~~OFFICIAL USE ONLY~~

August 13, 2004

MEMORANDUM TO: Jennifer Davis, Section Chief
Environmental & Low Level Waste Section
Environmental & Performance Assessment Directorate
Division of Waste Management
and Environmental Protection
Office of Nuclear Material Safety
and Safeguards

FROM: John Lubinski, Section Chief /RA/
Fuel Manufacturing Section
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

SUBJECT: TECHNICAL ASSISTANCE REQUEST - BWX TECHNOLOGIES ENVIRONMENTAL ASSESSMENT

The Division of Fuel Cycle Safety and Safeguards, Fuel Cycle Facilities Branch (FCFB) requests technical assistance from Division of Waste Management and Environmental Protection (DWMEP) in the completion of the following project:

PROJECT: Environmental Assessment for the attached Environmental Report on BWX Technologies. Inc. (BWXT) in Lynchburg, VA.

DOCKET NO./ TAC NO: 70-27 L31836

LICENSE: SNM-42

REQUESTED ACTION: Please review the attached Environmental Report provided by BWXT as part of its request for a license renewal and prepare an Environmental Assessment. To facilitate this request, we ask that you respond by September 1, 2004, and complete this project by May 1, 2005.

~~OFFICIAL USE ONLY~~

~~May be exempt [illegible] release [illegible] Freedom of Information Act (5 [illegible]~~

~~Exemption number [illegible]~~
~~Nuclear [illegible] Commission [illegible] before public [illegible]~~
~~John Lubinski /RA/~~
~~Name and organization of person making [illegible]~~

~~Date of Determination 8/13/04~~

~~OFFICIAL USE ONLY~~



C-1

Please note that all information associated with this action is Official Use Only. All documentation should be handled accordingly and not released to the public without consultation with the FCFB staff.

Please provide the information requested below and return a completed copy to the Licensing Assistant (LA) or Project Manager (PM).

Name of DWMEP's Reviewer: ______________________________

DWMEP Project Completion Date: ___________________________

DWMEP Branch Chief Signature: ____________________________

Contacts: PM: Billy Gleaves (301) 415-5848
LA: Judy Muszkiewicz (301) 415-8103

The above TAC No. should be referenced in future correspondence related to this request and on HRMS for recording staff time expended on this effort.

Attachment: Request to Renew License, SNM-42 (excluding Enclosure 3)

# Environmental Report

For Renewal of License SNM-42

BWXT, Nuclear Products Division

Lynchburg, Virginia

March 10, 2004

# Table of Contents

1.0 Introduction ........................................ 1-1
1.1 Purpose and Need for Proposed Action ........................................ 1-1
1.2 Proposed Action ........................................ 1-1
2.0 Detailed Description of the Alternatives ........................................ 2-1
2.1 No Action Alternative – Cessation of Operations ........................................ 2-1
2.2 Proposed Alternative - Continued Operation ........................................ 2-1
2.3 Alternatives - Cessation of operations ........................................ 2-14
3.0 Description of the Affected Environment ........................................ 3-1
3.1 Land Use ........................................ 3-1
3.2 Transportation ........................................ 3-2
3.3 Geology & Soils ........................................ 3-2
3.4 Water Resources ........................................ 3-5
3.5 Ecological Resources ........................................ 3-9
3.6 Meteorology, Climatology and Air Quality ........................................ 3-11
3.7 Noise ........................................ 3-12
3.8 Historical & Cultural Resources ........................................ 3-14
3.9 Visual/Scenic Resources ........................................ 3-15
3.10 Socioeconomic ........................................ 3-15
3.11 Public & Occupational Health ........................................ 3-16
3.12 Waste Management ........................................ 3-17
4.0 Environmental Impacts of Proposed Action and Alternative ........................................ 4-1
4.1 Land Use ........................................ 4-1
4.2 Transportation ........................................ 4-1
4. 3 Geology & Soils ........................................ 4-1
4.4 Water Resources ........................................ 4-2
4.5 Ecology ........................................ 4-5

4.6 Air Quality ........................................ 4-6
4.7 Noise ........................................ 4-8
4.8 Historical & Cultural Resources ........................................ 4-9
4.9 Visual/Scenic Resources ........................................ 4-9
4.10 Socioeconomic ........................................ 4-9
4.11 Environmental Justice ........................................ 4-9
4.12 Public & Occupational Health ........................................ 4-9
4.13 Waste Management ........................................ 4-10

5.0 Mitigation Measures ........................................ 5-1
5.1 ALARA Program ........................................ 5-1
5.2 Change Control ........................................ 5-2

6.0 Environmental Measurements and Monitoring Programs ........................................ 6-1

7.0 Cost Benefit Analysis ........................................ 7-1

8.0 Summary of Environmental Consequences ........................................ 8-1

9.0 List of References ........................................ 9-1

List of Tables


| | |
|---|---|
| 2-1 | Characteristics of Current Stacks |
| 3-1 | Earthquakes in the Virginia Area |
| 3-2 | VPDES Permit Limitations |
| 3-3 | Flooding of the James River |
| 3-4 | VPDES Discharge Limits |
| 3-5 | Threatened and Endangered Animal Species in Virginia |
| 3-6 | Threatened and Endangered Plants in Virginia |
| 3-7 | Climate Summary for Lynchburg, Virginia |
| 3-8 | Sites Listed in Federal Registry of Historical Places |
| 3-9 | Regional Populations |
| 3-10 | Lynchburg Employment Statistics |
| 3-11 | Background Radiation Exposure |
| 3-12 | Uranium Activity in Onsite Soils |
| 3-13 | Quantities of Waste Generated |
| 4-1 | NPD Water Usage |
| 4-2 | Liquid Effluent Discharge Summary |
| 4-3 | Ground Water Monitoring Wells, NPD |
| 4-4 | Ground Water Monitoring Wells, LTC |
| 4-5 | Gaseous Effluent Summary |
| 4-6 | Environmental Boundary Air Sampling Data |
| 4-7 | NOx and HF Emissions from Significant Sources |
| 4-8 | Exposures from Effluent Releases |
| 6-1 | Environmental Monitoring Data |

List of Figures

2-1 Geographical Location of the BWXT Facility
2-2 Topographic Map (Lynchburg Area)
2-3 Site Drawing
2-4 LTC Facility Layout
2-5 Waste Treatment Facility Layout
2-6 Waste Treatment Process Summary
2-7 Environmental Sampling Locations

3-1 Land Use Surrounding BWXT
3-2 Wetland Areas on the Mt. Athos Site
3-3 Tornado Probability

~~WITHHOLD~~



# 1.0 INTRODUCTION

In accordance with 10CFR51.60, BWX Technologies, Nuclear Products Division (NPD) has prepared this environmental report as a part of the license renewal effort for license SNM-42.

NUREG-1748, *Environmental Review Guidance for Licensing Actions Associated with NMSS Programs* and NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility* were used as guidance in the preparation of this report.

## 1.1 Purpose and Need for Proposed Action

The proposed action is the renewal of license SNM-42. SNM-42 was most recently renewed in September 1995. A supplemental Environmental Assessment was prepared by the NRC in June 1995 in support of the last license renewal. Renewal of SNM-42 will allow operations at NPD to continue.

NPD is a uranium fuel fabrication and research facility located in Lynchburg, Virginia. NPD fabricates nuclear components for various agencies and performs recovery of scrap uranium generated (b)(4) Ex 4 (b)(4) NPD is authorized to possess radioactive materials for the assembly and fabrication of nuclear components. The primary missions of the facility are:

(b)(4) Ex 4

- Fabrication of targets for irradiation in reactors;
- Performance of enrichment adjustment operations;
- Recovery of processed "scrap" uranium; Ex 4
- Examination of irradiated (b)(4) reactor components; Ex 4
- Analytical activities such as laboratory analysis, preparation and modification of radiation sources; and
- Preparation and decontamination of reactor related hardware for inspecting, evaluating and measuring reactor components.

## 1.2 Proposed Action

The proposed action that is supported by this environmental report is the renewal of license SNM-42 and the continuation of operations at the NPD facilities.

# 2.0 DETAILED DESCRIPTION OF THE ALTERNATIVES

## 2.1 No Action Alternative – Cessation of Operations

The no action alternative would cause termination of licensed operations, and eventually initiation of decommissioning activities. The environmental impact from decommissioning would, in the short term, be similar to operation of the facility, with the notable exceptions of a significant increase in waste generation and an increase in unemployment in the area. Due to the important products produced by BWXT, if operations were terminated, these processes would be transferred to a new site. The new site would likely have more significant environmental impacts due to construction and start up activities.

## 2.2 Proposed Alternative - Continued Operation

The proposed action is license renewal in support of continuing operations. Currently there are no major modifications planned to the facilities that would pose an environmental impact. The environmental impact of continued operations at NPD can be evaluated by analyzing data from current and past operations at the facility.

### 2.2.1 Description of Current Operations

BWXT (formerly Babcock & Wilcox) is an operating company of McDermott Inc., a subsidiary of McDermott International. BWXT has conducted operations at the site since 1955.

The NPD site is located on the James River in the northeastern corner of Campbell County in the central part of Virginia, approximately 5 miles east of Lynchburg, Virginia (see Figure 2-1). The center of the facility lies at an approximate latitude/longitude of 37° 25′ north, 79° 4′ west. Figure 2-2 depicts the topography of the site and surrounding areas. The site includes 476 acres, approximately 39 of which are enclosed within a security fence.

License SNM-42 details the types and quantities of radioactive material BWXT is authorized to possess. The primary type of material is uranium in varying enrichments and different chemical forms. NPD also handles lesser amounts of transuranic as well as by-product material. The possession limits are detailed in section 1.4 of license SNM-42.

### NPD Operations

The main manufacturing facilities occupy the central area of the site, as shown in Figure 2-3. The NPD manufacturing facilities along with the support facilities occupy approximately 730,000 square feet. The fabrication of reactor components and uranium recovery operations are conducted in this area. The feed materials (b)(4) [redacted] The fuel manufacturing process includes classified technology and proprietary methods unique to the facility. A more detailed description of operations can be found in the ISA Summary in Chapter 3 of SNM-42 (Docket No. 70-27).

Ex4

The recovery of uranium from scrap or recycled material and other programs (b)(4) [redacted] (b)(4) [redacted] More detail can be found in Chapter 3 of SNM-42.

Ex4

### LTC Operations

The Lynchburg Technology Center (LTC) facilities are located to the west of the main NPD facilities. LTC operations are widely diverse and change frequently to meet the demands of customers. Operations involving radioactive material are mostly limited to the lab and hot cell operations areas in Building B. The analytical labs are also located in these buildings. Figure 2-4 provides a layout of LTC facilities.

A majority of LTC facilities are used for office space, or non-radiological operations. (b)(4) [redacted] (b)(4) [redacted] (b)(4) [redacted] The building also houses a machine shop for work on contaminated equipment, as well as research and analytical labs.

Ex4

The hot cells provide an environment for conducting destructive and non-destructive testing and examination of radioactive materials requiring significant shielding and isolation controls. Examples of materials handled in the hot cells include reactor core hardware components, irradiated fuel and sealed sources. Personnel operate the hot cells in the hot cell operations area.

~~WITHHOLD~~



The cask handling area is a high bay area used to ship and receive containers of radioactive material. (b)(4) Ex 4

(b)(4)

(b)(4) The pool water is treated using ion exchange columns.

The radiochemistry and analytical laboratories conduct measurements of samples from other facilities, including NRC and DOE facilities.

**Waste Treatment Operations**

The Waste Treatment Facility (WTF) is located north of the main NPD facility. The WTF includes liquid waste treatment operations, as well as decontamination operations. The facility encompasses approximately 25,000 square feet, as shown in Figure 2-5. The facility consists of equalization, neutralization and other treatment tanks, a microfiltration unit, a sludge processing system, and a final equalization pond. Wastewater flows from the retention tanks and the LTC to the Low Level Radioactive (LLR) Feed Equalization Tanks either by gravity or through the LLR Pump Station. An Equalization Tank Header with automatic valves directs the wastewater to either of two (2) 40,000-gallon equalization tanks inside the equalization tank building. The equalization tanks are mixed in order to provide homogenization of the waste stream prior to batch-processing the LLR wastewater through the treatment system. Figure 2-6 summarizes the liquid waste treatment process.

LLR wastewater is pumped from the equalization tanks to a neutralization tank. In the neutralization tank, hydrated lime slurry is added to the waste stream for removal of contaminants such as fluorides and metal ions (aluminum, chromium, cadmium, zirconium, and uranium). Following an adjustable reaction time, the lime-wastewater mixture is pumped to the Memtek system for further treatment.

Precipitation is initiated at the head of the Memtek microfiltration unit when the pH of the wastewater is elevated through addition of a solution of liquid sodium hydroxide (liquid caustic). A variety of insoluble metal hydroxides precipitate out of solution as the wastewater pH is increased to alkaline levels.

Figure 2-1, Geographical Location of BWXT Facility

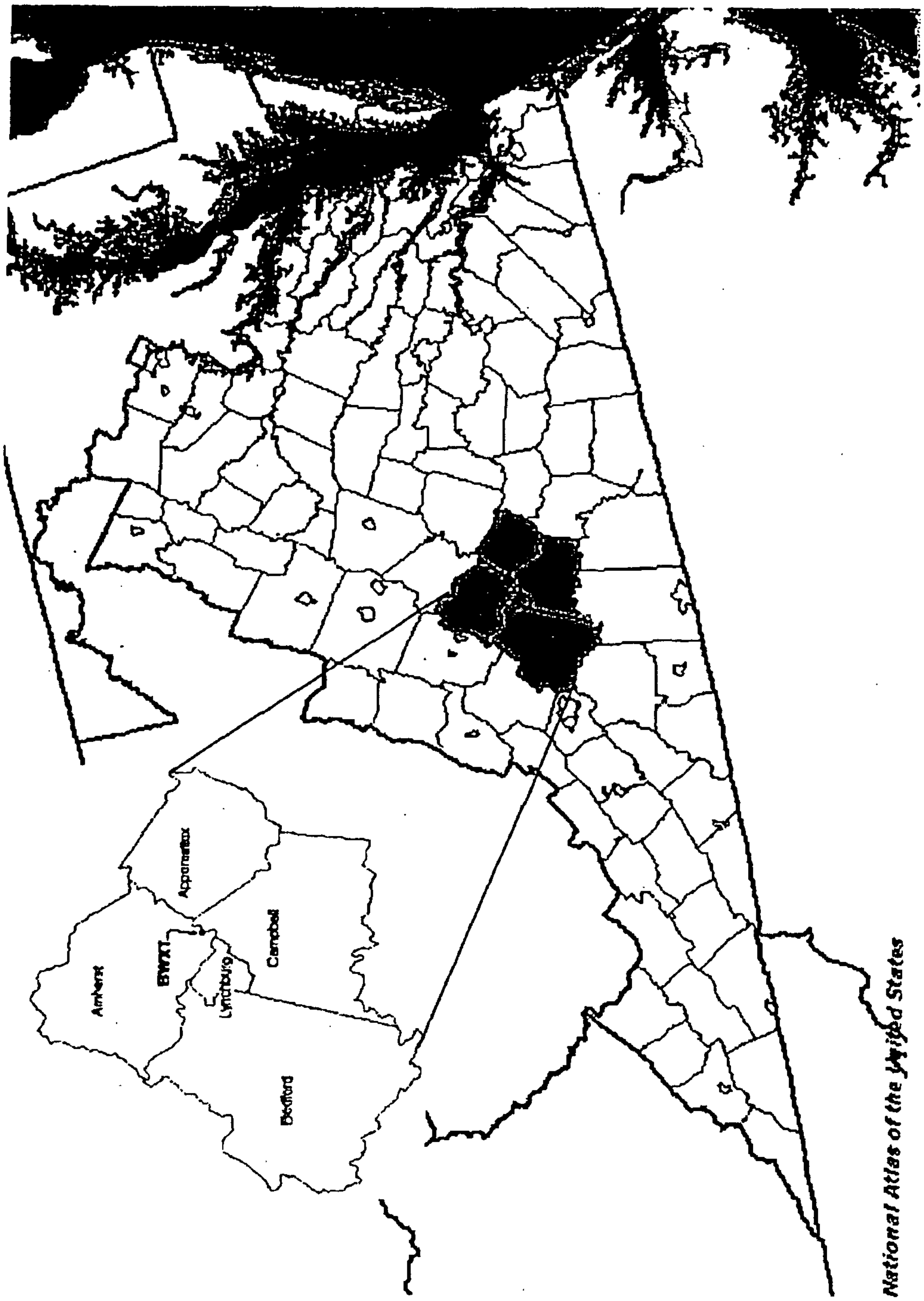
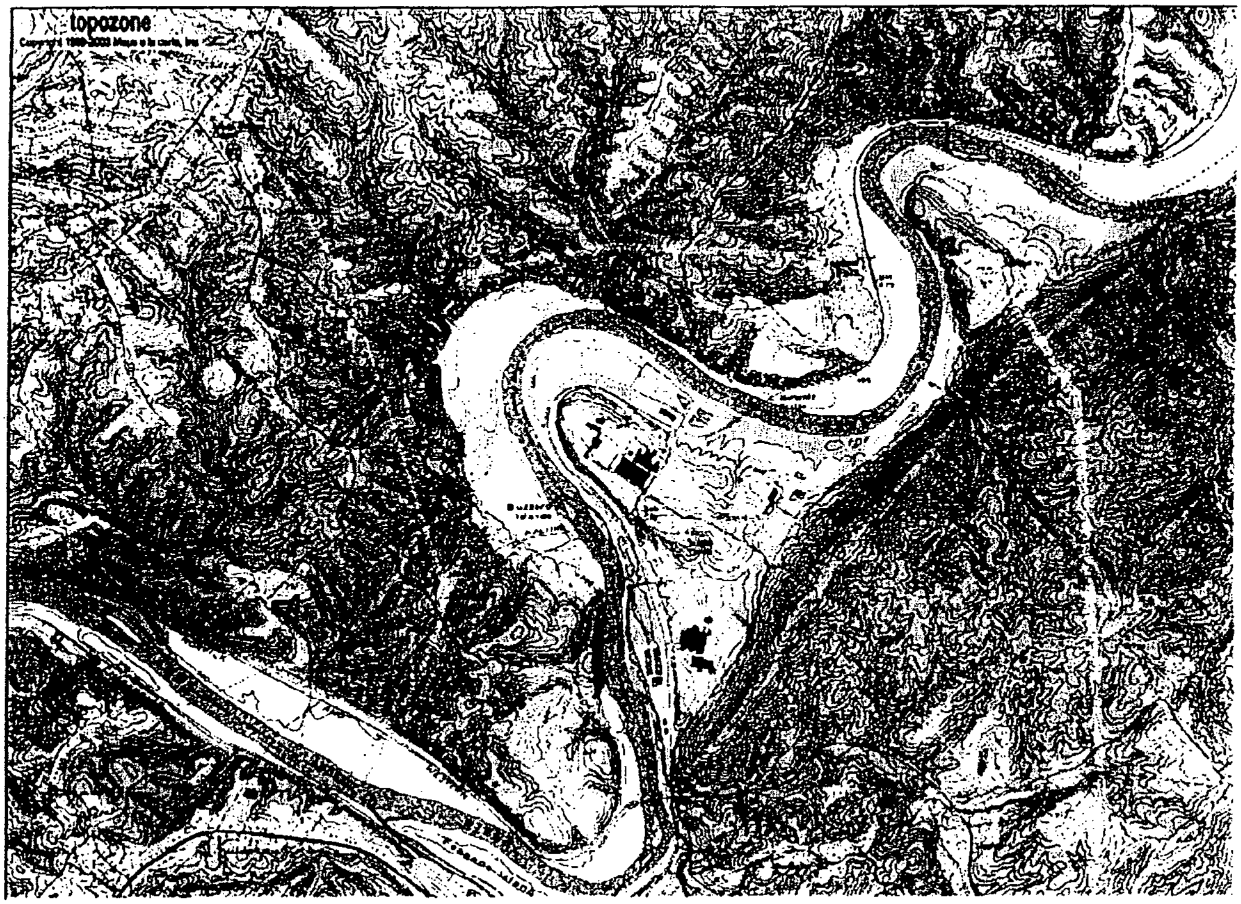
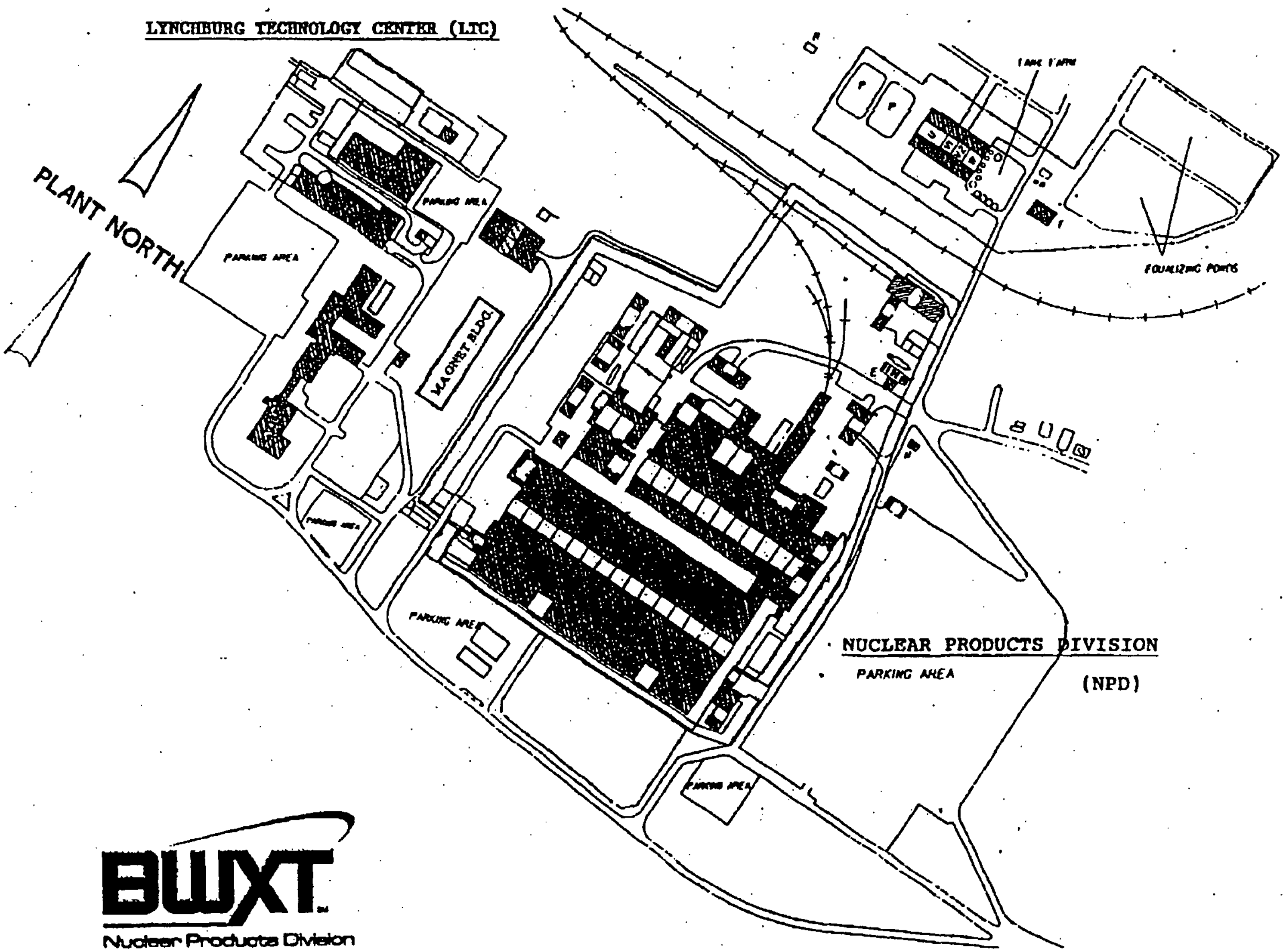


Figure 2-2, Topographic Map of the Area



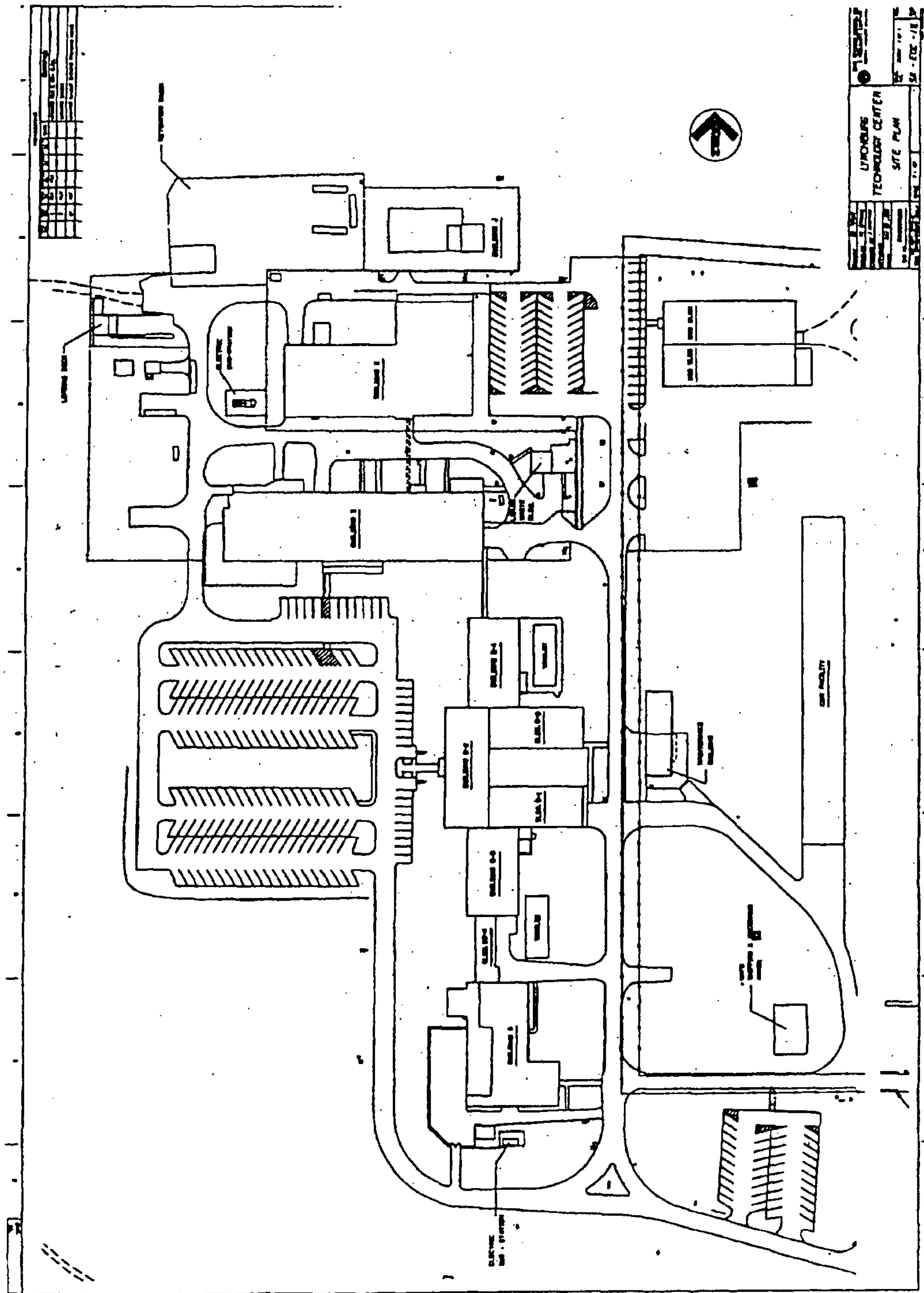
OFFICIAL USE ONLY




BWXT
Nuclear Products Division

OFFICIAL USE ONLY

Figure 2-4, LTC Layout



The result of the combined addition of lime slurry and liquid caustic is an alkaline waste stream consisting of water and a variety of suspended solids. The wastewater is concentrated in a tank and then pumped through a series of microfilters (~ 0.1 micron) that separate the suspended solids from the water. Filtrate from the microfiltration system and the filter presses flows to a tank and then to either of two final effluent tanks. Sulfuric acid may be added to the final effluent tanks to adjust the pH of the combined filtrate down to permitted discharge levels (6-8). Water from the final effluent tanks is discharged to a sump, final effluent pond #2, and eventually to the James River.

The LLR sludge dewatering and drying system handles solids from the Memtek microfiltration system, the LLR clarifier, and/or the sanitary sludge holding tank. The solids are either pumped to a tank for thickening via polymer addition, or pumped directly to either one or both of the LLR filter presses. The filter presses utilize hydraulic pressure to force high-solids wastewater through a series of filter cloths. The water that is pressed and drained out of the solids flows by gravity to the effluent day tank and is mixed with the LLR Memtek filtrate and pumped to the final effluent tanks.

Dewatered sludge from the filter presses (called "filter cake") is dried in either of two propane gas-fired dryers at approximately 500-550° F. The dryers empty to a pug mill where mixing and size reduction occurs, then to a drum packaging station. The dried solids are packaged in 55-gallon drums for final non-destructive radiological assay and disposal. Solids generated through the LLR system are called "Treatment Process" (TP) solids. Drums of collected TP solids may be compacted in the "Supercompactor" and/or shipped for burial in accordance with applicable regulations for disposal of LLR waste.

The LLR final effluent tanks are located adjacent to the LLR equalization tanks inside the Equalization Tank Building. The two 15,000 gallon tanks receive flow from the LLR Memtek system and the filter presses via the effluent day tank in the WT LLR controlled area. They are used for homogenization; monitoring and final pH adjustment of wastewater prior to discharge to final equalization pond #2 and VPDES permitted Outfall 001.

Figure 2-5, WT Facility Layout

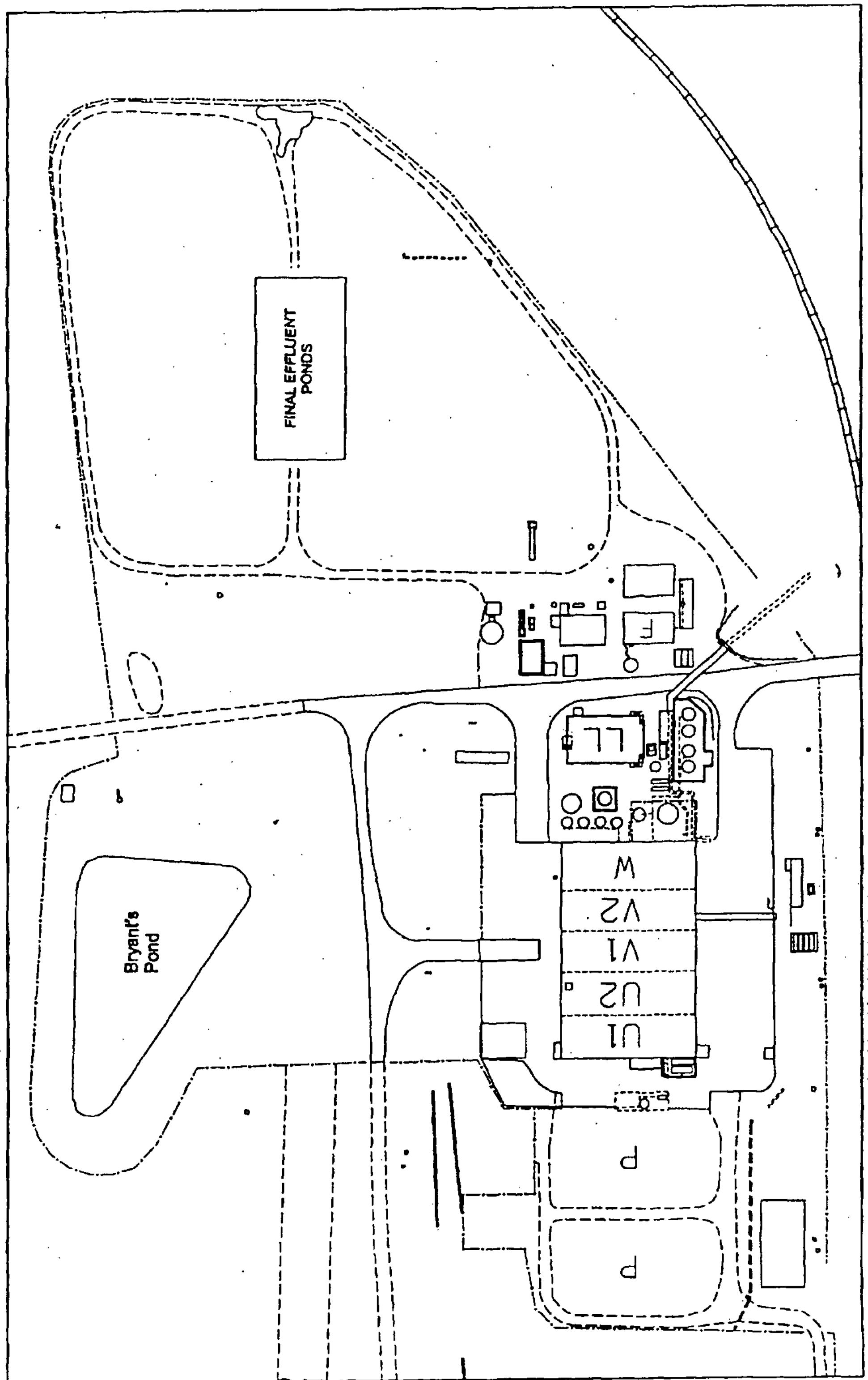
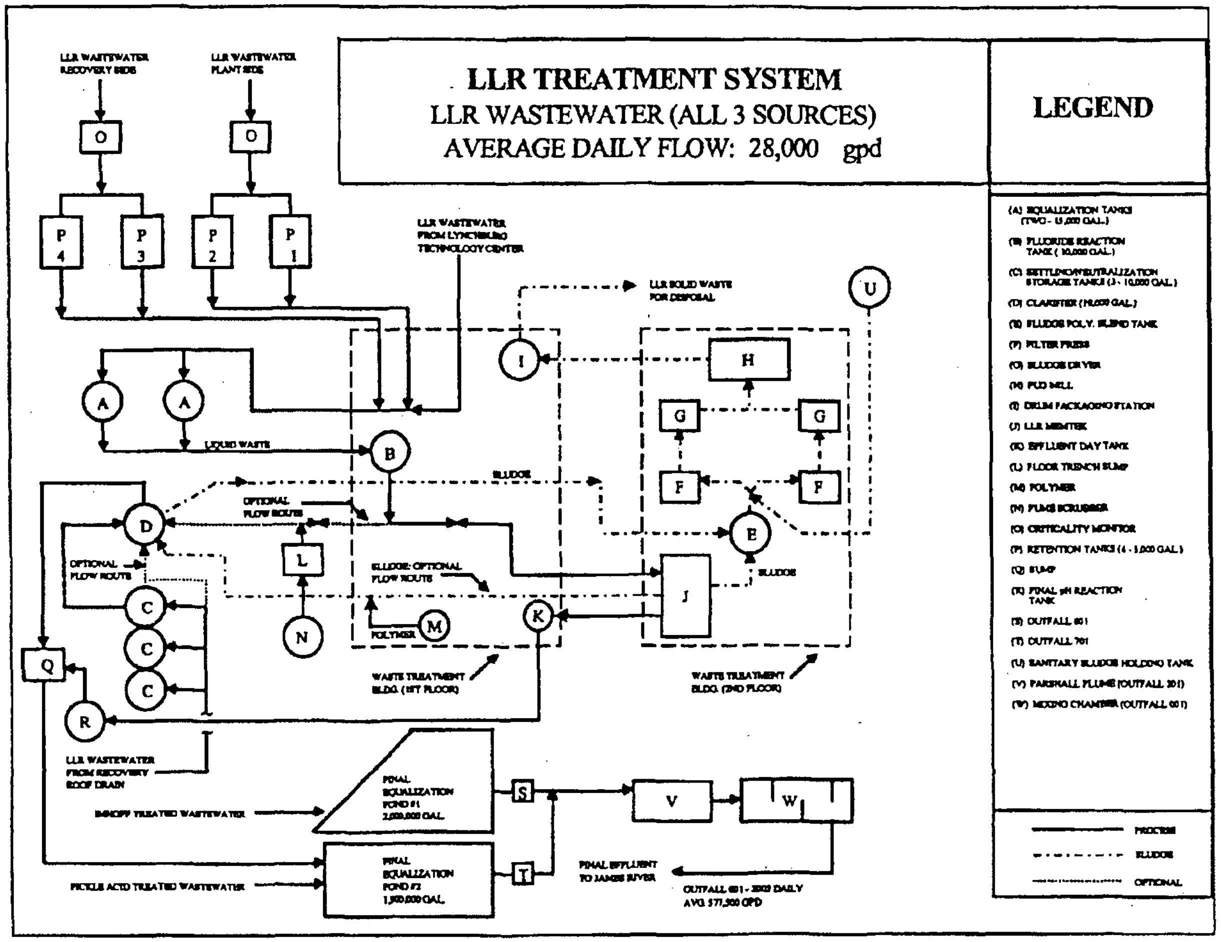


Figure 2-6, WT Process Summary



In addition to treatment of wastewater, the WTF may be used to treat a variety of miscellaneous solids and liquids generated at NPD. Solids, sludge, and solutions that are compatible with the Waste Treatment Facility system may be added to the system.

These materials are introduced into the WTF via waste drums, and are staged at a ventilated hood in the controlled area. Solids and sludge may be added to the LLR pug mill or dryer(s). Liquids may be added to the bottle-processing tank. This is a small tank adjacent to the hood that transfers solutions to the Waste Treatment Facility fluoride reaction (neutralization) tank.

The Decontamination Facility, located in the western portion of the WTF, is utilized for decontamination of radiologically contaminated materials for recycling, reuse, or disposal. Materials processed in this facility include piping, ductwork, building materials, office furniture, concrete masonry units, pumps, fans, motors, etc. These materials are recycled, reused, or scrapped if they meet free release limits. If they fail to meet free release limits, they are disposed of as low level radiological waste.

The type of decontamination process that is implemented in the processing area varies according to the decontamination needs and/or the type of material. Some materials can be decontaminated by wiping them down with alcohol or cleaning solution (as described above), while others require more aggressive techniques such as grinding or scabbling. All abrasive decontamination techniques utilize HEPA vacuums and ventilated hoods to minimize the amount of particulate material released to the area. With the exception of the hand wash sink in the change room, which discharges to the LLR Clarifier via the Waste Treatment floor drain system, there are no drainage connections to Waste Treatment.

The Supercompactor Facility, located within the secured fenced area, is utilized for the compaction of drums containing LLR solid wastes to reduce their volume, and thereby reducing disposal costs. LLR solid wastes processed in this facility include, but are not limited to, dry active waste, TP solids, discard solids, light metals, and construction materials.

Following assay, 55-gallon drums of LLR solid waste are transported to the drum storage area outside of the supercompactor building, and staged for processing through the supercompactor. The drums are then compacted and repackaged in 70-gallon overpack drums and shipped to an approved and licensed LLR waste disposal facility.

### 2.2.2 Gaseous Effluents

Gaseous effluents from radioactive material operations are treated and sampled prior to discharge. Table 2-1 lists each of the monitored stacks at NPD, along with the pollution control system and physical parameters.

Table 2-1 Characteristics of Current Stacks

| Stack No. | Stack | Pollution Control Equipment | Release Height (m) | Building Height (m) | Building Width (m) | Stack Diameter (m) | Stack Flow Rate ($m^3/s$)[1] |
|---|---|---|---|---|---|---|---|
| 11 | CRF | HEPA filter | 10.4 | 9.5 | 54.1 | 0.8 | 9.9 |
| 35 | 14A Maintenance | HEPA filter | 17.8 | 9.5 | 54.1 | 0.6 | 3.1 |
| 38 | 13A/14A/15A Dry | HEPA filter | 14.5 | 9.5 | 54.1 | 1.3 | 18.1 |
| 15 | Recovery Scrubber | Scrubber | 25.3 | 9.5 | 54.1 | 0.9 | 8.5 |
| 40 | Downblend Scrubber | Scrubber | 24.9 | 8.9 | 15.2 | 0.4 | 0.9 |
| 39 | Waste Mgmt Center | HEPA filter | 7.9 | 6.4 | 162.4 | 0.4 | 0.9 |
| 18 | 3A Stack | HEPA filter | 7.3 | 6.4 | 162.4 | 0.24 | 0.6 |
| 19 | MFP Load | HEPA filter | 7.3 | 6.4 | 162.4 | 0.4 | 0.7 |
| 20 | Reclamation | HEPA filter | 9.5 | 4.9 | 162.4 | 0.3 | 0.4 |
| 23 | 2A Stack | HEPA filter | 7.3 | 6.4 | 162.4 | 0.4 | 1.3 |
| 24 | 3A Pharmacy | HEPA filter | 7.3 | 6.4 | 162.4 | 0.5 | 2.0 |
| 43 | 1A Maintenance | HEPA filter | 7.9 | 6.4 | 162.4 | 0.7 | 4.4 |
| 37 | 12A Chem Lab Scrubber | Scrubber | 12.1 | 9.5 | 54.1 | 0.9 | 10.3 |
| 26 | Met Lab | HEPA filter | 11.1 | 6.4 | 162.4 | 0.5 | 4.4 |
| 16 | RTRT | HEPA filter | 11.9 | 9.5 | 179.7 | 0.8 | 5.5 |
| 42 | NMC Storage | HEPA filter | 11 | 9.5 | 179.7 | 0.3 | 1.0 |
| 30 | Laundry | Filter (non-HEPA) | 3.7 | 4.9 | 32.5 | 0.6 | 2.9 |
| 32 | Compactor | HEPA filter | 3.7 | 4.9 | 32.5 | 0.4 | 1.1 |
| 33 | Decon | HEPA filter | 6.7 | 5.2 | 52.0 | 0.5 | 2.0 |
| 36 | Retention Tanks | HEPA filter | 9.8 | 8.2 | 16.8 | 0.3 | 0.5 |
| 31 | Waste Treatment Scrubber | Scrubber | 7.3 | 6.4 | 52.0 | 0.4 | 1.9 |
| | 50 meter Stack | HEPA filter | 53 | 3 | 25 | 1.22 | 15.1 |
| | AC Stack[2] | Scrubber | 11 | 8 | 25 | 0.9 | 1.3 |
| | RCL Stack | Scrubber | 11 | 8 | 25 | 0.37 | 1.6 |

1 - flow rates based on average 2003 values;
2 – formerly the NEL Stack

WITHHOLD



Stacks emitting radioactive material are continuously sampled. Stack flow rates are measured quarterly to determine the isokinetic sampling flow rate. Samples are pulled through a pitot tube, to the sampling device. Samples are collected each normal working day, in accordance with license requirements.

### 2.2.3 Liquid Effluents

Liquid wastes from the main facility are collected and discharged in an above ground drain line to the waste treatment facilities, located north of the main facility and at a lower elevation. The largest generator of radioactive liquid waste is the uranium recovery facility. (b)(4) [redacted] During this process, acidic solutions containing low-level quantities of uranium are generated. Recovery and other process areas that may potentially generate high concentrations of radioactivity are sampled and analyzed prior to discharge. Ex4

Liquid wastes from operations at the LTC are collected at the Liquid Waste Disposal Facility. Here the waste is sampled and compared to discharge limits before it is sent to the Waste Treatment Facility.

The waste water is ultimately discharged into the James River through a diffuser. This discharge outfall is monitored for radioactivity and in accordance with the VPDES permit. A volume weighted composite is taken continuously each day.

### 2.2.4 Solid Waste

The generation of radioactive and mixed waste arises from the following general types of operations at NPD:

- Radiological area process and decontamination trash including gloves, paper, various empty fuel containers, etc.;
- Replacement of off-gas filters and systems;
- Solidification of various radioactive and mixed wastes;
- Building debris and soil from renovation and decommissioning;
- Solids generated from treating the facility's LLR liquid waste.

Waste specific to LTC includes:

- Laboratory use and decontamination trash including gloves, wipes, blotter paper, glassware, etc.;
- Filter and ion exchange resin replacement for water purification systems;
- Hot cell cleanups;
- Solidification of liquid wastes; and
- Miscellaneous materials (e.g., irradiated fuel debris, activated reactor components, power plant components that BWXT has contracted to dispose of upon completion of examination, etc.).

Waste is generally packaged in the area of generation, and dispositioned after assay using a drum counter for measurement. Most low specific activity waste is compacted to reduce the volume.

Low level radioactive waste disposal sites used by BWXT include the Barnwell Site in South Carolina and the Envirocare Site in Utah.

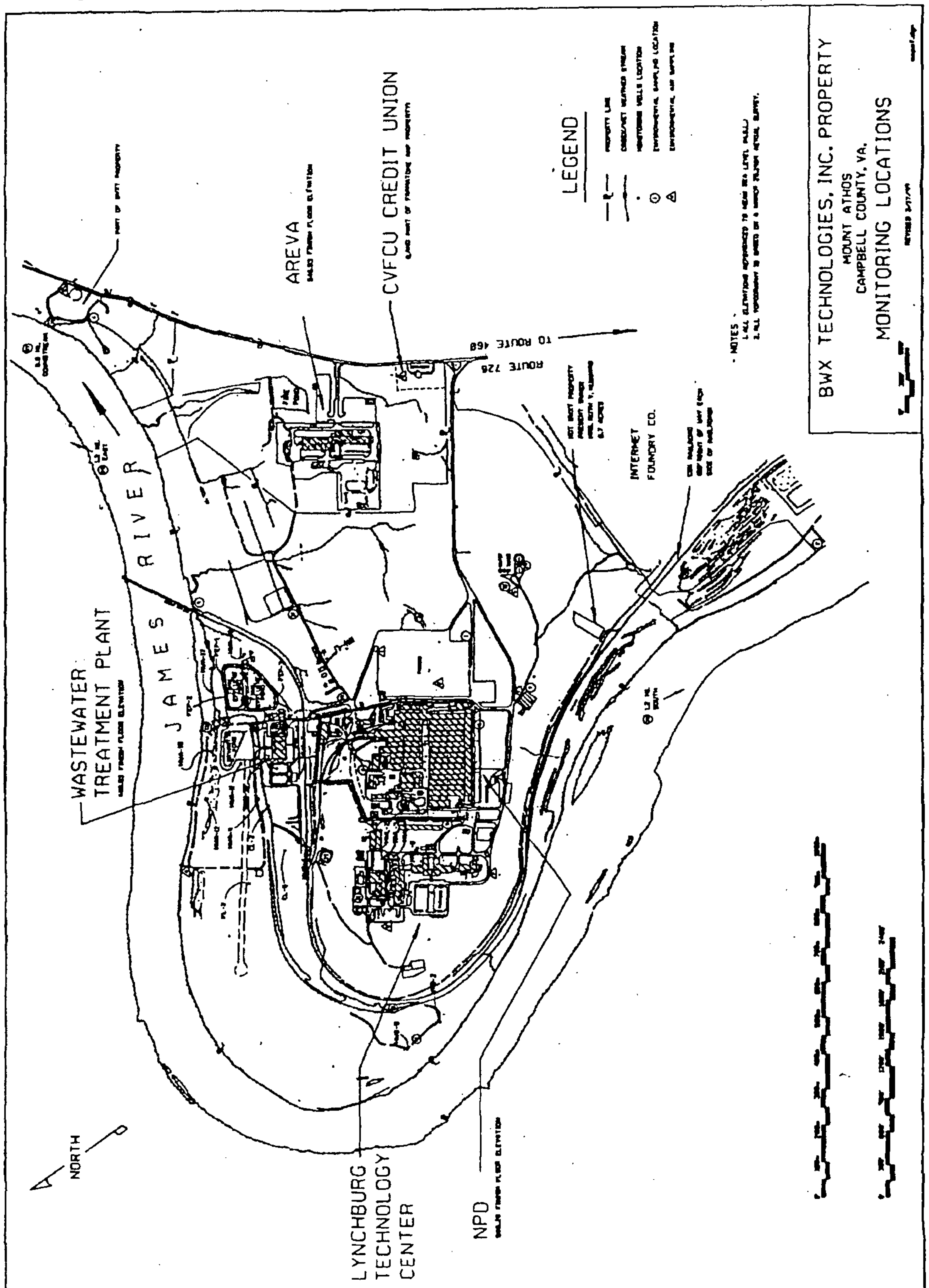
### 2.2.5 Environmental Monitoring

The environmental monitoring program at BWXT consists of boundary air samples to confirm that gaseous effluents are not effecting the off-site conditions and of sampling and analyzing soil, sediment, vegetation and water to detect any environmental accumulation of radioactive material. Boundary air sampling locations and other environmental sampling locations are presented in Figure 2-7.

## 2.3 Alternatives - Cessation of Operations

The alternative of not renewing license SNM-42 would lead to decontamination and decommissioning of NPD facilities, and license termination. The environmental impact from decommissioning would, in the short term, be similar to operation of the facility, with the exception of a significant increase in waste generation and an increase in unemployment in the area. Due to the important products produced by BWXT, if operations were terminated, these processes would be transferred to a new site. The new site would likely have more significant environmental impacts due to construction and start up activities.

Figure 2-7 Environmental Monitoring Locations



# 3.0 DESCRIPTION OF THE AFFECTED ENVIRONMENT

## 3.1 Land Use

### 3.1.1 Site Land Use

The BWXT facility is located on 476 acres on peninsula of land inside a bend of the James River. Ground surface elevations range from approximately 460 feet above sea level at the river, to approximately 700 feet above sea level.

The site is bordered by an oxbow of the James River on the western, northern, and northeastern sides. The nominal elevation of the James River is 458 feet above mean sea level. The highest point in the vicinity of the site is Mt. Athos, to the southeast, which rises to an elevation of 890 feet above mean sea level. The WTF was built at an elevation of 488 feet above mean sea level. The main manufacturing facility is 568 feet above mean sea level.

There are three primary industrial areas of the site. The NPD facility and LTC facility are located in the central part of the site. The Waste Treatment Facility is north of the NPD facility nearer to the river. There are also effluent ponds located around the waste treatment area. In addition there are two former industrial landfills located to the west of waste treatment. The status of these areas is documented in correspondence between BWXT and the NRC (docket 70-27).

### 3.1.2 Use of areas surrounding the site

The primary uses of land adjacent to the facility include industrial, agricultural and unused woodlands. The areas utilized for industrial purposes are to the east and south. To the southeast is the Framatome ANP Facility (an Areva company), an NRC licensed facility which supports commercial nuclear fuel fabrication and reactor operations. To the south is the Archer Creek iron foundry, a facility of the Intermet Company. The foundry manufactures cast-metal automotive components.

To the west through the north are rolling hills which include woodlands and farmlands. One recreational area near the facility is northeast at Joshua Falls, where a small park and area for access to the James River are situated.

Residential areas are located directly to the east, south, southwest and west. The closest residence to the facility is approximately 4,500 feet directly east. The nearest potential off-site receptor would be occupational workers at Framatome, approximately 3,000 feet east of the main NPD facility. The closest farming area is approximately 3,000 feet to the northeast. The nearest hospital or school is the Central Virginia Training Center in Lynchburg, which is approximately 2.9 miles west. Figure 3-1 depicts land use near the site.

## 3.2 Transportation

The site can be reached from State Route 726, which connects with State Route 460. Route 460 is a divided, four-lane highway, which is the main thoroughfare between Lynchburg, Appomattox and Richmond. Route 726 is the primary access road to the facility.

The site is also serviced by a spur of the CSX Transportation Railroad, which runs through BWXT property. The railroad maintains a right of way consisting of the railway and 50 feet from each side of the railway. The railway is depicted on Figure 2-3.

## 3.3 Geology & Soils

The site is located near the western limit of the Piedmont physiographic province. The bedrock consists of lower Paleozoic metamorphic rocks of the Evington Group, specifically a micaceous schist and phyllite member of the Chandler Formation and a graphite schist member of the Archer Creek Formation.

The surficial deposits are composed principally of young Quaternary-age alluvium below the 500-foot elevation contour, and older (Quaternary or Pliocene) terrace gravel at higher elevations. The alluvial deposits, which make up the overburden aquifer, vary from 10 to 35 feet in thickness across the facility. The deposits consist of various mixtures of sand, silt, and clay with increasing amounts of pebbles, cobbles, and boulders at depth (Shaw, 2003).

Figure 3-1 Land Use Surrounding BWXT

The soil found at the site has been identified as Cullen-Wilkins. It is generally characterized as deep and moderately deep, well drained, gently sloping to steep soils that have a dominantly clay subsoil and are found primarily in upland areas (NRC, 1995).

Seismic activity in the Central Virginia region is classified as moderate. The site falls within the western part of the Central Virginia cluster region which is classified as a Zone 2, moderate region on the Seismic Risk Map of the United States. Since 1774, there have been 18 earthquakes reported as having an intensity VI or higher. An intensity of VI on the Modified Mercalli Scale is defined as "Felt by all, many frightened and run outdoors, falling plaster and chimneys, damage small". It is comparable to 4.5 on the Richter Scale. Table 3-1 lists earthquake events of magnitude VI or higher in the Virginia region.

Table 3-1 Earthquakes in the Virginia Area

| Date | Maximum Intensity | Area Felt (Sq Miles) | Locality |
|---|---|---|---|
| 02/21/1774 | VI | 58,000 | Petersburg |
| 08/27/1833 | VI | 52,000 | Goochland County |
| 04/29/1852 | VI | 174,500 | Grayson County |
| 11/02/1852 | VI | 32,000 | Buckingham County |
| 12/23/1875 | VII | 50,000 | Buckingham County |
| 10/10/1885 | VI | 25,000 | Nelson County |
| 05/03/1897 | VII | 89,500 | Giles County |
| 05/31/1897 | VIII | 280,000 | Giles County |
| 02/05/1898 | VI | 34,000 | Wytheville |
| 02/11/1907 | VI | 5,600 | Arvonia |
| 04/10/1918 | VI | 65,000 | Luray |
| 09/06/1919 | VI | - | Warren County |
| 12/26/1929 | VI | 1,000 | Albemarle County |
| 01/02/1954 | VI | 0 | Bell County, KY/Lee County, VA |
| 04/23/1959 | VI | 2,050 | Giles County |
| 11/20/1969 | VI | 100,000 | Elgood, WV/Rich Creek, VA |
| 11/11/1975 | VI | - | Giles County |
| 09/13/1976 | VI | 9,000 | Carroll County |

(VDMR, 1994)

## 3.4 Water Resources

### 3.4.1 Surface Water

The James River borders three sides of the BWXT site. It flows generally east-southeast from the Blue Ridge Mountains to the Atlantic Ocean. The river is formed at the point where the Cowpasture and Jackson rivers merge, north west of Lynchburg. Based on data from U.S. Geological Survey gauging stations, the average annual flow rate of the James River at the site is estimated to be 3,900 cubic feet per second. Water quality of the river is currently classified as a Class II surface water body, not designated for drinking water use.

Until late in 2003, BWXT withdrew water from the James River for industrial purposes. In July-August of 2003, BWXT changed the source of water to the Campbell County Utilities Service Authority (CCUSA).

There are no natural ponds or lakes on the site. There are several man-made impoundments used in storm water management or as a part of the waste treatment process. The two final effluent ponds, and Bryant's pond are depicted on Figure 2-5. Most surface flow is drainage from the facilities during rain events. Three outfalls for surface water run-off exist. Each is a permitted outfall, regulated by the Commonwealth of Virginia Department of Environmental Quality.

BWXT's water discharge permit, VPDES Permit number 00367 is issued by the Commonwealth. The permit limits discharges at 6 outfall points. Three of these points actually discharge off-site. The other outfalls are intermediate outfalls that feed into the three off-site discharges. The effluent limitations specified by the VPDES permit are shown in Table 3-2.

Table 3-2 Permit Limitations for Outfall 001

| Effluent Characteristic | Monthly Average | Min | Max | Monitoring Requirements | |
|---|---|---|---|---|---|
| | | | | Frequency | Sample Type |
| Flow (MGD) | NL | NA | ML | Continuous | Recorded |
| pH (standard units) | NA | 6 | 9 | Continuous | Recorded |
| pH excursion time, individual | NA | NA | 60 minutes | Continuous | Recorded |
| pH excursion, total | NA | NA | 446 minutes | Continuous | Recorded |
| $BOD_5$ | NL mg/l 18.1 kg/d | NA | NL mg/l 27.2 kg/d | 1/Month | 24 HC |
| Total Suspended Solids | NL mg/l 47.8 kg/d | NA | NL mg/l 97.1 kg/d | 1/Month | 24 HC |
| Fluoride | NL mg/l 15 kg/d | NA | NL mg/l 30 kg/d | 1/Month | 24 HC |
| Total Recoverable Chromium | NL mg/l 0.1 kg/d | NA | NL mg/l 0.2 kg/d | 1/Month | 24 HC |
| Total Recoverable Copper | NL mg/l 1.0 kg/d | NA | NL mg/l 1.5 kg/d | 1/Month | 24 HC |
| Oil & Grease | NL mg/l 9.1 kg/d | NA | NL mg/l 14 kg/d | 1/Month | Grab |
| Temperature | NA | NA | 32 °C | 1/Month | Immersion Stabilization |
| Ammonia as N | 5.7 mg/l | NA | 8.3 mg/l | 1/Month | Grab |
| Nitrates | NL mg/l | NA | NL mg/l | 1/Quarter | Grab |
| Nitrites | NL mg/l | NA | NL mg/l | 1/Quarter | Grab |

NA - Not Applicable
NL - No Limitation, monitoring is required
24 HC = 24-hour composite

Other constituents are controlled at inner permitted outfalls.

Flooding of the James river occurs infrequently. There have been 11 significant flood events recorded along the James River since 1771. Each of the events is summarized in Table 3-3.

Table 3-3 Recorded Floods of the James River Since 1771 (units of feet)

| Month-Year | River Elevation | Distance Above Normal | Estimated Distance Below WTF |
|---|---|---|---|
| May 1771 | 489 | 31 | (1) |
| May 1795 | 494 | 36 | (6) |
| September 1870 | 488 | 30 | 0 |
| November 1877 | 487 | 29 | 1 |
| March 1913 | 483 | 25 | 5 |
| March 1936 | 484 | 26 | 4 |
| March 1969 | 486 | 28 | 2 |
| June 1972 | 485 | 27 | 3 |
| June 1982 | 482 | 24 | 6 |
| November 1985 | 493 | 35 | (5) |
| January 1996 | 482 | 24 | 6 |

(NRC, 1991); (NOAA, 2003)

### 3.4.2 Subsurface Water

Groundwater in the Piedmont Province occurs in crystalline bedrock, consisting of slates, schists, and gneisses, and in the overlying unconsolidated sediment which are of local extent. Reliable well yields for domestic supply are obtained on a wide spread basis from weathered or fractured zones in gneiss and schist. However, yields are generally low to moderate, typically ranging from 1 to 25 gallons per minute, and rarely exceeding 50 to 100 gallons per minute (IT, 1996).

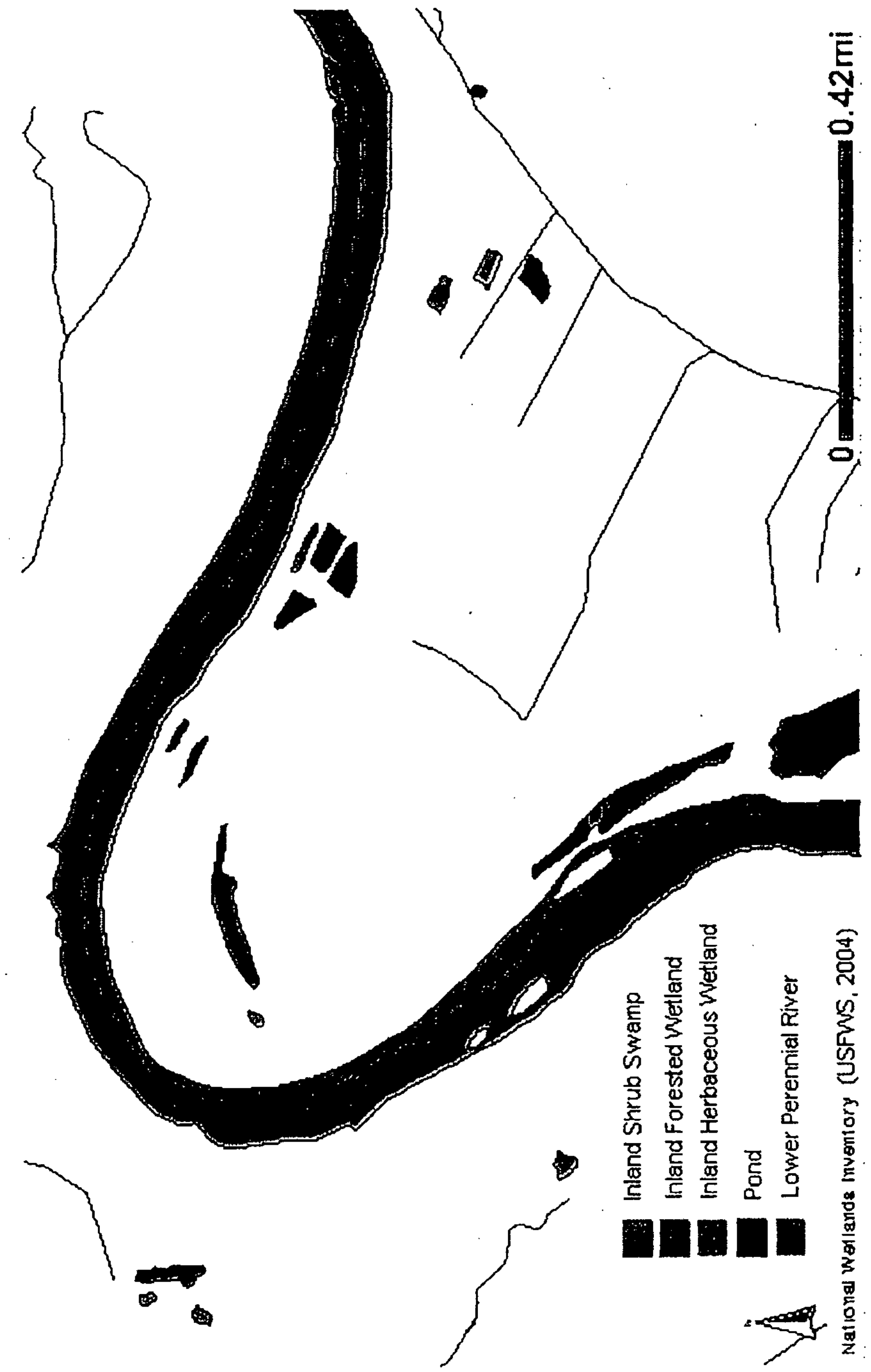
Groundwater flows radially from the high elevations located along the southwestern margin of the meander bend to the James River. Because the highest local elevations are to the southwest of NPD, all shallow groundwater in the vicinity of the facility is acted on by a northeasterly horizontal gradient. Slug tests in shallow zone and bedrock wells were used to estimate the mean hydraulic conductivity for the shallow zone of $3.7 \times 10^{-4}$ cm per second. On average the shallow zone is approximately one order of magnitude more conductive than the bedrock zone which has mean conductivity of $4.7 \times 10^{-5}$ cm per second (IT, 1996).

Until 2003, BWXT withdrew ground water for use as de-ionized and potable water using several of seven wells on site. In July-August of 2003, BWXT stopped the use of these wells and began using water supplied by CCUSA.

### 3.4.3 Wetlands

The BWXT site contains several small isolated wetland areas. These areas are shown in Figure 3-2. The wetlands are primarily located in the flood plain, in low lying areas of meadowland. Areas designated as wetlands by the US Fish and Wildlife Service also include the effluent ponds, although these areas do not meet the wetlands delineation criteria defined by the US Army Corp of Engineers.

Figure 3-2, Wetland Areas on the Mt. Athos Site



## 3.5 Ecological Resources

### 3.5.1 Terrestrial Resources

Natural climax vegetation in the region is classified as oak-hickory-pine (Quercus-Carya-Pinus) forest. Areas of the site that remain undeveloped consist primarily of second-growth forests and grasslands (NRC, 1991).

The Lynchburg/Campbell County area has approximately 350 different species of animals that are expected to reside in the area. There are more than 50 species of mammals, 33 species of reptiles, 53 types of invertebrates and 165 species of birds thought to inhabit the area. Species of importance in the area include game animals such as white-tailed deer, furbearers like the beaver and fox, and game birds and waterfowl including a variety of ducks. Threatened and endangered species are discussed in 3.5.3.

### 3.5.2 Aquatic Resources

The aquatic biota of the James River in the vicinity of NPD is generally characteristic of that of a moderately polluted flowing river. The benthic community of the James River near the facility is characteristic of areas with both flowing and backwater areas (NRC, 1984).

There are approximately 25 different species of fish. Fish common to the vicinity of the facility include large mouth bass, bluegill and a variety of shiner.

### 3.5.3 Threatened and endangered species

The state of Virginia has forty eight (48) species of animals listed as threatened or endangered by the federal government. These animals are listed in Table 3-5. There are also fifteen (15) species of plant in the state listed as threatened or endangered. A complete list is provided in Table 3-6.

According to the Virginia Department of Game and Inland Fisheries, there are no endangered species in the vicinity of the site. The only threatened species that may be present in the vicinity of the site is the Bald Eagle (Haliaeetus leucocephalus).

Table 3-5 Threatened and Endangered Animal Species in Virginia

| COMMON NAME | SCIENTIFIC NAME | STATUS | VERT/INVERT |
|---|---|---|---|
| Appalachian monkeyface (pearlymussel) | Quadrula sparsa | E | Invertebrate |
| Birdwing pearlymussel | Conradilla caelata | E | Invertebrate |
| Cracking pearlymussel | Hemistena lata | E | Invertebrate |
| Cumberland monkeyface (pearlymussel) | Quadrula intermedia | E | Invertebrate |
| Cumberlandian combshell | Epioblasma brevidens | E | Invertebrate |
| Dromedary pearlymussel | Dromus dromas | E | Invertebrate |
| Dwarf wedgemussel | Alasmidonta heterodon | E | Invertebrate |
| Fanshell | Cyprogenia stegaria | E | Invertebrate |
| Finerayed pigtoe | Fusconaia cuneolus | E | Invertebrate |
| Green blossom (pearlymussel) | Epioblasma torulosa gubernaculum | E | Invertebrate |
| James spinymussel | Pleurobema collina | E | Invertebrate |
| Lee County cave isopod | Lirceus usdagalun | E | Invertebrate |
| Littlewing pearlymussel | Pegias fabula | E | Invertebrate |
| Madison Cave isopod | Antrolana lira | T | Invertebrate |
| Northeastern beach tiger beetle | Cicindela dorsalis dorsalis | T | Invertebrate |
| Oyster mussel | Epioblasma capsaeformis | E | Invertebrate |
| Pink mucket (pearlymussel) | Lampsilis abrupta | E | Invertebrate |
| Purple bean | Villosa perpurpurea | E | Invertebrate |
| Rough pigtoe | Pleurobema plenum | E | Invertebrate |
| Rough rabbitsfoot | Quadrula cylindrica strigillata | E | Invertebrate |
| Shiny pigtoe | Fusconaia cor | E | Invertebrate |
| Tan riffleshell | Epioblasma florentina walkeri | E | Invertebrate |
| Virginia fringed mountain snail | Polygyriscus virginianus | E | Invertebrate |
| Bald eagle | Haliaeetus leucocephalus | T | Vertebrate |
| Delmarva Peninsula fox squirrel | Sciurus niger cinereus | E | Vertebrate |
| Duskytail darter | Etheostoma percnurum | E | Vertebrate |
| Eastern puma (=cougar) | Puma (=Felis) concolor couguar | E | Vertebrate |
| Finback whale | Balaenoptera physalus | E | Vertebrate |
| Gray bat | Myotis grisescens | E | Vertebrate |
| Green sea turtle | Chelonia mydas | E | Vertebrate |
| Hawksbill sea turtle | Eretmochelys imbricata | E | Vertebrate |
| Humpback whale | Megaptera novaeangliae | E | Vertebrate |
| Indiana bat | Myotis sodalis | E | Vertebrate |
| Kemp's ridley sea turtle | Lepidochelys kempii | E | Vertebrate |
| Leatherback sea turtle | Dermochelys coriacea | E | Vertebrate |
| Loggerhead sea turtle | Caretta caretta | T | Vertebrate |
| Piping Plover | Charadrius melodus | E | Vertebrate |
| Red-cockaded woodpecker | Picoides borealis | E | Vertebrate |
| Right whale | Balaena glacialis (incl. australis) | E | Vertebrate |
| Roanoke logperch | Percina rex | E | Vertebrate |
| Roseate tern | Sterna dougallii dougallii | E | Vertebrate |
| Shenandoah salamander | Plethodon shenandoah | E | Vertebrate |
| Shortnose sturgeon | Acipenser brevirostrum | E | Vertebrate |
| Slender chub | Erimystax cahni | T | Vertebrate |
| Spotfin chub | Cyprinella monacha | T | Vertebrate |
| Virginia big-eared bat | Corynorhinus (=Plecotus) townsendii virginianus | E | Vertebrate |
| Virginia northern flying squirrel | Glaucomys sabrinus fuscus | E | Vertebrate |
| Yellowfin madtom | Noturus flavipinnis | T | Vertebrate |

E – Endangered, T – Threatened (USFWS, 2004)

Table 3-6 Threatened and Endangered Plants in Virginia

| COMMON NAME | SCIENTIFIC NAME | STATUS |
|---|---|---|
| Eastern prairie fringed orchid | Platanthera leucophaea | T |
| Harperella | Ptilimnium nodosum | E |
| Michaux's sumac | Rhus michauxii | E |
| Northeastern bulrush | Scirpus ancistrochaetus | E |
| Peter's Mountain mallow | Iliamna corei | E |
| Seabeach amaranth | Amaranthus pumilus | T |
| Sensitive joint-vetch | Aeschynomene virginica | T |
| Shale barren rock-cress | Arabis serotina | E |
| Small whorled pogonia | Isotria medeoloides | T |
| Small-anthered bittercress | Cardamine micranthera | E |
| Smooth coneflower | Echinacea laevigata | E |
| Swamp pink | Helonias bullata | T |
| Virginia round-leaf birch | Betula uber | T |
| Virginia sneezeweed | Helenium virginicum | T |
| Virginia spiraea | Spiraea virginiana | T |

(USFWS, 2004)

## 3.6 Meteorology, Climatology and Air Quality

The climate in Central Virginia is moderate. The average annual temperature is approximately 55°F (13 °C). During the summer months, July is historically the month with the highest temperatures. The normal high being 86°F (30°C). Conversely, January is typically the coldest month with normal low temperatures averaging 24°F (-4°C). More detailed data is provided in Table 3-7. The meteorological data in Table 3-7 was measured at the Lynchburg Municipal Airport.

Annual precipitation amounts are expected to average 43 inches. The average rainfall for the month of July is more than 4 inches. Thunderstorms are common but not limited to the summer months.

Winds are generally out of the southwest. During the winter months they shift from the north. Average wind speeds range from 6 to 9 mph.

TABLE 3-7 Climate Summary for Lynchburg, Virginia

| AVERAGE WIND SPEED (1930-1996) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
| Direction | SW | W | SW | SW | SW | SW | SW | SW | SW | N | NE | SW | SW |
| Avg Speed (mph) | 8 | 8 | 8 | 9 | 7 | 7 | 6 | 6 | 6 | 7 | 7 | 7 | 7 |
| Peak Gust* | 48 | 46 | 56 | 53 | 59 | 74 | 64 | 46 | 46 | 48 | 64 | 47 | [redacted] |
| TEMPERATURE NORMALS (1971-2000) | | | | | | | | | | | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg |
| Max | 44.5 | 48.6 | 57.6 | 68.0 | 75.5 | 82.5 | 86.4 | 85.1 | 78.3 | 68.4 | 58.0 | 48.4 | 66.8 |
| Mean | 34.5 | 37.8 | 46.0 | 55.3 | 63.4 | 71.0 | 75.1 | 73.8 | 67.1 | 56.1 | 46.6 | 38.2 | 55.4 |
| Min | 24.5 | 26.9 | 34.4 | 42.6 | 51.2 | 59.5 | 63.7 | 62.4 | 55.9 | 43.7 | 35.2 | 27.9 | 44.0 |
| PRECIPITATION NORMALS (1971-2000) | | | | | | | | | | | | | |
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
| Precip (in) | 3.54 | 3.1 | 3.83 | 3.46 | 4.11 | 3.79 | 4.39 | 3.41 | 3.88 | 3.39 | 3.18 | 3.23 | 43.31 |
| * - peak gust calculated from the minimum time during which one mile of wind passed the station | | | | | | | | | | | | | |

(NOAA, 2002); (SRCC, 2004)

Tornadoes are not common to central Virginia. Figure 3-3 depicts tornado probabilities for the US. The relative probability for the Lynchburg area is low.

The Lynchburg area has been impacted by tropical storms. The most common form of severe weather in the Central Virginia area are thunderstorms.

## 3.7 Noise

Sources of noise related to site operations are limited. Most activities are conducted indoors. Of the potential sources of noise in the environment from site operations the most significant is likely from automobiles or building ventilation systems. Because of the size of the site and distance of facilities to the site boundary, there should be no measurable impact off site.

Figure 3-3, Tornado Probabilities

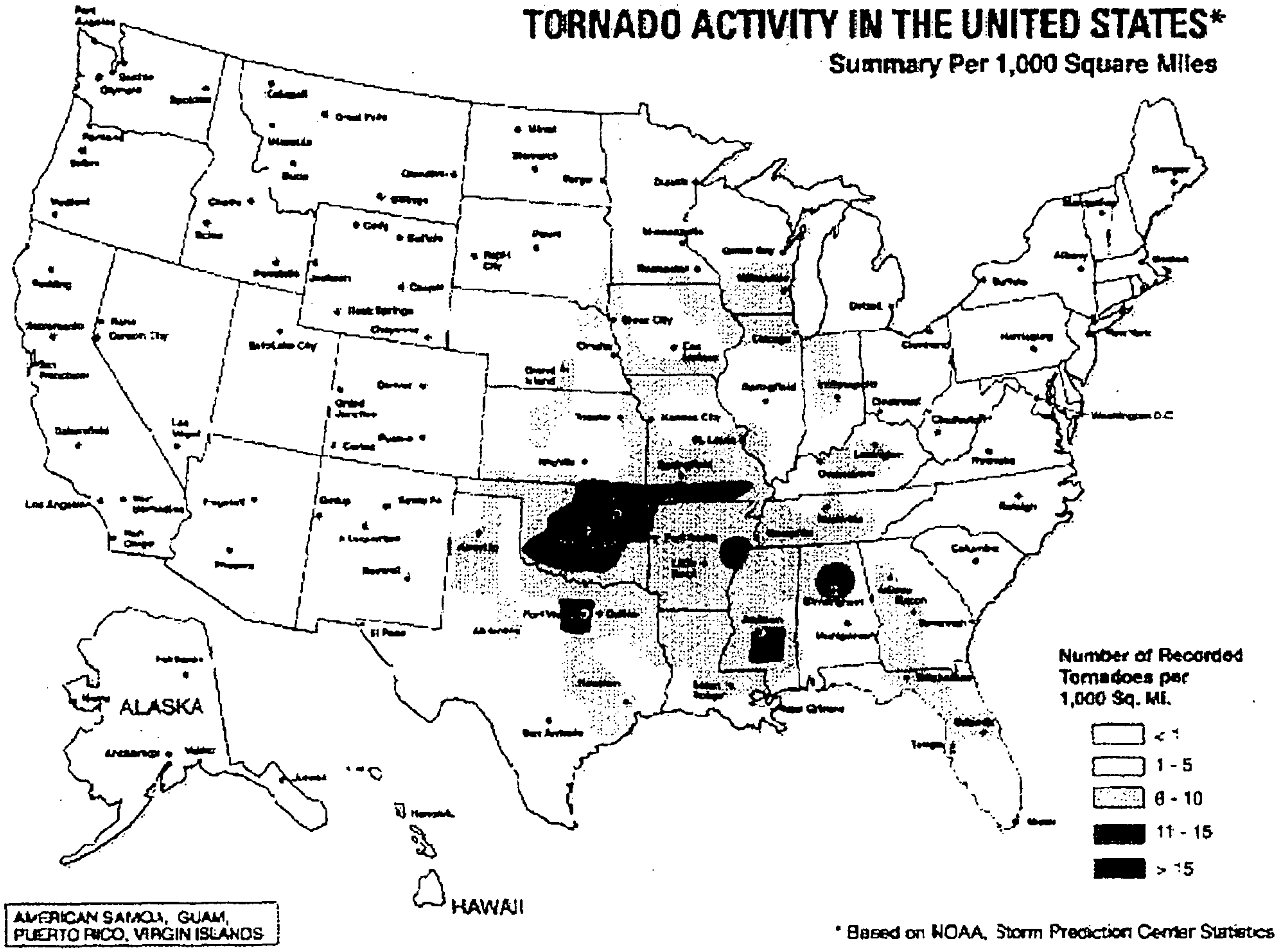



Figure I.1 The number of tornadoes recorded per 1,000 square miles

## 3.8 Historical & Cultural Resources

A review of the National Registry of historical places generated a list of 74 registered historical sites within the four county area. These sites are listed in Table 3-8. There are only 2 sites within 3 miles of the facility. The Mt. Athos Plantation and the Norfolk Southern 6 Mile Bridge, Number 58. Neither historical site is expected to attract visitors.

Table 3-8 Sites Listed in Federal Registry of Historical Places

| COUNTY | SITE NAME | LOCATION | LISTED |
|---|---|---|---|
| Amherst | Bear Mtn Indian Mission School | Amherst Jct VA 463 & 780 | 2/21/97 |
| | Fort Riverview | Madison Heights Address Restricted | 11/16/89 |
| | Geddes | Clifford St Rte 700 | 2/24/83 |
| | Hite Store | Lowesville S of Jct VA 778 & 666 | 6/6/97 |
| | Mountain View Farm | Clifford Jct of Cty Rte 3 & US 29 | 9/3/97 |
| | Red Hill Farm | W of Pedlar Mills VA 647 | 6/9/80 |
| | Sweet Briar College Historic Dist | Amherst Sweet Briar W of US 29 | 3/30/95 |
| | Sweet Briar House | Amherst SW of Jct US 29 & VA 624 | 9/15/70 |
| | Winton | Clifford W of VA 151 | 5/2/74 |
| Appomattox | Appomattox Court House National Park | Appomattox NE on VA 24 | 10/15/66 |
| | Appomattox Historic District | Appomattox VA 131 | 5/16/02 |
| | Pamplin Pipe Factory | Pamplin Address Restricted | 11/25/80 |
| Bedford* | Brook Hill Farm | US 221 & VA 643 | 6/6/97 |
| | Eldridge Bowling House | Lynchburg 1651 Fox Hill Rd | 8/12/93 |
| | Elk Hill | NW of Forest on VA 663 | 4/2/73 |
| | Hope Dawn | NW of Lynchburg VA 761 | 10/9/74 |
| | New London Academy | VA 297 & VA 211 | 4/13/72 |
| | Poplar Forest | Lynchburg Rts 661 and 460 | 11/12/69 |
| | Rothsay | US 221 & VA 881 | 10/30/92 |
| | St. Stephen's Episcopal Church | VA 663 | 11/7/85 |
| | Woodbourne | NE of Forest on VA 609 | 7/2/73 |
| Campbell | Avoca | Altavista N on US 29 | 9/16/82 |
| | Blenheim | Spring Mills 2.4 mi SW | 5/31/79 |
| | Campbell County Courthouse | Rustburg US 501 | 10/29/81 |
| | Cat Rock Sluice of Roanoke Navigation | Brookneal | 3/25/80 |
| | Federal Hill | Forest S VA 623 | 9/9/82 |
| | Green Hill | Long Island SW Jct Rts 663 & 728 | 11/12/69 |
| | Mansion Truss Bridge | Mansion VA 640 over Staunton Rvr | 4/15/78 |
| | Mount Athos | Kelly Address restricted | 7/24/75 |
| | Norfolk Southern 6 Mile Bridge No. 58 | Over James River W of VA 726 | 10/12/95 |
| | Oak Grove | Altavista 7378 Gladys Rd | 5/16/02 |
| | Shady Grove | Gladys E on VA 650 | 8/26/82 |
| | Walnut Hill | Lynchburg Rte 2 | 1/27/00 |
| City of Lynchburg | Academy of Music | 522-566 Main St | 6/11/69 |
| | Allied Art Building | 725 Church St. | 12/19/85 |
| | Aviary | 402 Grove St | 7/30/80 |
| | Bragassa Toy Store | 323-325 Twelfth St | 1/11/91 |
| | Centerview | 1900 Memorial Ave | 12/1/00 |
| | Courthouse Hill - Downtown | Church, Clay, Court, Main Sts | 8/16/02 |
| | Court Street Baptist Church | 6th and Court Sts | 7/8/82 |
| | Daniel's Hill Historic District | Cabell, Norwood, Hancock, Stonewall | 2/24/83 |
| | Diamond Hill Historic District | Dunbar, Main, Jackson, Arch Sts | 10/1/79 |
| | Federal Hill Historic District | 8th, 12th, Harrison, Polk Sts | 9/17/80 |
| | First Baptist Church | 1100 Court St | 9/9/82 |
| | Fort Early and Jubal Early Monument | 3511 Memorial Ave | 1/24/02 |
| | Garland Hill Historic District | 5th, Federal, Norfolk & West RR | 9/7/72 |
| | Glass, Carter House | 605 Clay St | 12/8/76 |
| | Johnson, Dr. Walker House | 1422 Pierce St | 1/24/02 |

| County | Site Name | Location | Listed |
|---|---|---|---|
| | Jones Memorial Library | 434 Rivermont Ave | 10/30/80 |
| City of Lynchburg | Kentucky Hotel | 900 5th St | 12/11/86 |
| | Locust Grove | US 501, VA 644 | 12/17/92 |
| | Lower Basin Historic District | Jefferson, Commerce, Main Sts | 4/24/87 |
| | Lynch's Brickyard House | 700 Jackson St | 3/13/02 |
| | Lynchburg Courthouse | Court & Church Sts | 5/19/72 |
| | Lynchburg Hospital | Hollins Mill Rd | 12/9/99 |
| | Main Hall, Randolph-Macons Women's Coll. | 2500 Rivermont Ave | 6/19/79 |
| | Miller, Samuel House | 1433 Nelson Dr | 11/12/92 |
| | Miller-Claytor House | Treasure Island Rd | 5/6/76 |
| | Montview | VA 670 and US 29 | 6/5/87 |
| | Old City Cemetery | 4th, Monroe, 1st Sts | 4/2/73 |
| | Phaup, William House | 911 Sixth St | 3/13/02 |
| | Point of Honor | 112 Cabell St | 2/26/70 |
| | Rivermont | 205 F St | 5/11/00 |
| | Rivermont Historic District | Rivermont Ave | 4/11/03 |
| | Rosedale | Old Graves Mill Rd | 7/7/83 |
| | St. Paul's Vestry House | 308 7th St | 2/21/97 |
| | Sandusky House | 757 Sandusky Dr | 7/26/82 |
| | South River Friends Meetinghouse | 5810 Fort Ave | 8/28/75 |
| | Spencer, Anne House | 1313 Pierce St | 12/6/76 |
| | St. Paul's Church | 605 Clay St | 9/9/82 |
| | Virginia Episcopal School | 400 Virginia Episcopal School Rd | 10/28/92 |
| | Warwick, John Marshall House | 720 Court St | 12/6/96 |
| | Western Hotel | 5th and Madison Sts | 7/22/74 |
| | Wood, JW Building | 23-27 Ninth St | 2/17/83 |

* - Lynchburg and Forest areas of Bedford County (DNR, 2004)

## 3.9 Visual/Scenic Resources

The viewscape of the BWXT facilities has not changed significantly in the past 10 years. Due to the size and geography of the site, the viewscape should not impact any local interested parties. The only changes made recently were upgrades to visibility for security purposes. These were on-site changes which should not impact any off-site parties.

## 3.10 Socioeconomic

The BWXT facility is located in Campbell County, Virginia, near the city of Lynchburg. Campbell County is a primarily rural county. Populations of Campbell County and surrounding counties is presented in Table 3-9.

Table 3-9 Regional Population

| County | Total Population | | | |
|---|---|---|---|---|
| | 2000 | 1990 | 1980 | 1970 |
| Amherst | 31,894 | 28,578 | 29,122 | 26,072 |
| Appomattox | 13,705 | 12,298 | 11,971 | 9,784 |
| Campbell | 51,078 | 47,572 | 45,424 | 43,319 |
| Lynchburg | 65,269 | 66,049 | 66,743 | 54,083 |
| Area Total | 161,946 | 154,497 | 153,260 | 133,258 |

(USCB, 2004)

BWXT is an important employer in the region. The company employs approximately 2,400 people. Employment data for the Lynchburg Region are presented in Table 3-10. BWXT is also a major contributor to local charitable organizations, and plays an important role in the Central Virginia Community.

Table 3-10 Lynchburg Employment Statistics

| **Lynchburg, VA Metropolitan Statistical Area as of December 2003** | |
|---|---|
| **Industry Type** | **Dec-03** |
| Natural Resources & Construction | 6,600 |
| Manufacturing | 17,800 |
| Trade, Transportation, Utilities | 19,300 |
| Information | 900 |
| Financial Activities | 3,700 |
| Professional & Business | 8,800 |
| Education & Health | 17,800 |
| Leisure & Hospitality | 7,000 |
| Other Services | 5,000 |
| Government | 13,400 |
| **Total (Non-farm)** | 100,000 |

(VEC, 2004)

## 3.11 Public & Occupational Health

### 3.11.1 Background Radiation

Background radiation exposures from natural sources are comparable to the national average of 360 mrem/year. Table 3-11 summarizes the sources of exposure.

Table 3-11 Background Radiation Exposure

| Source | Estimated Annual Exposure (mrem) |
|---|---|
| Radon & decay products | 200 |
| Cosmic | 27 |
| Cosmogenic | 1 |
| Terrestrial | 28 |
| Present in the Body | 39 |
| Medical Diagnostic Tests | 50 |
| Consumer Products | 10 |

| | |
|---|---|
| Total | 355 |

Source: Background Radiation Exposure in US (NCRP 93)

Measurements of natural uranium activity in soils on site were performed in 1995. The results indicate an average uranium concentration of 2.12 pCi/g. The isotopic data is presented in Table 3-12.

Table 3-12 Uranium Activity in On-site Soils

| Isotope | Average (pCi/g) | Standard Deviation (pCi/g) |
|---|---|---|
| U-234 | 1.09 | 0.39 |
| U-235 | 0.06 | 0.02 |
| U-238 | 0.98 | 0.27 |
| Total | 2.12 | 0.67 |

### 3.11.2 Occupational Exposures

Occupational exposures at BWXT are maintained ALARA, well below limits specified in 10CFR20. The average exposure for occupationally exposed personnel is less than 100 mrem per year (Total Effective Dose Equivalent).

The average OSHA Incident Rate for the past four years (2000 through 2003) is 1.8.

## 3.12 Waste Management

### 3.12.1 Liquid Wastes

Liquid waste is treated and measured prior to release to the James River. Section 2.2.3 describes the process.

### 3.12.2 Solid Wastes

Solid wastes from operations are typically packaged in the area of generation. Section 2.2.4 describes the generation of solid waste.

Solid wastes are shipped independently from LTC and NPD. Quantities of waste generated since 1994 are provided in Table 3-13.

TABLE 3-13 Quantities of Waste Generated ($ft^3$)

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NPD | LLW | 2003 | 2002 | 2001 | 2000 | FY99S | FY99 | FY98 | FY97 | FY96 | FY95 | FY94 |
| | | 23,419 | 24,332 | 20,271 | 40,135 | 26,742 | 13,594 | 12,947 | 7,499 | 7,242 | 6,777 | 7,010 |
| | | | | | | | | | | | | |
| LTC | Year | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 | |
| | LLW | 2,725 | 1,437 | 1,414 | 2,864 | 1,649 | 1,588 | 1,759 | 2,248 | 668 | 1734 | |
| | HLW | 0 | 0 | 57 | 63 | 0 | 0 | 0 | 124 | 484 | 68 | |

FY99S - reporting went from fiscal year to calendar year, FY99S represents a shortened year (3 quarters)

### 3.12.3 Hazardous and Mixed Wastes

NPD manufacturing operations use various types solvents, acids, and other chemicals which may generate hazardous wastes. A biennial hazardous waste generators report which lists all waste streams and their method of disposal is submitted to the Virginia Department of Environmental Quality in accordance with state regulations.

In general, non-radioactive hazardous wastes are generated and collected at satellite accumulation areas within the facility. The waste is transferred to the NPD Hazardous Waste Building where it is inventoried, documented and prepared for off-site shipment. Shipping is performed in accordance with applicable regulations.

Wastes that meet the definition of mixed waste are stored in the Mixed Waste Storage Area (in the Hazardous Waste Building). Materials that are typically stored in the area include trichloroethylene-contaminated solutions and sludges, x-ray film wastes (silver), mercury-contaminated wastes, and freon still bottoms. In addition to mixed wastes, various radioactive liquids, including waste oil and chemical solutions, are stored in the Hazardous Waste Building.

The Hazardous Waste Building is inspected regularly for leaks and to ensure compliance with storage requirements.

# 4.0 ENVIRONMENTAL IMPACTS OF PROPOSED ACTION AND ALTERNATIVE

## 4.1 Land Use

Land use at the facility is not expected to change. Expansion within areas that are currently within the industrial area of the site is likely. However, there are no current plans for expansion in non-industrial parts of the site. License renewal will not impact land use at the site.

The alternative to license renewal would impact land use at the site during the short-term. If license renewal was not granted, and decommissioning commenced, many areas of the site would be impacted for staging of equipment, waste, as well as characterization and potentially decontamination.

## 4.2 Transportation

Transportation of radioactive material to and from the facility will continue. There are not any anticipated changes to the quantities or types of shipments. There is no impact anticipated on transportation routes to the facility.

The alternative would result in a significant increase in the number of shipments of radioactive material from the site, until decommissioning activities were completed.

## 4. 3 Geology & Soils

Renewal of license SNM-42 will not impact the geology or seismology of the BWXT site. Soils will not be negatively impacted, as no major changes of land use are anticipated. Erosion of the site is controlled by the vegetation present and maintenance of the facilities, parking lots and roadways.

Not renewing license SNM-42 may have short term impacts on the site surficial geography, however, no long term affects would be anticipated.

## 4.4 Water Resources

Potential impacts on water resources (surface, sub-surface, and wetlands) associated with license renewal would be negatively impacting the water quality from leakage or spills into the James River. The likelihood of these impacts is mitigated by both engineering and administrative controls. NPD applies berms to tanks and drain lines are inspected routinely. The site Emergency Plan address scenarios that could initiate spills.

There is no longer any impact from water withdrawals. Beginning in the later part of 2003, BWXT began using water supplied by CCUSA. This eliminates the need to withdraw water from the James River or on-site wells. Table 4-1 details water usage at the site for the past 10 years.

Table 4-1, NPD Water Usage (data is in units of millions of gallons)

| DISCHARGES | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 |
|---|---|---|---|---|---|---|---|---|---|---|
| Treated Discharge to River, Outfall 001 | 210.8 | 196.4 | 194.1 | 175.3 | 182.3 | 227.6 | 185.3 | 136.2 | 50.2 | 54.1 |
| Cooling Tower Overflow, Outfall, 002 | 2.6 | 0.9 | 0.9 | 0.8 | 1.2 | 1.8 | 2.4 | 2.2 | 1.4 | 2.1 |
| Bryant's Pond Flow, Outfall 003 | 18.0 | 6.8 | 7.5 | 6.3 | 12.5 | 34.4 | 40.2 | 85.1 | 167.5 | 168.3 |
| **CONSUMPTION** | | | | | | | | | | |
| Water pumped from James River | 93.4 | 143.3 | 149.3 | 144.9 | 170.5 | 191.0 | 195.1 | 198.2 | 193.2 | 191.0 |
| Water from CCUSA (Service/ACF) | 49.6 | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| DI Water Total (Wells 6, 7, 9) | 8.9 | 13.0 | 15.7 | 15.2 | 15.2 | 13.8 | 13.4 | 11.4 | 11.0 | 11.0 |
| DI Water from CCUSA | 4.4 | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| Potable Water (wells 3, 8, 10, 11) | 19.2 | 32.7 | 33.3 | 33.0 | 26.8 | 36.6 | 35.7 | 43.9 | 32.6 | 32.8 |
| Potable Water from CCUSA | 8.2 | NR | NR | NR | NR | NR | NR | NR | NR | NR |
| **RECIRCULATED** | | | | | | | | | | |
| Recirc. Service/Process | 240.7 | 285.7 | 295.6 | 274.5 | 228.6 | 213.8 | 271.7 | 381.5 | 412.0 | 316.9 |
| **WASTE GENERATION** | | | | | | | | | | |
| LLR Liquid Waste (PLANT) | 5.3 | 2.8 | 3.3 | 3.0 | 3.3 | 2.9 | 2.6 | 3.8 | 3.6 | 3.7 |
| LLR Liquid Waste (RECOVERY) | 5.0 | 3.7 | 3.9 | 3.4 | 3.2 | 2.7 | 3.2 | 2.9 | 5.7 | 5.2 |
| PA Waste water (non-rad) | 4.3 | 3.9 | 4.6 | 4.4 | 4.3 | 3.0 | 3.6 | 5.6 | 5.6 | 3.6 |

NR – Not reported

Impacts on the water quality of the James River is minimized by the limits placed on discharges by the VPDES permit issued to BWXT by the state of Virginia (Table 3-2) and adherence to the limits set forth in 10CFR20. Liquid effluent releases for the past 10 years are summarized in Table 4-2.

Table 4-2, Liquid Effluent Discharge Summary

| Parameter | Units | Nuclide | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg Concentration | $1x10^{-8}$ µCi/ml | Uranium | 3.84 | 2.04 | 1.81 | 1.61 | 1.06 | 0.77 | 3.18 | 4.17 | 7.91 | 7.53 |
| | | Gross Beta | 1.13 | 1.44 | 1.51 | 1.30 | 0.82 | 0.59 | 0.92 | 2.61 | 12.00 | NR |
| | | Sr-90 | 0.04 | 0.15 | < MDC | 0.02 | 0.82 | NR | NR | NR | NR | NR |
| | | Tc-99 | < MDC | 0.11 | 0.32 | 0.38 | 0.56 | NR | NR | NR | NR | NR |
| | | Cs-137 | 0.12 | 0.14 | 0.39 | < MDC | < MDC | NR | NR | NR | NR | NR |
| Total Quantity Released | µCi | Uranium | 38,086 | 15,142 | 13,298 | 10,674 | 7,316 | 6,633 | 25,847 | 21,344 | 14,966 | 16,481 |
| | | Gross Beta | 8,968 | 10,686 | 11,125 | 8,602 | 5,674 | 3,636 | 7,297 | 11,070 | 22,761 | NR |
| | | Sr-90 | 349 | 1,085 | < MDC | 111 | 5,674 | NR | NR | NR | NR | NR |
| | | Tc-99 | < MDC | 841 | 2,352 | 2,507 | 3,885 | NR | NR | NR | NR | NR |
| | | Cs-137 | 989 | 1,005 | 2,851 | < MDC | < MDC | NR | NR | NR | NR | NR |
| % 10CFR20 Table II, column 2 | % | Total | 13.1% | 7.4% | 6.8% | 5.4% | 5.2% | 3.7% | 12.4% | 19.1% | 50.4% | 25.1% |
| Volume Discharged | $1x10^{8}$ liters | Total | 7.97 | 7.43 | 7.35 | 6.63 | 6.9 | 8.58 | 7.9 | 5.12 | 1.89 | 2.19 |

NR - not reported (Prior to 1995 license SNM-42 did not require beta activity to be reported)

Ground water has been impacted from past operations. In 1986, BWXT identified volatile organic compounds (VOCs) in a groundwater monitoring well at the site. The primary VOC found was trichloroethylene (TCE). After regulatory notifications, a period of monitoring began.

In 1991, BWXT executed an Administrative Consent Order with the EPA to perform corrective action in accordance with the Resource Conservation and Recovery Act (RCRA). A RCRA facility investigation was performed to define the nature and extent of any releases of past products or wastes. The RFI was completed in 1996. The RFI identified three separate groundwater plumes that are contaminated with TCE, tetrachloroethylene (PCE) and related degradation constituents above concentrations considered safe for drinking water.

The next phase of the order was the corrective measures study (CMS). Pilot tests were conducted from 1993 to 1995. In 1998 an ecological survey of the James River shoreline was conducted. The study, a Rapid Bioassessment Protocol III, concluded that the natural flow of groundwater into the James River for the site does not pose an ecological risk to the river. The levels for the constituents of concern were below the Federal Water Quality Criteria for a surface water body not designated as a source of drinking water.

Currently there are two corrective actions being performed. A soil vapor extraction system and a groundwater collection and treatment system are in operation to reduce the levels of VOCs in groundwater at the site. The EPA and BWXT agreed to a long-term alternative screening study of these two technologies. The Corrective Action Phase will continue to ensure that site contamination continues to pose no risk to human health or the ecology of the James River. BWXT submits monitoring reports to EPA Region III annually. (EPA, 2003)

Radiological ground water monitoring data presented in Tables 4-3 and 4-4 indicate no significant impact from radiological constituents from past operations at the site.

Table 4-3 Ground Water Monitoring, NPD (units of pCi/l)

| Location # | | 2003 | 2002[1] | 2001 | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MWB-3 | Alpha | 0.35 | 0.69 | 1.59 | 2.14 | 1.54 | 1.53 | 1.29 | 1.35 | 0.43 | 0.27 |
| | Beta | -0.36 | 4.38 | 2.71 | 3.69 | 2.99 | 2.82 | 4.07 | 3.34 | 2.10 | NR |
| MWB-5 | Alpha | 0.10 | 4.23 | 8.61 | 2.19 | 1.60 | 1.47 | 1.66 | 2.65 | 1.01 | 0.74 |
| | Beta | 0.96 | 7.07 | 17.72 | 2.46 | 5.52 | 3.45 | 3.43 | 5.04 | 1.17 | NR |
| MWA-4 | Alpha | 0.62 | 8.37 | 2.28 | 0.29 | 0.29 | 1.43 | 1.46 | 1.85 | 1.31 | 0.26 |
| | Beta | 0.83 | 12.86 | 3.69 | 1.94 | 0.94 | 3.44 | 3.33 | 2.75 | -1.70 | NR |
| MWA-7 | Alpha | 0.74 | 6.74 | 0.84 | 1.09 | 0.24 | 1.39 | 1.28 | 1.56 | 1.31 | 0.74 |
| | Beta | 2.74 | 7.34 | -1.00 | 1.48 | 2.38 | 3.00 | 2.98 | 2.85 | 4.14 | NR |
| MWA-9 | Alpha | 0.01 | 7.01 | 0.91 | 0.84 | -0.25 | 1.14 | 1.49 | 1.58 | 0.70 | 0.37 |
| | Beta | 1.18 | 10.57 | 3.98 | 1.51 | 1.81 | 2.83 | 3.42 | 3.29 | 1.61 | NR |
| MWA-10 | Alpha | 0.45 | 6.32 | 3.32 | 0.78 | -0.03 | 1.28 | 3.56 | 1.53 | 1.65 | 0.39 |
| | Beta | 3.13 | 8.74 | 3.87 | 1.60 | 1.42 | 3.20 | 3.47 | 2.93 | 5.52 | NR |
| MWA-11 | Alpha | 5.65 | 12.59 | 5.88 | 4.00 | 4.42 | 4.80 | 4.51 | 5.45 | 2.65 | 3.37 |
| | Beta | 4.26 | 12.99 | 4.45 | 0.32 | 3.40 | 2.81 | 4.67 | 5.06 | 5.00 | NR |
| MWA-12 | Alpha | 1.43 | 2.43 | 1.07 | 0.95 | 0.50 | 1.46 | 2.25 | 2.74 | 0.85 | 0.95 |
| | Beta | 3.84 | 4.61 | 3.12 | 2.92 | 3.74 | 5.05 | 5.60 | 6.10 | 6.39 | NR |
| MWA-15 | Alpha | 3.63 | 6.04 | 2.32 | 1.56 | 0.99 | 2.08 | 1.86 | 1.36 | 0.64 | 0.51 |
| | Beta | 2.58 | 3.00 | 5.94 | 1.26 | 3.48 | 2.77 | 3.79 | 4.91 | 2.78 | NR |
| MWA-17 | Alpha | -0.08 | 1.69 | 0.99 | 0.11 | 0.00 | 1.24 | 1.57 | 1.38 | 0.01 | 0.42 |
| | Beta | 1.94 | 1.87 | 2.52 | 6.70 | 2.19 | 3.20 | 5.14 | 3.53 | 4.50 | NR |
| MWA-18 | Alpha | 0.82 | 1.24 | 2.07 | 1.11 | 0.01 | 1.53 | 1.41 | 1.29 | 0.57 | 0.84 |
| | Beta | 1.16 | 0.76 | 0.37 | 0.63 | 1.67 | 2.77 | 3.21 | 3.18 | 0.73 | NR |
| FEP-1 | Alpha | 12.17 | 0.26 | 0.51 | 0.26 | 0.34 | 3.23 | 2.00 | 2.91 | -0.50 | -0.23 |
| | Beta | -2.28 | 7.13 | 8.64 | 3.95 | -6.28 | 3.01 | 11.01 | 7.42 | 1.26 | NR |

Table 4-3 Ground Water Monitoring, NPD (continued)

| Location # | | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FEP-2 | Alpha | 7.78 | 1.36 | 1.34 | 0.15 | 0.41 | 1.46 | 1.48 | 1.56 | 0.34 | -0.24 |
| | Beta | -8.58 | 9.31 | 5.71 | 16.34 | -0.35 | 3.44 | 7.77 | 2.93 | 4.07 | NR |
| FEP-3 | Alpha | 0.14 | 1.12 | 1.17 | 2.33 | 2.08 | 1.25 | 1.89 | 2.02 | 1.03 | 2.42 |
| | Beta | 3.50 | 0.87 | -0.90 | 5.37 | 3.54 | 3.15 | 2.98 | 3.39 | 5.18 | NR |
| CL-2 | Alpha | 2.22 | 1.80 | 1.33 | 0.89 | 0.21 | 1.49 | 1.82 | 3.78 | 0.81 | NR |
| | Beta | 2.56 | 1.67 | 3.29 | 1.77 | 3.67 | 3.50 | 3.28 | 3.46 | 0.94 | NR |
| CL-5 | Alpha | 0.64 | 3.29 | 4.41 | -0.69 | 1.28 | 1.95 | 7.09 | 1.95 | 0.23 | NR |
| | Beta | 0.40 | 6.60 | 5.82 | -1.74 | 3.31 | 3.01 | 10.60 | 4.11 | 4.56 | NR |
| FL-2 | Alpha | -0.08 | 1.36 | 1.02 | 2.84 | 1.14 | 1.13 | 8.89 | 1.80 | 0.13 | NR |
| | Beta | 0.49 | 3.93 | 1.46 | 3.46 | 1.16 | 2.82 | 13.71 | 3.98 | 0.61 | NR |

NR – Not reported;

1 – 2002 data for wells MWA-4, 7, 9, 10, 11, 12 and 15 was elevated. Investigation attributed activity to cross contamination during either sampling or analysis.

Table 4-4, Groundwater Monitoring Results for LTC (units of pCi/l)

| LTC Wells: | | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MWL-1 | Alpha | 1.6 | 0.00 | 1.30 | 0.60 | -0.30 | 0.40 | 1.40 | 0.33 | 0.83 | 0.25 |
| | Beta | 0.6 | -0.40 | 2.10 | 6.30 | 2.30 | 1.18 | 3.00 | 1.26 | 3.11 | 4.3 |
| MWL-2 | Alpha | 5.5 | 1.70 | 0.70 | 2.40 | 3.30 | 1.80 | 1.70 | 3.67 | 2.55 | 2.23 |
| | Beta | 2.5 | -0.10 | 1.00 | 5.50 | 5.20 | 4.09 | 4.00 | 6.38 | 7.30 | 3.75 |
| MWL-3 | Alpha | 2.0 | 0.20 | -0.80 | 1.30 | 1.10 | 0.36 | -0.10 | 1.54 | 0.80 | -0.13 |
| | Beta | 3.1 | -0.10 | -6.10 | 3.50 | 4.70 | -0.26 | -0.10 | 1.41 | 4.69 | 1.5 |
| MWL-4 | Alpha | 0.8 | 0.20 | -1.80 | 0.70 | 0.30 | 2.07 | 0.20 | 2.01 | 0.55 | 1.0 |
| | Beta | 0.6 | -0.60 | -4.20 | 0.40 | 1.60 | 5.41 | -1.20 | 2.14 | 2.12 | 3.23 |
| MWL-5 | Alpha | DRY | DRY | DRY | DRY | DRY | DRY | DRY | DRY | DRY | DRY |
| | Beta | DRY | DRY | DRY | DRY | DRY | DRY | DRY | DRY | DRY | DRY |
| MWL-6 | Alpha | 6.3 | -0.30 | -0.20 | 0.40 | 0.90 | 0.82 | -0.20 | 1.40 | 0.68 | -0.18 |
| | Beta | 5.0 | -2.00 | -1.30 | 3.00 | 0.70 | 1.35 | -0.60 | 2.79 | 3.00 | 0.88 |
| MWL-7[1] | Alpha | 5.9 | 13.30 | 5.70 | 7.90 | 28.70 | 72.20 | 32.20 | 14.55 | 4.87 | 2.0 |
| | Beta | 4.4 | 7.50 | 1.60 | 11.50 | 30.50 | 118.0 | 73.10 | 28.80 | 18.90 | 10.35 |
| MWL-8 | Alpha | 6.6 | 7.90 | 9.90 | NR | NR | NR | NR | NR | NR | NR |
| | Beta | 17.8 | 23.80 | 30.00 | NR | NR | NR | NR | NR | NR | NR |
| MWL-9 | Alpha | 0.6 | -0.10 | -0.40 | NR | NR | NR | NR | NR | NR | NR |
| | Beta | 0.7 | -0.70 | -1.60 | NR | NR | NR | NR | NR | NR | NR |
| MWL-10 | Alpha | DRY | DRY | DRY | NR | NR | NR | NR | NR | NR | NR |
| | Beta | DRY | DRY | DRY | NR | NR | NR | NR | NR | NR | NR |
| MWL-11 | Alpha | 0.1 | -0.50 | -0.40 | NR | NR | NR | NR | NR | NR | NR |
| | Beta | 1.5 | -2.20 | -1.00 | NR | NR | NR | NR | NR | NR | NR |
| MWL-12 | Alpha | 0.2 | -0.10 | 0.30 | NR | NR | NR | NR | NR | NR | NR |
| | Beta | 1.3 | 1.00 | 1.30 | NR | NR | NR | NR | NR | NR | NR |

1 – An investigation conducted in 1996 and 1998 concluded the activity seen in well MWL-7 was from naturally occurring radionuclides. NR – Not reported

## 4.5 Ecology

Site ecology will not be impacted by license renewal. NPD maintains all effluent releases within regulatory parameters. The environmental monitoring program described in section 6.0 demonstrates the minimal impact on the site ecology.

The alternative to license renewal would also not be likely to impact site ecology.

## 4.6 Air Quality

The impact of continued operations on air quality at the site should not change. NPD currently maintains radiological airborne discharges and chemical releases within applicable regulatory limits. Table 4-5 summarizes radiological effluent releases for the past 10 years. Site boundary air sampling data is presented in Table 4-6.

Table 4-5 Summary of Gaseous Effluent Releases (units of uCi)

| # | Stack | Nuclide | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | CRF | Uranium | 6.6 | 20.7 | 12.1 | 11.4 | 11.3 | 10.1 | 9.3 | 7.8 | 10.1 |
| 35 | 14A Maintenance | Uranium | 1.1 | 2.2 | 2.1 | 2.6 | 0.5 | NR | NR | NR | NR |
| 38 | 13A/14A/15A Dry[1] | Uranium | 4.9 | 14.7 | 14 | 34.1 | 233.9[2] | 56.7 | 6.1 | 10.4 | 11.5 |
| 15 | Recovery Scrubber[3] | Uranium | 895 | 1208 | 2397 | 2088 | 1070 | 811 | 761.6 | 585 | 1102 |
| | | Gross β | 115 | 176.3 | 320.7 | 414.6 | 52.1 | 69.2 | 158 | 151.8 | 89.6 |
| 40 | Downblend Scrubber | Uranium | 110 | 48.84 | NR | NR | NR | NR | NR | NR | NR |
| | | Gross β | 23 | 15.7 | NR | NR | NR | NR | NR | NR | NR |
| 18 | 3A Stack | Uranium | 0.0 | 0.2 | 0.1 | 0.3 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 |
| 19 | MFP Load | Uranium | 0.1 | 0.6 | 0.5 | 0.7 | 0.7 | 0.6 | 1.9 | 0.2 | 0.1 |
| 20 | Reclamation | Uranium | 0.1 | 0.7 | 0.3 | 0.5 | 0.3 | 0.2 | 0.6 | 0.3 | 0.2 |
| Term | 1A/2A Stack | Uranium | 0.0 | 0.3 | 0.2 | 0.3 | 0.2 | 0.1 | 0.1 | 0.1 | 0.3 |
| 23 | 2A Stack | Uranium | 0.6 | 1.8 | 1.4 | 0.1 | 0.1 | 0 | 0 | 0.2 | 0.3 |
| 24 | 3A Pharmacy | Uranium | 0.8 | 2.7 | 1 | 1.3 | 2.5 | 2.1 | 1.4 | 1.4 | 0.9 |
| 39 | Waste Mgmt Center | Uranium | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 1.9 | 0.1 | 0.2 | 0.3 |
| 43 | 1A Stack | Uranium | 0.0 | 0.9 | 1 | 4 | 2.2 | 1 | 1.3 | 2.5 | 2.3 |
| 37 | 12A Chem Lab Scrubber | Uranium | 17.6 | 26.5 | 29.2 | 23 | 28.5 | 27.4 | 2.8 | NR | NR |
| 26 | Met Lab | Uranium | 0.3 | 2.1 | 1.6 | 1.6 | 1.2 | 0.7 | 0.9 | NR | NR |
| 16 | RTRT | Uranium | 1.2 | 3.4 | 4.7 | 3 | 2.5 | 2 | 2.4 | 2.7 | 1.6 |
| 42 | NMC Storage | Uranium | 0.3 | 0.1 | NR | NR | NR | NR | NR | NR | NR |
| 30 | Laundry | Uranium | 1.9 | 6 | 3.3 | 2.2 | 2.9 | 3 | 2.6 | 2.8 | 8.9 |
| 32 | Compactor | Uranium | 0.2 | 0.7 | 0.5 | 0.7 | 0.4 | 0.5 | 0.3 | 0.4 | 0.3 |
| | BeWSPS Area | Uranium | NR | 0.5 | 1.1 | 1 | 0.4 | 0 | NR | 0.1 | NR |
| 33 | Decon | Uranium | 0.8 | 1.1 | 0.9 | 0.7 | 0.7 | 0.2 | 0.2 | 0.1 | NR |
| 36 | Retention Tanks | Uranium | 0.2 | 0.4 | 0.2 | 0.3 | 0.5 | 0.5 | 0.2 | 1.1 | NR |
| 31 | WT Scrubber | Uranium | 7.4 | 7.4 | 7.6 | 4.1 | 4.6 | 2.7 | 3.1 | 3.4 | 2.8 |
| | | Gross β | 5.7 | 7.2 | 6.4 | 3.6 | 6.2 | 3.4 | 3.3 | 4.5 | 1.6 |
| | 50 meter Stack | Gross α | 5.6 | 3.1 | 0.8 | 0.7 | 0.8 | 0.7 | 0.6 | 0.5 | 0.5 |
| | | Gross β | 21.3 | 12.5 | 10.8 | 8.6 | 9.4 | 7.9 | 7 | 7.9 | 6.4 |
| | AC Stack (NEL prior to 2003) | Gross α | 1.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 |
| | | Gross β | 3.3 | 1.8 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 2 | 1.8 |
| | RCL Stack | Gross α | 1.6 | 0.2 | NR | NR | NR | NR | NR | NR | NR |
| | | Gross β | 9.0 | 1.6 | NR | NR | NR | NR | NR | NR | NR |
| | TOTAL | Uranium | 1051.4 | 1350.6 | 2479 | 2180.1 | 1363.9 | 921.4 | 812.1 | 648.9 | 1163.3 |
| | | Gross α | 8.4 | 3.5 | 0.9 | 0.9 | 1 | 0.9 | 0.7 | 0.6 | 0.6 |
| | | Gross β | 177.3 | 215.1 | 339.4 | 428.3 | 69.2 | 82 | 169.8 | 166.2 | 99.4 |

NR – Not reported, not in service

1- Stack reconfigured from 2 previous stacks in 1999; data from prior years is combined discharge of the 2 stacks.

2- Increase in 1999 due to degraded HEPA filter, discovered and corrected 12/99.
3- Downblending began Jan. 2000; operation re-routed to new Downblend Stack in July 2002.

Table 4-6, Environmental, Boundary Air Samples (results are in units of 1x10-16 uCi/ml)

| | | River | Magnet Bldg | Ponds | Zirc Recov. | Ballfield | Parking Lot (N) | Front Gate | Credit Union | Tanks | Power Station | Assembly Area | LTC River | LTC Fence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | | N | N | NE | NE | E | E | E | SE | S | SW | SW | W | NW |
| 2003 | Avg | 4.90 | 2.25 | 2.70 | 2.55 | 2.60 | 2.10 | 2.40 | 3.55 | 2.85 | 2.45 | 2.50 | 2.65 | 2.45 |
| | Max | 12.50 | 2.80 | 3.40 | 2.90 | 3.10 | 2.35 | 3.10 | 4.70 | 3.30 | 3.20 | 2.80 | 3.00 | 2.75 |
| 2002 | Avg | 0.65 | -2.35 | 0.80 | 7.25 | 0.55 | 1.80 | 51.2[(1)] | 1.45 | 2.00 | 1.35 | 1.15 | -0.45 | 0.35 |
| | Max | 4.65 | 6.05 | 2.80 | 12.50 | 3.70 | 4.30 | 200[(1)] | 2.20 | 5.40 | 2.65 | 5.70 | 2.80 | 2.30 |
| 2001 | Avg | 0.95 | 1.55 | 2.35 | 2.50 | 0.25 | 2.00 | 2.60 | 1.25 | -0.20 | 1.15 | 2.10 | 0.95 | 3.30 |
| | Max | 2.40 | 2.40 | 5.45 | 3.35 | 0.95 | 3.25 | 4.60 | 2.65 | 1.00 | 2.25 | 3.40 | 1.55 | 12.00 |
| 2000 | Avg | 0.80 | 1.55 | 6.30 | 3.05 | 0.50 | 2.35 | 2.90 | 1.10 | -0.30 | 1.05 | 2.70 | 2.35 | 0.95 |
| | Max | 1.90 | 2.10 | 17.30 | 4.10 | 1.70 | 4.50 | 4.60 | 2.65 | 1.90 | 2.25 | 3.40 | 4.00 | 2.25 |
| 1999 | Avg | 1.00 | 1.45 | 2.20 | 3.65 | 0.35 | 3.40 | 2.25 | 1.20 | 1.95 | 1.60 | 2.35 | 1.80 | 0.60 |
| | Max | 3.50 | 2.20 | 4.10 | 9.35 | 1.95 | 8.40 | 5.05 | 3.70 | 5.00 | 3.60 | 5.85 | 4.60 | 1.80 |
| 1998 | Avg | 2.50 | 4.20 | 2.75 | 1.80 | 1.00 | 0.65 | 0.50 | 2.00 | 1.60 | 0.90 | 0.75 | 2.05 | 1.25 |
| | Max | 5.45 | 12.00 | 4.90 | 2.80 | 2.00 | 2.15 | 1.20 | 2.40 | 4.65 | 1.85 | 1.45 | 3.20 | 2.10 |
| 1997 | Avg | 4.35 | 5.30 | 5.85 | 4.75 | 3.70 | 4.05 | 4.60 | 4.75 | 4.30 | 3.50 | 4.35 | 3.00 | 3.85 |
| | Max | 9.35 | 10.50 | 11.70 | 9.05 | 11.30 | 7.85 | 9.05 | 11.90 | 8.40 | 9.35 | 8.30 | 6.60 | 10.10 |
| 1996 | Avg | 3.95 | 2.80 | 3.20 | 3.45 | 2.20 | 1.60 | 1.70 | 2.35 | 2.45 | 2.80 | 2.35 | 1.95 | 2.95 |
| | Max | 8.10 | 5.45 | 5.85 | 4.50 | 2.75 | 3.10 | 2.85 | 3.75 | 5.20 | 6.25 | 3.70 | 2.80 | 5.70 |
| 1995 | Avg | 2.55 | 2.05 | 2.35 | 2.30 | 0.70 | 2.40 | 1.80 | 1.25 | 2.05 | 1.20 | 1.75 | 2.80 | 1.35 |
| | Max | 5.15 | 5.80 | 5.50 | 3.15 | 1.35 | 6.65 | 4.75 | 3.50 | 3.20 | 3.25 | 3.45 | 7.75 | 3.80 |
| 1994 | Avg | 5.35 | 3.80 | 5.30 | 5.00 | 3.75 | 4.90 | 3.40 | 3.60 | 4.50 | 3.70 | 2.90 | 4.70 | 3.60 |
| | Max | 8.40 | 4.75 | 8.00 | 7.50 | 4.65 | 6.40 | 4.35 | 5.85 | 5.45 | 5.85 | 4.60 | 6.95 | 5.50 |

(1) – Front gate sample, 2002 was elevated, investigation concluded lab analysis was in error.

Non-radiological emissions are reported, as required by the Virginia Department of Environmental Quality. Table 4-7 summarizes the significant emissions from BWXT operations.

Table 4-7, NOx and HF Emissions from Significant Emissions Units (tons/yr)

| | NOx | HF |
|---|---|---|
| 2003 | 49.1 | 1.21 |
| 2002 | 37.9 | 0.93 |
| 2001 | 38.3 | 0.80 |
| 2000 | 37.3 | 0.82 |
| 1999 | 39.0 | 4.24 |

## 4.7 Noise

License renewal would allow operations to continue as they are currently conducted. No additional sources of noise are planned. The majority of the potential sources of noise are located within the facility. By not allowing license renewal, and requiring D&D of the facilities, the impact of noise would be increased when buildings are razed.

### 4.8 Historical & Cultural Resources

Renewal of license SNM-42 will not impact local historical or cultural resources described in 3.8. The alternative action would also not impact historical or cultural resources.

### 4.9 Visual/Scenic Resources

The BWXT site has been in operation since 1955. There will be no impact on visual or scenic resources from allowing license renewal. The alternative action would impact these resources in the short-term.

### 4.10 Socioeconomic

There will be a continued positive socioeconomic impact from license renewal. As a major employer in the Lynchburg area, and a valuable member of the community, BWXT will continue to create jobs, and provide opportunities for local residents.

Failure to renew license SNM-42 would have a negative socioeconomic impact on the local community.

### 4.11 Environmental Justice

The BWXT facility has been in operation since 1955. The area immediately surrounding the facility is sparsely populated. This population is considered during environmental assessments. Since it is the position of BWXT that the environmental impact from facility operation is not significant, there will be no environmental justice issues associated with license renewal.

### 4.12 Public & Occupational Health

The environmental impact of continued operations at NPD can be evaluated by analyzing data from current and past operations at the facility. Semi-annually BWXT prepares a report documenting releases to the environment. This includes an exposure assessment calculated by incorporating very conservative assumptions. Exposures from gaseous effluent releases are determined using the EPA-Comply code. The EPA-Comply code assumes a residential scenario, using conservative assumptions. It is primarily used as a screening tool.

Doses from liquid effluents are calculated using a resident scenario which includes drinking water & fish consumption pathways. Guidance from Regulatory Guide 1.109 is used. Dose conversion factors are taken from Federal Guidance Report Number 11. The results of the exposures from effluents are summarized in Table 4-8.

License renewal would ensure releases continue to meet NRC limits for exposure to the public, therefore the impact of license renewal is minimal.

Exposures from credible accident scenarios have been postulated and are documented in the ISA Summary in Chapter 3 of SNM-42 (docket 70-27).

Table 4-8, Radiological Exposures from Effluent Releases (mrem/yr)

| Exposure Pathway | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 |
|---|---|---|---|---|---|---|
| Airborne | 0.04 | 0.07 | 0.07 | 0.07 | 0.18 | 0.07 |
| Liquid | 0.4 | 0.3 | 0.58 | 0.11 | 0.13 | 0.09 |
| Total | 0.44 | 0.37 | 0.65 | 0.18 | 0.31 | 0.16 |

4.13 <u>Waste Management</u>

The impact of license renewal on waste management issues would be minimal. No significant changes to waste management methodologies are anticipated.

The alternative to license renewal would likely, for the short term, increase the impact of waste management issues. D&D of the facility would cause a significant increase in waste generation during the lifetime of the project.

# 5.0 MITIGATION MEASURES

Mitigation measures begin at the source for each process at the facility. Unencapsulated radioactive material is processed in ventilated enclosures in radiologically controlled areas. These areas maintain control of contamination using ventilation and other engineered controls such as gloveboxes and hoods.

All ventilation systems which exhaust to the environment have a pollution control device, except for the laundry facility. HEPA filtration is the primary method of pollution control. In many cases more than one stage of filtration is present. Some operations cannot be treated using HEPA filters due to excess vapors, moisture or heat. These processes are treated using a fume scrubber. Table 2-1 lists the pollution control device for each stack.

Liquid effluents are also controlled at the source. Process areas which have the potential to generate high concentrations of radioactivity are monitored prior to discharge. The waste is processed at the Waste Treatment Facility as described in section 2.2.1.

## 5.1 ALARA Program

BWXT has committed to a formal ALARA Program. It is the policy of BWXT to ensure exposures and effluents are maintained As Low As Reasonably Achievable, taking into account the current state of technology, and the economics of improvements in relation to benefits to the public health and safety. The goal of the program is to keep internal and external exposures, effluents from the facility and radiological conditions in the facilities, ALARA. The ALARA Program is implemented through procedure and ensures that it's considerations are included in the design of site systems, processes and facilities.

Annually an ALARA Report is prepared by Radiation Protection. The reports reviews data on personnel exposures, in-plant radiological conditions, effluent monitoring, and environmental monitoring. The data is tracked and trended to determine:

- If trends are developing in personnel exposures;
- If trends are developing in the conditions of different parts of the facilities;
- If trends are developing in effluent releases or environmental conditions on or off site;

- If personnel exposures or releases of radioactive material to the environment might be lowered in accordance with the concept of ALARA; and
- If trends are developing in the results of audits or inspections.

## 5.2 Change Control

BWXT has a formalized change control system. Any facility change must be evaluated. Any change which may have an impact on exposures to personnel or releases to the environment must be evaluated by the appropriate safety discipline.

## 6.0 ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

BWXT has a comprehensive Environmental Monitoring Program. Requirements for the program are maintained in the license, and are implemented by procedure RP-08, Environment and Effluent Monitoring and Controls. Samples are taken a minimum of annually from the locations identified on Figure 2-7.

A summary of environmental monitoring data for the past 10 years can be found in Table 6-1. Table 4-6 summarized the environmental air sampling data. Table 4-3 and Table 4-4 contain the ground water monitoring data which is also an important part of the Environmental Monitoring Program.

Table 6-1 Environmental Monitoring Data

| Loc # | Location Description | Type | Analysis | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Bank in south corner of main NNFD parking lot | Soil | Iso Uranium | 2.43 | 1.86 | 1.90 | 1.52 | 1.63 | 1.80 | 1.66 | 2.84 | 2.18 | 2.44 |
| | | | Gross Beta | 12.25 | 12.79 | 13.85 | 10.32 | 11.22 | 9.91 | 12.53 | 18.20 | ND | ND |
| 2 | River Bank at six mile bridge | Soil | Iso Uranium | 1.2 | 1.27 | 1.49 | 1.13 | 1.14 | 1.07 | 1.16 | 1.39 | 1.20 | 1.50 |
| | | | Gross Beta | 12.89 | 9.80 | 15.39 | 10.63 | 10.85 | 9.39 | 5.51 | 12.65 | ND | ND |
| | | Sed | Iso Uranium | 1.05 | 0.88 | 0.96 | 0.76 | 0.96 | 1.04 | 1.37 | 1.56 | 1.07 | 0.97 |
| | | | Gross Beta | 4.47 | 6.15 | 7.33 | 7.19 | 9.04 | 8.42 | 7.45 | 22.41 | 14.20 | ND |
| | | S. Water | Gross Alpha [1] | 1.06 | 2.97 | -0.36 | 0.79 | -0.10 | 0.85 | 3.13 | 0.25 | 0.32 | 0.34 |
| | | | Gross Beta | 3.32 | 6.89 | 3.18 | 3.80 | 3.20 | 2.80 | 5.73 | 6.74 | 13.60 | ND |
| | | Veg | Iso Uranium | 0.11 | 0.45 | 0.16 | 0.23 | -0.85 | 0.13 | 0.25 | 0.39 | 1.15 | 0.62 |
| | | | G. Beta - K40 | -7.98 | -5.94 | -0.22 | 1.56 | -10.0 | -6.49 | -3.98 | -0.28 | ND | ND |
| 3 | In field SE of main parking lot beside big tree | Soil | Iso Uranium | 2.63 | 2.51 | 2.49 | 2.41 | 2.04 | 2.25 | 2.02 | 7.41 | 2.73 | 4.32 |
| | | | Gross Beta | 7.83 | 7.99 | 14.32 | 10.90 | 8.78 | 8.92 | 12.94 | 18.80 | ND | ND |
| | | Veg | Iso Uranium | 1.61 | 0.26 | 0.56 | 0.04 | 0.42 | 0.27 | 0.42 | 0.19 | 0.20 | 3.33 |
| | | | G. Beta - K40 | 0.33 | -4.93 | 2.51 | 4.26 | -1.98 | 2.15 | 1.89 | 6.93 | ND | ND |
| 4 | NE of the Compactor Building [2] | Soil | Iso Uranium | 4.87 | 3.10 | 7.56 | 25.60 | 2.36 | 2.19 | 1.83 | 2.83 | 7.67 | 49.85 |
| | | | Gross Beta | 12.73 | 7.62 | 9.83 | 16.03 | 2.94 | 5.16 | 3.67 | 22.85 | ND | ND |
| | | Veg | Iso Uranium | 1.23 | 0.27 | 0.67 | 0.32 | 1.76 | 2.60 | 0.46 | 0.56 | 2.93 | 66.45 |
| | | | G. Beta - K40 | -6.63 | -0.16 | 1.45 | 1.69 | 7.68 | -3.36 | -4.43 | 3.36 | ND | ND |
| 5 | Between NPD and LTC near shipping and receiving | Soil | Iso Uranium | 2.69 | 2.55 | 2.41 | 2.30 | 2.57 | 2.21 | 1.95 | 3.71 | 2.72 | 2.31 |
| | | | Gross Beta | 13.14 | 10.88 | 10.18 | 9.01 | 6.18 | 6.38 | 3.30 | 22.25 | ND | ND |
| | | Veg | Iso Uranium | 0.21 | 1.98 | 0.19 | 0.52 | 0.01 | 0.20 | 1.62 | 2.18 | 2.49 | 1.01 |
| | | | G. Beta - K40 | -3.03 | -2.46 | -1.46 | 2.90 | 0.37 | -6.13 | -7.86 | 2.60 | ND | ND |
| 6 | Beside fire hydrant across road from main entrance | Soil | Iso Uranium | 2.79 | 2.75 | 2.52 | 2.57 | 1.89 | 2.22 | 2.08 | 2.70 | 2.74 | 2.72 |
| | | | Gross Beta | 7.57 | 9.71 | 13.50 | 7.22 | 7.73 | 8.04 | 14.00 | 21.30 | ND | ND |
| | | Veg | Iso Uranium | 2.15 | 0.34 | 0.11 | 0.40 | 0.52 | 0.39 | 0.93 | ND | ND | ND |
| | | | Gross Beta | 7.03 | -0.93 | -0.78 | 3.78 | 8.07 | 3.63 | 1.15 | ND | ND | ND |
| 7 | Beside telephone pole just past the electrical substation | Soil | Iso Uranium | 2.84 | 2.48 | 2.35 | 2.36 | 2.58 | 1.76 | 1.41 | 2.61 | 2.25 | 2.65 |
| | | | Gross Beta | 11.01 | 10.75 | 10.49 | 12.93 | 2.38 | 4.55 | 3.40 | 18.05 | ND | ND |
| | | Veg | Iso Uranium | 0.15 | 0.15 | 0.08 | -0.27 | -0.12 | 0.28 | 0.85 | 0.45 | 0.83 | 0.46 |
| | | | G. Beta - K40 | 24.60 | -5.06 | -1.87 | 3.95 | 0.51 | -3.12 | -3.88 | -0.44 | ND | ND |
| 8 | Brook near eastern property line beside access road | Soil | Iso Uranium | 4.90 | 2.90 | 2.34 | 1.91 | 2.91 | 2.99 | 3.18 | 3.35 | 2.83 | 3.26 |
| | | | Gross Beta | 20.95 | 11.49 | 15.17 | 10.14 | 14.22 | 14.35 | 18.90 | 19.10 | ND | ND |
| | | Sed | Iso Uranium | 3.16 | 2.05 | 1.99 | 2.10 | 2.39 | 2.62 | 3.03 | 2.26 | 3.16 | 3.34 |
| | | | Gross Beta | 16.13 | 12.99 | 19.04 | 14.94 | 13.65 | 14.10 | 13.90 | 13.70 | ND | ND |
| | | S. Water | Gross Alpha [1] | 2.71 | ND | 1.05 | 2.59 | -0.34 | 2.35 | 0.99 | 0.26 | 2.20 | 0.24 |
| | | | Gross Beta | 6.32 | ND | 6.79 | 2.48 | -0.19 | 5.13 | 1.62 | 3.75 | ND | ND |
| | | Veg | Iso Uranium | 0.20 | 0.82 | 0.19 | 0.17 | 0.13 | 0.27 | 0.39 | 0.22 | 0.14 | 0.68 |
| | | | G. Beta - K40 | -2.08 | -2.06 | -0.76 | 5.55 | 4.98 | 0.81 | -1.39 | 5.40 | ND | ND |

| Loc # | Location Description | Type | Analysis | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | Near the trestle at Nine Mile Bridge | S. Water | Gross Alpha (1) | 0.66 | 1.32 | 0.28 | 1.39 | 0.58 | 0.82 | 1.60 | 0.60 | 1.13 | 0.59 |
| | | | Gross Beta | 3.58 | 5.27 | 4.71 | 3.45 | 2.54 | 2.98 | 3.40 | 5.78 | 13.03 | 18.51 |
| | | Sed | Iso Uranium | 1.37 | 1.31 | 1.67 | 1.48 | 0.89 | 1.03 | 1.02 | 0.91 | 0.97 | 1.21 |
| | | | Gross Beta | 12.71 | 9.34 | 16.10 | 13.87 | 8.09 | 12.86 | 6.57 | 15.97 | 6.53 | 2.72 |
| 10 | Drainage ditch between fence and railroad track south of contaminated material burial site | Soil | Iso Uranium | 2.85 | 1.92 | 2.61 | 3.56 | 1.61 | 2.61 | 1.94 | 2.41 | 1.75 | 1.78 |
| | | | Gross Beta | 10.99 | 16.47 | 14.68 | 11.80 | 7.57 | 11.95 | 12.46 | 27.10 | ND | ND |
| | | Veg | Iso Uranium | 1.38 | 0.08 | 0.20 | -0.13 | 0.30 | 0.42 | 0.17 | 0.80 | 0.22 | 0.36 |
| | | | G. Beta - K40 | 2.38 | -0.72 | -1.51 | 5.23 | 2.12 | 0.86 | 1.22 | 5.20 | ND | ND |
| 11 | Near contaminated material burial site | Soil | Iso Uranium | 1.72 | 1.69 | 1.98 | 1.62 | 1.35 | 1.27 | 1.30 | 1.71 | 1.52 | 1.02 |
| | | | Gross Beta | 13.25 | 9.98 | 16.45 | 15.20 | 7.01 | 11.00 | 8.53 | 25.50 | ND | ND |
| | | Veg | Iso Uranium | 0.17 | 0.10 | 0.07 | -0.15 | 0.02 | 0.36 | 1.15 | 0.77 | 0.28 | 0.23 |
| | | | G. Beta - K40 | -8.93 | 1.23 | 2.27 | 3.91 | 8.00 | -1.27 | -10.28 | 0.79 | ND | ND |
| 12 | On southern side of smaller water tanks | Soil | Iso Uranium | 2.13 | 2.01 | 2.02 | 1.86 | 1.62 | 1.63 | 1.13 | 3.03 | 2.61 | 2.77 |
| | | | Gross Beta | 18.24 | 11.04 | 13.99 | 13.88 | 9.57 | 9.00 | 9.14 | 36.6 (3) | ND | ND |
| | | Veg | Iso Uranium | 0.29 | 0.22 | 0.19 | 0.08 | -0.12 | 0.22 | 0.79 | 0.71 | 0.15 | 81.0 (4) |
| | | | G. Beta - K40 | -3.44 | -6.51 | 2.78 | -1.77 | 1.66 | 5.16 | -0.72 | 4.28 | ND | ND |
| 13 | East of WTF on river bank upstream of plant outfall | S. Water | Gross Alpha (1) | 0.35 | 1.07 | 0.62 | 0.77 | -0.16 | 0.64 | 1.64 | 0.51 | 0.29 | 0.41 |
| | | | Gross Beta | 2.75 | 3.34 | 6.19 | 4.26 | 3.18 | 4.26 | 5.36 | 7.43 | ND | ND |
| | | Sed | Iso Uranium | 1.66 | 1.13 | 1.07 | 1.32 | 0.83 | 0.91 | 0.97 | 1.37 | 1.34 | 1.30 |
| | | | Gross Beta | 12.75 | 12.72 | 12.88 | 12.01 | 9.07 | 11.40 | 11.10 | 14.20 | ND | ND |
| 14 | Outfall from Bryant's Pond | Soil | Iso Uranium | 2.29 | 2.27 | 2.10 | 2.01 | 1.63 | 1.59 | 1.75 | 2.27 | 2.10 | 3.52 |
| | | | Gross Beta | 14.82 | 17.47 | 18.57 | 19.26 | 11.26 | 9.52 | 13.16 | 22.43 | ND | ND |
| | | Veg | Iso Uranium | 0.75 | 0.72 | 0.25 | 0.05 | 0.02 | 0.42 | 2.01 | 0.38 | 1.03 | 0.43 |
| | | | G. Beta - K40 | -4.78 | -0.89 | 2.00 | -0.88 | 3.81 | -0.32 | 0.08 | 0.89 | ND | ND |
| | | S. Water | Gross Alpha (1) | ND | ND | ND | ND | 5.85 | 2.47 | 3.37 | 2.04 | 4.79 | 1.27 |
| | | | Gross Beta | ND | ND | ND | ND | 3.41 | 2.39 | 1.98 | 2.27 | ND | ND |
| | | Sed | Iso Uranium | 3.60 | 3.18 | 2.36 | 2.85 | 1.65 | 3.77 | 1.49 | 3.16 | 5.41 | 2.32 |
| | | | Gross Beta | 13.51 | 16.89 | 19.90 | 14.48 | 12.96 | 12.54 | 8.59 | 20.33 | ND | ND |
| 15 | River bank at eastern property line | Soil | Iso Uranium | 1.52 | 1.85 | 2.10 | 1.89 | 4.84 | 1.63 | 1.20 | 1.55 | 1.75 | 2.58 |
| | | | Gross Beta | 11.47 | 10.09 | 19.31 | 15.10 | 7.09 | 12.65 | 2.29 | 18.80 | ND | ND |
| | | Sed | Iso Uranium | 2.08 | 1.56 | 1.70 | 1.28 | 0.79 | 1.03 | 1.30 | 1.30 | 1.05 | 0.81 |
| | | | Gross Beta | 11.5 | 12.62 | 15.14 | 13.73 | 7.91 | 9.28 | 10.40 | 18.69 | 9.64 | ND |
| | | S. Water | Gross Alpha (1) | 0.24 | 0.36 | 0.63 | 0.60 | 0.34 | 0.24 | 2.10 | 0.18 | 0.30 | 0.28 |
| | | | Gross Beta | 2.48 | 5.07 | 4.27 | 3.18 | 3.73 | 4.34 | 4.66 | 5.43 | 15.16 | 21.15 |
| | | Veg | Iso Uranium | 0.14 | 0.13 | 0.03 | -0.87 | 0.05 | 0.27 | 1.85 | 1.25 | 3.14 | 0.21 |
| | | | G. Beta - K40 | -4.78 | -6.34 | -0.15 | -2.45 | 2.68 | -1.21 | -4.81 | 0.27 | ND | ND |
| 16 | Final Effluent Pond closest to the river (5) | Sed | Iso Uranium | 1,502 | 1,522 | 759.8 | 552.8 | 250.8 | 1,049 | 696.1 | 745.8 | 1,070 | 607.2 |
| | | | Gross Beta | 89.37 | 71.37 | 46.93 | 37.14 | 21.98 | 44.50 | 42.18 | 72.82 | 15.21 | 10.08 |
| 17 | Next to potable well # 2 | Soil | Iso Uranium | 2.05 | 1.80 | 1.80 | 2.37 | 1.71 | 2.57 | 1.92 | 2.67 | 2.38 | 2.79 |
| | | | Gross Beta | 10.48 | 8.43 | 13.41 | 12.17 | 6.95 | 12.10 | 6.96 | 14.95 | ND | ND |
| | | Veg | Iso Uranium | 0.19 | 0.12 | 0.06 | 0.17 | 0.13 | 0.27 | 1.30 | 0.52 | 0.18 | 0.30 |
| | | | G. Beta - K40 | -9.46 | 0.23 | -1.87 | 3.09 | 7.12 | -1.20 | 0.03 | 1.49 | ND | ND |
| 18 | Near cooling tower outfall | Soil | Iso Uranium | 3.47 | 4.88 | 10.60 | 12.06 | 2.72 | 23.06 | 10.10 | 6.35 | 6.52 | 8.57 |
| | | | Gross Beta | 11.74 | 11.82 | 13.97 | 11.23 | 8.39 | 8.44 | 7.22 | 16.72 | ND | ND |
| | | Sed | Iso Uranium | 12.95 | 24.68 | 53.37 | 15.46 | 2.83 | 4.27 | 23.08 | 68.01 | 37.11 | 34.82 |
| | | | Gross Beta | 6.21 | 11.16 | 10.03 | 9.91 | 6.68 | 7.41 | 7.46 | 19.47 | ND | ND |
| | | S. Water | Gross Alpha (1) | ND | ND | ND | ND | 3.02 | 2.26 | 2.57 | 2.57 | 3.73 | 2.30 |
| | | | Gross Beta | ND | ND | ND | ND | 2.29 | 2.89 | 2.12 | 2.96 | ND | ND |
| | | Veg | Iso Uranium | 0.86 | 8.63 | 0.42 | 0.12 | 0.24 | 0.59 | 12.52 | 0.28 | 2.98 | 19.63 |
| | | | G. Beta - K40 | -1.62 | -3.86 | -1.00 | 4.48 | 2.44 | -3.66 | -1.17 | 4.31 | ND | ND |
| 19 | End of drainage ditch next to road behind WTF pads (6) | Soil | Iso Uranium | 10.49 | 7.18 | 4.96 | 3.74 | 5.10 | 2.86 | 3.88 | 2.49 | 7.88 | 123.30 |
| | | | Gross Beta | 13.09 | 9.19 | 17.25 | 12.58 | 10.02 | 5.73 | 8.84 | 15.44 | ND | ND |
| | | Sed | Iso Uranium | 19.22 | 19.51 | 15.56 | 20.70 | 9.22 | 27.69 | 13.21 | 22.60 | 82.33 | 17.77 |
| | | | Gross Beta | 10.76 | 15.36 | 12.18 | 23.02 | 7.05 | 9.19 | 9.32 | 19.85 | ND | ND |
| | | S. Water | Gross Alpha (1) | 4.46 | 5.23 | 10.20 | 8.84 | 11.69 | 5.45 | 14.97 | 8.43 | 11.78 | 14.52 |
| | | | Gross Beta | 4.90 | 3.90 | 5.16 | 4.68 | 3.00 | 3.35 | 5.44 | 6.28 | ND | ND |
| | | Veg | Iso Uranium | 0.84 | 0.70 | 0.60 | 0.49 | 0.59 | 0.42 | 2.01 | 0.64 | 0.23 | 1.64 |
| | | | G. Beta - K40 | -6.05 | -4.33 | -1.69 | 2.55 | 1.31 | -3.83 | 0.88 | 3.23 | ND | ND |

| Loc # | Location Description | Type | Analysis | 2003 | 2002 | 2001 | 2000 | 1999 | 1998 | 1997 | 1996 | 1995 | 1994 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | Near the overflow out-fall from the million gallon storage tanks(7) | Soil | Iso Uranium | 3.09 | 2.70 | 2.28 | 2.25 | 1.65 | 5.97 | 76.91 | 417.3 | 132.70 | 299.52 |
| | | | Gross Beta | 14.48 | 16.77 | 18.22 | 13.65 | 9.37 | 12.65 | 19.90 | 48.25 | ND | ND |
| | | Veg | Iso Uranium | 0.68 | 1.63 | 0.33 | 0.60 | 0.90 | 47.52 | 2.34 | 0.76 | 0.43 | 22.98 |
| | | | G. Beta - K40 | -1.82 | -2.83 | -0.46 | 2.03 | 0.19 | 2.03 | -0.09 | 5.34 | ND | ND |
| 25 | 1.2 miles east of site | Soil | Iso Uranium | 1.58 | 1.88 | 1.37 | 1.93 | 1.90 | 1.48 | 1.37 | ND | ND | ND |
| | | | G. Beta – K40 | 11.77 | 12.13 | 28.41 | 12.53 | 6.29 | 6.70 | 5.23 | ND | ND | ND |
| | | Veg | Iso Uranium | 0.10 | 0.10 | 0.86 | -0.03 | 0.13 | 0.35 | 0.44 | 0.16 | -1.53 | 1.90 |
| | | | G. Beta – K40 | -6.40 | 0.89 | -0.54 | 2.67 | 2.30 | 2.53 | 0.44 | 3.55 | 0.57 | 1.05 |
| 26 | 1.2 miles west of site | Soil | Iso Uranium | 1.86 | 1.86 | 2.33 | 1.94 | 1.16 | 1.37 | 1.67 | ND | ND | ND |
| | | | G. Beta – K40 | 7.53 | 8.04 | 12.72 | 13.08 | 4.72 | 8.82 | 7.78 | ND | ND | ND |
| | | Veg | Iso Uranium | 0.07 | 0.19 | 0.08 | -0.13 | 0.55 | 0.16 | 0.93 | 0.14 | -0.93 | 1.30 |
| | | | G. Beta – K40 | -7.54 | -6.06 | -0.49 | 1.59 | 2.12 | -4.72 | -5.97 | 1.53 | 2.80 | 5.33 |
| 27 | 5.5 miles downstream | Sed | Iso Uranium | 1.27 | 1.60 | 1.03 | 1.26 | 1.01 | 0.82 | 1.03 | 1.17 | 2.39 | 1.00 |
| | | | Gross Beta | 7.12 | 9.55 | 11.18 | 10.19 | 7.94 | 6.78 | 8.13 | 16.69 | 1.53 | -1.30 |

Notes on Table 6-1:

ND – No Data (samples not taken or not analyzed)

(1) – Beginning in 1996 surface water samples were analyzed by gross alpha/beta analysis. Prior to 1996 samples were analyzed by isotopic.

(2) – Variability in activity attributed to variation in location. Location monitors run-off from old drum storage area. Elevated activity anticipated.

(3) – Investigation concluded large portion of beta activity was due to K-40.

(4) – Elevated activity was the result of one quarter with an elevated result. Subsequent samples have shown no elevated activity.

(5) – Final effluent pond known to be contaminated.

(6) – Location known to have elevated activity due to recycle water contamination and field storage run-off.

(7) – Area known to have been contaminated. Remediation performed in 1998.

Procedural action levels have been established for each type of sampling media. Past reviews of the Environmental Monitoring Program by regulatory agencies has found the program to provide adequate protection of public health and safety.

## 7.0 COST BENEFIT ANALYSIS

10CFR51.45 (c) states in part,

> *"Environmental Reports prepared at the license renewal stage pursuant to 51.53(c) need not discuss the economic or technical benefits and costs of either the proposed or alternatives except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation."*

Since there is only one proposed alternative no cost benefit analysis is necessary. BWXT utilizes the ALARA Program discussed in section 5.0 which may include cost benefit analyses for determining when additional controls or mitigation is necessary.

## 8.0 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

BWXT continues to operate the Mt. Athos Facility in a manner that will have a minimal impact on the surrounding environment. All effluent releases and potential exposures to the public are maintained below regulatory limits and in accordance with the ALARA philosophy.

Impacts from past sources of contamination are being monitored by BWXT and the EPA. To date, no significant health impacts have been identified. BWXT continues to improve the conditions of the site in accordance with the Consent Order Agreement.

## 9.0 LIST OF REFERENCES

IT Corporation, 1996, RCRA Facility Investigation RFI Report, September 1996

National Oceanic and Atmospheric Administration, 2002, Climatology of the US, No. 81, Report 44, Virginia, February 2002.

National Oceanic and Atmospheric Administration, 2003, National Weather Service, Virginia Floods, December 2003.

Southeastern Regional Climate Center, 2004, Historical Climate Summaries and Normals for the Southeast, January 2004

Shaw Environmental, Inc., 2003, Draft 2003 Annual Monitoring Report for the RCRA Corrective Measures Study, BWXT Inc., Mt. Athos Site, Lynchburg, Virginia, December 2003.

US Census Bureau, 2004, Census Data for the United States (website www.census.gov)

US Department of Natural Resources (website www.cr.nps.gov/nr), 2004

US Environmental Protection Agency, 2003, Corrective Actions Facility Fact Sheet, BWXT NPD Facility, December 2003.

US Fish and Wildlife Service, National Wetlands Inventory, (website wetlands.fws.gov), generated January 2004.

US Fish and Wildlife Service, Division of Endangered Species, 2004, Threatened and Endangered Species System Report, Generated January 2004.

US Nuclear Regulatory Commission, 1984, Environmental Impact Appraisal for Babcock and Wilcox Company, Docket No. 70-27, Renewal of SNM-42, Lynchburg, VA, March 1984.

US Nuclear Regulatory Commission, 1991, Environmental Assessment for Renewal of Special Nuclear Material License No. SNM-42, Docket No. 70-27, B&W, Lynchburg, VA, August 1991.

US Nuclear Regulatory Commission, 1995, Supplemental Environmental Assessment for Renewal of Special Nuclear Material License No. SNM-42, Docket No. 70-27, Babcock & Wilcox, Lynchburg, VA, August 1991.

US Nuclear Regulatory Commission, 2003, NUREG-1748, Environmental Review Guidance for Licensing Actions Associated with NMSS Programs, August 2003.

Virginia Department of Mines, Minerals and Energy, 1994, Virginia Earthquake Brochure, 1994.

Virginia Department of Game and Inland Fisheries, 2004, List of Endangered Species.

Virginia Employment Commission, 2003, Virginia Employment Statistics for December 2003.