient Air Pollutant Concentrations

A conservative screening analysis of ambient air quality impacts from the proposed ATG gasification and vitrification building was developed using a Gaussian dispersion model. The latest version of the industrial complex model was used for these analyses (ISCST3 Industrial Source Complex Short Term 3, EPA version 95250). The model was run for a 24-h meteorological pattern representing a winter day with a persistent wind direction and limited pollutant dispersion characteristics.

Wind speeds were assumed to vary between 1 and 2 m/sec (2.2 to 4.4 mph). Moderate temperature inversion conditions were assumed to persist all day (stability classes E and F). Mixing height limits were set at 100 to 150 m (328 to 482 ft). A realistic variation in precise wind directions was simulated by using a random number generator to produce a sequence of independent wind direction fluctuations of 10° to either side of the assumed prevailing wind direction.

Table 5-1 summarizes anticipated facility emissions and the maximum expected pollutant concentrations downwind of the proposed ATG mixed-waste facility. None of the modeled pollutant concentrations approach or exceed applicable state or federal air quality standards or ambient concentration guidelines. Details of the emissions and modeling analyses are documented in Sculley (1996).

5.1.3 Hazardous Chemicals

The modeling results presented in Table 5-1 are directly proportional to the waste feed rate. The screening-level dispersion modeling analysis assumed a daily average feed rate of 68 kg (150 lb)/hr for the Hanford Site LLMW. More recent facility design changes now anticipate intermittent batch processing of the Hanford Site LLMW, with no waste processed on some days and a feed rate of 114 kg (250 lb)/hr or more on days when the Hanford Site LLMW is processed. Averaged over 250 working days per year, the Hanford Site LLMW will be processed at a rate of 35.3 kg (77.6 lb)/hr.

Impacts associated with hazardous chemicals would not be expected if standard hazardous waste storage and handling procedures were followed.

Small quantities of acids, bases, oxidizers, toxins, flammables, reactives, heavy metals, and pesticides would be necessary for waste sample analyses and analytical equipment calibration in ATG's mixed-waste facility laboratory. In addition to the ATG gasification and vitrification buildings, the mixed-waste facility includes a nonthermal treatment building and a waste storage building. Laboratory personnel would be protected by conformance with regulatory requirements of 29 CFR 1910.1450. Laboratory hazardous chemical inventories would include compressed gases and flammable, explosive, toxic and/or corrosive liquids.

Table 5.1
Summary of Nonradiological Facility Emissions and Dispersion Modeling Results

Pollutant	Estimated Emission Factor, gm/ton[a]	Emission Rate (gm/s) for Feed Rate of 150 lb/hr	Maximum 24-h Average Breathing Zone Concentration ($\mu g/m^3$)
Particulate Matter (PM_{10})	4.68	9.75E-05	4.42E-04
Carbon Monoxide	1,450	3.02E-02	1.37E-01
Nitrogen Oxides	2,389	4.98E-02	2.26E-01
Sulfur Oxides	168	3.50E-03	1.59E-02
Sulfur Dioxide	107	2.22E-03	1.01E-02
Hydrochloric Acid	62.69	1.31E-03	5.92E-03
Hydrogen Fluoride	3.07	6.39E-05	2.90E-04
Formaldehyde	134	2.79E-03	1.27E-02
Acetaldehyde	672	1.40E-02	6.35E-02
Butyraldehyde	52	1.08E-03	4.88E-03
Diphenylene Methane (Fluorene)	0.031	6.42E-07	2.91E-06
Phenol	0.90	1.87E-05	8.48E-05
1,4-Dichlorobenzene (p-Dichlorobenzene)	0.012	2.57E-07	1.17E-06
2-Methylphenol (Cresol)	0.074	1.54E-06	6.99E-06
3/4-Methylphenol (Cresol)	0.063	1.30E-06	5.91E-06
Combined Methylphenol (Cresol) isomers	0.14	2.84E-06	1.29E-05
Acetophenone	0.032	6.60E-07	3.00E-06
Phenanthrene	0.05	1.08E-06	4.89E-06
Benzoic Acid	4.04	8.42E-05	3.82E-04
Naphthalene	0.41	8.59E-06	3.89E-05
2-Methylnaphthalene	0.14	2.84E-06	1.29E-05
Acenaphthylene	0.044	9.23E-07	4.18E-06
Dimethyl Phthalate	0.026	5.36E-07	2.43E-06
Diethyl Phthalate	0.15	3.20E-06	1.45E-05
Di-n-Butyl Phthalate	0.36	7.58E-06	3.44E-05
Butylbenzyl Phthalate	1.25	2.60E-05	1.18E-04
bis(2-Ethylhexyl) Phthalate	177	3.68E-03	1.67E-02
Dibenzofurans	0.040	8.31E-07	3.77E-06
2,3,7,8-Tetrachlorodibenzo-p-dioxin	8.36E-08	1.74E-12	7.90E-12
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	2.39E-07	4.98E-12	2.26E-11
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	2.39E-07	4.98E-12	2.26E-11

1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	1.20E-07	2.49E-12	1.13E-11
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	1.20E-07	2.49E-12	1.13E-11
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	3.47E-06	7.23E-11	3.28E-10
Octachlorodibenzo-p-dioxin	1.56E-05	3.24E-10	1.47E-09
2,3,7,8-Tetrachlorodibenzofuran	4.78E-07	9.97E-12	4.52E-11
1,2,3,7,8-Pentachlorodibenzofuran	3.59E-07	7.48E-12	3.39E-11
2,3,4,7,8-Pentachlorodibenzofuran	3.59E-07	7.48E-12	3.39E-11
1,2,3,4,7,8-Hexachlorodibenzofuran	1.56E-06	3.24E-11	1.47E-10
1,2,3,7,8,9-Hexachlorodibenzofuran	7.18E-07	1.50E-11	6.78E-11
2,3,4,6,7,8-Hexachlorodibenzofuran	2.51E-06	5.23E-11	2.37E-10
1,2,3,7,8,9-Hexachlorodibenzofuran	1.20E-07	2.49E-12	1.13E-11
1,2,3,4,6,7,8-Heptachlorodibenzofuran	7.78E-06	1.62E-10	7.35E-10
1,2,3,4,7,8,9-Heptachlorodibenzofuran	2.51E-06	5.23E-11	2.37E-10
Octochlorodibenzofuran	7.90E-05	1.64E-09	7.46E-09
Total Tetrachlorodibenzofuran	1.44E-07	3.00E-12	1.36E-11
Total Dibenzo-p-Dioxin Toxicity Equivalent	3.01E-07	6.28E-12	2.85E-11
Total Dibenzofuran Toxicity Equivalent	1.35E-06	2.81E-11	1.27E-10
Total Dioxin + Furan Toxicity Equivalent	1.65E-06	3.44E-11	1.56E-10
Aluminum (particulate)	0.129	2.68E-06	1.22E-05
Aluminum (vapor phase)	0.091	1.89E-06	8.55E-06
Aluminum (combined particulate and vapor)	0.22	4.57E-06	2.07E-05
Barium (particulate)	0.0033	6.92E-08	3.14E-07
Barium (vapor phase)	0.0078	1.62E-07	7.33E-07
Barium (combined particulate and vapor)	0.011	2.31E-07	1.05E-06
Cadmium	0.0037	7.67E-08	3.48E-07
Copper	0.0092	1.93E-07	8.73E-07
Iron (particulate)	0.104	2.17E-06	9.83E-06
Iron (vapor phase)	0.026	5.32E-07	2.41E-06
Lead	0.043	8.87E-07	4.02E-06
Magnesium (particulate)	0.015	3.11E-07	1.41E-06
Magnesium (vapor phase)	0.0056	1.16E-07	5.25E-07
Mercury[b]	N/A[b]	7.4E-05	3.35E-04
Nickel	0.032	6.63E-07	3.00E-06
Zinc	0.050	1.04E-06	4.70E-06

Notes:

[a] As discussed in Section 5.1.1, estimated emission factors were derived from pilot facility emission test results, pilot study waste feed rates, pilot study exhaust gas flow rates, and emission control factors to account for the effects of the HEPA and carbon filters proposed for the ATG gasification and vitrification building. Modeling analysis results are based on the ISCST3 dispersion model assuming 24 consecutive hours of low wind speeds, poor dispersion conditions (stability categories E and F), and persistent wind directions (randomized fluctuations within 10˚ either side of the mean direction). Stack tip downwash and building wake effects were included in the model runs. Feed rates for the Hanford Site LLMW will vary significantly on a daily basis, ranging from no Hanford Site LLMW on some days to 250 lb/hr or more on other days. Averaged over a 250-d

work year, the Hanford Site LLMW processing will average 77.6 lb/hr.

[b] Mercury emissions were not monitored in the pilot facility emissions testing. Mercury emissions were estimated based on 130 ppm mercury in the waste feed, a release fraction of 1 in the melter, and a 97% removal efficiency in the off-gas treatment system(ATG 1998a).

Source: Sculley 1996.

As part of standard RCRA facility requirements, a plan outlining specific workplace practices and procedures to ensure employee safety would be developed. Adherence to these requirements would minimize the potential impacts from the storage of hazardous chemicals, including acids and bases, two-part polymers, flammables, and compressed gases.

5.1.4 Solid and Hazardous Waste

Compliance with the laws and regulations identified in Section 6 would minimize impacts of solid and hazardous waste disposal. After treatment in the ATG gasification and vitrification building, waste would be returned to the Hanford Site for final disposition. The treatment processes may generate secondary waste as waste is treated. Any secondary waste generated at the ATG gasification and vitrification building would be packaged and certified before being returned to the Hanford Site.

5.1.5 Transportation

The radiological and chemical transportation accidents associated with the thermal treatment of LLMW from the Hanford Site are evaluated in this section.

Radiological Risk.

Predicted health effects from exposure to radiation are commonly expressed in numbers of latent cancer fatalities (LCF) expected in a population. To predict the LCF from waste transport, factors provided in the 1990 Recommendations for the International Commission on Radiation Protection (ICRP 1990) were used, which are also consistent with factors used by the NRC in its rulemaking Standards for Protection Against Radiation (NRC 1991). These factors are applicable where the dose to an individual would be less than 20 rem and the dose rate would be less than 10 rem/h. The dose-to-risk conversion factors are 500 LCF/million person-rem effective dose equivalent (5E-04 deaths/person-rem) for the general population and 400 LCF/million person-rem (4E-04 deaths/person-rem) for workers.

LLMW from the 200 West Area may contain up to 100 nCi/g of transuranic radionuclides, with container surface radiation doses up to 200 mrem/hr. This LLMW would be transported from the 200 West Area to the ATG gasification and vitrification building by truck (see Figure 2-2). The proposed transfer route is largely (95%) within the Hanford Site boundaries and approximately 50% of the route is subject to access control. Only authorized personnel are permitted to travel on this road. After treatment, the vitrified waste would be transported back to the 200 West Area for land disposal. Transportation health effects were estimated using the computer model RADTRAN 4 (Version 4.0.18) (Neuhauser and Kanipe 1992).

RADTRAN 4 was developed at Sandia National Laboratories to evaluate the risk of transporting radioactive material. Several input data files, representing various types of waste and transportation scenarios, are available for public use on the Sandia mainframe computer. The input data file representing the transfer of spent fuel to the Hanford Site was modified based on the radiological characteristics (Table 5-2) of the waste that would be treated at the proposed facility (Place 1994). The isotopes included in the input data files accounted for 99% or more of the activity of the current inventory of waste. The exclusion of isotopes present only in relatively small amounts would not change the output significantly. The waste characteristics described were for the 890 m3 (1,164 yd3) of thermally treatable waste accumulated by 1994. Identical waste characteristics were assumed for the additional 4,230 m3 (5,533 yd3) expected to be generated and treated by the year 2010.

In addition to modifying the isotope activity variables in the existing input data file, several parameters relating to shipment were altered, including the following:

- Fraction of travel in rural population zone changed to 1.0
- Fraction of rural travel on freeways changed to 0.9
- Kilometers traveled per trip (one-way) changed to 33
- Stop-time per trip changed to 0.

Other general assumptions made in the input file were not changed. The worker population was assumed to consist of two people, the driver and an assistant. Because of the controlled access over most of the transport route, the majority of nonworkers potentially exposed during incident-free transport would be those sharing the roadway with the truck. Using a traffic count of 470 vehicles/h (one way), the model would estimate that 317 people would be exposed during a single incident-free trip. The maximally exposed individual nonworker is assumed to live 10 m (33 ft) from the roadway. From a default rural population density of 6 people/km2, the model estimates that 8,100 people could be exposed to radioactive material released in an accident.

Other important variables in calculating transportation risk are the number and size of shipments. Over a 10-yr period, 5,120 m3 of LLMW would be treated. Assuming a waste density of 347 kg/m3 and a truck capacity of 18,100 kg (39,820 lb), approximately 160 inbound (to the proposed facility) trips would be necessary over the 10-yr period. Although the volume of the processed waste would be reduced by up to 80%, its density would increase to up to 2,650 kg/m3 (7,626 lb/yd3) limiting the number of drums that could be transported to approximately 50/shipment. Based on these calculations, approximately 150 outbound (away from the proposed facility) trips would be necessary over the 10-yr period. Separate input data files were created for the inbound and outbound scenarios.

Incident-free Transportation. RADTRAN 4 can calculate the radiological dose and associated health risk from incident-free travel. Predicted doses and risks are presented in Table 5-3. The inbound and outbound doses for both workers and nonworkers are similar, and, as expected, the doses received by the nonworkers passing the truck transports are lower than for the workers driving the trucks. The RADTRAN 4 model predicts that a member of the public receiving the maximum exposure from 10 yr of

Table 5-2
Radiological Characteristics of the Hanford Site Low-level Mixed Waste

Fission Products	Activity in current stockpile (Ci)[a]	Activity in Current Stockpile + Future Stockpile[b]	Activity/Shipment (inbound)[c]	Activity/Shipment (outbound)[d]	
Cs-137	26.6	153.0247	0.9564	1.0202	
Sr-90	24.2	139.4481	0.8716	0.9297	
H-3	4.2	24.1618	0.1510	0.1611	
Fe-55	2.78	15.9928	0.1000	0.1066	
Mn-54	1.38	7.9389	0.0496	0.0529	
Ce-144	0.40	2.3011	0.0144	0.0153	
Co-60	0.27	1.5533	0.0097	0.0104	
Eu-154	0.23	1.32	0.0082	0.0088	
Pm-147	0.18	1.0355	0.0065	0.0069	
Alpha-bearing radionuclides	**Weight of Current Stockpile (g)[e]**	**Activity in current stockpile (Ci)[f]**	**Activity in Current Stockpile + Future Stockpile[b]**	**Activity/Shipment (inbound)[c]**	**Activity/Shipment (outbound)[d]**
Pu-241	1.2	125.0	719.0	4.5	4.8
Pu-238	0.13	2.21	12.7	0.079	0.085
Am-241	0.60	2.09	12.0	0.075	0.080
Pu-239	11.3	0.71	4.1	0.026	0.027
Pu-240	0.70	0.16	0.92	0.057	0.061
Np-237	11.3	0.008	0.046	0.00029	0.00031
Pu	0.78	13.5	78.0	0.49	0.52
Mobile Isotopes	**Activity in current stockpile (Ci)[g]**	**Activity in Current Stockpile + Future Stockpile[b]**	**Activity/Shipment (inbound)[c]**	**Activity/Shipment (outbound)[d]**	
C-14	0.060	0.345	0.0022	0.0023	
I-129	0.012	0.069	0.00043	0.00046	
Tc-99	0.021	0.121	0.00076	0.00081	

Notes:

[a] From Table 12, Place (1994); includes isotopes responsible for 99% of the activity.

[b] Current stockpile = 890 m^3; current stockpile + future stockpile = 5,120 m^3.

[c] Assuming 160 inbound shipments.

[d] Assuming 150 outbound shipments.

[e] From Table 14, Place (1994); includes isotopes responsible for 99.9% of the activity.

[f] Calculated using specific activity for each isotope; calculated by Specific activity (Ci/g) = 3.578E+05/(half-life (years) x atomic mass).

[g] From Table 23, Place (1994).

operation will receive less than 0.01% of the 100-mrem maximum allowable dose from a licensed nuclear facility during 1 yr of operation. Exposure of either of the two workers in the

worker population, the transport driver and an assistant, is predicted to be limited to 0.5% of the 5,000-mrem annual limit for workers.

Table 5-3
Radiological Dose and LCF from Incident-free Transportation of LLMW to and from the ATG Gasification and Vitrification Building

Inbound Waste	Workers	Nonworkers
Average annual population dose (person-rem/yr)	0.025	0.0098
10-yr cumulative population dose (person-rem)	0.25	0.098
10-yr cumulative LCF	1.0E-04	4.9E-05
10-yr maximally exposed individual (rem)	n/c[a]	9.3E-05
Outbound Waste		
Average annual population dose (person-rem/yr)	0.023	0.0092
10-yr cumulative population dose (person-rem)	0.23	0.092
10-yr cumulative LCF	9.4E-05	4.6E-05
10-yr maximally exposed individual (rem)	n/c[a]	8.75E-05

Notes:

[a] Not calculated by model.

Source: Deshler 1996.

Predicted radiological exposures of the public and of workers posed by an accident occurring along the rural transport route are even smaller than the maximum annual operating dose (provided in Section 5.2.6). As the LCF for the worker and nonworker population is less than one, no observable health effects are expected to result from transport accidents.

Transportation Accidents.

The radiological and toxicological impacts associated with transporting waste are evaluated in this section. The bounding transportation accident identified in the preliminary hazards analysis (Jacobs 1998) would be a potential truck fire. This accident scenario assumes that the truck is involved in a serious accident in which the truck burns and ignites the waste in the containers resulting in a radiological and toxicological release.

Radiological Risk from Transportation Accident

The following assumptions and parameters were used in calculating the radiological health impacts to the various receptors.

- Net weight of waste per truck shipment = 36,000 lb contained in metal drums (ATG 1998).
- Inventory of waste in a shipment was developed considering maximum license limits from ATG's license application to Washington Department of Health (ATG 1998).
- Amount of waste released in the fire or the damage ratio = 50% (WHC 1993)

- Release fraction for a fire = 5.0 E-04 (DOE 1994) with the exception of I-129 (1.5E-01 [Elder 1986])
- Waste burns for 1 hour (conservative assumption made to support modeling of airborne contaminant concentrations)
- Atmospheric dispersion coefficients provided as input for GENII were generated with the GXQ computer code.

Radiation doses from the source term listed in Table 5-4 were computed with the GENII code (Napier et al. 1988). The LCF risk to the designated receptors as a result of the transportation accident scenario is presented in Table 5-5.

Table 5.4
Source Term for Transportation Fire

Isotope	Inventory (Ci)	Damage Ratio	Release Fraction	Source Term (Ci)
P-32	3.53E-02	50%	5.0E-04	8.83E-06
Sr-90	1.45E+00	50%	5.0E-04	3.63E-04
I-129	1.66E-04	50%	1.5E-01	1.25E-05
Cs-137	2.66E+00	50%	5.0E-04	6.65E-04
Pu-238	1.09E-02	50%	5.0E-04	2.73E-06
Pu-239	4.93E-04	50%	5.0E-04	1.23E-07
Pu-241	8.71E-02	50%	5.0E-04	2.18E-05
Am-241	1.45E-03	50%	5.0E-04	3.63E-07

Table 5-5
Radiological Exposures and Number of Latent Cancer Fatalities Resulting from a Worst-Case Credible Transportation Accident Scenario Occurring during a 10-yr Operational Period

Receptor	Dose (rem EDE)	LCF Risk	Probability	LCF Point Estimate Risk
General Public Population	2.0E-01[1]	1.0E-04	6.8E-05	6.8E-09
Involved Worker MEI (located less than 10 m from accident)	1.0E+00	5.0E-04	6.8E-05	3.4E-08
Hypothetical Resident (at 100 m)	3.5E-04	1.8E-07	6.8E-05	1.2E-11
Childcare Center MEI	1.7E-05	8.5E-09	6.8E-05	5.8E-13
Notes:				

[1] Population dose would be in units of person-rem EDE.

Dose based on inhalation only. Accident assumes interdiction.

Involved worker dose based on hand calculation.

The accident probability is based on a frequency of 1.3E-08 accidents/km • 160 trips • 33 km/trip

When the probability of the transportation accident occurring is considered, the resulting point estimate risks would be lower than the routine transportation impacts.

Chemical Risk from Transportation Accident

Potential acute hazards associated with exposure to concentrations of chemicals resulting from postulated LLMW transportation accidents were evaluated using a screening-level approach. The screening-level assessment involved direct comparison of calculated exposure concentrations of chemicals to an MEI located within a 10-m (33-ft) radius of the accident to air concentration screening criteria known as Emergency Response Planning Guides (ERPG). ERPGs are defined as follows:

- ERPG-1 - The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 h without experiencing other than mild transient adverse effects or perceiving a clearly defined objectionable odor.
- ERPG-2 - The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 h without experiencing or developing irreversible or other serious health effects or symptoms that could impair their ability to take protective action.
- ERPG-3 - The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to 1 h without experiencing or developing life-threatening health effects.

The health hazards were evaluated based on the central nervous system depressant effects, corrosive/irritant effects, and toxic effects. Chemicals within each group were assumed additive. This is a conservative assumption because many different chemicals affect different organs. Cumulative hazards for the depressant, corrosive/irritant, and toxic chemicals were evaluated as follows:

Cumulative Hazard = C1/E1 + C2/E2 + ... + Ci/Ei

Where:

C = Calculated airborne exposure point concentration for an individual chemical, (mg/m3)
E = The ERPG for the chemical (mg/m3).

A cumulative HI greater than 1.0 indicates that the acute hazard guidelines for a chemical class has been exceeded and the chemical class may pose a potential acute health impact.

The chemical health hazards associated with a transportation accident are dependent on the severity of the accident, nature of the chemicals, local population density, and the weather conditions. The worst-case credible accident would be an accident resulting in a fire while transporting LLMW to the ATG Facility to be treated. Chemical consequences from untreated waste would be more severe than treated waste because the treatment process would destroy or immobilize hazardous organic chemicals, and the treated waste has a low probability of igniting.

The following assumptions and parameters were used in calculating the chemical concentrations within a 10-m (33-ft) radius of the accident:

- Waste per truck shipment = 18,100 kg (40,000 lb)
- Total volume of waste to be transported and treated = 5,120 m3 (180,800 ft3)
- Waste density = 347 kg/m3 (21.7 lb/ft3) (Tetra Tech 1996b)
- Total weight of the hazardous chemical constituents = 14,917 kg (32,900 lb) (City of Richland 1998)
- Amount of waste released in the fire = 50% (assumed)
- Release fraction for a fire = 5.0 E-04 (DOE 1994)
- The material released is assumed to spread instantaneously and uniformly over a hemisphere 10-m (33-ft) in radius. The MEI is assumed to be located at the center of the hemisphere.

The weight of the total waste to be transported and treated is 1,776,640 kg (2,600,000 lb) (5,120 m3 times 347 kg/m3); therefore, the ratio of hazardous chemical in a shipment of waste was calculated as follows:

$$\frac{\text{Hazardous chemicals per shipment}}{\text{18,100 kg waste per shipment}} = \frac{\text{14,917 kg chemicals total}}{\text{1,776,640 kg total waste}}$$

Hazardous chemical/shipment = 152 kg (340 lb)

The chemical concentration within a 10-m (33-ft) hemisphere is calculated using the following equation:

$$C(mg/m3) = [Q\ (kg)] \times \times (1.0\ E+06\ mg/kg)$$

Where:

C = Concentration
Q = Respirable quantity released
Q = (Truck inventory) × (50% released in fire) × (respirable release fraction)
r = Assumed 10-m (33-ft) radius for distribution of source.

Therefore: C = (152 kg) × (50%) × (5.0 E-04) × (4.77E-04/m3) × (1.0E+06 mg/kg) = 1.81 E+01 mg/m3

The chemical inventory involved in a potential truck accident was based on a breakdown of the Hanford Site LLMW by hazardous and toxic material constituents (City of Richland 1998). The chemicals were sorted into chemical classes and representative chemicals from each chemical class were selected that would best represent the class. The chemical classes and the weight of each class are as follows:

- Solvents/thinners/glycols/glycol ethers (3,881 kg [8,560 lb])
- Metals/metal salts/pigments (1,666 kg [3,670 lb])
- Resins/plastics/polymers (70 kg [150 lb])
- Caustics (406 kg [895 lb])
- Petroleum/coal tar derivatives (5,656 kg [12,470 lb])
- Pesticides/herbicides/PCBs (517 kg [1,140 lb])
- Freons (37 kg [82 lb])
- Amines (241 kg [530 lb])
- Other (2,441 kg [5,380 lb]) is comprised of water and additives (e.g., food additives, antioxidants) and would have no acute health impacts.

The solvents, thinners, glycols, and glycol ethers represent 26% (3880.87 kg/ 14,917.36 kg) of the total hazardous chemicals. At 10 m (33 ft), the air concentration of the solvent waste stream would be 4.71 mg/m3 (18.1 mg/m3 × 26%). The total solvent waste stream was estimated to have the following composition:

- >Aromatic solvents = 46%
- Chlorinated solvents = 20%
- Glycols/glycol ethers/alcohols = 24%
- Aliphatics = 10%.

Each of the solvent components would have the following air concentrations

- Aromatic solvents = 2.17 mg/m3 (4.71 mg/m3 × 46%)
- Chlorinated solvents = 0.94 mg/m3 (4.71 mg/m3 × 20%)
- Glycols/glycol ethers/alcohols = 1.13 mg/m3 (4.71 mg/m3 × 24%)
- Aliphatics = 0.47 mg/m3 (4.71 mg/m3 × 10%).

Metals/metal salts represent 11% (1665.97 kg/14,917.36 kg) of the total hazardous chemicals. The air concentration of the metal waste stream would be 1.99 mg/m3 (18.1 mg/m3 × 11%). Approximately 93% of the waste stream would be particulate material (City of Richland 1998) with no acute health impacts. Assuming that the remaining 7% is equivalent to sodium silicate, the air concentration of sodium silicate would be 0.14 mg/m3 (1.99 mg/m3 × 7%).

Resins/plastics represent 0.47% (70.17 kg/14,917.36 kg) of the total hazardous chemicals. At 10 m (33 ft), the air concentration of the resins/plastics waste stream would be 0.09 mg/m3 (18.1 mg/m3 × 0.47%). However, resins/plastics are inert and nontoxic for acute exposure and would not result in any acute health impacts.

Caustics represent 3% (406.15 kg/14,917.36 kg) of the total hazardous chemicals. The air concentration of caustics would be 0.54 mg/m3 (18.1 mg/m3 × 3%). The entire air concentration of caustics conservatively was assumed to be represented by sodium hydroxide.

The petroleum/coal tar waste stream represents 38% (5,657.9 kg/14,917.36 kg) of the total hazardous chemicals. The air concentration of this waste stream would be 6.89 mg/m3 (18.1 mg/m3 × 38%). The entire air concentration of the petroleum/coal tar waste stream conservatively was assumed to be represented by tridecane (similar to kerosene).

PCBs/pesticides represent 3% (516.88 kg/14.917.36 kg) of the total hazardous chemicals and are comprised almost entirely of PCBs. The air concentration of PCBs would be 0.54 mg/m3 (18.1 mg/m3 × 3%).

Freons represent 0.25% (37.45 kg/14,917.36 kg) of the total hazardous chemicals. The air concentration of freons would be 0.05 mg/m3 (18.1 mg/m3 × 0.25%). The entire air concentration of freons was assumed to be represented by the chlorinated solvent methylene chloride.

The amine waste stream represents 1.6% (240.71 kg/14,917.36 kg) of the total hazardous chemicals. The air concentration of this waste stream would be 0.29 mg/m3 (18.1 mg/m3 × 1.6%). The entire air concentration of amines conservatively was assumed to be represented by ammonia.

The air concentrations of the chemical classes are compared to the ERPGs in Table 5-6 (central nervous system depression concentration limits), Table 5-7 (corrosive/irritant concentration limits), and Table 5-8 (toxic concentration limits). As shown in these tables, the accident would not result in anticipated fatalities, the development of irreversible or serious health effects, or the development of mild transient adverse effects.

5.2 HUMAN HEALTH IMPACTS FROM PLANT OPERATIONS

5.2.1 Hazardous Waste

Downwind concentrations of the compounds emitted from the Plasma Energy Applied Technology, Inc. (PEAT) test facility during gasification and vitrification were modeled using the EPA model ISCST3 (see Section 5.1.1.1). This modeling resulted in estimations of breathing zone air chemical concentrations. The analyses of the human health impacts of inhaling these predicted site-related chemical concentrations is presented in this section.

Quantitative Analysis: Chemical toxicities were analyzed using standard EPA human health risk assessment methodologies (EPA 1991a, 1991b). Human health risk assessment is a series of analyses comparing probable exposures to site-related chemicals with doses correlated with deleterious health effects. These analyses produce estimates of cancer risk or noncancer hazard. A noncancer hazard quotient (HQ) of greater than 0.25

and an excess cumulative cancer risk greater than 1.0E-05 for an individual (one excess cancer per 100,000 exposed population) is used as a standard of significance by EPA. These estimates are provided for those chemicals expected to be in ATG's gasification and vitrification building emissions and for which sufficient toxicological data are available.

HQs, or noncancer hazard quotients, are computed by comparing estimated daily intake levels with risk reference doses (RfD) available on EPA's Integrated Risk Information System (IRIS). RfDs are benchmark daily doses to which humans may be subjected without an appreciable risk of noncarcinogenic adverse effects during a lifetime (assumed to be 70 yr). HQ values less than 0.25 indicate that the potential for adverse health impacts is negligible.

Estimates of incremental carcinogenic risk posed by assumed daily intake levels of contaminants of concern are calculated with cancer potency factors developed by the EPA. A chemical's cancer potency factor provides an upper-bound estimate on the cancer risk resulting from continuous chemical exposure throughout the course of a 70-yr lifetime. In Table 5-4, cancer potency factors are expressed both as slope factors for inhalation and as RfD for oral intake. A cumulative excess cancer risk of 1.0E-06 indicates that less than one additional cancer would be expected to be observed in 1 million people exposed to the chemical as compared to the number of cancers observed in 1 million people not exposed to the chemical.

Critical variables used in the risk estimates included the exposed receptors, exposure frequency (days/year exposed), chemical concentrations at certain distances from the stacks, and inhalation rates of the exposed receptors. For this study, both onsite workers and offsite residents were assumed to be exposed to site-related compounds. Based on available information (RCRA Part B Application), the analysis assumed that the facility would operate 250 d/yr, which was used as the exposure frequency for both exposure scenarios. Based on EPA default parameters, workers were assumed to be breathing 20 m3 of air/d (greater activity) and residents 15 m3 of air/d (less activity).

To be conservative, the maximum modeled 24-hr average air concentrations using stable wind conditions were used as exposure point concentrations for the risk assessment of inhalation of ATG gasification and vitrification building emissions. The air modeling demonstrated that the peak air chemical concentrations were far below regulatory standards as shown in Tables 5-9 and 5-10. These values were used in the risk assessment. These maximum concentrations also were used for the worker scenario analysis.

Table 5-6
Comparison of Chemical Concentrations to Central Nervous System Depression Concentration Limits for Transport Truck Fire

Analyte (Threshold values are presented in mg/m^3)	Exposure (mg/m^3)	ERPG-1 (mg/m^3)	ERPG-2 (mg/m^3)	ERPG-3 (mg/m^3)
Solvent/Thinner Waste Stream				

Benzene[a]	MEI	2.2E+00	**Threshold Value**		
			7.80E+01	1.57E+03	3.13E+03
			Ratio of Exposure to ERPG[e]		
			2.8E-02	1.4E-03	6.9E-04
N-Butyl Alcohol[b]	MEI	1.1E+00	**Threshold Value**		
			7.50E+01	7.50E+02	7.50E+03
			Ratio of Exposure to ERPG		
			1.5E-02	1.5E-03	1.5E-04
2-Hexanone[c]	MEI	4.7E-01	**Threshold Value**		
			5.00E+01	5.00E+02	5.00E+03
			Ratio of Exposure to ERPG		
			9.4E-03	9.4E-04	9.4E-05
Petroleum/Coal Tar Derivatives					
Tridecane[d]	MEI	6.9E+00	**Threshold Value**		
			3.70E+01	1.45E+03	7.33E+03
			Ratio of Exposure to ERPG		
			1.9E-01	4.8E-03	9.4E-04
Total MEI ratios			2.4E-01	8.6E-03	1.9E-03

Notes:

ERPG = Emergency Response Planning Guideline values. (ERPG values were obtained from the Hanford Environmental Health Foundation.)

MEI = Maximally exposed individual

[a] Benzene used as a representative chemical for aromatic compounds.

[b] N-butyl alcohol used as a representative chemical for glycols/alcohols.

[c] 2-hexanone used as a representative chemical for aliphatics.

[d] Tridecane (similar to kerosene) used as a representative chemical for petroleum and coal tar derivatives.

[e] A ratio less than 1 indicates that the calculated exposure concentration is lower than the ERPG.

Because of uncertainties surrounding the release fractions for volatile or semi-volatile chemical compounds, exposure concentrations and ratios of exposure to ERPG threshold values were calculated using an airborne release fraction of 1.0 and a respirable release fraction of 1.0. The resulting ratio of exposure concentration to ERPG-3 would be an exceedence of 3.8. However, when the probability of the accident (6.8E-05) is taken into account the resulting risk would be 2.6E-04. The accident probability is based on a frequency of 1.3E-08/km, 160 trips, and 33 km/trip.

Table 5-7
Comparison of Chemical Concentrations to Corrosive/Irritant Concentration Limits for Transport Truck Accident

Analyte (Threshold values are presented in mg/m^3)		**Exposure Concentration (mg/m^3)**	**ERPG-1 (mg/m^3)**	**ERPG-2 (mg/m^3)**	**ERPG-3 (mg/m^3)**
Solvent/Thinner/Freon Waste Stream					
Methylene Chloride[a,c]	MEI	9.9E-01	**Threshold Value**		
			7.00E+02	3.48E+03	1.74E+04
			Ratio of Exposure to ERPG[f]		

			1.4E-03	2.8E-04	5.7E-05
Metals/Metal Salts Waste Stream					
Sodium Silicate[b]	MEI	1.4E-01	**Threshold Value**		
			5.80E+00	1.16E+02	2.90E+02
			Ratio of Exposure to ERPG		
			2.4E-02	1.2E-03	4.8E-04
Amine Waste Stream					
Ammonia[d]	MEI	2.9E-01	**Threshold Value**		
			1.70E+01	1.40E+02	6.80E+02
			Ratio of Exposure to ERPG		
			1.7E-02	2.1E-03	4.3E-04
Caustic (Acids/Bases) Waste Stream					
Sodium Hydroxide[e]	MEI	5.4E-01	**Threshold Value**		
			2.00E+00	4.00E+01	1.00E+02
			Ratio of Exposure to ERPG		
			2.7E-01	1.4E-02	5.4E-03
Total MEI Ratios			3.1E-01	1.7E-02	6.4E-03

Notes:

ERPG = Emergency response planning guideline values. (ERPG values were obtained from the Hanford Environmental Health Foundation.)

MEI = Maximally exposed individual

[a] Methylene chloride used as a representative chemical for chlorinated solvents.

[b] Sodium silicate used as a representative chemical for metals and metal salts.

[c] Methylene chloride used as a representative chemical for freon.

[4]Ammonia used as a representative chemical for amines.

[d] Sodium hydroxide used as a representative chemical for caustics.

[e] A ratio less than 1 indicates that the calculated exposure concentration is lower than the ERPG.

Because of uncertainties surrounding the release fractions for volatile or semi-volatile chemical compounds, exposure concentrations and ratios of exposure to ERPG threshold values were calculated using an airborne release fraction of 1.0 and a respirable release fraction of 1.0. The resulting ratio of exposure concentration to ERPG-3 would be an exceedence of 12.8. However, when the probability of the accident (6.8E-05) is taken into account, the resulting risk would be 8.7E-04. The accident probability is based on a probability of 1.3E-08/km, 160 trips, and 33 km/trip.

Table 5-8
Comparison of Chemical Concentrations to Toxic Concentration Limits for Transport Truck Accident

Analyte (Threshold values are presented in mg/m^3)	Exposure (mg/m^3)	PEL[a] (mg/m^3)	ERPG-1 (mg/m^3)	ERPG-2 (mg/m^3)	ERPG-3 (mg/m^3)
PCBs/Pesticides Waste Stream					
PCBs[a]	MEI	4.9E-01	**Threshold Value**		

			1.0 mg/m^3	NA	NA	NA
			Ratio of Exposure to ERPG			
			4.9E-01[b]	N/A	N/A	N/A
Total MEI Ratios			4.9E-01	N/A	N/A	N/A

Notes:

ERPG = Emergency Response Planning Guidelines. ERPG values were obtained from the Hanford Environmental Health Foundation. ERPG values have not been developed for PCBs.

MEI = Maximally exposed individual

NA = No ERPG values available.

N/A = Not applicable.

[a] PEL = Permissible Exposure Limit. The PEL is designed to be protective of workers who are chronically exposed to polychlorinated biphenyls (PCB) throughout their working lifetime. The PEL value was used instead of ERPGs because ERPG values for PCBs have not been developed. Typically, ERPG-1 guidelines are equivalent to PELs with ERPG-2 and ERPG-3 values being 10 to 1,000 times higher than the PELs. Consequently, acute exposure to PCBs under this accident scenario would not be expected to produce irreversible, toxic, or life-threatening health effects.

[b] Ratio of exposure to PEL.

Table 5-9 provides the analytical results, which show that modeled individual chemical concentrations corresponded to excess cumulative cancer risks of less than 1.0E-06 for both residential or worker scenarios. The highest excess cumulative cancer risk was found for worker exposure to acetaldehyde (1.34E-07).

Calculated hazard quotients are not shown in Table 5-9 because calculations showed these values to be extremely low. For example, the highest individual HQ calculated was for mercury and, as shown in the footnote to Table 5-9, is many times less than one. A hazard quotient equal to 0.25 is considered significant.

Qualitative Analysis. For a small subset of chemicals expected to be a component of the ATG gasification and vitrification facility emissions, quantitative analysis was not possible because of the lack of scientific evidence of their health effects. Measurements of these chemicals were compared to other health-based regulatory standards.

Regulations promulgated under the Washington Industrial Safety and Health Act (49.17 RCW) have established permissible exposure limits (PEL) to regulate workplace exposure to air contaminants (WAC 296-62-07515). The Benton County Clean Air Authority regulates air emission sources within Benton County but largely incorporates by reference the Washington State Department of Ecology (Ecology) regulations (WAC 173-400). Table 5-10 provides the results of this qualitative comparison. Again, the maximum chemical concentrations determined by air modeling were compared to the benchmark values. This is a conservative approach because actual onsite concentrations to which workers may be exposed would be much less than the values

Table 5-9
Human Health Risk from Inhalation of ATG Gasification and Vitrification Building Air Emissions

Worker	Site Conc. Worker/Resident ($\mu g/m^3$)	Inhalation SF $(\mu g/kg\text{-}d)^{-1}$	Oral RfD ($\mu g/kg\text{-}d$)	Resident RBSC-CA $\mu g/m^3$	Resident RBSC-NC $\mu g/m^3$	Worker RBSC-CA $\mu g/m^3$	CA Risk Resident	CA Risk
2-Me phenol	6.99E-06		0.05		794.89			
4-Me phenol	5.90E-06		0.005		79.49			
Acenapthalene	4.10E-06		0.03		476.93			
Acetaldehyde	6.40E-02	0.03		0.53		0.48	1.21E-07	1.34E-07
Acetophenone	3.00E-06		0.1		1589.78			
Benzoic acid	3.80E-04		4		63591.11			
Bis-(2-Ethylhexyl phthalate)	1.70E-02	0.014	0.02	1.14	317.96	1.02	1.50E-08	1.66E-08
Butyl Benzyl Phthalate	1.20E-04		0.2		3179.56			
Dibutyl Phthalate	3.40E-05		0.1		1589.78			
Dichlorbenzene	1.20E-06	0.11		0.14	0.00	0.13	8.30E-12	9.23E-12
Diethyl phthalate	1.50E-05		0.8		12718.22			
Dime Phthalate	2.40E-06		10		158,978			
Dioxins(Toxicity Equivalent)	1.60E-10	150,000		1.06E-07			1.51E-09	1.68E-09
Fluorene	2.90E-06		0.04		635.91			
Formaldehyde	1.30E-02	0.14	0.02	0.11	317.96	0.10	1.14E-07	1.27E-07
Napthalene	3.90E-05							
Nitrogen Oxides	2.30E-01							
Phenanthrene	4.90E-06		0.03		476.93			
Phenol	8.50E-05		0.6		9538.67			
Barium	1.00E-06		0.07		1112.84			
Cadmium	3.50E-07	37.85		4.20E-04			8.33E-10	9.26E-10
Copper	8.70E-07		0.04		588.22			
Mercury	3.35E-04				0.3			
Nickel	3.00E-06	2.8		0.01		0.01	5.28E-10	5.87E-10
Zinc	4.70E-06		0.3		4769.3333			
Total Cancer Risk							2.53E-07	2.81E-07

Notes:

Toxicity of dichlorobenzene based on benzene.

CA= Cancer; RBSC=Risk-Based Screening Concentration; Calculated using risk = 1.0E-05; HQ=0.25; NC= Noncancer; RfD= Reference Dose; SF= Slope Factor.

Hazard Quotient calculations not shown because of extremely low numbers (i.e., largest HQ [mercury]=1.0E-03.

Site concentrations are the maximum predicted concentrations downwind of the stacks. Site concentrations are based on modeling analyses assuming a waste feed rate of 150 lb/hr. The expected annual average feed rate for the Hanford Site LLMW will be 77.6 lb/hr over a 250-d work year.

conservative approach because actual onsite concentrations to which workers may be exposed would be much less than the values used for analysis. The results show that, for the chemicals examined, the maximum air chemical concentrations related to ATG emissions do not exceed PELs for worker exposure.

Table 5-10
Comparison Between ATG Airborne Site Chemical Concentrations and Regulatory Standards

Chemical	Site Conc.[a] $\mu g/m^3$	PEL $\mu g/m^3$	ASIL $\mu g/m^3$
Aluminum Oxide[b]	0.000009	5000	17
Aluminum[b]	0.00001	5000	33
Carbon Monoxide	0.14	55000	NA
Hydrochloric Acid	0.006	7000	7
Hydrogen Fluoride	0.0003	2500	8.7
Iron Oxide	0.000006	10000	NA
Lead	0.000004	50	0.5
Magnesium Oxide	0.0000007	15000	33
Naphthalene	0.00004	50000	170

Notes:

NA = Not Available.

[a] Based on highest predicted concentration as a conservative estimate.

[b] Respirable particle concentration.

5.2.2 Radioactive Waste Characteristics

A total of 90 radionuclides have been identified in the Hanford Site LLMW. Analyses of the radionuclide inventory have distinguished between fission products (primarily beta-gamma emitters) and actinides (primarily alpha emitters). Ninety-nine percent of the fission product curie content is contributed by 10 radioactive constituents. The inventory of mobile radionuclides includes carbon-14, iodine-129, selenium-79, technetium-99, and uranium isotopes. Total accumulated activity based on the list of fission products is 61.06 curies and total accumulated activity for the actinides is 144 curies (Leung 1996).

The radionuclides are present in the following waste matrices:

Dirt-Soil-Diatomaceous Earth	27%
Metal-Iron-Galvanized-Sheet	17%
Sludges	8%
Plastic-Polyurethane	8%
Absorbent-Kity Ltr-Vermiculite	8%
Oils	6%
Liquids	1%
Other	25%

5.2.3 Analysis Methodology

The following sections discuss the basic concepts and the methodology used in this environmental assessment report to calculate the impacts from normal operations and a credible worst-case accident scenario.

5.2.4 Radiation Limits

The effects on human beings of radiation emitted during the decay of a radioactive substance depends on the type of radiation and the total amount of radiation energy absorbed by the body. The total energy absorbed per unit quantity of tissue is referred to as absorbed dose. The absorbed dose, when multiplied by certain quality factors that take into account different sensitivities of various tissues, is referred to as effective dose equivalent, or simply dose. The unit of dose is the rem or mrem (1/1,000 rem).

The maximum annual allowable radiation dose to the members of the public from the NRC and State of Washington-licensed nuclear facilities is 100 mrem/yr (Subpart D of 10 CFR 20, WAC 246-227-060). The National Emissions Standards for Hazardous Air Pollutants (NESHAP) dose limit to an offsite individual from air emissions of radionuclides from the operation of Washington-licensed facilities is 10 mrem/yr (WAC 173-400-075). Annual worker limit is 5,000 mrem/yr (Subpart C of 10 CFR 20, WAC 246-221-010). The 100-mrem/yr limit on maximum allowable dose is consistent with DOE Order 5400.5 (DOE 1988) and the 5,000-mrem/yr limit on worker exposure is consistent with DOE Order 5480.11 (DOE 1988b). A limit of 5 rem/yr and 25 rem lifetime for a planned special exposure has been established by the DOE in 10 CFR 835.

The average individual in the U.S. receives a dose of about 360 mrem/yr from all sources combined, including natural and medical sources of radiation. A person must receive an acute (short-term) dose of 300,000 mrem before the probability of near-term death becomes high (National Council on Radiation Protection and Measurements 1971).

In addition to limits on dose, assessments of radiological health effects are expressed in terms of LCF that may be observed after the exposure. Radiological health effects for individuals are expressed as the estimated increase in probability that an individual will develop a fatal cancer as a result of a received dose. That increase in probability is referred to in this document as risk. Radiological health effects for populations near the

facility (within 80 km [50 mi]) are expressed as the increase in the LCF attributable to the received dose.

Risk from normal operations and accident scenario was calculated using the following formula:

Risk = Frequency x Dose (person-rem) x Dose-to-Risk Conversion Factor (LCF/person-rem)

Normal operations are assigned a frequency of 1; which means that they are always expected to occur. The frequency of exposure resulting from an accident is estimated for each accident scenario. The dose-to-risk conversion factor was discussed earlier in the presentation of transportation impacts.

5.2.5 Dose Assessment For Airborne Releases

Airborne effluents would be the only releases to the environment from the operation of the ATG gasification and vitrification building. Table 5-11 presents the anticipated annual facility emissions for radionuclides. These are evaluated using the GENII computer code developed at the Pacific Northwest National Laboratory. The code implements the internal dosimetry models recommended by the International Commission on Radiological Protection in Publications 26 and 30. Committed effective dose equivalent from internal exposure is calculated in the code by applying weighting factors for the various body organs. The total effective dose equivalent is then the sum of the effective dose equivalent from external exposure and the committed effective dose equivalent from internal exposure.

Table 5-11
Summary of Radiological Facility Emissions

Radionuclide	Annual Facility Emission (Curies)
H-3	2.6
C-14	3.7E-03
S-35	6.4E-05
Sr-90	3.8E-07
I-129	1.6E-05
I-125	1.5E-08
Cs-137	4.1E-07
Th-232	1.0E-11
Th-228	2.1E-09
U-235	7.9E-11
U-238	8.4E-12

Np-237	1.3E-10
Pu-238	3.4E-08
Pu-240	2.5E-09
Pu-241	2.0E-06
Am-241	3.3E-08
Pu-239	1.1E-08
Source: Summarized from Leung (1996).	

GENII is used to evaluate doses resulting from two general scenarios: airborne release from normal operations, and a worst-case credible accident scenario. The code uses the Gaussian plume model for air dispersion and accounts for the release height.

Radiation doses from airborne releases are calculated for the following receptors:

- Population: All members of the public who live within 80 km (50 mi) of the ATG gasification and vitrification building
- Worker: A facility worker at 100 m from the release point
- Maximally Exposed Individual (MEI): A hypothetical member of the general public living near the site boundary and receiving the maximum exposure as a result of releases from the normal operation scenario or the accident scenario. A child dose scenario was analyzed as part of the SEPA EIS for a childcare center located 2 km (1.25 mi) to the east-southeast (see Section 5.10).

Atmospheric releases are considered through the following pathways:

- External exposure from immersion in the plume
- External exposure from the plume
- Internal exposure from inhalation of radionuclides in the plume
- Internal exposure from previously-deposited radioactive material resuspended in air due to wind actions (inhalation)
- Internal exposure from the ingestion of food crops and animal products. (This pathway is not considered for workers).

For chronic releases, average meteorological data are used. Average meteorological conditions are a time-weighted average composite of possible combinations of meteorological conditions. These data sets are generated by the APPRENTI module of the GENII code for specific applications of different analysis models. The Hanford Site 300 Area population and meteorological data within a 80-km (50-mi) radius is used for the analysis. A business located 800 m (2,624 ft) away was used as the location for the maximally exposed individual. A 30-yr food uptake is used for all scenarios.

5.2.6 Normal Operations Analyses

A series of GENII cases was performed for a 10-yr period of normal operations for evaluating the dose for a worker and the MEI member of the public. The Hanford Site 300 Area joint frequency meteorological file was used.

Table 5-12 presents the results of the dose and risk analysis for the population that lives within 80 km (50 mi) of the ATG gasification and vitrification building. The GENII calculations predict that releases over a 10-yr period of operations will result in a cumulative dose to the population of 0.0095 person-rem, or an approximate average individual dose of 0.000034 mrem based on a population of 281,600. The number of excess LCF expected in this population as a result of 10 yr of normal operation is 0.000047, a number too low to be observed.

The calculated doses presented do not take credit for the effects of the ceramic filters. Adding the effects of filtering mechanisms would further reduce the dose and risk from radionuclide emissions.

Table 5-12
Population Radiological Exposures Resulting from 10 yr of Normal Processing of Hanford Site Waste

	Cumulative Dose person-rem	Maximum Annual Dose person-rem	Number of Latent Cancer Fatalities	Controlling Nuclide	Controlling Pathway
Offsite population within 80 km	**0.0095**	**0.00093**	0.000047	H-3	Ingestion

Source: Leung 1996.

Table 5-13 contains the results of the analyses, which show that the MEI member of the public would receive 0.0018 mrem from 10 yr of facility operations, or an average 0.00018 mrem/yr. This cumulative dose is less than 0.02% of the EPA regulatory limit of 10 mrem/yr (Subpart I of 40 CFR 61) and less than 0.002% of the annual limit for total radiological exposure of 100 mrem/yr (10 CFR 20 Subpart D). The controlling pathway for the public doses is ingestion of food products grown locally, and the controlling nuclide is H-3.

The calculated dose for workers at 100 m is 0.00017 mrem after 10 yr. This dose is less than 0.000004% of the regulatory limit of 5,000 mrem/yr for occupational exposure (10 CFR 20 Subpart C).

Table 5-13
Radiological Exposures to the Public and Worker Resulting from Effluents Resulting from Processing of Hanford Site Waste

	Total Effective Dose Equivalent in mrem	Risk of Fatal Cancer	Controlling Nuclide	Controlling Pathway	Risk of Fatal Cancer

MEI—Public at 800 m	0.0018	9.0E-10	H-3	Ingestion	9.0E-10
MEI—Worker at 100 m	0.00017	6.0E-11	H-3	Inhalation	6.0E-11

Notes:

1. Site 300 Joint frequency files are used. Site 300 data are representative of Richland meteorology.
2. MEI Public is calculated to be at 800 m from release point.
3. Worker is calculated at a distance of 100 m from the release point for all sectors. The sector with the highest dose is evaluated with all radionuclides.
4. The above dose computes total exposure from both beta and alpha-emitting radionuclides.
5. Operation assumed to continue for 10 yr. Uptake by residents is assumed to continue for a period of 30 yr after operation shutdown.
6. Fatal Cancer Risk = Frequency (equal to 1.0) x Dose in rem x 5.0E-04 fatal cancer per rem (ICRP-60 conversion factor) for the public if dose is less than 20 rem. For worker, the factor is 4.0E-04 fatal cancer per rem.

MEI Public—Assumptions

1. 30 yr of food intake.
2. Release ends after 10 yr.
3. Finite plume, ground and recreation external, inhalation uptake, terrestrial foods ingestion, animal product ingestion, and inadvertent soil ingestion all considered.

Worker—Assumptions

1. Intake, if any, ends after 10 yr.
2. Annual number of hours of exposure to plume and ground contamination is 2,000.
3. Same sector as the MEI public calculation.
4. Exposure pathways considered are finite plume, ground external, and inhalation uptake.

Source: Leung 1996.

The above doses are those attributable to the ATG gasification and vitrification treatment of Hanford Site LLMW. This waste would account for 1/3 to 1/6 the ATG gasification and vitrification building processing capability. Total doses from the facility with the possible addition of a second ATG gasification and vitrification unit, may be six times those presented above, still far below regulatory limits.

The annual doses to the maximally exposed offsite individual from routine emissions (0.00018 mrem) would be less than 0.002% of the 10-mrem/yr limit to members of the public for airborne emissions and less than 0.0002% of the 100-mrem/yr total limit (maximum annual allowable to the members of the public). The hypothetical maximum occupational dose from routine ATG gasification and vitrification building emissions is an even smaller fraction of the 5,000-mrem/yr regulatory limit for workers. Several conservative assumptions were made in performing the dose assessment, and it is likely that actual doses would be substantially lower than estimated.

Annual occupational doses from direct exposure to penetrating radiation resulting from operations may be inferred from the annual doses received from waste processing at the existing ATG low-level radioactive processing facility. That facility operates under a Radioactive Material License stipulating the types and quantities of radioactive material that can be received and processed. The ATG gasification and vitrification building will operate under similar licensing requirements and process waste with similar radiological

characteristics. Average annual doses from penetrating radiation measured by thermoluminescent dosimeters to ATG process operators is approximately 200 mrem.

Assuming that 1/4 of the waste processed at the ATG gasification and vitrification building originates from the Hanford Site, the annual worker dose from exposure to the Hanford Site LLMW would be 50 mrem. Ten years of operations would result in a cumulative dose of approximately 500 mrem. The facility is estimated to employ approximately 30 process operators. The collective dose to the workforce from 10 years of operations would be 15 person-rem with an LCF risk of 6E-03.

5.2.7 Accident Scenario Analyses

The bounding facility accident identified in a preliminary hazards analysis (PHA) for the MWF operations is a potential fire in the waste storage area. The operational accidents evaluated in the PHA included a potential waste storage fire, breached process chamber, and filter failure (Jacobs 1998). The bounding or worst-case facility accident, a fire in the waste storage area, is presented in this section. The other operational accidents evaluated in the PHA would be less severe (i.e., lower consequences) than the waste storage area fire.

LLMW would be transported by truck from the Hanford Site to the ATG MWF and stored before treatment. This accident scenario assumes that a major facility fire ignites the containerized waste stored in the facility, resulting in the release of radiological and toxicological contaminants.

Radiological Risk

The following assumptions and parameters were used in calculating the radiological health impacts to the various receptors:

- Radiological inventory involved in the accident is the maximum allowable license limit from ATG's license application to Washington Department of Health. In addition to the nuclides specified in the license strontium-90 and cesium-137 are included as unspecified nuclides with limits of 2 Ci (ATG 1998).
- Amount of waste released in the fire or the damage ratio = 50% (WHC 1993)
- Release fraction for a fire = 5.0 E-04 (DOE 1994) with the exception of tritium and carbon (release fraction of 1.0) and Iodine (release fraction of 1.5E-01).
- Waste burns for one hour (conservative assumption made to support modeling of airborne contaminant concentrations)
- Atmospheric dispersion coefficients provided as input for GENII were generated with the GXQ computer code.
- In the event of an accident, interdiction was assumed; therefore, ingestion was not included in the radiological dose.

Radiation doses from the source term listed in Table 5-14 were computed with the GENII code (Napier et al. 1988). The LCF risk to the designated receptors as a result of the accident scenario is presented in Table 5-15.

Table 5-14
Source Term for Waste Storage Fire

Isotope	Inventory (Ci)	Damage Ratio	Release Fraction	Source Term (Ci)
H-3	3.0E+01	50%	1.0E+00	1.5E+01
C-14	5.0E+00	50%	1.0E+00	2.5E+00
S-35	5.0E+00	50%	5.0E-04	1.3E-03
Co-60	1.0E+01	50%	5.0E-04	2.5E-03
Sr-90	2.0E+00	50%	5.0E-04	5.0E-04
I-129	2.5E-01	50%	1.5E-01	6.3E-05
Cs-137	2.0E+00	50%	5.0E-04	5.0E-04
Pb-210	5.0E-01	50%	5.0E-04	1.3E-04
Pu-238	1.0E-02	50%	5.0E-04	2.5E-06
Pu-241	9.0E-02	50%	5.0E-04	2.3E-05

Table 5-15 Radiological Risk for Waste Storage Fire

Receptor	Dose (rem EDE)	LCF Risk	Probability	LCF Point Estimate Risk
Involved Worker MEI[b]	1.2E+00	4.8E-04	1.0E-06	4.8E-10
Noninvolved Worker MEI	2.5E-03	1.0E-06	1.0E-06	1.0E-12
Noninvolved Worker Population	5.0E-01[a]	2.0E-04	1.0E-06	2.0E-10
General Public MEI	2.5E-03	1.3E-06	1.0E-06	1.3E-12
General Public Population	1.4E+00[a]	7.0E-04	1.0E-06	7.0E-10
Childcare MEI	1.2E-04	6.0E-08	1.0E-06	6.0E-14

Notes:

[a] Population dose would be in units of person-rem EDE.

[b] The involved worker doses are highly conservative. The analysis is based on a 10-min. exposure duration and does not take credit for personal protective equipment or emergency response actions. Involved worker population dose would equal the number of involved workers times the involved worker MEI dose assuming the involved workers would receive the same dose as the involved worker MEI.

Noninvolved worker population dose conservatively assumes all workers (200 workers) receive Noninvolved worker MEI dose.

Chemical Risk from Waste Storage Fire

The chemical health hazards associated with a waste storage fire are dependent on the severity of the accident, nature of the chemicals, local population density, and the weather conditions.

The following assumptions and parameters were used in calculating the chemical concentrations within a 10-m (33-ft) radius of the accident:

- Waste in storage facility = 512 m^3 (volume that would be processed in 1 year or 10% of total volume).
- Total volume of waste to be treated = 5,120 m^3 (180,800 ft^3)
- Waste density = 347 kg/m^3 (21.7 lb/ft^3)
- Total weight of the hazardous chemical constituents = 14,917 kg (32,900 lb) (City of Richland 1998)
- Amount of waste released in the fire = 50% (WHC 1993)
- Release fraction for a fire = 5.0 E-04 (DOE 1994)
- The material released is assumed to spread instantaneously and uniformly over a hemisphere 10 m (33 ft) in radius. The MEI is assumed to be located at the center of the hemisphere.

The weight of the total waste to be treated is calculated to be 1,776,640 kg (5,120 m^3 × 347 kg/m^3) and the weight of the waste to be treated in storage is calculated to be 177,664 kg (512 m^3 × 347 kg/m^3); therefore, the ratio of hazardous chemical in the storage facility was calculated as follows:

$$\frac{\text{Hazardous chemicals in storage}}{\text{177,664 kg waste in storage}} = \frac{\text{14,917 kg hazardous chemicals total}}{\text{1,776,640 kg total waste}}$$

Hazardous chemicals in storage = 1,492 kg (3,290 lb)

The chemical concentration within a 10-m (33-ft) hemisphere is calculated using the following equation:

$$C(mg/m^3) = [Q\ (kg)] \times (3/2\pi\ r^3) \times (1.0\ E{+}06\ mg/kg)$$

Where:

C = Concentration
Q = Respirable quantity released
Q = (Storage inventory) × (50% released in fire) × (respirable release fraction)
r = Assumed 10 m (33 ft) radius for distribution of source.

Therefore:

$C = (1{,}492\ kg) \times (50\%) \times (5.0\ E\text{-}04) \times (4.77E\text{-}04/m^3) \times (1.0\ E{+}06\ mg/kg) = 178\ mg/m^3$

The chemical inventory involved in a storage fire was based on a breakdown of the Hanford Site LLMW by hazardous and toxic material constituents (City of Richland 1998). The chemicals were sorted into chemical classes and representative chemicals from each chemical class were selected that would best represent the class. The chemical classes and the weight of each class are as follows:

- Solvents/thinners/glycols/glycol ethers (3,881 kg [8,560 lb])
- Metals/metal salts/pigments (1,666 kg [3,670 lb])
- Resins/plastics/polymers (70 kg [150 lb])
- Caustics (406 kg [895 lb])
- Petroleum/coal tar derivatives (5,656 kg [12,470 lb])
- Pesticides/herbicides/PCBs (517 kg [1,140 lb])
- Freons (37 kg [82 lb])
- Amines (241 kg [530 lb])
- Other (2,441 kg [5,380 lb]) is comprised of water and additives (e.g., food additives, antioxidants) and would have no acute health impacts.

The solvents, thinners, glycols, and glycol ethers represent 26% (3880.87 kg/ 14,917.36 kg) of the total hazardous chemicals. At 10 m (33 ft), the air concentration of the solvent waste stream would be 46.3 mg/m^3 (178 mg/m^3 × 26%). The total solvent waste stream was estimated to have the following composition:

- Aromatic solvents = 46%
- Chlorinated solvents = 20%
- Glycols/glycol ethers/alcohols = 24%
- Aliphatics = 10%.

Each of the solvent components would have the following air concentrations

- Aromatic solvents = 21.3 mg/m^3 (46.3 mg/m^3 × 46%)
- Chlorinated solvents = 9.26 mg/m^3 (46.3 mg/m^3 × 20%)
- Glycols/glycol ethers/alcohols = 11.1 mg/m^3 (46.3 mg/m^3 × 24%)
- Aliphatics = 4.63 mg/m^3 (46.3 mg/m^3 × 10%).

Metals/metal salts represent 11% (1665.97 kg/14,917.36 kg) of the total hazardous chemicals. The air concentration of the metal waste stream would be 19.6 mg/m^3 (178 mg/m^3 × 11%). Approximately 93% of the waste stream would be particulate material (City of Richland 1998) with no acute health impacts. Assuming that the remaining 7% is equivalent to sodium silicate, the air concentration of sodium silicate would be 1.37 mg/m^3 (19.6 mg/m^3 × 7%). Resins/plastics represent 0.47% (70.17 kg/14,917.36 kg) of the total hazardous chemicals. At 10 m (33 ft), the air concentration of the resins/plastics waste stream would be 0.84 mg/m^3 (178 mg/m^3 × 0.47%). However, resins/plastics are inert and nontoxic for acute exposure and would not result in acute health impacts.

Caustics represent 3% (406.15 kg/14,917.36 kg) of the total hazardous chemicals. The air concentration of caustics would be 5.34 mg/m^3 (178 mg/m^3 × 3%). The entire air concentration of caustics conservatively was assumed to be represented by sodium hydroxide.

The petroleum/coal tar waste stream represents 38% (5,657.9 kg/ 14,917.36 kg) of the total hazardous chemicals. The air concentration of this waste stream would be 67.6 mg/m^3 (178 mg/m^3 × 38%). The entire air concentration of the petroleum/coal tar waste stream conservatively was assumed to be represented by tridecane (similar to kerosene). PCBs/pesticides represent 3% (516.88 kg/14.917.36 kg) of the total hazardous chemicals and is comprised almost entirely of PCBs. The air concentration of PCBs would be 5.34 mg/m3 (178 mg/m3 × 3%). Freons represent 0.25% (37.45 kg/14,917.36 kg) of the total hazardous chemicals. The air concentration of freons would be 0.45 mg/m3 (178 mg/m3 × 0.25%). The entire air concentration of freons was assumed to be represented by the chlorinated solvent methylene chloride.

The amine waste stream represents 1.6% (240.71 kg/14,917.36 kg) of the total hazardous chemicals. The air concentration of this waste stream would be 2.85 mg/m3 (178 mg/m3 × 1.6%). The entire air concentration of amines conservatively was assumed to be represented by ammonia.

The air concentrations of the chemical classes are compared to the ERPGs in Table 5-16 (central nervous system depression concentration limits), Table 5-17 (corrosive/irritant concentration limits), and Table 5-18 (toxic concentration limits). As shown in these tables, the accident would not result in any anticipated fatalities or the development of irreversible or serious health effects or the development of mild transient adverse effects.

5.3 MIXED WASTE STORAGE

Waste storage is limited to the physical capacity of containers and facilities as well as by regulatory permit capacities and time limits. RCRA Part B-permitted (or RCRA Interim Status) storage facilities are limited by land disposal restrictions (LDR) of 40 CFR 268. Untreated mixed waste may not be land disposed. For mixed waste, storage is limited to 1 yr (40 CFR 268.50[c]). RCRA allows for temporary extensions resulting from unforeseen problems, with proper approval.

Table 5-16
Comparison of Chemical Concentrations to Central Nervous System Depression Concentration Limits for Waste Storage Fire

Analyte (Threshold values are presented in mg/m^3)		Exposure (mg/m^3)	ERPG-1 (mg/m^3)	ERPG-2 (mg/m^3)	ERPG-3 (mg/m^3)
Solvent/Thinner Waste Stream					
			Threshold Value		
Benzene[a]	MEI	2.13E+01	7.80E+01	1.57E+03	3.13E+03
			Ratio of Exposure to ERPG[e]		

			2.73E-01	1.36E-02	6.81E-03
N-Butyl Alcohol[b]	MEI	1.11E+01	**Threshold Value**		
			7.50E+01	7.50E+02	7.50E+03
			Ratio of Exposure to ERPG		
			1.48E-01	1.48E-02	1.48E-03
2-Hexanone[c]	MEI	4.63E+00	**Threshold Value**		
			5.00E+01	5.00E+02	5.00E+03
			Ratio of Exposure to ERPG		
			9.26E-02	9.26E-03	9.26E-04
Petroleum/Coal Tar Derivatives					
Tridecane[d]	MEI	6.76E+01	**Threshold Value**		
			3.70E+01	1.45E+03	7.33E+03
			Ratio of Exposure to ERPG		
			1.83E+00	4.66E-02	9.22E-03
Total MEI ratios			2.34E+00	8.43E-02	1.84E-02

Notes:

ERPG = Emergency Response Planning Guideline values. (ERPG values were obtained from the Hanford Environmental Health Foundation.)

MEI = Maximally exposed individual

[a] Benzene used as a representative chemical for aromatic compounds.

[b] N-butyl alcohol used as a representative chemical for glycols/alcohols.

[c] 2-hexanone used as a representative chemical for aliphatics.

[d] Tridecane (similar to kerosene) used as a representative chemical for petroleum and coal tar derivatives.

[e] A ratio less than 1 indicates that the calculated exposure concentration is lower than the ERPG.

Because of uncertainties surrounding the release fractions for volatile or semi-volatile chemical compounds, exposure concentrations and ratios of exposure to ERPG threshold values were calculated using an airborne release fraction of 1.0 and a respirable release fraction of 1.0. The resulting ratio of exposure concentration to ERPG-3 would be an exceedence of 36.8. However, when the probability of the accident (1.0E-06) is taken into account, the resulting risk would be 3.68E-05.

Table 5-17
Comparison of Chemical Concentrations to Corrosive/Irritant Concentration Limits for Waste Storage Fire

Analyte (Threshold values are presented in mg/m^3)	**Exposure Concentration (mg/m^3)**	**ERPG-1 (mg/m^3)**	**ERPG-2 (mg/m^3)**	**ERPG-3 (mg/m^3)**
Solvent/Thinner/Freon Waste Stream				
Methylene Chloride[a, c]	MEI	9.7E+00	**Threshold Value**	
			7.00E+02	3.48E+03	1.74E+04
			Ratio of Exposure to ERPG[f]		
			1.4E-02	2.8E-03	5.6E-04
Metals/Metal Salts Waste Stream					
Sodium Silicate[b]	MEI	1.4E+00	**Threshold Value**		

			5.80E+00	1.16E+02	2.90E+02
			Ratio of Exposure to ERPG		
			2.4E-01	1.2E-02	4.7E-03
Amine Waste Stream					
Ammonia[d]	MEI	2.9E+00	**Threshold Value**		
			1.70E+01	1.40E+02	6.80E+02
			Ratio of Exposure to ERPG		
			1.7E-01	2.0E-02	4.2E-03
Caustic (Acids/Bases) Waste Stream					
Sodium Hydroxide[e]	MEI	5.3E+00	**Threshold Value**		
			2.00E+00	4.00E+01	1.00E+02
			Ratio of Exposure to ERPG		
			2.7E+00	1.3E-01	5.3E-02
Total MEI Ratios			3.1E+00	1.7E-01	6.3E-02

Notes:

ERPG = Emergency response planning guideline values. (ERPG values were obtained from the Hanford Environmental Health Foundation.)

MEI = Maximally exposed individual

[a] Methylene chloride used as a representative chemical for chlorinated solvents.

[b] Sodium silicate used as a representative chemical for metals and metal salts.

[c] Methylene chloride used as a representative chemical for freon.

[d] Ammonia used as a representative chemical for amines.

[e] Sodium hydroxide used as a representative chemical for caustics.

[f] A ratio less than 1 indicates that the calculated exposure concentration is lower than the ERPG.

Because of uncertainties surrounding the release fractions for volatile or semi-volatile chemical compounds, exposure concentrations and ratios of exposure to ERPG threshold values were calculated using an airborne release fraction of 1.0 and a respirable release fraction of 1.0. The resulting ratio of exposure concentration to ERPG-3 would be an exceedence of 126. However, when the probability of the accident (1.0E-06) is taken into account, the resulting risk would be 1.26E-04.

Table 5-18
Comparison of Chemical Concentrations to Toxic Concentration Limits for Waste Storage Fire

Analyte (Threshold values are presented in mg/m^3)	**Exposure (mg/m^3)**	**PEL[b] (mg/m^3)**	**ERPG-1 (mg/m^3)**	**ERPG-2 (mg/m^3)**	**ERPG-3 (mg/m^3)**
PCBs/Pesticides Waste Stream					
PCBs[a]	MEI	5.3E+00	**Threshold Value**		
			1.0 mg/m^3	NA	NA	NA
			Ratio of Exposure to ERPG		
			5.3E+00	N/A	N/A	N/A
Total MEI Ratios			5.3E+00	N/A	N/A	N/A

Notes:

ERPG = Emergency Response Planning Guidelines. ERPG values were obtained from the Hanford Environmental Health Foundation. ERPG values have not been developed for PCBs.

MEI = Maximally exposed individual

NA = No ERPG values available.

N/A = Not applicable.

[a] PEL = Permissible Exposure Limit. The PEL is designed to be protective of workers who are chronically exposed to polychlorinated biphenyls (PCB) throughout their working lifetime. The PEL value was used instead of ERPGs because ERPG values for PCBs have not been developed. Typically, ERPG-1 guidelines are equivalent to PELs with ERPG-2 and ERPG-3 values being 10 to 1,000 times higher than the PELs. Consequently, acute exposure to PCBs under this accident scenario would not be expected to produce irreversible, toxic, or life-threatening health effects.

[b] Ratio of exposure to PEL.

The ATG gasification and vitrification building would treat approximately 500 m^3 (650 yd^3) of the Hanford Site LLMW annually. Waste with the incinerator (INCIN) treatment code, such as PCB waste, would be stored in the mixed-waste storage building, along with other waste. Except possibly for bulk soil contaminated with PCBs, most PCB waste would be stored in the containerized waste storage area. The ATG mixed-waste storage building would be managed in compliance with an approved spill prevention, control, and countermeasures (SPCC) plan, employing secondary containment, physical barriers between incompatible waste, and routine inspections. The ATG mixed-waste storage building would have the capacity to store approximately 1,020 m^3 (1,330 yd^3) of untreated RCRA waste and 45 m^3/60 yd^3) of untreated TSCA waste (ATG 1998a).

5.3.1 Hazardous Chemical Storage

Hazardous chemical storage within the ATG gasification and vitrification building would be limited to the amounts required to support daily operations, which in the care of hazardous waste, is equivalent to 1 to 3 d of processing. The reagent storage area and chemical handling procedures are designed to allow safe and effective operational access to the hazardous chemicals and to reduce impacts resulting from spills. Safety measures for acids and bases prevent vapor or liquid contact with skin, eyes, and mucous membranes. Physical barriers will separate oxidizers and flammables/combustibles. Other controls will include secondary containment, temperature controls, and ventilation. Storage of hazardous chemicals will be in accordance with Occupational Safety and Health Administration (OSHA) requirements and the SPCC plan.

5.4 SEISMIC HAZARDS

The facility will be designed to meet or exceed uniform building code design standards for Seismic Zone 3. Such standards for wind forces generally are more stringent than Seismic Zone 3 requirements for the facility because they require the structure to withstand up to 113 km/h (70 mi/h) winds. Tanks and containers of liquids will be

secured, to the extent feasible, to prevent overturning in a seismic event. Spill control measures are described in Section 5.3.

5.5 WATER RESOURCES

The 200 West Area, the ATG gasification and vitrification building site and the transport route are not located within a flood-prone area.

The ATG gasification and vitrification building will be equipped with a secondary spill containment system, described in Section 2.4. This system will prevent spills from impacting surface or ground water.

The secondary containment system would have to fail for liquid waste to be released to the environment. In the unlikely event that such a failure occurred in conjunction with a hazardous materials spill, a portion of the spill could be released to the ground surface. In that event, normal hazardous material spill recovery procedures would be implemented to control and remediate the spilled material.

The ATG gasification and vitrification building will be equipped with wet scrubbers to process the secondary waste from the syngas processing as described in Section 2.4.2. During the second-stage syngas processing, the supernatant liquid produced from the scrubber bottom would be recycled and reused in the scrubbing process. Sorbent injection and scrubber liquid discharge lines would be equipped with devices to prevent syngas backflow.

This process would ensure no liquid discharges would be allowed to enter the sanitary sewer or environment, via liquid discharge, from the ATG gasification and vitrification building.

5.6 BIOLOGICAL RESOURCES

No threatened or endangered species are known to exist or suspected to be present at the proposed ATG site, and no ground-disturbing activities are planned at the 200 West Area as part of this action. Therefore, no effects on such species are anticipated. During a wildlife survey conducted in 1989 at an area less than 1 mi from the proposed project location, no threatened or endangered species were encountered. Activities related to the proposed action at the 200 West Area primarily involve loading and unloading of waste, which should not adversely affect the relatively few threatened or endangered species found at the Hanford Site. Neither wetlands nor sensitive habitats would be affected by the proposed action.

Existing roads would be used to transport waste to and from the 200 West Area. Risk to wildlife species from truck collisions would be minimal because few transport trips are expected.

Therefore, no effects on wildlife or vegetation, including threatened and endangered species, are expected to occur from waste transport.

5.7 CULTURAL RESOURCES

A cultural resources review was part of the siting process for the ATG gasification and vitrification building conducted by Ecology (Appendix E). This review found that the ATG gasification and vitrification building is not located within an archeological or historic site (Appendix E). If cultural resources are discovered during operation of the ATG gasification and vitrification building, activities that may disrupt these resources should be stopped and appropriate cultural resource agencies contacted.

5.8 SOCIOECONOMIC IMPACTS

No additional employees would be required at the Hanford Site 200 West Area. Approximately 30 to 50 employees would be added by ATG to operate the gasification and treatment building. With an estimated population of approximately 200,000 in the 2-county area, the addition of this number of jobs would be expected to have a minor effect on the economy of the area.

5.9 ENVIRONMENTAL JUSTICE

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-income Populations, directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs and activities on minority and low-income populations. The following analysis was guided by the procedures set forth in the EPA Draft Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses (EPA 1996) and CEQ Guidelines for Addressing Environmental Justice under the National Environmental Policy Act (CEQ 1998). CEQ and EPA guidance for identifying disproportionately high and adverse effects on low-income and/or minority populations is evaluated in terms of environmental effects and health effects described as follows.

Environmental Effects. When identifying disproportionately high and adverse environmental impacts to minority and/or low-income populations, the following factors should be considered:

- Whether there is or will be an impact on the natural or physical environment that significantly (as employed by NEPA) and adversely affects a minority or low-income population. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities or low-income communities when those impacts are interrelated to impacts on the natural or physical environment
- Whether environmental effects are significant (as employed by NEPA) and are or may be having an adverse impact on minority populations that appreciably

exceeds or is likely to appreciably exceed those in the general population or other appropriate comparison group
- Whether the environmental effects occur or would occur in a minority population or low-income population affected by cumulative or multiple adverse exposures from environmental hazards.

Health Effects. When identifying disproportionately high and adverse health impacts to minority and/or low-income populations, the following factors should be considered:

- Whether the health effects, which may be measured in risks and rates, are significant (as employed by NEPA), or above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death
- Whether the risk or rate of hazard exposure by a minority population or low-income population to an environmental hazard is significant (as employed by NEPA) and appreciably exceeds or is likely to appreciably exceed those in the general population or other appropriate comparison group
- Whether health effects occur in a minority population or low-income population affected by cumulative or multiple adverse exposures from environmental hazards.

The analysis in this EA indicates that implementation of the proposed action would not result in significant impacts to the environment or to human health. Impacts would be minimal to both the offsite population and potential workforce for normal operations and accident scenario conditions. The closest identified low-income communities in Benton and Franklin Counties are located at least 8 km from the ATG gasification and vitrification building. The maximally exposed public individual would be within 800 m (2,624 ft) of the facility, and the effects are not above thresholds for human health protection. Impacts to populations from transport of the waste would be minimal because the transportation route to and from the 200 West Area has been used in the past to transport radioactive waste similar to that of the proposed action. It follows that there would not be disproportionately high or adverse impacts to minority or low-income populations.

5.10 PROTECTION OF CHILDREN FROM ENVIRONMENTAL HEALTH RISKS

Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks (62 Federal Register [FR] 19885), states that each federal agency shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children and ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. Environmental health risks and safety risks are risks to health or safety attributable to products or substances with which the child is likely to come into contact or ingest.

The closest child receptor is a childcare center located approximately 2 km (1.25 mi) to the east-southeast of the ATG gasification and vitrification building (City of Richland 1998). As described under Environmental Justice, the maximally exposed public individual would be within 800 m (2,624 ft) of the facility, and the effects are not above thresholds for human health protection. Impacts to populations from transport of the waste also would be minimal. Therefore, there would not be disproportionately high or adverse impacts to children.

5.11 CUMULATIVE IMPACTS

This section describes potential impacts associated with implementing the proposed action. In addition to treating LLMW from DOE's Hanford Site, the ATG mixed-waste facility would treat commercial waste from commercial generators. DOE waste and commercial waste would be treated in separate campaigns to accommodate disposal requirements. The cumulative effects of these two waste streams would not be greater on an annual basis than the impacts presented in Section 2.0 of the SEPA EIS for Treatment of Low-Level Mixed Waste (City of Richland 1998) because those impacts were based on operating the mixed-waste facility at full capacity throughout the year.

In addition to ATG waste treatment activities, there are other nuclear and industrial facilities with air emissions or direct radiation exposure near the Hanford Site that potentially could contribute to the impacts described for the proposed action. These facilities include a commercial nuclear power plant (Washington Public power Supply System Plant 2), a nuclear fuel production plant (Siemens Power Corporation), and a food processing facility (Lamb-Weston). Current DOE planning includes constructing and operating treatment plants for high-level tank waste on the Hanford Site.

5.11.1 Radiation

The potential cumulative radiological impacts from routine operations are shown in Table 5-19. The dose information provided for the combined commercial sources and the sources on the Hanford Site are based on the 1996 Hanford Site Environmental Report (PNNL 1997a). The dose resulting from thermal treatment of Hanford Site LLMW is based on the analysis results presented in Section 5.2.6. Because the receptor locations associated with these doses are not the same, the doses are not completely additive. However, if the doses were to be added, the combined dose of 0.09 mrem/yr is less than 1% of the EPA standard of 10 mrem/yr through the air pathway.

Table 5-19
Involved and Noninvolved Worker and General Public Annual Radiological Risk From Routine Operations

Receptor	Annual Dose EDE (mrem/yr)

Offsite MEI from combined commercial sources[a]	0.05
Offsite MEI from Hanford operations	0.007
Offsite MEI from diffuse Hanford sources	0.03
Offsite MEI from thermal treatment of Hanford Site LLMW	0.00018

Notes:

EDE = Effective dose equivalent.

LCF = Latent cancer fatality.

MEI = Maximally exposed individual.

[a] Commercial sources at or near the Hanford Site include: US Ecology, Washington Public Power Supply System, Siemens Power Corporation, Allied Technology Group (low-activity radioactive waste treatment facility), and PN Services.

Source: PNNL 1997a.

Cumulative population doses were evaluated in the ATG SEPA EIS (City of Richland 1998). The total population dose from the ATG facility was estimated at 7.8E-02 person-rem/year, which included the existing low-level waste treatment operations and operation of the proposed MWF at maximum-design capacity. The annual population dose from the nearby Washington Public Power Supply System Plant No. 2 is 0.7 person-rem/year (PNNL 1997a). The population dose from Hanford Site operations during 1996 was 0.2 person-rem (PNNL 1997a). The population dose calculated for the proposed action analyzed in this EA was 9.3E-04 person-rem/year. The incremental increase resulting from the proposed action would result in an increase in the annual population dose of approximately 0.1%.

The routine radiological dose from the MWF and the LLW treatment facilities combined would not be expected to exceed 200 mrem/year/involved worker as used in the impact analyses. Based on this, there would be no substantial cumulative radiological impacts to facility workers from routine radiological exposure.

5.11.2 Air Quality

Cumulative air quality effects of processing the Hanford Site LLMW at the proposed ATG facility would occur in several contexts. Other industrial facilities in the Richland area also would be releasing air pollutants, and emissions from the proposed ATG gasification and vitrification building would be added to those of neighboring industrial uses. In addition, the Hanford Site LLMW is not expected to be the sole source of waste processed at the ATG gasification and vitrification building. Thus, the ATG gasification and vitrification building would be contributing incrementally to the cumulative total of air pollutants released in the area around the Hanford Site. There are no indications, however, that the cumulative emissions in the region would cause violations of federal or state air quality standards; nor are there any indications that the combination of chemical

and radiological emissions would cause appreciable change in cumulative cancer risk for the region.

5.11.3 Solid and Hazardous Waste

With a design capacity of 700 metric tons (770 tons) per year per unit, the ATG gasification and vitrification building would have ample capacity to treat the forecast 5,120 m3, or nearly 1,800 metric tons (2,000 tons) of the subject Hanford Site waste within a 10-yr period. The ATG gasification and vitrification process is designed to destroy hazardous organic compounds safely and reduce waste volume.

5.11.4 Storage

No cumulative impacts are expected from the storage of hazardous chemicals or waste. The hazardous chemicals that would be brought to the ATG gasification and vitrification building would be consumed during waste treatment operations.

5.11.5 Transportation

Cumulative impacts of transportation to and from the 200 West Area were analyzed and considered insignificant for both incident-free and accident transportation. Transporting waste from the 200 West Area to the ATG facility would require 160 trips over the 10-yr period, while 150 trips would be required for disposal at the 200 West Area from the ATG facility. These shipments, in combination with the approximately 50 ATG thermal treatment workers commuting to and from the ATG Site, would constitute approximately 1% of the 3,000 vehicles per hour projected at peak morning traffic volumes on Stevens Drive near the 1100 Area in 1999 (DOE 1996) Radiological impacts associated with transporting commercially generated (non-DOE) LLMW were evaluated in the SEPA EIS for Treatment of Low-Level Mixed Waste (City of Richland 1998). Since the transportation impacts evaluated in the SEPA EIS were based on the maximum design-capacity of the MWF, transportation impacts from treating DOE waste cannot be added to the annual impacts identified in the SEPA EIS.

5.12 IMPACTS OF ALTERNATIVES

Though not analyzed in detail, transport of Hanford LLMW to Idaho or Tennessee sites would be expected to result in a greater risk of transportation accident because of the longer distances and travel time involved. Impacts from treatment were expected to be similar to those from treatment at ATG.

SECTION 6
PERMITS AND REGULATORY REQUIREMENTS

This section describes permits and regulations applicable to hazardous waste transport and ATG gasification and vitrification facility operation. The proposed action is subject to federal, state,

and local permits and regulations governing the storage, treatment, handling, and transport of LLMW.

To support permits needed in Washington State, ATG prepared the SEPA EIS for Treatment of Low-Level Mixed Waste (City of Richland 1998).

6.1 FACILITY OPERATION

Table 6-1 provides the major permits and approvals required for ATG gasification and vitrification facility operation and related permitting or approving agencies. The ATG gasification and vitrification facility also must comply with WSHWMA, Hanford Site Solid Waste Acceptance Criteria, NRC, and other federal, state, and local regulations.

Table 6-1
Major Permits and Approvals Required for ATG Gasification and Vitrification Facility Operation

Permit	Permitting Agency
RCRA Part B	Washington State Department of Ecology
Treatment of PCBs by Alternative Methods (TSCA)	US Environmental Protection Agency
Notification of PCB Activity (TSCA)	US Environmental Protection Agency
Radiological Air Permit (NESHAP)	Washington State Department of Health
Radiological Permit Update	Washington State Department of Health

Source: RCRA Part B Application.

6.1.1 Resource Conservation and Recovery Act (PL 94-580)

The RCRA required the EPA to establish regulations governing the handling of hazardous waste. These regulations are set forth in EPA-Administered Permit Programs: The Hazardous Waste Permit Program (40 CFR 270) and standards for generators and transporters of hazardous waste, including owners and operators of TSDFs. The general permit requirements for all TSDFs are described in "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities" (40 CFR 264). RCRA regulations also require owners and operators of a TSDF to obtain an operating permit for the ATG gasification and vitrification facility from the appropriate state regulatory agency, which is Ecology.

The ATG gasification and vitrification building is being permitted as a miscellaneous thermal treatment unit under WAC 173-303-680.

The Part B permit application for the ATG gasification and vitrification facility will contain detailed information on the facility description and site-specific information, such as facility

inspection schedules (40 CFR 270). The application will outline and detail the general requirements necessary to demonstrate compliance with 40 CFR 264 standards, including emission controls.

The permit application will contain: chemical and physical characteristics of the waste to be treated; waste analysis procedures; waste acceptance criteria; security procedures; engineering design criteria and supporting drawings; waste handling procedures; and other information required by EPA and Ecology to verify compliance. The application also will include: data from the demonstration test operations; optimized operating parameters of the ATG gasification and vitrification process including operating temperatures; waste feed rates and mass balance studies; training methodology; and location of pollution prevention equipment. The approved Part B permit would be subject to changes, updates, and regulatory agency-approved modifications (40 CFR 270.42).

6.1.2 Toxic Substances Control Act (PL 94-469)

In addition to Ecology's approval of the ATG gasification and vitrification process, a TSCA Part B permit from the EPA would be required. The RCRA Part B permit will be modified to include TSCA requirements. The result is expected to be a RCRA/TSCA permit. Ecology and EPA Region X would decide which would be the controlling agency.

6.1.3 Treatment of PCBs by Alternative Methods

The gasification and vitrification process is an alternative method to an EPAdesignated best demonstrated and available technology (BDAT) for PCBs, and will be permitted as an alternative method. The RCRA Part B permit will include tests to demonstrate that treatment with gasification and vitrification is equivalent to treatment with a BDAT technology.

6.1.4 Technology Equivalency Approvals

Because gasification and vitrification is a nonincinerator process, approvals from EPA will be needed for treating PCB-contaminated waste and RCRA waste designated with incineration and combustion treatment codes. The RCRA/ TSCA Part B permit application will include equivalency test plans for complying with requirements for treatment waste with INCIN codes.

6.1.5 Radiological Permit

An amendment to ATG's current radioactive waste license to include the gasification and vitrification facility operations will be required from the Washington State Department of Health.

6.1.6 Air Permits

The federal Clean Air Act (PL 91-604) and Washington State regulations require many types of industrial facilities to obtain air quality permits before construction or operation. State and federal requirements generally are addressed through integrated permit regulations established by

state or local air pollution control agencies. Air quality permits for facilities in Benton, Franklin, or Walla Walla Counties are processed by the Benton County Clean Air Authority. Federal aspects of such permits include prevention of significant deterioration requirements for attainment areas, new source review requirements for nonattainment areas, and NESHAP requirements. Federal TitleV operating permit requirements also might apply if the proposed facilities cause emissions from the overall ATG site to exceed threshold quantities for either criteria pollutants or hazardous air pollutants. Compliance with state hazardous air pollutant ambient concentration limits also will be addressed as part of the air quality permit process.

6.2 TRANSPORTATION

The loading and transport of hazardous waste will be governed by the applicable regulations, orders, and guidance of agencies including DOE, Ecology, DOT, NRC, and EPA. These regulations, orders, and guidance cover shipping, packaging, vehicle safety, routing of shipments, and protection of workers. Regulations specific to hazardous waste transport include those presented in Table 6-2.

6.3 WORKER SAFETY

The OSHA, RCRA, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), require action to prevent injury and illness, to limit worker exposure to hazardous chemicals, to develop emergency planning, and to provide the community with information. ATG will be required to report on these required activities annually, including the reporting of hazardous chemical quantities.

Table 6-2
Applicable Hazardous Waste Transport Regulations

Washington State	
WAC 173-303	Washington Administrative Code, "Dangerous Waste Regulations," as amended. Administered through Ecology.
U.S. Department of Transportation	
49 CFR 171	General Information, Regulations, and Definitions
49 CFR 172	Hazardous Materials Table and Hazardous Materials Communications Regulations
49 CFR 173	Shippers-General Requirements for Shipments and Packaging

49 CFR 177	Carriage by Public Highway
49 CFR 178	Shipping Container Specifications
Other	
10 CFR 71	Packing and Transportation of Radiological Material
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards applicable to Generators of Hazardous Waste
49 CFR 107	Hazardous Materials Program Procedures
49 CFR 263	Standards applicable to Transporters of Hazardous Waste
49 USC 1801	Hazardous Materials Transportation Act

ATG would use a hazard communication program (29 CFR 1910.1200); train waste operation and emergency response personnel (29 CFR 1910.120); educate employees; and prevent, control, and minimize impacts resulting from hazardous chemical releases according to a SPCC plan (40 CFR 264.52). ATG also would be subject to the Washington Industrial Safety and Health Act. For the ATG gasification and vitrification building, ATG would be required to maintain uptodate copies of material safety data sheets (MSDS) and a master list of all hazardous chemicals associated with operations. The SPCC plan contained within the RCRA Part B permit application would include information on personal protective equipment (e.g., respirators, suits, gloves), engineering controls, and management procedures to minimize hazards to personnel and the environment. Laboratory personnel would be protected by conformance with regulatory requirements of 29 CFR 1910.1450.

SECTION 7
AGENCIES CONSULTED

Agencies contacted for information during preparation of this EA include the Washington State Department of Ecology, City of Richland Planning Department, the Benton County Planning Department, and the Benton County Clean Air Authority.

The Confederated Tribes of the Umatilla Indian Reservation, Wanapum People, Yakama Indian Nation, Nez Perce Tribe, Oregon Department of Energy, and Washington State Department of Ecology were notified of the intent to prepare this EA.

Copies of the draft EA were distributed to these entities and others for a 30-day review period. All comments received on the Draft EA (AppendixF) were considered in preparing the final EA.

SECTION 8
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APPENDIX A
PEER REVIEW OF SECONDARY WASTE STREAM MASS FLOW RATES AND COMPOSITION

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TO: Fred Moseley, Project Manager

DATE: March 29, 1996

FROM: Jim Bartosch, Waste Management

FILE NO: Memo #0396.29A

SUBJECT: Mass Balance Review

The scope of the review consisted of two elements: review of the mass balance data for fatal flaws and identification of possible outlier issues with the test data. Based on the data provided in the three reports and several calculations completed as part of the review, the data appears to balance for the three tests. I reviewed both the March 4 and March 6, 1996 reports Emissions Data Summary For the PEAT TDR System Processing: Contaminated Dunnage, Ash Waste, and Medical Waste. The March 4 and March 6 reports are essentially identical with the later version being more polished.

The mass balance review was completed using three types of calculations. The first calculation was an overall mass balance performed on each material stream entering and exiting various pieces of equipment (e.g. scrubber). This required using the process flow diagram and the data in the table of summary process streams provided in each report. The second calculation checked selected individual contaminant (e.g. aluminum) air emissions based on emissions concentrations data and sample calculations information. Similarly, the third calculation tracked the mass balance of selected individual contaminants (e.g. aluminum) found in the wastewater. Water emissions concentrations were provided in a table. It is noted that the proposed LLMW treatment facility would not discharge wastewater.

The tests clearly show high organic content wastes are destroyed, high metal content wastes are treated to meet LDR requirements, and radioactive elements introduced as part of the tests are successfully controlled in the residuals and wastewater. I did not find a fatal flaw requiring immediate correction.

Recognizing these tests are a snapshot and not the end all for air emissions of the proposed ATG facility, questions can be raised about data relevancy. The data represents the conditions at the time and parameters of the experiments. Because the data is not a test on actual operating parameters of the proposed ATG facility, the following issues may require further explanation in the future:

1. The tests' feed rates of the dunnage (20 lbs/hr), medical (50 lbs/hr), and ash wastes (86 lbs/hr) are less than the design feed rate of 150 lbs/hr for the ATG facility. An explanation of why the data is still applicable is necessary.
2. The test studies do not address highly chlorinated wastes and liquids with high concentrations of volatile organic compounds (VOCs).
3. For total facility emissions, the studies are not designed to address or cover fugitive emissions from drum handling (VOCs), drum sampling (VOCs), laboratory emissions, mercury waste operations, and macroencapsulation operations using high density polymers that may include emissions of styrene, toluene diisocyanate, and naphthalene.

4. Tritium contamination and emissions are not addressed.
5. The tests do not address PCB contaminated wastes while the ATG facility will be TSCA permitted.
6. The radioactive spikes tested are not transuranic. The public's fear of plutonium is very high. Addressing volatility of transuranic elements is probably appropriate.

None of these issues undermine the validity of the tests, but reflect the difficulty of precisely simulating full scale operational performance. Tests required for the permitting process, actual operation, and compliance monitoring are necessarily the true test of the success of the design and management of a facility. Problematic issues identified in actual tests and operation would be addressed to ensure safety and regulatory compliance.

I hope this information is sufficient. Thank you for opportunity to support the San Francisco Office.

APPENDIX B
ENVIRONMENTAL SYNOPSIS FOR PROCUREMENT OF LOW-LEVEL MIXED WASTE THERMAL TREATMENT SERVICES, 10 CODE OF FEDERAL REGULATIONS 1021.216

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Westinghouse
Hanford Company

P.O. Box 1970 Richland, WA 99352

November 2, 1995

9555821

Mr. R. F. Guercia, Program Manager
Solid Waste
U.S. Department of Energy
Richland Operations Office
Richland, Washington 99352

Dear Mr. Guercia:

ENVIRONMENTAL SYNOPSIS FOR PROCUREMENT OF LOW-LEVEL MIXED WASTE THERMAL TREATMENT SERVICES, 10 CODE OF FEDERAL REGULATIONS 1021.216

Reference: Letter, R. H. Engelmann, WHC, to R. F. Guercia, RL, Environmental Critique for Procurement of Low-Level Mixed Waste Thermal Treatment Services, 10 Code of Federal Regulations 1021.216, Number 9552624, dated May 12, 1995.

The Westinghouse Hanford Company (WHC) is pleased to transmit the enclosed Environmental Synopsis (ES) for procurement of low-level mixed waste thermal treatment services. During the procurement process, an Environmental Critique (EC) was prepared by WHC pursuant to requirements presented in the U.S. Department of Energy's National Environmental Policy Act (NEPA) Implementing Procedures and Guidelines (10 Code of Federal Regulations [CFR] 1021.216). The purpose of this EC was to support the decision to select a proposal to thermally treat some of the Solid Waste Program's low-level mixed waste.

Pursuant to 10 CFR 1021.216[h] a publicly available ES based on the EC must be prepared to document consideration given to environmental factors and to record the relevant environmental consequences of reasonable alternatives that have been evaluated in the selection process. As specified in 10 CFR 1021.216[h], the ES is not to contain business, confidential, trade secret or other information that the U.S. Department of Energy otherwise would not disclose. Nor is it contain data or other information that may in any way reveal the identity of offerors.

After a selection has been made, the ES is required to be filed with the U.S. Environmental Protection Agency and shall be made public.

9555821

If you have any questions, please feel free to contact either myself on 376-7485 or Mr. C. H. Eccleston of my staff, on 376-9364.

Very truly yours,

R. H. Engelmann, Manager
NEPA Services
Environmental Services

dak

Attachment

RL - K. D. Bazzell
S. R. Brechbill
R. M. Carosino
P. F. X. Dunigan
A. H. Wirkkala (w/o attachment)

ENVIRONMENTAL SYNOPSIS

FOR

THE SOLID WASTE THERMAL TREATMENT

U.S. DEPARTMENT OF ENERGY'S 10 CFR 1021.216 PROCESS

HANFORD SITE, RICHLAND WASHINGTON

U.S. DEPARTMENT OF ENERGY

October 1995

ENVIRONMENTAL SYNOPSIS FOR THE SOLID WASTE THERMAL TREATMENT, U.S. DEPARTMENT OF ENERGY'S (DOE) HANFORD SITE, RICHLAND WASHINGTON

An inventory of radioactive and hazardous waste is stored at the U.S. Department of Energy's (DOE) Hanford Site located near Richland, Washington. Part of this inventory includes low-level mixed waste (LLMW) which contains both low-level radioactive and hazardous constituents. Some of the LLMW contains constituents that need to be thermally treated to meet regulatory standards for eventual disposal. Because of the high capital cost associated with constructing and operating a treatment facility, the DOE directed its Management and Operations contractor, Westinghouse Hanford Company (WHC), to seek an outside contractor to treat this waste.

THE DEPARTMENT OF ENERGY'S NATIONAL ENVIRONMENTAL POLICY ACT REQUIREMENTS

Requirements of the National Environmental Policy Act (NEPA) of 1969 must be met before a final decision can be made to pursue a federal action. Additional requirements also apply to certain types of procurement actions, if such actions are pursued prior to completing the NEPA process. Specifically, such procurement actions may be subject to DOE's NEPA Implementing Procedures and Guidelines (10 Code Of Regulations 1021.216), referred to as the 216 Process. The 216 Process is intended to insure that environmental factors are considered in awarding a contract before the NEPA process has been completed.

Under the 216 Process, an environmental critique (EC) must be prepared to evaluate and compare proposals, providing environmental information that will be considered in the procurement selection process. Once a decision has been made to select an offeror's proposal, an Environmental Synopsis (ES) is prepared, based on the environmental critique, to publicly record consideration given to environmental factors in the selection process. The ES may not contain proprietary or other information that DOE is prohibited from disclosing. A substantial amount of the data submitted in the offeror's proposals is considered to be proprietary and cannot be discussed in this ES. Upon completing the 216 process, a contract may be awarded contingent on successfully completing the NEPA process.

In April of 1994, WHC issued an Request for Proposal (RFP) inviting outside parties to submit proposals for thermally treating Hanford Site LLMW. Proposals were received in response to this RFP. Consistent with the 216 Process requirements, this ES has been prepared, based on information provided in the EC, to record consideration given to environmental factors during the selection process.

ENVIRONMENTAL FACTORS THAT HAVE BEEN CONSIDERED

Each of the proposals were screened, for environmental concerns, against criteria shown below.

(1) Is there a history of significant environmental violations in the company's past business practices?

(2) Is the proposal in accordance with all existing environmental laws, regulations, and requirements?

Results of Past Environmental Violations

With respect to the first environmental concern, a background check was conducted by WHC to determine if there is a history of environmental violations on the part of any of the offerors. The review of past business practices, indicates that no substantial environmental violations were associated with any of the offerors past business practices.

Compliance with Existing Environmental Regulations

In reviewing the second environmental concern, an effort was conducted to determine the principal permits, approvals, and authorizations that would need to be obtained for each proposal. There is no evidence that any of the proposals would violate existing environmental laws, regulations, and requirements.

THE SELECTED OFFEROR

Allied Technology Group (ATG), located in Richland, Washington, has been selected to supply thermal treatment services on Hanford Site LLMW. ATG's proposal involves construction and operation of a thermal treatment facility, at a currently licensed low-level waste processing facility, located on a 20 acre site owned by ATG.

The selected proposal is based on a continuous operating, non-incineration thermal treatment process. A high temperature gasification/vitrification system would be used to thermally treat the LLMW, producing a vitrified waste form.

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APPENDIX C
POLLUTION PREVENTION AND WASTE MINIMIZATION

Body

APPENDIX E
DEPARTMENT OF ENERGY RESPONSE TO COMMENTS RECEIVED ON DRAFT EA

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BENTON COUNTY
CLEAN AIR AUTHORITY
650 George Washington Way
Richland WA 99352-4289
Ph:(509) 943-3396 FAX (509) 943-2232
E-Mail: bccaa@3-cities.com

27 January 1997

Prent C. Houck, Engineer
Allied Technology Group, Inc.
P O BOX 969
Richland, Washington 99352

RE: NOC 970108, Mixed Waste Plasma Arc at ATG, Request for Comment from Dunigan, NEPA Compliance Officer, U S Dept of Energy

Dear Mr. Houck,

On January 21, I received a letter from Paul F.X. Dunigan, NEPA Compliance Officer, U.S. Dept. of Energy, with four volumes regarding ATG's proposed mixed waste incinerator. He asked for comment within 30 days. Local and State rules require a fee for Notice of Construction review, and submission on a form sent by the air authority. Enclosed is my one page form. With the submission of the NOC form, please include a fee of $453 for review of the NOC (filing fee of $50 plus 10 hours of my review time which includes overhead). I would like an incomplete submittal promising answers to the questions I am raising, the form, with the fee, by return mail, in order to respond to Mr. Dunigan's letter by the date he requested, which is February 20th.

My letter of January 7 to you was three and a half pages of comments on your submittal to Washington State Dept. of Ecology. I will not repeat that in this letter.

In the volume titled Environmental Assessment, section 6.1.6 is incorrect and misleading. This Authority is referred to as it was in 1993. The State of Washington, Dept. of Ecology, administers the PSD rule, which is very likely not applicable. If ATG, including the mixed waste facility, exceeds 10 tons per year of chlorine, also unlikely, then it will need a federal Title V Air Operating Permit, which this Authority administers.

The correct sentence in section 6.1.6 is the last: "Compliance with state

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hazardous air pollutant ambient concentration limits also will be addressed as part of the air quality permit process." This hazardous air pollutant rule, WAC 173-460, has three screening steps. First, is the toxic air pollutant released below the small quantity emission rates in the two tables following WAC 173-460-080 (2)(e)? If not, run the T-Screen model, and see if the quantity released exceeds the Acceptable Source Impact Level (ASIL). If it does exceed the ASIL, have Washington State Dept. of Ecology run a more accurate model. In the ISCST3... volume, ATG had a more accurate model run, without allowing Ecology to OK Robert Sculley usurping their perogative, and without comparing the modelling results to the ASIL's in WAC 173-460.

I look forward to your return of the one page form, and the review fee.

If you have questions, do not hesitate to contact me.

Peter B. Bosserman, review engineer

Enclosures: NOC form

CC:
Pat Irle, Dangerous Waste Group
Ecology Kennewick Office
1315 W 4th Av
KENNEWICK WA 99336-6018

John Martell, Engineer
WA Dept. of Health, Div. of Rad. Protection
4815 Blue Heron Blvd
WEST RICHLAND WA 99353

Paul F.X. Dunigan, Jr., NEPA Compliance Officer
U.S.Dept. of Energy
Richland Operations Office
P O BOX 550
RICHLAND WA 99352

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BENTON COUNTY
CLEAN AIR AUTHORITY
650 George Washington Way
Richland WA 99352-4289
Ph:(509) 943-3396 FAX (509) 943-2232

Date: _____

Notice of Construction and Application for Approval NOC 970108

I. OWNER
Name: _____
Contact Person: _____ Phone _____
Mailing Address: _____
_____

II. LOCATION
Type of Facility and Source of Pollution: Mixed Waste processing using a plasma arc, exhaust will have scrubber, HEPA filter, carbon absorber
Address of Facility: _____
~~Directions to Drive to Facility~~: _____
_____

III. Attach~~ed forms to be filled out~~: Dept. of Ecology submittal including Vol. III-A revised 2 Dec. 1996, Dept. of Energy EA-1135 draft rec'd 21 Jan. 1997, already submitted; answers to BCAA letters 7 and 27 January 1997 being prepared.

IV. Costs and Schedule:
Cost of Project: _____
Installation's Est. Start Date _____ Est.Completion Date _____

V. Certification:
I certify that I have filled out this form ~~and the attached forms~~ completely and accurately to the best of my knowledge and my firm's knowledge.

_____ _____
Signed Date

_____ _____
Typed or Printed Name Title of Person Signing

In accordance with Regulation 1 Section 10.06 (A) of this Authority, a filing fee of $50.00 shall be paid with the filing of this form.

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BENTON COUNTY
CLEAN AIR AUTHORITY
650 George Washington Way
Richland WA 99352-4289
Ph:(509) 943-3396 FAX (509) 943-2232

Date: _____

Notice of Construction and Application for Approval NOC 970108

I. OWNER
Name: _____
Contact Person: _____ Phone _____
Mailing Address: _____
_____

II. LOCATION
Type of Facility and Source of Pollution: Mixed Waste processing using a plasma arc, exhaust will have scrubber, HEPA filter, carbon absorber
Address of Facility: _____
~~Directions to Drive to Facility~~: _____
_____

III. Attached ~~forms to be filled out~~: Dept. of Ecology submittal including Vol. III-A revised 2 Dec. 1996, Dept. of Energy EA-1135 draft rec'd 21 Jan. 1997, already submitted; answers to BCAA letters 7 and 27 January 1997 being prepared.

IV. Costs and Schedule:
Cost of Project: _____
Installation's Est. Start Date _____ Est.Completion Date _____

V. Certification:
I certify that I have filled out this form ~~and the attached forms~~ completely and accurately to the best of my knowledge and my firm's knowledge.

_____ _____
Signed Date

_____ _____
Typed or Printed Name Title of Person Signing

In accordance with Regulation 1 Section 10.06 (A) of this Authority, a filing fee of $50.00 shall be paid with the filing of this form.

D:\PETE\COVERNOC.APL

A copy of the final EA will be provided for your information. If you have any questions, or need additional information about the proposed action, please contact Anna V. Beard, the NEPA Document Manager, on (509) 376-7472. Questions concerning the NEPA process may be directed to me on (509) 376-6667.

Sincerely,

Paul F. X. Dunigan, Jr.
NEPA Compliance Officer

WPD:AVB

cc: R. Feizollahi, ATG
K. Salmon, ATG
C. Stephen, ATG
D. E. Nesten, WMH

324 Gulf Court
Richland, WA 99352
February 19, 1997

Mr. Paul Dunigan
NEPA Compliance Officer
Department of Energy
P.O. Box 550, Mailstop A5-15
Richland, WA 99352

RE: DOE/EA-1135, Low Level Waste Treatment

Dear Mr. Dunigan:

The stated purpose and need is to treat contact-handled low-level mixed waste (LLMW) containing polychlorinated biphenyl (PCBs) and other organics, to meet regulatory standards.

The proposed action is to construct a thermal treatment facility in the city of Richland. The City of Richland Planning Departments records indicate the proposed facility would be a [non-thermal] solidification facility. The SEPA checklist submitted to the City does not list this as a thermal facility.

A logical alternative to the proposed action would be to locate a facility of this nature on the Hanford Site. Preferably close the source of the low-level waste material and its eventual disposal location; in other words the 200 Area.

Section 3.2.2 identifies an alternative "Build a thermal treatment facility at the Hanford Site 200 West Area." This alternative is discounted in the EA because of the estimated cost of $620 million. However, the $620 million facility would be capable of treating "contact-handled LLMW, remote-handled transuranic waste." In other words materials that would greatly complicate safety and environmental control requirements. This alternative needs to be reexamined.

It appears logical that the construction and operation of this facility would be less if transport costs and risks were minimized. This could be accomplished on land in the 200 Area leased to ATG.

Note that DOE NEPA regulations normally require an EIS for "Siting, construction, and operation of incinerators, other than research and development incinerators ...." Please provide information why an EIS would not be required in this situation.

Also, please note that one of the nearest downwind receptors of the atmospheric effluent from this facility would be a day care center.

Sincerely,

Carolyn Auker

Carolyn Auker

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

MAY 0 5 1997

97-SWT-086

Ms. Carolyn Auker
324 Gulf Court
Richland, Washington 99352

Dear Ms. Auker:

DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR OFFSITE THERMAL TREATMENT OF LOW-LEVEL MIXED WASTE (LLMW)

Thank you for commenting on the Draft EA for Offsite Thermal Treatment of LLMW. The following paragraphs respond to your comments:

The proposed action is not to construct a thermal treatment facility in the city of Richland as your letter states, but rather to transport up to 5,120 cubic meters of contact-handled LLMW from the Hanford Site to the Allied Technology Group (ATG) gasification and vitrification (GASVIT) building in Richland for treatment, and return the treated waste to the Hanford Site for disposal. Construction of the thermal treatment facility is outside of the scope of the subject EA, and will be addressed in the Environmental Impact Statement (EIS) that will be prepared by ATG for the City of Richland under the State Environmental Policy Act (SEPA).

Your comment correctly notes that the State of Washington Environmental Policy Act (SEPA) checklist filed with the City of Richland Planning Department applies only to ATG's proposed non-thermal treatment systems. The SEPA checklist for the proposed non-thermal treatment systems was submitted in March 1996 with the Part B Dangerous Waste permit application. The Part B permit application was supplemented in December 1996 to include two GASVIT thermal systems. Together, the non-thermal systems and the GASVIT systems comprise ATG's proposed LLMW Facility.

Locating a Department of Energy (DOE) owned thermal treatment facility on site was examined in the subject EA as an alternative. It was discounted because of the high estimated capital cost and declining capital funds available for new DOE facilities. It is noted that this onsite DOE facility would have treated additional waste such as transuranic and remote-handled waste, so a direct cost comparison cannot be made between the proposed DOE facility and the contract to treat LLMW with ATG. However, a large sum of capital funds would still be required if a DOE facility to treat only LLMW was constructed on site. The volume of Hanford LLMW that requires thermal treatment is not sufficient to justify construction of a DOE owned facility on the Hanford Site.

The contract solicitation was structured such that vendors submitted bids based on building their own facility off the Hanford Site. Leasing of land by DOE to interested bidders was not an option in the contract solicitation. This allowed vendors to utilize their existing infrastructure to the maximum extent practicable, to treat other than Hanford waste if desired, to utilize the economies of scale, and therefore submit the most cost-effective bid. Contractor owned facilities could not be put on DOE land because of the potential liability for DOE that could not be transferred to the contractor. This explanation has been added to Chapter 2 of the EA.

The DOE, Richland Operations Office (RL) agrees that DOE National Environmental Policy Act regulations normally require an EIS for "Siting, construction, and operation of incinerators, other than research and development incinerators..." as stated in your letter. However, construction of the proposed thermal treatment facility is not within the scope of DOE's proposed action, as mentioned in paragraph two of this letter. ATG will prepare an EIS for the City of Richland under SEPA for construction of the proposed thermal treatment facility. It should also be noted that the proposed ATG thermal treatment facility is not being permitted as an incinerator, but as a "miscellaneous unit."

ATG's facility is located west of Hanford's 1100 Area within an area designated by the City of Richland as an industrial park for nuclear and non-nuclear industrial plants. Some of the nearest receptors of the atmospheric effluent from the GASVIT systems include a recently established Child Care Facility within North Richland, as shown in Figure 2-1 of the subject EA. The EA documents that risks presented by processing of DOE waste in ATG's GASVIT systems to the maximum exposed individual, and thus to these receptors, will be extremely low. Risks potentially posed by the GASVIT systems are extremely low for several reasons. These reasons, described in the EA, are outlined below:

- Screening-level radiological and chemical risk assessments included in the EA indicate the design of the GASVIT system is more than adequate to maintain risks at extremely low levels for the maximum exposed individual at or near the ATG site, either during normal operations or in the event of an accident.

- Similarly, an analysis of transportation risks indicate risks to the public posed by either routine transport or by an accident during transport are extremely low. The proposed transportation route is largely (95%) within the Hanford Site boundaries, and is subject to access control.

- The proprietary GASVIT system will generate fewer toxic emissions than conventional thermal treatment facilities processing an equal amount of waste.

- The emissions control system downstream of the process chamber (refer to Fig 2-4 of EA) is extensive and uses Best Available Control Technology. It includes a scrubber located between the process chamber and the syngas converter to remove halogens that might otherwise form acids and toxic compounds in the syngas converter, a prefilter, High Efficiency Particulate Filters, and carbon filters, which are located downstream of the syngas converter.

- The ATG facility will operate under permits from the State of Washington, Department of Health and Department of Ecology, which will require that all emissions be kept at safe levels.

Please direct any questions about this proposed action to Mr. Joe Waring, the NEPA Document Manager, on (509) 373-7687. Questions about the NEPA process may be directed to me on (509) 376-6667.

Sincerely,

Paul F. X. Dunigan, Jr.

Paul F. X. Dunigan, Jr.
NEPA Compliance Officer

WPD:JJW

cc: T. L. Baker, RFSH
F. Feizollahi, ATG
R. L. Martinez, EM-38, HQ

324 Gulf Court
Richland, WA 99352
April 14, 1998

Mr. Paul Dunigan
NEPA Compliance Officer
U.S. Department of Energy
P.O. Box 550
Richland, Washington

Regarding: ATG Draft EA-1135

Dear Mr. Dunigan:

This letter is an additional comment on the ATG facility proposed for treatment of Hanford Site low level mixed waste.

In earlier correspondence I proposed that a reasonable alternative would be to construct the facility on the Hanford site, near the source of the waste, and away from the City of Richland. In your reply you indicated that this alternative was considered and rejected because of cost.

This left me a little bewildered because I did not understand how the same project would cost more to construct it on DOE owned lands (leased to ATG at a nominal fee). There seemed to imply that construction cost on federal lands would be more costly because of bureaucratic inefficiency. An alternative that ran through my mind was that the project would be more costly because the health and safety measures would be more stringent. That was in intriguing possibility -- that health and safety standards for a facility would be more stringent at a location further removed from a population center. Well this has preyed on my mind for some time so I went to the DOE Hanford Web page to check how this issue was presented.

What I discovered was that the on Hanford Site alternative was not the same as the off Hanford Site alternatives. The Hanford Site facility used in this comparison was a "rotary kiln incinerator," not a melter. The rotary kiln would be able to treat "contact handled transuranic waste, remote handled LLMW, remote-handled transuranic mixed waste" in addition to the LLMW identified in the purpose and need.

The intent of CEQ and DOE regulations and guidance is most certainly to consider and compare alternatives that achieve the same purpose and need. In other words DOE should include a comparison of the costs, impacts, and health effects of constructing the proposed ATG facility in the vicinity of the LLMW rather than within the city limits of Richland. Following is a table contrasting the two alternatives in the EA:

	Proposed Action - ATG Facility - Richland	Hanford Site Alternative
Treatment Process	Gasification and vitrification	Rotary kiln incinerator
Materials Treated	Contact handled LLMW	Contact handled TRU mixed waste Remote handled LLMW Remote handled TRU mixed waste Contact handled LLMW

Based on this comparison, the EA did not fairly compare siting alternatives; an issue I identified in my earlier letter. The final EA needs to be revised to adequately and fairly consider the alternative of constructing and operating the proposed gasification and vitrification facility on land in the 200 Area.

Sincerely,

Carolyn Auker

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

98-WPD-124

JUL 17 1998

Ms. Carolyn Auker
324 Gulf Court
Richland, Washington 99352

Dear Ms. Auker:

DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR OFFSITE THERMAL TREATMENT OF LOW-LEVEL MIXED WASTE (LLMW)

Thank you for your letter, dated April 14, 1998, providing additional comments on the Draft EA for Offsite Thermal Treatment of LLMW. The following paragraphs provide a detailed response to your most recent comments and concerns:

You are correct in stating the onsite Hanford alternative was not the same as the offsite alternatives. This was noted in my response letter, dated May 5, 1997, to your original February 19, 1997, comments. As stated in the subject EA, building a Thermal Treatment Facility (a rotary kiln incinerator) on the Hanford Site 200 West Area was proposed by a 1993 Engineering Study. It was not pursued due to high capital cost required for construction and the desire to investigate commercial treatment options to reduce the financial burden to the Government. Your concern that the onsite project would be more costly because the health and safety measures may be more stringent than the offsite facility should be allayed. Both an onsite facility and an offsite facility would require Resource Conservation and Recovery Act, Toxic Substances Control Act, and Clean Air Act permitting from the State of Washington and the U.S. Environmental Protection Agency. Additionally, the Allied Technology Group (ATG) Gasification and Vitrification Facility will operate under a Nuclear Regulatory Commission agreement state radioactive material license from the Washington State Department of Health.

The thermal treatment contract solicitation was structured such that vendors submitted bids based on building their own facility off the Hanford Site. Siting of their facility on the Hanford Site was not an option in the contract solicitation. This allowed a vendor to construct a facility that could treat other LLMW in addition to Hanford LLMW and thereby use the economies of scale to submit a cost-effective bid. Under this commercial contract, DOE is obligated to pay for waste treatment on a per unit basis, and the vendor, ATG, is responsible for all facility siting, construction, permitting, maintenance, and decommissioning.

Including a comparison of the costs, impacts, and health effects of constructing the proposed ATG Facility on the Hanford Site rather than within the city limits of Richland is not within the purpose and scope of this EA. In considering and comparing alternatives that achieve the same purpose and need, DOE has compared several commercial vendors' proposals which could have received Hanford LLMW for treatment in addition to other customers' waste. The scope of

the EA bounds offsite commercial thermal treatment of Hanford waste, which only includes transportation, waste handling, and treatment of Hanford waste at a permitted facility. The City of Richland has prepared a State of Washington Environmental Policy Act (SEPA) Environmental Impact Statement (EIS) on the siting, construction, and operation of the ATG Facility to treat a variety of LLMW, including Hanford's.

Your last comment states that the final EA needs to be revised to adequately and fairly consider the alternative of constructing and operating the proposed gasification and vitrification facility on land in the 200 Area. As addressed earlier in this response letter, that analysis is outside of the scope of this EA. Through the Hanford LLMW contract solicitation, the purpose was to select a commercial facility for waste treatment so that once constructed or modified, the Hanford Site would be one of its customers. Siting of the facility was to be off the Hanford Site per the contract solicitation. We are making minor changes to the EA to explain this point better.

ATG's process selected for treating DOE's contact-handled LLMW is a technology that has been adopted for commercial application after several years of development at Massachusetts Institute of Technology and Pacific Northwest National Laboratory. The technology has been licensed to a local firm, Integrated Environmental Technologies, LLC, (IET).

The system was selected by ATG because of several inherent environmentally desirable features. These features minimize risk to the public by minimizing emissions while producing a waste form that is highly stable. The waste form also resists the leaching of hazardous constituents into the environment. A prototype version of the system is available for inspection at IET's facility in Richland, Washington. If you are interested in a site visit, please contact Kevin Salmon, ATG, on (509) 375-5160.

DOE and ATG would be happy to meet with you, if you so desire, to further discuss the above responses to your comments. You may call me on 376-6667, or you may call Joe Waring, Waste Programs Division, on 373-7687, to schedule a meeting within two weeks from the date of this letter.

Sincerely,

Paul F. X. Dunigan, Jr.
NEPA Compliance Officer

WPD:JJW

cc: F. Feizollahi, ATG
K. Salmon, ATG
T. L. Baker, WMH

JEFFREY R. MARKILLIE, REM
552 HOLLY STREET
RICHLAND, WA 99352

February 19, 1997

Mr. Paul F. Dunigan
NEPA Compliance Officer
U.S. Department of Energy
PO Box 550, MSIN: A5-15
Richland, WA 99352

Re: DOE/EA-1135, *Offsite Thermal Treatment of Low-Level Mixed Waste*

Dear Mr. Dunigan:

A significant disconnect exists between the proposed action identified in this environmental assessment (thermal treatment of low-level mixed waste) and the action presented in the SEPA checklist submitted to the City of Richland (stabilization and abrasive blasting of waste). It is unclear why such a disconnect exists, and raises ethical questions as to how the project has been presented to the City.

Federal air rules require destruction efficiencies of some hazardous and toxic contaminants that approach 99.9999% (a.k.a. "six nines destruction efficiency"). It is not clear if the proposed process is capable of achieving this level of performance. Additionally, it is not clear how destruction testing would be undertaken before operations are commended at the facility.

One alternative not analyzed in detail involves treatment of wastes in the 200 Area. The highly industrialized 200 Area Plateau provides an excellent location for treatment activities due to the close proximity of the wastes to be treated, and the heavy industrial infrastructure that already exists. ATG could be leased land by DOE to undertake these endeavors. Although a $620 million incinerator facility was proposed for the 200 Area some four years ago, DOE should analyze the construction and operation of the scaled-back version of the incinerator being presented in the environmental assessment.

Although not specifically mentioned in the analysis, the closest downwind population to the proposed facility is a day care center, followed by the residential north Richland community. It is unclear why DOE would support the construction and operation of a thermal waste treatment facility less than 1 kilometer from such areas.

Thank you for the opportunity to comment on this environmental assessment; I am looking forward to your response.

Sincerely,

JMarkillie.

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

MAY 0 5 1997

97-SWT-089

Mr. Jeffrey R. Markillie
552 Holly Street
Richland, Washington 99352

Dear Mr. Markillie:

DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR OFFSITE THERMAL TREATMENT OF LOW-LEVEL MIXED WASTE (LLMW)

Thank you for commenting on the Draft EA for Offsite Thermal Treatment of LLMW. The following paragraphs respond to your comments:

The proposed action is not to construct a thermal treatment facility in the city of Richland as your letter states, but rather to transport up to 5,120 cubic meters of contact-handled LLMW from the Hanford Site to the Allied Technology Group (ATG) gasification and vitrification (GASVIT) building in Richland for treatment, and return the treated waste to the Hanford Site for disposal. Construction of the thermal treatment facility is outside of the scope of the subject EA, and will be addressed in the Environmental Impact Statement (EIS) that will be prepared by ATG for the City of Richland under the State Environmental Policy Act (SEPA).

Your comment correctly notes that the State of Washington Environmental Policy Act (SEPA) checklist filed with the City of Richland Planning Department applies only to Allied Technology Group's (ATG) proposed non-thermal treatment systems. The SEPA checklist for the proposed non-thermal treatment systems was submitted in March 1996 with the Part B Dangerous Waste permit application. The Part B permit application was supplemented in December 1996 to include two gasification and vitrification (GASVIT) thermal systems. Together, the non-thermal systems and the GASVIT systems comprise ATG's proposed LLMW Facility.

A GASVIT system is not an incinerator and will not have the impacts normally associated with incinerators. During the demonstration test described in the Addendum to the Part B Application submitted in December 1996, ATG will demonstrate that a GASVIT system, a flameless plasma arc process, meets or exceeds all standards imposed on an incinerator. Additionally, as a flameless unit, a GASVIT system offers very real advantages over incinerators. These advantages include nearly complete elimination of toxic pollutants and significant reductions in sulfur oxide and nitrogen oxide emissions. ATG has described in detail the differences between a GASVIT system and an incinerator in their letter of application for permitting GASVIT systems as Miscellaneous Treatment Units. A copy of this letter, dated December 12, 1995, from

Mr. Fred Feizollahi, ATG, to Ms. Pat Irle, Washington State Department of Ecology, is attached.

Locating a Department of Energy (DOE) owned thermal treatment facility on site was examined in the subject EA as an alternative. It was discounted because of the high estimated capital cost and declining capital funds available for new DOE facilities. It is noted that this onsite DOE facility would have treated additional waste such as transuranic and remote-handled waste, so a direct cost comparison cannot be made between the proposed DOE facility and the contract to treat LLMW with ATG. However, a large sum of capital funds would still be required if a DOE facility to treat only LLMW was constructed on site. The volume of Hanford LLMW that requires thermal treatment is not sufficient to justify construction of a DOE owned facility on the Hanford Site.

The contract solicitation was structured such that vendors submitted bids based on building their own facility off the Hanford Site. Leasing of land by DOE to interested bidders was not an option in the contract solicitation. This allowed vendors to utilize their existing infrastructure to the maximum extent practicable, to treat other than Hanford waste if desired, to utilize the economies of scale, and therefore submit the most cost-effective bid. Contractor owned facilities could not be put on DOE land because of the potential liability for DOE that could not be transferred to the contractor. This explanation has been added to Chapter 2 of the EA.

ATG's facility is located west of Hanford's 1100 Area within an area designated by the City of Richland as an industrial park for nuclear and non-nuclear industrial plants. Some of the nearest receptors of the atmospheric effluent from the GASVIT systems include a recently established Child Care Facility within North Richland, as shown in Figure 2-1 of the subject EA. The EA documents that risks presented by processing of DOE waste in ATG's GASVIT systems to the maximum exposed individual, and thus to these receptors, will be extremely low. Risks potentially posed by the GASVIT systems are extremely low for several reasons. These reasons, described in the EA, are outlined below:

- Screening-level radiological and chemical risk assessments included in the EA indicate the design of the GASVIT system is more than adequate to maintain risks at extremely low levels for the maximum exposed individual at or near the ATG site, either during normal operations or in the event of an accident.

- Similarly, an analysis of transportation risks indicate risks to the public posed by either routine transport or by an accident during transport are extremely low. This proposed transportation route is largely (95%) within the Hanford Site boundaries, and is subject to access control.

MAY 0 5 1997

- The proprietary GASVIT system will generate fewer toxic emissions than conventional thermal treatment facilities processing an equal amount of waste.

- The emissions control system downstream of the process chamber (refer to Fig 2-4 of EA) is extensive and uses Best Available Control Technology. It includes a scrubber located between the process chamber and the syngas converter to remove halogens that might otherwise form acids and toxic compounds in the syngas converter, a prefilter, High Efficiency Particulate Filters, and carbon filters, which are located downstream of the syngas converter.

- The ATG facility will operate under permits from the State of Washington, Department of Health and Department of Ecology, which will require that all emmissions be kept at safe levels.

Please direct any questions about this proposed action to Mr. Joe Waring, the NEPA Document Manager, on (509) 373-7687. Questions about the NEPA process may be directed to me on (509) 376-6667.

Sincerely,

Paul F. X. Dunigan, Jr.

Paul F. X. Dunigan, Jr.
NEPA Compliance Officer

WPD:JJW

Attachment

cc w/o attach:
T. L. Baker, RFSH
F. Feizollahi, ATG
R. L. Martinez, EM-38, HQ

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

APR 21 1999

99-WPD-217

Mr. Jeffrey R. Markillie
552 Holly Street
Richland, Washington 99352

Dear Mr. Markillie:

THE U.S. DEPARTMENT OF ENERGY (DOE), RICHLAND OPERATIONS OFFICE (RL) DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR OFFSITE THERMAL TREATMENT OF LOW-LEVEL MIXED WASTE (LLMW)

References: (1) RL letter to Jeffery R. Markillie, from P. F. X. Dunigan, RL, same subject as above, (letter number 97-SWT-089), dated May 5, 1997.

(2) Letter from Jeffery R. Markillie, to P. F. Dunigan, RL, same subject as above, dated February 19, 1997.

In my letter to you (see Reference [1]) I stated that the EA would include an explanation of why the Allied Technology Group (ATG) Facility is not located within the Hanford Site. Since then the EA has undergone several iterations reflecting additional public comments, discussions about siting, the City of Richland's State Environmental Policy Act Environmental Impact Statement on the ATG Facility, and DOE's original intent in considering this proposed action.

Through this process we have clarified the purpose and need for the proposed action to read: "The DOE, RL needs to demonstrate the feasibility of offsite commercial treatment of contact-handled LLMW containing polychlorinated biphenyls, and other organics to meet existing regulatory standards for eventual disposal." In addition, a broader discussion of siting has been added to Chapter 2.

A copy of the final EA will be provided to you for your information.

APR 2 1 1999

RL would like to thank you again for commenting on the Draft EA. If you have any questions concerning the proposed action, please contact Anna V. Beard, National Environmental Policy Act of 1969 (NEPA) Document Manager, on (509) 376-7472. Please direct questions concerning the NEPA process to me on (509) 376-6667.

Sincerely,

Paul F. X. Dunigan, Jr.
NEPA Compliance Officer

WPD:AVB

cc: C. Stephen, ATG
R. L. Martinez, EM-38, HQ
R. R. Connolly, WMH
M. L. Estes, WMH
D. E. Nester, WMH

Hiskes, Edward V

From: bobcook@mail.tcfn.org
Sent: Tuesday, April 21, 1998 10:16 AM
To: edward_v_hiskes@rl.gov
Subject: ATG MIXED WASTE RICHLAND INCINERATOR

Issues and comments on the DOE EA

1. The EA does not address disposition of the volatile radioactive materials that are found in low level mixed wastes such as tritium, carbon-14 and Iodine-129. Impacts of the disposition of such wastes should be addressed in the EA. The ATG unit to my knowledge has no planned treatment to recover the C-14, the tritium or the I-129. (Depending upon the iodine species, activated carbon may not be effective.) These radioactive substances appear are intended to be released to the environment. In fact the description of the process indicates that carbon dioxide and steam will be released. Although not stated in the system description provided in the EA it would appear that the addition of steam could be used to dilute the tritium in the wastes before discharge. This would not be an acceptable treatment scheme for the tritium. As to the C-14 the planned release of CO2 would include the C-14. This would also be unacceptable. Potential dilution of the contaminants as an incidental aspect of the process should be addressed as well as deliberate dilution, if it is planned.

2. The EA description of the organic waste stream does not include oxygen. The free oxygen that would be produced by the plasma arc would react or "combust" with the gaseous waste stream in a controlled manner depending upon the oxygen present. The CO2 would be the major combustion product as noted in the system description. The definition of a "Plasma Arc Incinerator" in the Washington State Dangerous Waste Reg's is as follows:

" Plasma Arc Incinerator means any enclose device using a high intensity electrical discharge or arc as a source of heat followed by an afterburner using controlled flame combustion and which is not listed as an industrial furnace."

The chamber where the recombination of carbon and oxygen combust would constitute the "afterburner" in this context. Afterburner is not a defined term in the regulations. The combustion must be controlled to assure violent explosive recombination does not occur in the hot gaseous waste stream. The only time combustion would not be a concern is if oxygen were not a component of the waste stream.

This context is entirely inconsistent with the DOE discussion which would lead on to believe there is no oxygen involved in the process reaction.

3. The credible accidents do not appear to address a fire at the facility that would effect the inventory of mixed wastes including any explosive or organic wastes in inventory. A worst case facility fire in which the maximum inventory of wastes on hand would be dispersed by the fire should be assessed in the EA. The SEPA should have also looked at this accident. The mere consideration of air borne releases from vitrified waste product is inadequate. Secondary containment much like that necessary for a commercial reactor may be necessary in order to reduce the risk of fire at an urban site. Remote sites where geographic isolation serves as a secondary protective barrier should reduce facility costs significantly and economically favor such a remote site.

4. HEPA filters are known to have a reduced efficiency for particles of a certain size in the range of 0.1 micron to 1.0 micron. The production of particulate wastes as a function of their size should be identified and their impacts for normal operations considered.

5. Alternate siting of the facility away from a populated area should be considered.

6. Since the City of Richland has an objective of promoting industrial operations within the City boundaries, they have a conflict of interest in providing an unbiased SEPA. The Department of Health having responsibility for the radioactive waste should be a joint preparer of the SEPA and responsible for the decision regarding siting. The City of Richland lands do not provide an alternative remote site away from any population center. A site near the 200 area at Hanford would substantially reduce the health risk to the population associated with routine operations as well as worst case accident. Such a site would substantially reduce the cost of transportation and risk of traffic accidents associated with the DOE wastes alone.

It appears in fact that the City has tried to hide the facility from public scrutiny. The lack of public comments and participation is apparent. There was no credible effort to involve the public. I do not consider the Newspaper add was a credible effort considering the innocuous description of the facility and the lack of public response.

7. The DOE revised EA should be made public on the internet with the request for comments. Effective advertisement should be accomplished. Specific letters to the two child care centers and the Hanford PTA notifying them of the nature and proximity of the proposed facility should be prepared to alert potentially interested public. Comments from the Hanford Advisory Board should be requested.

8. DOE should assure an appropriate oversight entity for nuclear material is responsible for preparation of an alternative siting evaluation, since a large fraction of the DOE wastes are intended to be processed at the ATG facility. Potential future liability for a site in Richland not now contaminated should weigh heavily in favor of an industrial site already contaminated such as in the 200 area. DOE would not be prudent to advocate an urban site such as the one proposed in the City when considering potential future liability. The entity responsible for licensing should not be a consideration when considering this future liability.

A meeting with other commenters, Dunnigan, and the City, WDOE and WDOH is warranted. This may be more than you had in mind, but this is what I would recommend.

Bob Cook

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

98-WPD-200

JUL 17 1998

Mr. F. R. Cook
2552 Harris Avenue
Richland, Washington 99352

Dear Mr. Cook:

DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR OFFSITE THERMAL TREATMENT OF LOW-LEVEL MIXED WASTE (LLMW)

Mr. Edward Hiskes received your e-mail on April 21, 1998, regarding your issues and comments on the subject EA. The following paragraphs provide a detailed response to your comments.

Comment: The EA does not address disposition of the volatile radioactive materials that are found in LLMW such as tritium, carbon-14, and iodine-129. Impacts of the disposition of such wastes should be addressed in the EA.

Response: The EA has addressed the disposition of the volatile radioactive materials that are found in U.S. Department of Energy's (DOE) contact-handled (CH) LLMW, including materials such as tritium, carbon-14 and iodine-129. Firstly, it should be noted that only DOE's CH-LLMW is being evaluated for processing at Allied Technology Group's (ATG) site. Secondly, the three radionuclides referred to in the comment have very low average concentrations in the DOE's CH-LLMW[1]. Thirdly, recognizing the difficulties with the treatment of the volatile radionuclides, the analysis of the gasification/vitrification (GASVIT) effluents have used a highly conservative removal factor and the results, presented in Section 5.2.6 of the EA, show that the total dose to the public during 10 years of normal facility operations is 0.02 percent of the U.S. Environmental Protection Agency (EPA) regulatory limit of 10 mrem per year. As indicated, the volatile nuclide tritium, was the largest contributor to this permissible dose.

The volatile radioactive materials were also included in the accident scenario. The description of the accident scenario in Section 5.2.7 includes the statement that "Iodine, tritium, carbon, and sulfur are assumed to be released as gases."

Comment: The ATG unit to my knowledge has no planned treatment to recover the carbon-14, tritium, or the iodine-129. (Depending upon the iodine species, activated carbon may not be effective). These radioactive substances appear are intended to be released to the environment. In fact, the description of the process indicates that carbon dioxide and steam will be released.

[1] Based on the total waste inventory of 265,590 kg, the average curie content for carbon-14 is 0.226 nanocuries per gram, iodine-129 is 0.045 nanocuries per gram, and tritium is 15.8 nanocuries per gram. For comparison, the U.S. DOT defines radioactive material at greater than 2 nanocuries per gram (49 CFR 173.403.)

Response: The proposed method would treat all of the waste. As indicated above, the EA has taken into account the difficulties associated with recovering volatile radionuclides and the analysis has assumed a highly conservative release fraction for the volatile radionuclides including carbon-14, iodine-129, and tritium.

During normal operations, the EA assumes that 10 percent of the carbon-14 is released, 100 percent of the tritium is released, and 0.25 percent of the iodine species are released. Release fractions for these and other radionuclides are listed in Table 1 of the Radiological Dose and Risk Assessment for ATG Gasification and Vitrification Building that accompanied the EA.

The fate of tritium introduced into the process chamber with the waste is difficult to predict. Tritium acts similar to hydrogen in water or other compounds entering the chamber and may participate in many competing reactions and exit as gaseous hydrogen molecule, as an acid gas such as hydrogen chloride, or as water. Consequently, the risk assessment analysis conservatively assumes that all tritium introduced with the waste would be released even though some of the tritium would actually be recovered as hydrogen chloride and water in the scrubbers when the exhaust gas from the chamber is treated. The treatment of carbon-14 is discussed in the response to comment below.

Iodine would be removed as hydrogen iodide in the scrubbers and also adsorbed in the carbon beds. Recovery efficiencies for iodine in carbon filters were taken from a DOE report by Elders, *et al.* titled "Guide of Radiological Accident Consequences for Siting and Design of DOE Non-Reactor Nuclear Facilities." Analysis of accidents at the facility assumes zero credit for removal of tritium and carbon-14, and 50 percent plate-out for iodine-129.

Comment: Although not stated in the system description provided in the EA, it would appear that the addition of steam could be used to dilute tritium in the waste before it is discharged. This would not be an acceptable treatment scheme for the tritium.

Response: The process would not use steam or other gases for the purpose of diluting tritium. Steam would be added for steam reformation of carbonaceous material. Water (or steam) would also be used for cooling and scrubbing the contaminants from the gaseous streams.

For the purpose of assessing risks in the EA, as explained in a previous response, it is not assumed that any of the tritium would be treated. The EA has shown in Section 5.2.6 that risks from operating the facility as designed would be very low.

Comment: As to the C-14, the planned release of CO_2 would include C-14. This would also be unacceptable.

Response: Much of the carbon –14 would be removed as carbonates in the two scrubbers. The system is also capable of removing some of the carbon as carbon black. The analysis of

normal operations in Section 5.2.6, which uses conservative assumptions relative to carbon-14 removal, demonstrates that the total dose from normal operations for the maximally exposed individual (MEI) would be 0.02 percent of the EPA regulatory limit of 10 mrem per year.

Comment: Potential dilution of the contaminants as an incidental aspect of the process should be addressed as well as deliberate dilution, if it is planned.

Response: No deliberate dilution solely for the purpose of reducing the contaminant concentrations in the gas streams leaving the facility would occur. Besides steam addition to the process chamber, there are several other materials that would be added to the process gas during treatment process. The process description in the EA has been modified to include some of these: a constant stream of nitrogen would flow into the process chamber to keep the process chamber inert and to cool key instrumentation components; water and reagents would be added to the gaseous stream for scrubbing purposes; after cleaning, the process gas would be mixed with air to facilitate a flameless syngas conversion in the converter unit; and, the exhaust gas from the converter would be released to the building exhaust ducts where it would mix with the building ventilation before passing through the HEPA and carbon filters and entering the building stack.

Comment: The EA description of the organic waste stream does not include oxygen. The free oxygen that would be produced by the plasma arc would react or "combust" with the gaseous waste stream in a controlled manner depending upon the oxygen present. The CO_2 would be the major combustion product as noted in the system description.

Response: Due to a highly reducing environment in the GASVIT process chamber, a flame combustion reaction (a chemical reaction that produces heat and light) would not be possible. The process is categorized as gasification (or steam reforming) in which heat would be added (i.e. endothermic) to force the gasification reaction of the organic material with water. Any oxygen in the waste would reduce the amount of water (steam) that must be used, but the bulk of the oxygen required for reaction of carbon in the waste would be supplied primarily by the added water (steam). In a typical industrial combustion process, the free oxygen in air, not water, is used to produce a flame combustion reaction in which heat is released (i.e. exothermic). The amount of CO_2 present in the GASVIT chamber is a minor constituent, usually less than one or two percent.

The carbon monoxide is converted to CO_2 downstream of the process chamber, after the process gas has been scrubbed of acid gases. The flameless converter that transforms the carbon monoxide to carbon dioxide is described in Section 2.4.2. The conversion occurs entirely within the heat exchange media, within which no flame can form.

Comment: The definition of a "plasma arc incinerator" in the Washington State Dangerous Waste Regulations is as follows:

"Plasma Arc Incinerator means any enclosed device using a high intensity electrical discharge or arc as a source of heat followed by an afterburner using controlled flame combustion and which is not listed as an industrial furnace."

The chamber where the recombination of carbon and oxygen combust would constitute the "afterburner" in this context. Afterburner is not a defined term in the regulations. The combustion must be controlled to assure violent explosive recombination does not occur in the hot gaseous waste stream. The only time combustion would not be a concern is if oxygen were not a component of the waste stream.

This context is entirely inconsistent with the DOE discussion, which would lead one to believe there is no oxygen involved in the process reaction.

Response: The process does not use an "afterburner using controlled flame combustion." As noted in the above response, flame combustion in the reducing environment found in the plasma process chamber is theoretically impossible. The above response also clarifies the sources and role of oxygen in the gasification reactions that occur within the process chamber.

Comment: The credible accidents do not appear to address a fire at the facility that would affect the inventory of mixed wastes including any explosive or organic wastes in inventory. A worst case facility fire in which the maximum inventory of wastes on hand would be dispersed by the fire should be assessed in the EA. The SEPA should have also looked at this accident. The mere consideration of air borne releases from vitrified waste product is inadequate.

Response: The accident case considered in the EA document is credible as a worst case scenario. The EA has been revised to reflect that a waste container handling accident has also been evaluated. The consequences of this accident are smaller than the process chamber accident, which is considered worst case.

The scenario suggested in the above comment would not be credible because of the design of the facility. The suggested scenario assumes that the maximum inventory of wastes on hand would be dispersed by a fire. Dispersion of the maximum inventory is not credible because wastes are stored (1) within different buildings; (2) within a building in areas separated by fire walls; (3) in areas protected by fire protection systems, and (4) combustible wastes are stored in steel containers.

Comment: Secondary containment much like that necessary for a commercial reactor may be necessary in order to reduce the risk of fire at an urban site. Remote sites where geographic isolation serves as a secondary protective barrier should reduce facility costs significantly and economically favor such a remote site.

Response: The comparison with a commercial reactor is not justified since the facility would handle only contact-handled low-level radioactive material. A typical commercial reactor would contain highly radioactive material and would have an inventory of radionuclides that is several million times higher than the total inventory allowed by the ATG Facility license.

Additional containment would be provided for all combustible liquids in the process area. Furthermore, these materials would be kept in metal enclosures. The facility would be licensed by the Department of Health and would have all the measures and controls needed to minimize risk to the public during normal and abnormal conditions.

Comment: HEPA filters are known to have a reduced efficiency for particles of a certain size in the range of 0.1 micron to 1.0 micron. The production of particulate wastes as a function of their size should be identified and their impacts for normal operation considered.

Response: Nearly all of the airborne particulates released from the facility would be smaller that one micron. As required by the licensing agency (the Washington State Department of Health) the HEPA filters would be tested and certified to have a minimum 99.97 percent efficiency for removing particles larger than

0.3 microns. Thus, large particles will be trapped by the HEPA filters, and very small (respirable) particles will be emitted. The analyses of impacts of these emissions assume that emitted particles are of respirable size. The results of these analyses are discussed in Section 5.2.6

Comment: Alternate siting of the facility away from a populated area should be considered.

Response: Alternate siting of a DOE owned thermal treatment facility on the 200 area of the Hanford Site was considered in a 1993 Engineering Study, prior to considering commercial treatment options. This facility was not pursued due to high capital cost required for construction and the desire to investigate commercial treatment options to reduce the financial burden to the Government. The Request for Proposals contract solicitation, which was issued in 1995, did not allow the commercial vendors to propose siting their treatment facility on the Hanford Site. This allowed vendors to utilize their existing infrastructure to the maximum extent practicable, to treat other than Hanford waste if desired, to utilize the economies of scale, and therefore submit the most cost-effective bid.

Comment: Since the City of Richland has an objective of promoting industrial operations within the City boundaries, they have a conflict of interest in providing an unbiased State of Washington Environmental Protection Agency (SEPA). The Department of Health having responsibility for the radioactive waste should be a joint preparer of the SEPA and responsible for the decision regarding siting. The City of Richland lands do not provide an alternative remote site away from any population center. A site near the 200 Area at Hanford would substantially reduce the health risk to the population associated with routine operations as well as worst case accident. Such a site would substantially reduce the cost of transportation and risk of traffic accidents associated with the DOE wastes alone.

Response: A site near the 200 Area on the Hanford Site is not available for the purpose of treating non-Hanford waste as ATG proposes to do.

Comment: It appears in fact that the city has tried to hide the facility from public scrutiny. The lack of public comments and participation is apparent. There was no credible effort to involve the public. I do not consider the newspaper ad was a credible effort considering the innocuous description of the facility and lack of public response.

Response: DOE cannot comment on the SEPA Environmental Impact Statement (EIS) public participation processes since that is not under DOE's purview. However, we note that there were public comment periods announced, and that 99 comments were received from the public and other agencies on the Draft EIS that the city addressed prior to issuing the Final EIS.

On May 29, 1996, Ecology held a public meeting on ATG's Notice of Intent to site a thermal destruction unit at their site in North Richland. Formal comments were received from the public and responses to those comments were addressed in writing by Ecology.

Comment: The DOE revised EA should be made public on the Internet with the request for comments. Effective advertisement should be accomplished. Specific letters to the two child care centers and the Hanford PTA notifying them of the nature and proximity of the proposed facility should be prepared to alert potentially interested public. Comments from the Hanford Advisory Board should be requested

Response: The Draft EA was made public on the Internet with a request for public comments in 1997. In accordance with standard policy, letters were sent to the Tribes, Oregon Department of Energy, and Washington State Department of Ecology (Ecology), notifying those parties of a determination to prepare the EA. The Draft EA was subsequently sent to these parties and others including the City of Richland for their review and comment. Comments received from members of the public at that time were considered and responded to.

Comment: DOE should assure an appropriate oversight entity for nuclear material is responsible for preparation of an alternative siting evaluation, since a large fraction of the DOE wastes are intended to be processed at the ATG facility. Potential future liability for a site in Richland not now contaminated should way heavily in favor of an industrial site already contaminated such as the 200 Area. DOE would not be prudent to advocate an urban site such as the one proposed in the City when considering potential future liability. The entity responsible for licensing should not be a consideration when considering this future liability.

Response: Like the other two proposers, ATG proposed using their existing site, which is being developed for commercial low-level radioactive mixed waste treatment. ATG is working to obtain the necessary permits from the Washington State Departments of Ecology and Health. Treatment of DOE's waste by ATG is contingent on their ability to obtain those permits.

ATG's process selected for treating DOE's CH-LLMW is a technology that has been adopted for commercial application after several years of development at Massachusetts Institute of Technology and

Pacific Northwest National Laboratory. The technology has been licensed to a local firm, Integrated Environmental Technologies, LLC, (IET).

The system was selected by ATG because of several inherent environmentally desirable features. These features minimize risk to the public by minimizing emissions while producing a waste form that is highly stable. The waste form also resists the leaching of hazardous constituents into the environment. A prototype version of the system is available for inspection at IET's facility in Richland, Washington. If you are interested in a site visit, please contact Kevin Salmon, ATG, on (509) 375-5160.

DOE and ATG would be happy to meet with you, if you so desire, to further discuss the above responses to you comments. You may call me on 376-6667, or you may call Joe Waring, Waste Programs Division, on 373-7687, to schedule a meeting within two weeks from the date of this letter.

Sincerely,

Paul F. X. Dunigan, Jr.
NEPA Compliance Officer

WPD:JJW

cc: F. Feizollahi, ATG
K. Salmon, ATG
T. L. Baker, WMH

Comment Number: 001 *F. Robert Cook*

Comment: Segmentation. The EA seems to delimit the consideration to ten years of contractual action which seemed to be arbitrary and would be classified as segmenting the actions that should be considered in this mixed waste treatment arena.

Response: The purpose and need section (Section 1.0) was revised to state that the proposed action evaluated in this EA is the demonstration of the feasibility of offsite commercial treatment of LLMW and that the proposed action is an interim action under the Hanford Site Solid Waste EIS.

Comment Number: 002 *F. Robert Cook*

Comment: Alternative Siting. Alternative siting of the mixed waste facility (MWF) in the Hanford Site 200 area should be addressed in the EA.

Response: Siting has been addressed in a separate State Environmental Policy Act (SEPA) Environmental Impact Statement (City of Richland 1998).

Comment Number: 003 *F. Robert Cook*

Comment: Combined Impact with Commercial Facility. DOE contract is the primary incentive for ATG's investment in the privatized facility. Without this contract the facility may not be built. Therefore, DOE's EA must consider the full impact of the commercial wastes as well as DOE wastes to be treated by MWF.

Response: As stated on p. 2-1, ATG would proceed with the facility whether or not the Hanford Site LLMW is included. The Hanford Site LLMW will supply only 25% of the capacity of the facility. Therefore, for this EA, only Hanford Site LLMW was analyzed. In addition, the EIS for Treatment of Low-Level Mixed Waste provides the cumulative impacts of this privatized facility processing DOE and non-DOE waste while operating at full capacity.

Comment Number: 004 *F. Robert Cook*

Comment: Cumulative Impact. The EA section addressing cumulative impacts to be expanded to include:

- Cumulative radiological impacts from various commercial and DOE facilities.
- Cumulative toxicological impact.
- Cumulative impact from unlicensed (DOE) sources.

Response: A table was added in Section 5.11 of the EA that presents the cumulative radiological impacts from surrounding commercial facilities, DOE facilities, and unlicensed sources. Cumulative toxicological impacts were not addressed in detail because of the lack of data

available for airborne chemical concentrations. Based on the human health impacts from routine chemical emissions presented in Section 5.2 of the EA, there are no indications that the incremental increase in impacts from chemical emissions associated with thermal treatment of DOE LLMW would cause appreciable change in the surrounding region.

Comment Number: 005 *F. Robert Cook*

Comment: Accident Analysis. Expand the section on accident analysis to cover the following:

- Analysis of a fire accident involving 64 cubic feet of waste in the process chamber.
- Analysis of a fire accident involving all of the combustible material stored in the thermal processing room, and, if appropriate the covered storage building.
- Analysis of a fire accident involving HEPA and Charcoal filters.
- Evaluate accident scenarios of one chance in a million magnitude.
- Assessment of inventory of total radionuclides in the metal and in the glass.

Response: The accident analysis presented in Section 5.1.5 (Transportation) and Section 5.2.7 (Facility Accidents) has been revised to evaluate bounding accidents from among those identified in the comment. A preliminary hazards analysis was completed for the thermal treatment facility and the bounding transportation and facility accident were incorporated into the final EA. In addition to the accidents presented in the EA, additional accident analyses were performed to evaluate a number of accident scenarios. This analysis is documented in Jacobs (1998). The impacts from other accident scenarios were less severe than the bounding accidents presented in the EA.

Comment Number: 006 *F. Robert Cook*

Comment: Treatment of Carbon-14 and Tritium to Comply with NRC Regulation. Certain NRC regulations require that the applicant must demonstrate that the facility is doing a reasonable effort to minimize the radioactivity contained in the effluents. The NRC regulations 10CFR20.106(B)(1) and 10CFR20.305 are cited as an evidence for this requirement. The issue to be addressed in the EA is that how the facility meets these NRC regulations with respect to carbon-14, and tritium given the fact that the proposed thermal treatment appear to release these two isotopes without a best effort for their treatment. Also, a comment is raised as to the feasibility of scrubbing carbon-14 with lime (i.e., to convert CO2 in the offgas to carbonate salts).

Response: The ATG facility is being permitted as a miscellaneous thermal treatment unit under Washington Administrative Code 173-303-680. As identified in Section 6 of the Draft EA, ATG is required to obtain the major permits and approvals identified in the following table. These licenses require that ATG utilize maximum available control technology and/or best available radionuclide control technology, which will be verified by the responsible agency prior to permit approval.

Permits Required for ATG Facility

Permits and Notifications	Permitting Agency
RCRA Part B (e.g., 40 CFR 264)	Washington State Department of Ecology
Toxic Substances Control Act (TSCA) – Treatment of PCBs by Alternative Methods and Notification of PCB Activity	U.S. Environmental Protection Agency
Radiological Air Permit (NESHAP)	Washington State Department of Health
Radiological Permit Update	Washington State Department of Health

In addition to these permits and approvals, the ATG facility must comply with the Nuclear Regulatory Commission regulations, the Washington State Hazardous Waste Management Act, Hanford Site Solid Waste Acceptance Criteria, and other federal, state, and local regulations.

Appropriate off-gas treatment technologies have been considered for the ATG off-gas treatment system. In specific, technologies targeted at removing carbon-14 from the off-gas stream were considered and determined to be infeasible due to the generation of a substantial secondary waste stream that would require further processing and disposal. During vitrification, the carbon-14 would be converted to carbon oxides along with all other nonradioactive carbon in the waste stream. The carbon oxides containing the carbon-14 would make up a small percentage of the total carbon oxides in the off-gas stream. Removal of carbon-14 from the off-gas could be done by scrubbing the off-gas with a lime solution to convert the carbon oxides into carbonate salts. Any treatment technology used to capture the carbon-14 would also have to capture all of the other carbon oxides.

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- The effect of tritium on egg cells and mutigenic effect on egg cells of individuals, mothers, mothers to-be who have chronic inventory of tritium from water and from the critical amino acids in some plants should be addressed.

Response: The impact analysis for routine operations was based on iodine emissions being gaseous and scrubbable in the off-gas treatment system with an overall release fraction of 2.25E-03. The accident analysis was based on a release fraction of 0.15 for iodine. A report addressing special effects of internally incorporated radioactivity was developed in response to this comment (IDIAS 1998). The conclusions of the special effects report include:

- The risk from inhaled insoluble particles of alpha-emitting radionuclides deposited in the lungs is dependent on the activity median aerodynamic diameter (AMAD). As the AMAD of the aerosol increases, the deposition (risk) in the lungs decreases. Hence, the risk is no greater than and in some cases lower from inhaled hot particles than from uniformly distributed activity assumed in the dose modeling.

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- The risk of a mutagenic effect to the second generation progeny from exposures of females to organically bound tritium cannot be greater than 2.7 times the risk that would occur if the tritium was in water (1993 Health Physics Special Issue).

The special effects report, available for review as a part of the Thermal EA Administrative Record, provides a comprehensive discussion on the radiation health effects identified in the comment. Based on the findings of the referenced report, the radiological health effects were not revised in the EA. The potential increase in risks due to organically bound tritium would be below levels of concern even if the maximum potential increase (2.7 times) were to occur.

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Response:

- Ruthenium is identified as present in Hanford Site waste. It is assumed to be in particulate form for both the normal operation scenario and the accident analyses presented in the Draft EA. However, ruthenium is not one of the 10 fission product radionuclides that comprise over 99% of the radioactivity in the waste. The following table shows the estimated inventory of ruthenium and fraction released to the environment in the impact analysis. These data may be found in the following reference (available in the Hanford Reading Rooms):

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Radionuclide	**Inventory**	**Yearly Curies Processed**	**Release Fraction**	**Yearly Curies Released to Atmosphere**
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Note: Ruthenium includes metastable decay product rhodium.

A screening-level risk assessment was performed to determine the dose to receptors if a conservative fraction of the ruthenium present in the waste was released to the environment during routine operations (30 percent) (Goossens, Eicholz, and Tedeer [editors] 1991). The results of this assessment show that releasing 30 percent of the radionuclide does not affect the conclusions of this Environmental Assessment.

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- H-3 = 1.2E-01 pCi/L (0.0006% of the drinking water standard)
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These concentrations result in a potential dose through the drinking water pathway of 3.8E-04 mrem/year (ATG 1998), which is well below all applicable regulatory limits.

Comment Number: 014 *F. Robert Cook*

Comment: Mercury. Do we have an acceptable design for handling mercury?

Response: Confinement systems would be provided to capture fugitive emissions including any mercury vapor or particulates released during operations. Mercury absorbing filters would be provided to remove nearly all mercury from the offgas before being discharged to the stack. Mercury removal units would have an overall removal efficiency greater than 97% for mercury. In the gasification and vitrification unit, this would be accomplished by cooling and scrubbing the offgas, followed by multiple filtration steps. The facility Preliminary Risk Assessment (ATG

1998a), conducted as a part of the RCRA/TSCA permitting process, showed that the design features provided for mercury treatment would reduce risks to a level that is below EPA risk guidelines. Therefore, it is concluded that the ATG Facility has an acceptable design for handling mercury.

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August 26, 1998

The Honorable Slade Gorton
United States Senator for
The State of Washington
Tri-Cities Office
8915 West Grandridge
Boulevard, Suite M
Kennewick, Washington
99336

The Honorable Patty Murry
United States Senator for
The State of Washington
111 Russell Senate Office Building
Washington, D.C. 20510

The Honorable Doc Hastings
U.S. House of Representative for
The Fourth District, State of Washington
Tri-Cities Office
2715 St. Andrews Loop, Suite D
Pasco, WA 99301

Dear Senators Murry, and Gorton, and Representative Hastings;

Please help stop the insanity! Stop the Department of Energy's radioactive mixed waste from being treated and stored within the City of Richland.

Recently I attended a public meeting conducted by the Washington State Department of Ecology at their Kennewick, Washington offices. The subject of that meeting was a risk assessment for the Allied Technology Group's transportation, treatment and storage of radioactive mixed waste at their Richland, Washington facility. During this meeting it was revealed that the source of the radioactive mixed waste was the Hanford Reservation, and that a majority of the radioactive mixed waste scheduled for treatment and storage in Richland, while currently residing on the Hanford Reservation, was shipped there from a DOE facility at Portsmouth, Ohio. It was also revealed that the technology proposed for the treatment of this DOE radioactive mixed waste has never been implemented beyond a pilot test and that pilot test was on a dis-similar waste stream. While the dangerous waste component of the radioactive mixed waste can be eliminated through treatment, there is no treatment for the radioactive portion of the waste. That portion will remain radioactive long into the future.

Aren't DOE's Hanford missions environmental cleanup, waste management, and the conduct of cleanup-related research? Why in the world would any sane person

deliberately spread radioactive contamination from the relatively geographically expansive and isolated Hanford Reservation into a residential environment? Why would any sane person conduct large scale radioactive cleanup research in a residential environment?

Richland and the entire Tri-City area receive considerable financial benefit from the DOE, and DOE, its predecessors, and the nation received considerable benefit from operations at Hanford. It is recognized that part of the national benefit resulted in what the national press frequently calls "...the most contaminated site in the US." It is also recognized that the DOE cleanup mission will come to a close, leaving the area to grapple for their economic survival with the problem of attracting living-wage jobs. While the frequent national press articles do sell papers and are apparently effective in DOE's budget negotiations with Congress, they locally create an extreme handicap for attracting clean, living-wage jobs.

DOE's exodus from the area is being hastened by their "privatization" concept. Under this concept, DOE is shifting their responsibility for cleanup and compliance with the environmental regulations to private industry. Private industry may indeed be better equipped to recognize that radioactive waste storage tanks with a 20 year design life might start to leak after 30 or 40 years. However, using "privatization" as an excuse for spreading DOE's radioactive waste into the community only continues the cycle of DOE irresponsibility.

The Hanford Reservation is advertised as occupying an area of some 560 square miles. Surely, there is some portion of that 560 square miles that could be used by Allied Technology Group to treat and store DOE's radioactive mixed waste, and commercially prove a new technology. This novel concept (of keeping radioactive waste on the Hanford Reservation) recognizes both the abilities of private industry and DOE, and keeps from spreading DOE's radioactive mixed waste into the City of Richland.

Without your active support, I firmly believe that future generations of Richland residents will have to address the adverse effects of yet another DOE disaster. Please help stop the insanity. Stop the Department of Energy's radioactive mixed waste from being treated and stored within the City of Richland.

Sincerely,

Bill Green
424 Shoreline Ct.
Richland, WA 99352

cc: M. Jaraysi, Wa. St. Dept. of Ecology

SLADE GORTON
WASHINGTON

730 HART SENATE OFFICE BUILDING
(202) 224 3441

United States Senate

WASHINGTON, DC 20510–4701

COMMITTEES:

APPROPRIATIONS

BUDGET

COMMERCE, SCIENCE, AND TRANSPORTATION

ENERGY AND NATURAL RESOURCES

INDIAN AFFAIRS

September 1, 1998

MANAGER'S ACTION *WPD
D198165966 MGR
DUEDATE: 9/17 AMW
ESH
OEA
PAD
QSH

Mr. John Wagoner
Manager
USDOE-RL
P.O. Box 550
Richland, WA 99352

RE: Mr. Bill Green

Dear Mr. Wagoner,

I have been asked to assist my constituent, Mr. Bill Green, in the matter described in the enclosed correspondence. I am referring this inquiry to you for your consideration.

Please provide the necessary information to the attention of Suzanne Heaston in my Kennewick office, 8915 Grandridge Blvd., Suite M, Kennewick, WA, 99336.

In advance, thank you for your prompt attention to this matter.

Sincerely,

SLADE GORTON
UNITED STATES SENATOR

SG/smh

10900 N.E. FOURTH STREET
SUITE #2110
BELLEVUE, WA 98004
(425) 451-0103

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VANCOUVER, WA 98660
(206) 696-7838

697 U.S. COURT HOUSE
W. 920 RIVERSIDE AVENUE
SPOKANE, WA 99201
(509) 353-2507

BOX 4083
402 EAST YAKIMA AVENUE
YAKIMA, WA 98901
(509) 248-8014

1350 GRANDRIDGE BLVD.
SUITE #212
KENNEWICK, WA 99336
(509) 783-0640

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

98-WPD-319

SEP 2 0 1998

The Honorable Slade Gorton
United States Senate
Washington, D. C. 20510

Dear Senator Gorton:

This is in response to your letter of August 26, 1998, which listed concerns raised by your constituent, Bill Green, regarding the use of an Allied Technology Group (ATG) commercial facility for thermal treatment of Hanford Site low-level mixed waste. ATG is constructing a commercial facility located off the Hanford Site with their own capital for the treatment of low-level mixed waste.

Low-level mixed waste treatment is required before disposal under the Resource Conservation and Recovery Act (RCRA), State of Washington Administrative Code-Dangerous Waste Regulations, and Toxic Substances Control Act. Some of Hanford's waste requires thermal treatment under these regulations prior to land disposal of the waste. Following treatment, ATG will return Hanford low-level mixed waste, which will be greatly reduced in volume, to the Hanford Site. Nearly all of the Hanford radioactive mixed waste currently residing at Hanford, and scheduled for treatment at the ATG facility, was generated at Hanford. Only a small portion of the currently scheduled Hanford waste has come from other sources and all future scheduled Hanford waste will be Hanford generated, except as may be authorized by site treatment plans developed as part of the Federal Facilities Compliance Agreement (FFCA). Treatment followed by land disposal would reduce long-term surveillance and maintenance requirements at the Hanford Site.

We understand ATG plans to treat waste from both Hanford and other sources. However, waste from the Hanford Site will be kept separate from other waste streams by treating it in separate campaigns. Likewise, treatment of wastes from other DOE and non-DOE sources will be treated and returned to those sources. We also understand the ATG treatment of the Hanford Site low-level mixed waste would require the use of no more than 25 percent of the facility. Permitting of the facility is underway through the State of Washington Department of Ecology (Ecology). The DOE is not a party to the permit.

ATG currently manages low-level waste at their Richland, Washington facility. They have volume reduction (compaction, thermal, cutting, etc.), decontamination, sorting/consolidation, and decay storage services. With the addition of low-level mixed waste treatment services to ATG's capabilities, only the "hazardous" component of mixed waste is unique. This coincides with Hanford currently sending all their hazardous

waste offsite for treatment and, as stated above, the treated Hanford radioactive waste will be returned to the Hanford Site and not stored at the ATG facility.

It should be noted that the effects of the overall operation were evaluated under the Washington State Environmental Policy Act by the City of Richland Environmental Impact Statement for Treatment of Low-Level Mixed Waste, February 1998 (City of Richland 1998). ATG can only operate the facility after obtaining permits and approvals from Ecology, Washington State Department of Health, and the U.S. Environmental Protection Agency. The state and other Federal agencies will oversee the ATG plant; DOE provides no regulatory oversight for this facility.

It is also noted that the services DOE will be receiving from ATG for treatment of mixed waste is not a transition of an existing Hanford capability via privatization. It is simply contracting for a needed service that will be available from a local private business. We see this as a very positive feature for both DOE and the local community's economic development. Mr. Green's statement that "...using 'privatization' as an excuse for spreading DOE's radioactive waste into the community..." is inaccurate and misleading.

We hope this information is responsive to your request. If you have any questions, please contact me, or your staff may contact Helen E. Bilson, Waste Programs Division, on (509) 376-1366.

Sincerely,

John D. Wagoner
Manager

cc: S. Heaston

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APPENDIX E
COMMENTS/RESPONSES

ATG Thermal Treatment Environmental Assessment

Comment Number: 001 *F. Robert Cook*

Comment: Segmentation. The EA seems to delimit the consideration to ten years of contractual action which seemed to be arbitrary and would be classified as segmenting the actions that should be considered in this mixed waste treatment arena.

Response: The purpose and need section (Section 1.0) was revised to state that the proposed action evaluated in this EA is the demonstration of the feasibility of offsite commercial treatment of LLMW and that the proposed action is an interim action under the Hanford Site Solid Waste EIS.

Comment Number: 002 *F. Robert Cook*

Comment: Alternative Siting. Alternative siting of the mixed waste facility (MWF) in the Hanford Site 200 area should be addressed in the EA.

Response: Siting has been addressed in a separate State Environmental Policy Act (SEPA) Environmental Impact Statement (City of Richland 1998).

Comment Number: 003 *F. Robert Cook*

Comment: Combined Impact with Commercial Facility. DOE contract is the primary incentive for ATG's investment in the privatized facility. Without this contract the facility may not be built. Therefore, DOE's EA must consider the full impact of the commercial wastes as well as DOE wastes to be treated by MWF.

Response: As stated on p. 2-1, ATG would proceed with the facility whether or not the Hanford Site LLMW is included. The Hanford Site LLMW will supply only 25% of the capacity of the facility. Therefore, for this EA, only Hanford Site LLMW was analyzed. In addition, the EIS for Treatment of Low-Level Mixed Waste provides the cumulative impacts of this privatized facility processing DOE and non-DOE waste while operating at full capacity.

Comment Number: 004 *F. Robert Cook*

Comment: Cumulative Impact. The EA section addressing cumulative impacts to be expanded to include:

- Cumulative radiological impacts from various commercial and DOE facilities.
- Cumulative toxicological impact.
- Cumulative impact from unlicensed (DOE) sources.

Response: A table was added in Section 5.11 of the EA that presents the cumulative radiological impacts from surrounding commercial facilities, DOE facilities, and unlicensed sources. Cumulative toxicological impacts were not addressed in detail because of the lack of data available for airborne chemical

concentrations. Based on the human health impacts from routine chemical emissions presented in Section 5.2 of the EA, there are no indications that the incremental increase in impacts from chemical emissions associated with thermal treatment of DOE LLMW would cause appreciable change in the surrounding region.

Comment Number: 005 *F. Robert Cook*

Comment: Accident Analysis. Expand the section on accident analysis to cover the following:

- Analysis of a fire accident involving 64 cubic feet of waste in the process chamber.
- Analysis of a fire accident involving all of the combustible material stored in the thermal processing room, and, if appropriate the covered storage building.
- Analysis of a fire accident involving HEPA and Charcoal filters.
- Evaluate accident scenarios of one chance in a million magnitude.
- Assessment of inventory of total radionuclides in the metal and in the glass.

Response: The accident analysis presented in Section 5.1.5 (Transportation) and Section 5.2.7 (Facility Accidents) has been revised to evaluate bounding accidents from among those identified in the comment. A preliminary hazards analysis was completed for the thermal treatment facility and the bounding transportation and facility accident were incorporated into the final EA. In addition to the accidents presented in the EA, additional accident analyses were performed to evaluate a number of accident scenarios. This analysis is documented in Jacobs (1998). The impacts from other accident scenarios were less severe than the bounding accidents presented in the EA.

Comment Number: 006 *F. Robert Cook*

Comment: Treatment of Carbon-14 and Tritium to Comply with NRC Regulation. Certain NRC regulations require that the applicant must demonstrate that the facility is doing a reasonable effort to minimize the radioactivity contained in the effluents. The NRC regulations 10CFR20.106(B)(1) and 10CFR20.305 are cited as an evidence for this requirement. The issue to be addressed in the EA is that how the facility meets these NRC regulations with respect to carbon-14, and tritium given the fact that the proposed thermal treatment appear to release these two isotopes without a best effort for their treatment. Also, a comment is raised as to the feasibility of scrubbing carbon-14 with lime (i.e., to convert CO2 in the offgas to carbonate salts).

Response: The ATG facility is being permitted as a miscellaneous thermal treatment unit under Washington Administrative Code 173-303-680. As identified in Section 6 of the Draft EA, ATG is required to obtain the major permits and approvals identified in the following table. These licenses require that ATG utilize maximum available control technology and/or best available radionuclide control technology, which will be verified by the responsible agency prior to permit approval.

Permits Required for ATG Facility

Permits and Notifications	Permitting Agency
RCRA Part B (e.g., 40 CFR 264)	Washington State Department of Ecology
Toxic Substances Control Act (TSCA) – Treatment of PCBs by Alternative Methods and Notification of PCB Activity	U.S. Environmental Protection Agency
Radiological Air Permit (NESHAP)	Washington State Department of Health
Radiological Permit Update	Washington State Department of Health

In addition to these permits and approvals, the ATG facility must comply with the Nuclear Regulatory Commission regulations, the Washington State Hazardous Waste Management Act, Hanford Site Solid Waste Acceptance Criteria, and other federal, state, and local regulations.

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Comment Number: 014 *F. Robert Cook*

Comment: Mercury. Do we have an acceptable design for handling mercury?

Response: Confinement systems would be provided to capture fugitive emissions including any mercury vapor or particulates released during operations. Mercury absorbing filters would be provided to remove nearly all mercury from the offgas before being discharged to the stack. Mercury removal units would have an overall removal efficiency greater than 97% for mercury. In the gasification and vitrification unit, this would be accomplished by cooling and scrubbing the offgas, followed by multiple filtration steps. The facility Preliminary Risk Assessment (ATG 1998a), conducted as a part of the RCRA/TSCA permitting process, showed that the design features provided for mercury treatment would reduce risks to a level that is below EPA risk guidelines. Therefore, it is concluded that the ATG Facility has an acceptable design for handling mercury.

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Acronyms and Abbreviations

ATG	Applied Technology Group, Inc.
BDAT	best demonstrated available technology
CAA	Clean Air Act
CAP88-PC	Clean Air Act Assessment Package 1988 Personal Computer
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DC	direct current
DOE	U.S. Department of Energy
DOE-HQ	U.S. Department of Energy Headquarters
DOT	U.S. Department of Transportation
EA	environmental assessment
Ecology	Washington State Department of Ecology
EIS	environmental impact statement

EPA	U.S. Environmental Protection Agency
ERPG	Emergency Response Planning Guideline
FR	Federal Register
HEPA	high-efficiency particulate air (filter)
HQ	hazard quotient
INCIN	incinerator
INEEL	Idaho National Engineering and Environmental Laboratory
IRIS	Integrated Risk Information System
LCF	latent cancer fatality
LDR	land disposal restrictions
LLMW	low-level mixed waste
MEI	maximally exposed individual
MSDS	material safety data sheets
MWF	mixed waste facility
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
P^2	pollution prevention
PCB	polychlorinated biphenyl
PEAT	Plasma Energy Applied Technology, Inc.
PEL	permissible exposure limits
PHA	preliminary hazards analysis
PPOA	pollution prevention opportunity assessment
RCRA	Resource Conservation and Recovery Act of 1976
RCW	Revised Code of Washington

rem	dosage of an ionizing radiation that will cause the same biological effect as one roentgen of x-ray or gamma-ray dosage.
RfD	reference dose
RL	U.S. Department of Energy, Richland Operations Office
SARA	Superfund Amendments and Reauthorization Act
SEPA	Washington State Environmental Policy Act
SPCC	spill prevention, control, and countermeasures
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
USC	United States Code
WAC	Washington Administrative Code
WSDOH	Washington State Department of Health
WSHWMA	Washington State Hazardous Waste Management Act