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Southern Nuclear Operating Company
Project Number: 00737
Vogtle Electric Generating Plant Early Site Permit Application
Site Safety Analysis Report Section 2.2 Supplement 1

Ladies and Gentlemen:

By letter AR-06-1579, dated August 14, 2006, Southern Nuclear Operating Company (SNC) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) requesting an Early Site Permit (ESP) for two additional reactors at the Vogtle Electric Generating Plant (VEGP) site near Waynesboro, Georgia. The application was submitted in accordance with Part 52, Subpart A of Title 10 of the Code of Federal Regulations. Based on subsequent discussions with the NRC regarding ESP Application Site Safety Analysis Report (SSAR) Section 2.2, *Identification of Potential Hazards in Site Vicinity*, SNC is providing additional detail in this section to assist in its review. Thus, the enclosure to this letter contains a new, supplemented SSAR Section 2.2. The revision number for this new, supplemented section is changed to "0-S1" to distinguish it from the original Revision "0" version.

This material does not contain restricted data or other defense information that requires separation from the unclassified information in accordance with 10 CFR 50.33(j) pursuant to 10 CFR 52.17(a)(1).

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If you have any questions regarding this letter, please contact Mr. J. T. Davis at (205) 992-7692.

Respectfully submitted,
SOUTHERN NUCLEAR OPERATING COMPANY

Joseph A. (Buzz) Miller

Sworn to and subscripted before me this 6th *day of* September, *2006*

Debra Bates
Notary Public

Debra Bates
Notary Public
Ala. State at Large
My Commission Expires
July 2, 2008

JAM/BJS/dmw

Enclosure: Vogtle Early Site Permit Application Site Safety Analysis Report Section 2.2 Revision 0-S1

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AR-06-1932

Enclosure

Vogtle Early Site Permit Application

Site Safety Analysis Report

Section 2.2

Revision 0-S1

2.2 Identification of Potential Hazards in Site Vicinity

2.2.1 Location of Nearby Industrial, Transportation, and Military Facilities

Within a 5-mile vicinity of the VEGP site, there are several major industrial facilities, one railroad, and one highway with commercial traffic. Specifically, the following transportation routes and facilities are shown on the indicated figures:

- Plant Wilson (see Figure 2.2-1)
- Savannah River Site (see Figure 2.2-2)
- Georgia State Highway 23 (see Figure 2.2-3)
- CSX Railroad (see Figure 2.2-1)
- A coal-fired steam plant operated by Washington Savannah River Company in D-Area of the SRS
- VEGP Unit 1 and Unit 2

Figures 2.2-2 and 2.2-3 shows the location of major industrial facilities, military bases, highway transportation routes, airports, railroads, and pipelines within a 25-mile radius of the site. In addition, Figure 2.2-2 shows nearby airways and military operation areas.

Items illustrated on the maps are described in Section 2.2.2. The only military facility within a 50-mile radius is Fort Gordon. The Fort Gordon U.S. Army Signal Corps training facility is barely within 25 miles of the VEGP site. The only major storage facility within 25 miles of the VEGP site, other than those at the SRS and at Chem-Nuclear Systems, is a group of oil storage tanks associated with the existing combustion turbine generators for Plant Wilson on the VEGP site.

2.2.2 Descriptions

2.2.2.1 Industrial Facilities

The Burke County Comprehensive Plan: 2010, Part 1 **(Burke 1991)** shows a relatively slow, stable population growth pattern for the county. This is indicative that the nearby industries have not experienced much growth.

The Comprehensive Plan also reveals that services and manufacturing industries dominate the top 10 employers in the county. Southern Nuclear and Samson Manufacturing Company (curtains and draperies) are the largest Burke County employers. Nearby industries also include the Chem-Nuclear Systems radioactive waste disposal site (18 miles away in South Carolina) operated by Duratek; Unitech Services Group nuclear laundry facility (21 miles away in South Carolina); and the facilities of the SRS (also in South Carolina). Table 2.2-1 lists the largest employers for the three-county region, based on recent data obtained for Burke County **(Burke 2005)** in Georgia, and nearby Aiken and Barnwell counties in South Carolina **(Aiken 2005; Barnwell 2005)**.

There currently are no projected major increases to industrial, military, or transportation facilities within a 25-mile radius of the VEGP site except for the development of the site for VEGP Units 3 and 4.

2.2.2.1.1 Savannah River Site

The SRS borders the Savannah River for approximately 17 miles opposite the VEGP site. It occupies an approximately circular area of 310 square miles (198,344 acres) encompassing parts of Aiken, Barnwell, and Allendale counties in South Carolina **(WSRC 2006)**. The SRS is owned by the DOE and operated by an integrated team led by Washington Savannah River Company (WSRC). The site is a closed government reservation except for through traffic on South Carolina Highway 125 (Savannah River Site Road A) and the CSX Railroad.

The SRS processes and stores nuclear materials in support of the national defense and U. S. non-proliferation efforts. The site also develops and deploys technologies to improve the environment and treat nuclear and hazardous wastes left from the Cold War. **(WSRC 2006)**

The following is a list of current and near-term operating facilities at the SRS and the activities conducted at these facilities **(WSRC 2006; DOE 2006)**:

- Separations facilities for processing irradiated materials (H Area).
- Waste management facilities that process, dispose or ship solid radioactive waste, hazardous waste, mixed waste, transuranic waste, and sanitary waste (E Area).
- The Defense Waste Processing Facility is processing high-level radioactive waste into stable borosilicate glass for disposal (S Area).
- The Savannah River National Laboratory (a process development laboratory to support production operations and containing two test reactors) and administrative facilities (A Area).

- The L Area Disassembly Basin which provides receipt and interim storage of research reactor fuel (L Area).
- Tritium Extraction Facility to extract tritium from fuel rods irradiated at TVA's reactors and to load the extracted tritium into canisters for shipment to the Department of Defense. Expected to begin operation in fiscal year 2007.
- Replenishment of tritium – recycling, purifying, and reloading nuclear weapons reservoirs.
- MOX Fuel Fabrication Facility (to be constructed) to manage and convert excess weapons-grade plutonium to a form that can be used in commercial nuclear power plants.
- Stabilization, management, and storage of plutonium materials (K Area).
- Salt waste Processing Facility to remove radioactive constituents from high-level waste (under construction).
- A variety of non-nuclear facilities necessary for plant operations.

Five nuclear production reactors and several small test reactors are deactivated and are awaiting decommissioning and decontamination.

The major waste storage areas for high-level waste are adjacent to the two separations areas and consist of two tank farms linked to the separations areas and to each other by pipelines with secondary containment. In addition, the SRS uses engineered concrete vaults and engineered trenches for the permanent disposal of solid low-level radioactive waste **(WSRC 2006)**. The deactivated reactors, separations areas, and waste storage areas are at least 4 miles from the nearest VEGP site boundary.

2.2.2.1.2 Unitech Services Nuclear Laundry Facility

Although not located within 5 miles of the VEGP site, the Unitech Services Nuclear Laundry Facility, located in the Barnwell County Industrial Park, is described due to its relative proximity to and association with the SRS (Figure 2.2-3). It was constructed by Unitech Service Group to provide radiological laundry, decontamination and respirator services. The facility has about 50 employees as of May 2006 **(Unitech 2006)**.

2.2.2.1.3 Chem-Nuclear Systems

Chem-Nuclear Systems developed, constructed, and operates the largest radioactive waste disposal site in the country near Barnwell, South Carolina (Figure 2.2-3). This site contains 308 acres, of which 235 have been deeded to the State of South Carolina as a designated exclusion area. Waste receipts are in the form of solids only; no liquids are accepted. Since the disposal

facility began operation in 1971, about 28 million cubic feet, or 90 percent of the available disposal volume, have been used **(Chem-Nuclear 2006)**. The facility handles approximately 400 shipments of low-level spent fuel per year. The products and materials associated with Chem-Nuclear Systems are described in Table 2.2-2 **(Still 2005)**.

2.2.2.1.4 Georgia Power Company's Plant Wilson

Plant Wilson is located approximately 6,000 feet east-southeast from the proposed VEGP Units 3 & 4 footprint. The existing combustion turbine plant is an electrical peaking power station of Georgia Power Company. The plant consists of six combustion turbines with a total rated capacity of 351.6 MW. The storage capacity of the fuel storage tanks is 9,000,000 gallons.

2.2.2.1.5 VEGP Units 1 and 2

The existing VEGP Units 1 and 2 reactors are located about 3,600 ft and 3,900 ft, respectively west of the Savannah River. For these units, the exclusion area is the same as that for the proposed units and it is defined as an irregular shaped area which generally conforms to the site's boundary lines. There are no residents within the exclusion area, and there are no highways, railways, or waterways crossing the area. Besides the activities at Plant Wilson, the only other activities that may occur within the exclusion area that are unrelated to plant operations are those associated with the operation of the Visitor's Center. VEGP has made arrangements to control and, if necessary, evacuate the exclusion area in the event of an emergency.

2.2.2.2 Mining Activities

There are no mining activities within 5 miles of the VEGP site.

2.2.2.3 Roads

The nearest highway with commercial traffic is Georgia State Highway 23 (Figure 2.2-3). Segments of Georgia State Highways 23, 80, and 56 Spur are located within a 5-mile radius of the site. Other than traffic volumes, the Georgia Department of Transportation does not maintain data on the products and materials carried over these roads. However, major commercial traffic occurs only on State Highway 23, which serves as a major link between Augusta and Savannah. The heaviest truck traffic along State Highway 23 near the site consists primarily of timber and wood products and materials. State Highways 80 and 56 Spur serve primarily as minor transportation routes for local traffic. Available statistical data on personal injury accidents on these roads between 1999 and 2003 are presented in Table 2.2-3 **(GDT 2005)**.

2.2.2.4 Railroads

CSX is the nearest railroad with commercial traffic and is approximately 4.5 miles northeast of the VEGP site. CSX runs through and services the SRS. Major chemical substances identified as being carried by the CSX Railroad include cyclohexane, anhydrous ammonia, carbon monoxide, molten sulfur, and elevated temperature liquid. **(Murta 2006)**

Burke County has two local Norfolk Southern rail lines, one through Waynesboro and one through Midville. These are approximately 12 miles west of the VEGP site.

2.2.2.5 Waterways

The VEGP Units 3 & 4 footprint is located about 4,850 feet southwest of the Savannah River. In 1979, the last commercial shipment passed through the New Savannah Bluff Lock and Dam, located approximately 35 river miles north of the VEGP site **(USACE 2000)**. Since that time, there has been no commercial river traffic between Augusta and Savannah, and only limited commercial river traffic past the VEGP site **(DOE 1999)**. The small amount of traffic that does exist is primarily composed of barge-tug tows moving up and down the river channel out of the Port of Savannah. There are no locks or dams in the vicinity of the plant site. The proposed intake structure is located approximately 1,800 feet upstream of the existing VEGP Units 1 and 2 intake structure (see Figure 1-4).

In 2004, only 13 commercial vessels (8 upbound and 5 downbound) were recorded on the Savannah River below Augusta. Within this section of the river, a total of less than 500 tons of residual fuel oil were transported near or past the VEGP site. Except for residual fuel oil, no flammable or potentially explosive materials were transported on this portion of the Savannah River **(IWR 2004)**.

2.2.2.6 Airports, Airways, and Military Training Routes

2.2.2.6.1 Airports

There are no airports within 10 miles of the VEGP site. The closest airport, Burke County Airport, is approximately 16 miles west-southwest of the VEGP site. It has a 4,035-foot asphalt runway oriented 250° WSW – 70° ENE. The airport, which has a non-directional radio beacon for runway approach, is used by single-engine private aircraft and by crop-dusting operations. There are only two multi-engine and five single-engine aircraft based at the field. The average number of operations (landings and takeoffs are counted separately) is about 57 per week. Most operations are transient general aviation; only about 33 percent are local general aviation **(Burke Airport 2006)**.

The closest commercial airport is Augusta Regional Airport at Bush Field, which is located approximately 17 miles north-northwest of the VEGP site. It has an 8,000-foot primary runway oriented 170° SSE – 350° NNW and a 6,000-foot crosswind runway oriented 80° ENE – 260° WSW. FAA information effective April 13, 2006 indicates that 17 aircraft are based on the field. Ten of these are single-engine airplanes, four are multi-engines airplanes, and three are jet-engine airplanes. The average number of operations is about 91 per day. Most (40 percent) are general transient aviation, 24 percent are air taxi, 12 percent are local general aviation, 14 percent are commercial, and 10 percent are military **(FAA 2006)**. Based on the historical flight data recorded prior to 2005, projections for air traffic at Bush Field up to fiscal year 2025 are given in Table 2.2-4 **(APO 2006)**. Approach and departure paths at Bush Field are not aligned with the VEGP site; and no regular air traffic patterns for Bush Field extend into airspace over the VEGP site.

A small un-improved grass airstrip is located immediately north of the VEGP site (north of Hancock Landing Road and west of the Savannah River). At its closest point, the airstrip is more than 1.4 mile from the power block of the new units. This privately owned and operated airstrip has a 1,650-foot turf runway oriented 80° East – 260° West. Thus take-offs and landings are tangential to the site property and oriented away from the plant. While no FAA traffic information is available for this airstrip, informal communication with the owner/operator revealed that the airstrip is for personal use and the associated traffic consists only of small single-engine aircraft **(Rhodes 2006)**. In addition, there is a small helicopter landing pad on the VEGP site. This facility exists for corporate use and for use in case of emergency. The traffic associated with either of these facilities may be characterized as sporadic. Therefore, due to the small amount and the nature of the traffic, these facilities do not present a safety hazard to the VEGP site.

2.2.2.6.2 Airways

The centerline of Airway V185 is approximately 1.5 miles west of the VEGP site (Figure 2.2-2). Additionally, Airway V417 is about 12 miles northeast of the VEGP site, and Airway V70 is approximately 20 miles south of the VEGP site (Figure 2.2-2) **(FAA 2005)**. Due to its close proximity to the VEGP site, an evaluation of hazards from air traffic along the V185 airway is presented in Section 3.5.1.6. That evaluation shows that the presence of Airway V185 is not a safety concern for the VEGP site.

2.2.2.6.3 Military Training Routes

In August 2005, Shaw Air Force Base (AFB), South Carolina, issued a draft Environmental Impact Statement (EIS) **(Shaw 2005)** regarding implementing airspace modifications to the

Gamecock and Poinsett Military Operation Areas (MOAs) in South Carolina and the Bulldog MOAs in Georgia. The west edge of the Poinsett MOA is about 75 miles east-northeast of the VEGP site. The Gamecock MOAs are east of the Poinsett MOA. The proposed Gamecock E MOA would be created to form a "bridge," allowing maneuvering and training between the Gamecock MOAs and the Poinsett MOA. The east edge of the Bulldog MOAs is about 11 miles west of the VEGP site (see Figure 2.2-2). Because of the relatively long distances between the VEGP site and these MOAs, and their related training routes, no aircraft accident analysis is required for flight activities associated with these MOAs and their related training routes.

Under the proposed action, the airspace structure at Bulldog A MOA would be expanded to the east under the Bulldog B "shelf" to match the boundary of the existing Bulldog B. Mainly, the current 500-foot msl floor as allowed at Bulldog A would be laterally expanded into Bulldog B. Because the current Bulldog B floor is 10,000 feet msl, this lateral expansion would increase the airspace volume in the Bulldog MOAs. The overall distance from the MOA boundary to the VEGP site is unchanged.

Military aircraft in the Bulldog MOAs are expected to come mainly from Shaw AFB (about 32 miles east of Columbia, South Carolina) and McEntire Air National Guard Station (about 13 miles east-southeast of Columbia). Among the military training routes, VR97-1059 is located closest to the VEGP site. The distance between the centerline of VR97-1059 and the VEGP site is about 18 miles (Figure 2.2-2). The maximum route width of VR97-1059 is 20 nautical miles (NM); therefore, the width on either side of the route centerline is assumed to be 10 NM (11.5 miles). The VEGP site is located more than 6 miles from the edge of this training route. Additionally, the total number of military aircraft using route VR97-1059 is approximately 833 per year **(Shaw 2005)**.

According to RS-002, *Processing Applications for Early Site Permits*, May 2004 (RS-002), the aircraft accident probability for military training routes is considered to be less than 10^{-7} per year if the distance from the site is at least 5 statute miles from the edge of military training routes, including low-level training routes, except for those associated with a usage greater than 1,000 flights per year, or where activities may create an unusual stress situation.

In summary, the MOA use is projected to remain relatively unchanged and no modifications are proposed to the military routes. The VEGP site is located more than 5 statute miles from the edge of VR97-1059, and the total military flights using the same route is less than 1,000 per year; therefore, no aircraft accident analysis is required for flights using VR97-1059 **(Shaw 2005)**.

2.2.2.7 Natural Gas or Petroleum Pipelines

Three pipelines are within 25 miles of the VEGP site (Figure 2.2-3); however, none are located within 10 miles of the VEGP site.

Pipeline 1, located approximately 21 miles northeast of the VEGP site, is an 8-inch-diameter line constructed in 1959. It operates at a maximum pressure of 750 psi; is buried 3 feet deep; has 8-inch Rockwell isolation valves at 25-mile intervals; and carries natural gas. It is not used for storage.

Pipeline 2, located approximately 19 miles southwest of the VEGP site, has a 14-inch-diameter line constructed in 1954 and a 20-inch-diameter line constructed in 1977. Both lines are buried 3-feet deep; operate at a maximum pressure of 1,250 psi; have buried Rockwell isolation valves every 8 to 9 miles; and carry natural gas. They are not used for storage.

Pipeline 3, located approximately 20 miles northwest of the VEGP site, has two 16-inch-diameter lines constructed in 1953 and 1957. Both operate at a maximum pressure of 1,250 psi; are buried 3 feet deep; have buried Rockwell isolation valves every 8 to 9 miles; and carry natural gas.

Because the pipelines identified are well over 10 miles from the VEGP site, there is no need to identify the locations of individual pipeline valves.

2.2.2.8 Military Facilities

There are no military facilities within 5 miles of the VEGP site.

2.2.2.9 VEGP Units 1 and 2 Storage Tanks / Chemicals

Chemicals currently stored at the VEGP site are presented in Table 2.2-5.

2.2.3 Evaluation of Potential Accidents

Analyses were performed in order to evaluate control room habitability following potential accidents resulting in an explosion or flammable cloud or toxic chemical releases within a 5-mile radius of the VEGP site. The postulated accidents which would result in a chemical release were analyzed at the following locations.

- Nearby transportation routes (Savannah River, Highway 23, and CSX Railroad)
- Nearby chemical and fuel storage facilities (Savannah River Site, Plant Wilson)

- Onsite chemical storage tanks
- Other nearby fire sources

The existing analysis of potential hazards to the Units 1 and 2 was reviewed for applicability to the Units 3 & 4. That analysis evaluated postulated releases of flammable materials and toxic gases transported or stored at industrial facilities within a 5-mile radius of the VEGP site. In addition, new chemicals, which have been identified as being associated with Units 1 and 2, were subsequently evaluated or analyzed for this ESP Application to determine their impact to Units 3 and 4. As described below, in each case, these analyses concluded that the potential for hazard is minimal and will not affect safe operation of Units 3 and 4.

2.2.3.1 Explosion and Flammable Vapor Clouds

The effects of explosion and formation of flammable vapor clouds from the nearby sources are evaluated below.

2.2.3.1.1 Truck Traffic

Segments of Georgia State Highways 23, 80, and 56 Spur are located within a 5-mile radius of the VEGP site. Major commercial traffic occurs only on State Highway 23, which serves as a major link between Augusta and Savannah, Georgia.

An analysis of truck-borne hazards was performed for Units 1 and 2 which identified that chlorine (1 ton), anhydrous ammonia (6 tons), liquid nitrogen (6500 gallons), phosphoric acid (200 lbs), nitric acid (5000 gallons), and diesel oil (6000 gallons) are transported on nearby Highway 23. At its nearest point, Highway 23 passes about 4.7 miles from the center point of the Units 1 and 2 control rooms. The allowable and actual distances of hazardous chemicals transported on highways were evaluated according to NRC Regulatory Guide 1.91, Revision 1, *Evaluations of Explosions Postulated to Occur on Transportation Routes Near Nuclear Power Plants* (RG 1.91). RG 1.91 cites 1 psi as a conservative value of peak positive incident overpressure, below which no significant damage would be expected. The analysis demonstrated that truck-borne substances transported within a 5-mile radius of the VEGP Units 1 and 2, as well as explosions and flammable vapor clouds induced by these chemicals, will not adversely affect safe operation of the units.

In addition to the chemicals previously evaluated for Units 1 and 2, it is assumed that gasoline may be transported in tank trucks along Highway 23. As evaluated by the NRC in NUREG-1835 (Safety Evaluation Report for an Early Site Permit (ESP) at the North Anna ESP Site, September 2005), a typical 8500 gallon gas truck was found to be equivalent to 50,700 pounds of TNT. An explosion of this quantity results in a peak overpressure of 1 psi at 1900 feet from

the point of explosion. Since the distance from the Units 1 and 2 control rooms is about 4.7 miles, the overpressure from the explosion of the gasoline truck would be much less than 1 psi.

The centerline of VEGP Units 3 and 4 will be approximately 1,500 feet west and 200 feet south of the center of the existing Unit 2 containment building. Unit 4 will be approximately 900 feet west of Unit 3. Units 3 and 4 control rooms would be over 4 miles from highway 23 and similar consequences from explosions and flammable vapor clouds are expected during the accidental releases of truck-transported chemicals as have been analyzed for Units 1 and 2. For Units 3 and 4, as described in the AP1000 Design Control Document (AP1000 DCD), operation of the main control room emergency habitability system is automatically initiated by either high-high particulate or iodine radioactivity in the main control room supply air duct or loss of ac power for more than 10 minutes. The AP1000 design also provides manual actuation to initiate the emergency habitability system. The chlorine and ammonia impacts due to truck accidents to the main control rooms will be further evaluated at the time of the COL in accordance with DCD COL Information Item 6.4-1.

2.2.3.1.2 Pipelines and Mining Facilities

No natural gas pipeline or mining facilities are located within 10 miles of the VEGP site. No pipelines carrying potentially hazardous materials are located within 5 miles of the VEGP site. Therefore, the potential for hazards from these sources are minimal and will not adversely affect safe operation of the plant.

2.2.3.1.3 Waterway Traffic

The VEGP site is located along the Savannah River. Commercial traffic on the Savannah River is composed of barge-tug tows traveling up and down the river channel from Savannah, Georgia. The only chemical substance transported along the river that could potentially cause hazardous effects is identified as fuel oil **(IWR 2004)**. This substance is neither a solid explosive material, nor is it a hydrocarbon which has been liquefied under pressure. Therefore, in accordance with RG 1.91, this material is not required to be evaluated for explosion.

In addition, an analysis for VEGP Units 1 and 2 determined that the concentration of flammable material in the vapor-space of the tanks carrying the fuel oil is below the lower limit of flammability. In that case, an explosion of fuel oil tanks is not considered a credible event. The analyses also show that vapor clouds induced by the release of fuel oil will not be flammable. The proposed VEGP Units 3 and 4 will be farther away from the river than the existing VEGP units. Therefore the potential for hazards from explosions and vapor clouds from waterway traffic is minimal and will not affect safe operation of the new units.

2.2.3.1.4 Railroad Traffic

The only railroad within a 5-mile radius of the VEGP site is the CSX Railroad (approximately 4.5 miles northeast of the center point between Units 1 & 2), which runs through, and services, the SRS. A hazards analysis performed for VEGP Units 1 and 2 showed that explosions and flammable vapor clouds induced by chemicals carried by this rail line will not adversely affect safe operation of Units 1 and 2. The critical distance (given by $kW^{1/3}$ in Regulatory Guide 1.91) that could cause overpressures of 1 psi to safety-related structures is 2250 feet. This scenario is caused by the 26-ton ammonia release from a railroad tank car. Because of the relatively long distance (approximately 4.5 miles) between the railroad and the VEGP site, if an explosion due to an ammonia release from a railroad tank car occurred, it would occur at a distance great enough not to pose an overpressure hazard to the safety-related structures. Since the proposed VEGP Units 3 and 4 will be located farther away from the railroad line than Units 1 and 2, the possibility of adverse effects from explosions and flammable vapor clouds is even smaller for the new units.

Information obtained from CSX (Director of Infrastructure Security) **(Murta 2006)** indicates that the top five substances carried by CSX during 2005 which qualified as DOT hazardous chemicals are cyclohexane, anhydrous ammonia, carbon monoxide, molten sulfur and elevated temperature material liquids (ETMLs).

Evaluations were made for each of the above chemicals. Some of the above chemicals were already analyzed in a previous analysis for effect on Units 1 and 2, and some were evaluated specifically for their potential effect on Units 3 and 4. In each case, the evaluations concluded that the potential hazard from the chemicals is minimal and will not affect the safe operation of the new units.

ETMLs are not necessarily flammable. According to the DOT, the hazard from ETMLs is the potential to cause contact burns due to the elevated temperature of the substance. Because of the long distance separation between the CSX Railroad and the new units, no direct contact with these substances is expected. Therefore, no adverse impact is expected from the accidental releases of the ETML substances.

Potential adverse impact caused by accidental release of cyclohexane was analyzed for the ESP because it was not previously evaluated, it is flammable, and it has an established toxic threshold limit value (TLV). Using approaches specified in NUREG-0570, *Toxic Vapor Concentrations in the Control Room Following a Postulated Accidental Release* (NUREG 0570), the analysis has concluded that the accidental release of cyclohexane from a railcar will not have adverse effects to the control room operators. The meteorological conditions for the ESP analysis were based on guidance provided in Regulatory Guide 1.78, Rev. 1, *Evaluating of the*

Habitability of a Nuclear Power plant Control room during a Postulated Hazardous Chemical Release, (RG 1.78). RG 1.78 describes a simplified procedure for calculating weights of hazardous chemicals for control room evaluations. In that simplified procedure, stable atmospheric stability (F stability) is used because it represents the worst 5% meteorology observed at the majority of nuclear plant sites per Regulatory Guide 1.91. Therefore, in the ESP analysis, stable atmospheric meteorological conditions (F stability with a wind speed of 1 m/s) were assumed.

In the ESP analysis, the assumed railcar capacity (67 tons) is similar to that described in RG 1.91. With a control room air intake height about 60 ft above grade, the control room outside concentration was estimated to be 0.12 g/m^3 (34.3 ppm) which is much lower than the cyclohexane lower flammable limit of 45.8 g/m^3. In addition, the TNT equivalent mass (117.5 pounds) of the cyclohexane at the point of release would produce a peak incident pressure of 1 psi at a distance of 1026 ft from the railroad. Because of the long distance separation between rail line and the new units, no adverse impact is expected due to the explosion or a traveling flammable vapor cloud resulting from an accidental cyclohexane railcar release.

2.2.3.2 Hazardous Chemicals

Regulatory Guide 1.78 requires evaluation of control room habitability for a postulated release of chemicals stored within 5 miles of the control room. As described in Subsection 2.2.2, no manufacturing plants, chemical plants, storage facilities, or oil or gas pipelines are located within 5 miles of the VEGP site. Therefore, three scenarios were evaluated:

1. Potential hazards from chemicals transported on routes within a 5-mile radius of the site, at a frequency of 10 or more per year, and with weights outlined in RG 1.78
2. Potential hazards from major depots or storage areas
3. Potential hazards from onsite storage tanks

Each hazard is discussed and evaluated below. The VEGP Units 1 and 2 analysis was reviewed for applicability to Units 3 and 4 for the effects from each of these hazards. The review determined that the impact to the new units for each of these postulated events is bounded by the impact to Units 1 and 2.

2.2.3.2.1 Release of Hazardous Chemicals Due to a Transportation Accident

As previously discussed, three routes (Georgia State Highways 23, 80, and 56) pass within 5 miles of the VEGP site. Of these three routes, major commercial traffic occurs only on State Highway 23, which serves as a major link between Augusta and Savannah. The VEGP site is also located along the Savannah River. Limited barge traffic moves up and down the river

channel nearby the plant site. In addition, rail traffic exists within the five mile radius of the plant.

The hazardous chemical sources due to a transportation accident were analyzed for Units 1 and 2 using the same methodology as for onsite toxic hazards. The results of the analysis indicated that control rooms of VEGP Units 1 and 2 would remain habitable for all chemicals except gasoline and ammonia. Unit 1 and 2 control room operators would be required to don respirators after odor detection for gasoline and ammonia hazards. In all cases, except for cyclohexane, as noted below, the meteorological conditions considered for these transportation accident analyses were based on the extremely stable G stability class.

In the analysis for truck traffic, methods specified in NUREG-0570 were used to estimate pollutant emission rates and their dispersion. For a chlorine truck accidental release, the VEGP Units 1 and 2 control rooms automatically isolate upon detection of a vapor cloud by the chlorine detectors in the control room air intakes. During isolation, inleakage (1500 cfm) occurs from the surrounding control building. The set point for the chlorine detector is 2 ppm, and the damper for the respective HVAC duct system will be closed 17 seconds after the detection. The analysis indicates that the control room concentration 2 minutes after detection is 2.9 ppm, which is below the short-term toxicity limit of 10 ppm as specified in RG 1.78. For an accidental release of anhydrous ammonia, 2 minutes after odor detection (50 ppm), even without isolating the control room, the control room concentration was calculated to have increased to only 69 ppm, which is below the short-term toxicity limit of 300 ppm as specified in RG 1.78. Other truck transported chemicals would not cause the concentrations outside the control room to reach the corresponding toxicity limits.

The analysis of barge traffic for Units 1 and 2 evaluated the rupture of a large gasoline tank (5,620,000 lbs) on a barge that is transported along the Savannah River. However, as discussed previously, only fuel oil is currently barged up or down river, and #5 or 6 fuel oil is not as volatile as gasoline. Therefore, the impact on control room habitability for Units 3 and 4 due to a barge transport accident is not evaluated for gasoline or for residual fuel oil.

For a postulated accident on a rail line, the chemicals listed in Section 2.2.3.1.4 were evaluated. Using approaches specified in NUREG-0570, the analysis has concluded that the accidental release of cyclohexane from a railcar will not have adverse effects to the control room operators. As discussed previously, the meteorological conditions used in the ESP analysis were based on guidance provided in RG 1.78. RG 1.78 describes a simplified procedure for calculating weights of hazardous chemicals for control room evaluations. In that simplified procedure, stable atmospheric stability (F stability) is used because it represents the worst 5% meteorology observed at the majority of nuclear plant sites per Regulatory Guide 1.91.

Therefore, in the ESP analysis, stable atmospheric meteorological conditions (F stability with a wind speed of 1 m/s) were assumed.

The assumed railcar capacity (67 tons) is similar to that described in RG 1.91. With a control room air intake height about 60 ft above grade, the control room outside concentration was estimated to be 0.12 g/m^3 (34.3 ppm). The threshold limit value (TLV) of cyclohexane is 300 ppm for an 8-hour exposure per day continuously for 5 days (CHRIS 1999). Since the control room outside concentration was estimated to be only 34.3 ppm, the accidental release of the cyclohexane tank car will not cause adverse effects to the control room operators. The evaluation of ammonia was originally performed for Units 1 and 2 assuming the release from a rail car containing 26 tons of anhydrous ammonia. The evaluation showed that Units 1 and 2 control room concentration at 2 minutes after odor detection (69 ppm), even without taking credit for control room isolation, was found to be much lower than the short-term toxicity limit of 300 ppm. The 8-hour average control room concentration (9 ppm) was also much lower than the 8-hour TLV of 25 ppm. In accordance with Regulatory Guide 1.91, the evaluation for Units 1 and 2 assumed two minutes as sufficient time for a trained operator to put a self contained breathing apparatus into operation, if they are to be used.

Due to the proximity of Units 3 and 4 to Units 1 and 2 and assumed design similarities, the results of the Units 1 and 2 control room analyses were largely extended to Units 3 and 4 control rooms. In addition, as previously described, the AP1000 design provides manual actuation to initiate the emergency habitability system. Protective measures (including manual actuation of the main control room habitability system) required to be taken by the control room operators will be evaluated further at the time of the COL application in accordance with DCD COL Information Item 6.4-1.

2.2.3.2.2 Potential Hazard from Major Depots or Storage Areas

There are no major depots within 5 miles of the VEGP site. The only chemical storage areas within 5 miles of the VEGP site exist at the SRS and the Wilson combustion turbine plant. The SRS borders the Savannah River for approximately 17 miles opposite the VEGP site. The combustion turbine plant is located approximately 6,000 feet from the new AP1000 units' power block.

The chemicals stored at the Plant Wilson combustion turbine plant (approximately 4400 feet from the VEGP Units 1 & 2 control rooms), consist of fuel oil, sulfuric acid, and several other chemicals kept in small quantities. These oils and solvents have low volatility and toxicity, and there would be no potential hazard to the new AP1000 unit control rooms habitability from these substances. The three No. 2 fuel oil tanks located at east of the Service Building for the combustion turbine plant have a capacity of 3,000,000 gallons each **(Wilson Plant 2006)**. The

tanks are surrounded by a dike, which would prevent a fuel leak from spreading into a large spill area. An analysis has also shown that a postulated release of the No. 2 fuel oil outdoors will form a vapor cloud of insufficient concentration (lower than the 1.3 % lower flammable limit) to pose either a fire or an explosion hazard. In addition, the vapor space in tanks storing low vapor pressure substances, such as No. 2 fuel oil or kerosene, is normally too lean to burn. Therefore, the Plant Wilson fuel oil storage tanks are not capable of exploding.

The hazardous chemical sources at the SRS and the Wilson combustion turbine plant were analyzed using the same methodology as for onsite toxic hazards. Potential chlorine (34 tons) and anhydrous ammonia (2 tons) releases that could occur at the SRS (about 3 mi from the Units 1 and 2 control room) were analyzed under the extremely stable meteorological condition (G stability). The control room chlorine concentration 2 minutes after detection (0.28 ppm) was much lower than the short-term toxicity limit of 10 ppm. Similarly, the control room anhydrous ammonia concentration 2 minutes after odor detection (70 ppm) is below the short term toxicity limit of 300 ppm. Compared to the existing VEGP Units 1 and 2 power block area, the new AP1000 power block area is approximately 1,400 feet further away from the Savannah River. Therefore, the impacts of the above accidental chemical releases will be expected to be even smaller for Units 3 and 4.

2.2.3.2.3 Potential Hazard from Onsite Storage Tanks

The storage facilities for VEGP Units 1 and 2 are listed in Table 2.2-5. Many of the chemicals listed in that table are excluded from further consideration due to their properties (e.g., low volatility or low toxicity) or due to the relatively small quantities that are stored. The guidelines and methodologies of NUREG-0570 were used to determine the release rates and concentrations of toxic gases at the control room air intake for existing VEGP Units 1 and 2. This analysis shows that the control room would remain habitable for most release scenarios without any operator action and that there would be sufficient time for control room operators to take emergency action (donning emergency breathing apparatus) for the remaining release scenarios. For all releases except ammonia and hydrazine, the average concentration over an 8-hour period would never exceed the long-term toxicity limit. Where the long-term limit would be exceeded, it has been shown by calculation for VEGP Units 1 and 2 that at least 2 minutes would be available between detection and the time the short-term toxicity limit (as defined in RG 1.78) would be reached. Since both ammonia and hydrazine are stored northeast of the VEGP Unit 1 reactor, these chemicals would be separated by a minimum of about 1,800-feet from Units 3 and 4. Therefore, the impact on the new Units 3 and 4 due to an accidental ammonia or hydrazine release will be expected to be smaller than those for existing Units 1 and 2, and will be evaluated at the time of the COL in accordance with DCD COL Information Item 6.4-1.

As shown in Table 2.2-5, some chemicals previously used for Units 1 and 2 have recently been replaced. Phosphoric acid (Nalco 3DT177) is one of the new chemicals used for the existing Units 1 and 2 that was identified to be toxic. This material is stored in a 5050-gallon tank located between two existing cooling towers at a distance of about 3200 feet from the Units 3 and 4 control room. An analysis has shown that under stable atmospheric conditions (F stability) the phosphoric acid concentration outside the new control room air intake would be 94 $\mu g/m^3$, which is much lower than the 8-hour TLV of 1 mg/m^3 and the short term exposure limit of 3 mg/m^3 (CHRIS 1999) following an accidental release. Since this material is not flammable, the explosion effect was not evaluated.

Table 2.2-6 lists chemicals which will be used in conjunction with the AP1000 Units 3 and 4. Section 6.4 of the Westinghouse AP1000 Design Control Document addresses habitability systems for the new AP1000 units and concludes that the DCD-listed sources of AP1000 onsite chemicals do not represent a toxic hazard to AP1000 control room personnel **(Westinghouse 2005)**.

2.2.3.3 Fires

In the vicinity of the VEGP site, the following potential fire hazards exist:

a. Fire due to a transportation accident

b. Forest fire

c. Fire due to an accident at offsite industrial storage facilities

d. Fire due to an onsite storage tank spill

An analysis was performed for VEGP Units 1 and 2 which evaluated the potential fire hazards identified above. Items a, c and d above have been addressed in previous sections. For each event, the analysis concluded that combustion products would not reach concentrations in the VEGP Unit 1 and 2 control room that approached toxicity limits.

An analysis of a postulated forest fire indicates that toxic chemicals (such as CO, NO_2 and CH_4) emitted from the forest fire, located approximately 1800 feet from the Units 1 and 2 control room, produce negligible concentrations outside the Units 1 and 2 control room air intakes due to the relatively high buoyancy of the plume. In addition, due to the long distance separating the tree line from the control room, the analysis indicates that there would not be any adverse heat impact in the form of heat flux from the forest fire. The temperature rise for each event was calculated to be insignificant when compared with fuel oil fires for causing thermal damage to any safety-related structures at VEGP Units 1 and 2. For all of the fire events evaluated, the location of the new AP1000 units on the VEGP site is the same distance from the source of the

fire as the existing VEGP Units 1 and 2, or is further removed, and therefore the same conclusions concerning impact may be made. In addition the design of the control room HVAC for the AP1000 includes smoke detectors. Any smoke detected from an onsite or offsite fire would initiate isolation of the control room HVAC prior to toxicity limits being exceeded. Other fire hazards for the AP1000 plant have been addressed in the Design Control Document **(Westinghouse 2005)**.

2.2.3.4 Radiological Hazards

The hazard due to the release of radioactive material from either VEGP Units 1 and 2 or the facilities at SRS, as a result of normal operations or an unanticipated event, would not threaten safety of the new units. Smoke detectors, radiation detectors, and associated control equipment are installed at various plant locations as necessary to provide the appropriate operation of the systems. Radiation monitoring of the main control room environment is provided by the radiation monitoring system (RMS). The habitability systems for the AP1000 are capable of maintaining the main control room environment suitable for prolong occupancy throughout the duration of the postulated accidents that require protection from external fire, smoke and airborne radioactivity. Automatic actuation of the individual systems that perform a habitability systems function is provided. In addition, safety related structures, systems, and components for the AP1000 have been designed to withstand the effects of radiological events and the consequential releases which would bound the contamination from a release from either of these potential sources. **(Westinghouse 2005)**

Table 2.2-1 Nearby Largest Employers

Burke County, GA	Aiken County, SC	Barnwell County, SC
Burke County Hospital	Westinghouse Savannah River	Dixie Narco Inc.
Kwikset Corporation	Aiken County Board of Education	Barnwell School District #45
Management Analysis & Utilization Inc.	Bechtel Savannah River Company	Ness Motley Loadholt Richardson
Samson Manufacturing Inc.	Avondale Mills Inc.	Sara Lee Sock Company Inc.
Southern Nuclear Operating Co. Inc.	Kimberly-Clark Corporation	Excel Comfort Systems Inc.

Table 2.2-2 Description of Products and Materials: Chem-Nuclear Systems, Inc.

Products or Materials	Status	Annual Amounts	Shipment
Isotopes – Including Co-60 (by far largest quantity),Fe-55, and Ni-63	Stored	0.50×10^6 ft^3 (7/1/04-6/30/05) 0.45×10^6 ft^3 (7/1/05-6/30/06) 0.40×10^6 ft^3 (7/1/06-6/30/07) 0.35×10^6 ft^3 (7/1/07-7/30/08)	400/year; average volume - 150 ft^3; largest volume for a single shipment - 8,000 ft^3

Note: The above materials are transported via highway.

Table 2.2-3 Burke County, Georgia Transportation Accident Data Within 5 Miles of the VEGP Site

	1999	2000	2001	2002	2003
State Route 80					
Accidents					
Injuries	5	0	10	3	3
Fatalities	0	0	0	0	0
State Route 23					
Accidents					
Injuries	14	3	9	15	12
Fatalities	3	0	0	0	0
State Route 56C					
Accidents					
Injuries	0	0	0	0	0
Fatalities	0	0	0	0	0

Table 2.2-4 Bush Field (Augusta) Terminal Area Forecast Fiscal Years 1990–2025 Total Flights

Year	Total[a]
1990	47981
1991	38455
1992	37682
1993	36246
1994	33057
1995	34008
1996	33346
1997	34459
1998	34428
1999	37631
2000	36961
2001	35222
2002	34617
2003	33916
2004	35561
2005	27917
2006	28330
2007	28753
2008	29184
2009	29625
2010	30074
2011	30532
2012	31001
2013	31479
2014	31967
2015	32305
2016	32647
2017	32995
2018	33347
2019	33703
2020	34065
2021	34430
2022	34801
2023	35178
2024	35558
2025	35945

[a] Itinerant Operations (air taxi & commercial + general aviation + military)

Table 2.2-5 VEGP Units 1 and 2 Onsite Chemical Storage

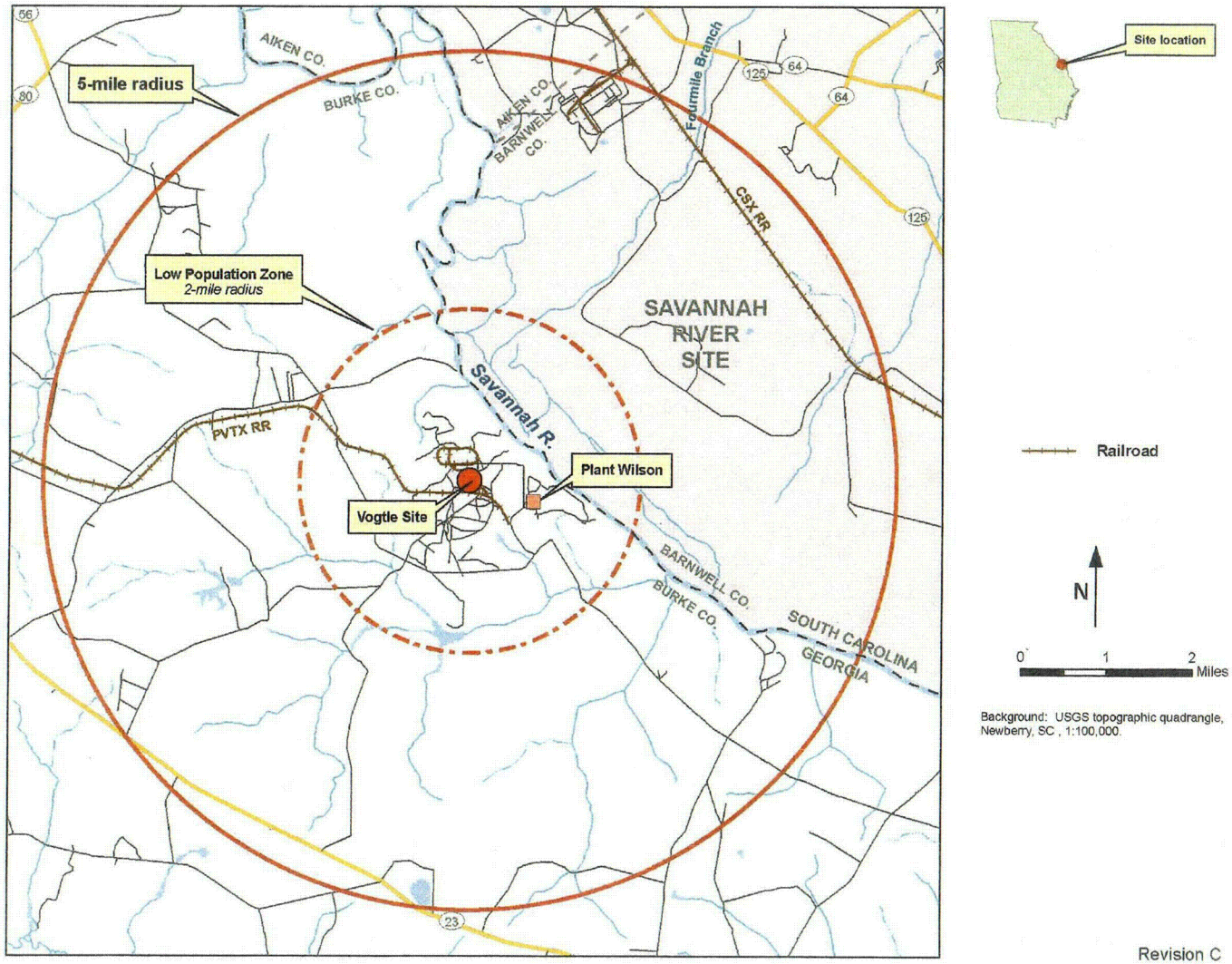
Material	Quantity	Location
Kitchen Grease	550 gallons	Underground tank east of service building
No. 2 Diesel Fuel	1,500 gallons	South of PESB
No. 2 Diesel Fuel	160,000 gallons*	East of U1 diesel generator building
No. 2 Diesel Fuel	160,000 gallons*	West of U2 diesel generator building
Hydrazine	6,000 gallons	East of turbine building
Methoxypropylamine	12,780 gallons	East of turbine building
Clean Lube Oil	30,000 gallons	East of turbine building
Dirty Lube Oil	30,000 gallons	East of turbine building
No. 2 Diesel Fuel	100,000 gallons	East of turbine building
No. 2 Diesel Fuel	560 gallons	Fire protection pumphouse
No. 2 Diesel Fuel	560 gallons	Fire protection pumphouse
Main Turbine Lube Oil	12,800 gallons	Turbine building
Main Turbine Lube Oil	12,800 gallons	Turbine building
SGFP Lube Oil	2,800 gallons	Turbine building
SGFP Lube Oil	2,800 gallons	Turbine building
EHC Fluid	1,600 gallons	Turbine building
EHC Fluid	1,600 gallons	Turbine building
No. 2 Diesel Fuel	1,250 gallons	U1 diesel generator building
No. 2 Diesel Fuel	1,250 gallons	U1 diesel generator building
No. 2 Diesel Fuel	1,250 gallons	U2 diesel generator building
No. 2 Diesel Fuel	1,250 gallons	U2 diesel generator building
Unleaded Gasoline	6,000 gallons	East of receiving warehouse
No. 2 Diesel Fuel	3,000 gallons	East of receiving warehouse
Sodium Hypochlorite	6,700 gallons	Main Cooling towers
Dispersant**	4,400 gallons	Main Cooling towers
MS Corrosion Inhibitor***	5,050 gallons	Main Cooling towers
Copper Corrosion Inhibitor****	2,200 gallons	Main Cooling towers
Kerosene	7,000 gallons	Fire training area
Sodium Hypochlorite	250 gallons	East of plant potable water storage tank
Boric Acid	46,000 gallons	U1 aux building
Boric Acid	46,000 gallons	U2 aux building
Used Oil	4,000 gallons	NW of admin support building
Used Oil	5,000 gallons	NW of admin support building
Sodium Bromide	4,000 gallons	Main Cooling towers
Nalco STABREX	6,700 gallons	Main Cooling towers
Sodium Hypochlorite	200 gallons	Plant potable water building
Sodium Phosphate, Tribasic	200 gallons	Plant potable water building
Copper Corrosion Inhibitor****	200 gallons	U1 NSCW tower chemical addition building
Copper Corrosion Inhibitor****	200 gallons	U2 NSCW tower chemical addition building
Ammonium Bisulfite	200 gallons	Circulating water dechlorination building

* Actually two 80,000 gallon tanks that are interconnected and function as one tank.
** Currently using Nalco 3DT102, swapping to Nalco 3DT190 during summer 2006.
*** Currently using Nalco 73297, swapping to Nalco 3DT177 during summer 2006.
**** Currently using Nalco 1336.

Table 2.2-6 AP1000 (VEGP Units 3 and 4) Onsite Chemicals

Material	State	Location
Hydrogen	Gas	Gas storage
Nitrogen	Liquid	Turbine building
CO_2	Liquid	Turbine building
Oxygen Scavenger	Liquid	Turbine building
pH Addition	Liquid	Turbine building
Sulfuric Acid	Liquid	Turbine building
Sodium Hydroxide	Liquid	Turbine building
Dispersant[a]	Liquid	Turbine building
Fuel Oil	Liquid	DG fuel oil storage tank/DG building/ Turbine building/ Annex building
Corrosion Inhibitor	Liquid	Turbine building
Scale Inhibitor	Liquid	Turbine building
Biocide/Disinfectant	Liquid	Turbine building
Algaecide	Liquid	Turbine building

[a]Site specific, by Combined License applicant



Revision C

Figure 2.2-1 Site Vicinity Map

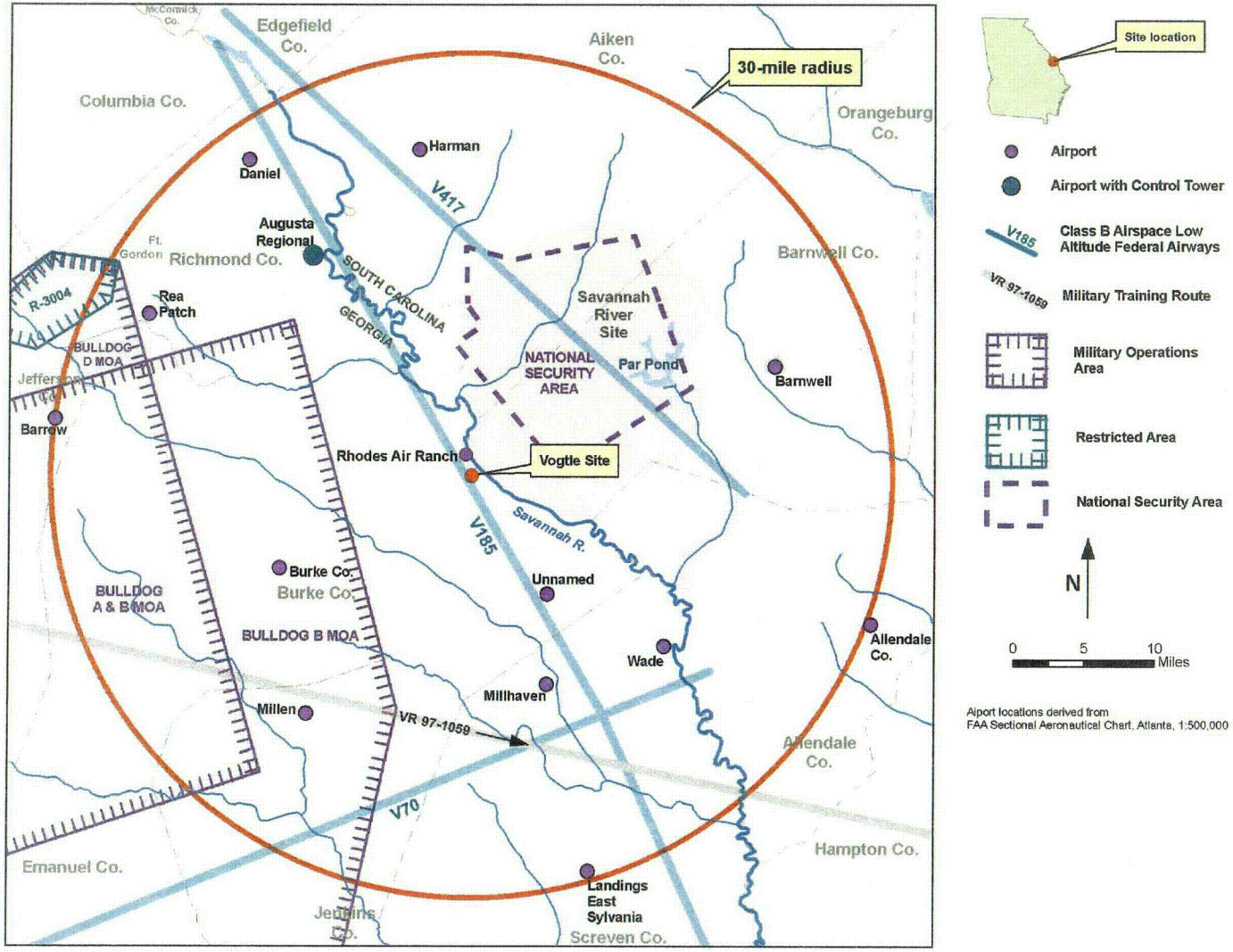


Figure 2.2-2 Airports within 30 miles of VEGP

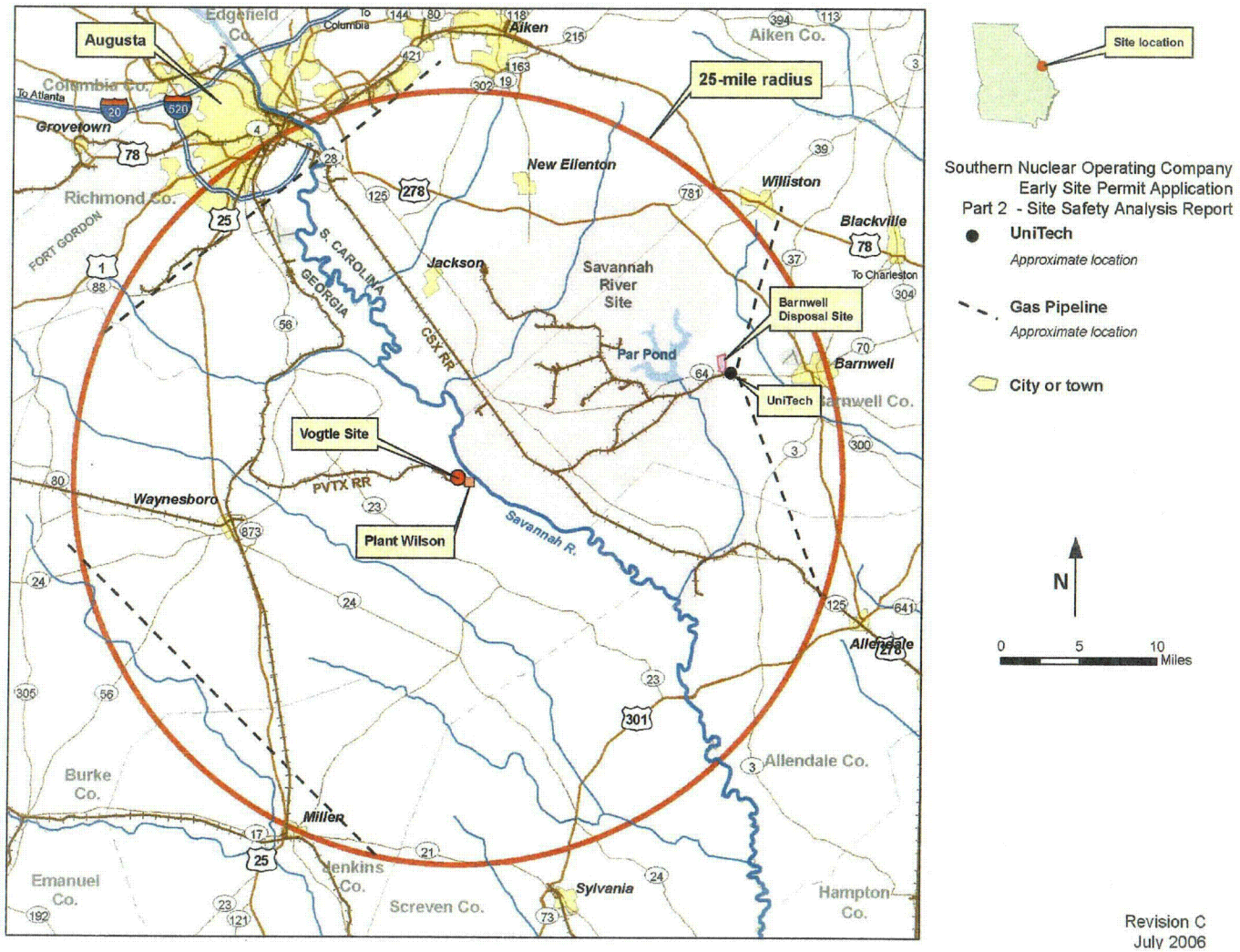


Figure 2.2-3 Industrial Facilities within 25 miles of VEGP

Section 2.2 References

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