3.13 PARTIALLY COMPLETED REACTOR SITE

For this PEIS, the approach used to define the environmental setting for a partially completed reactor site was to use data from a representative site. Consequently, the environmental resource/issue areas are described in a general sense; not for a specific site.

The representative site used in this case is the partially completed Bellefonte Nuclear Plant, located in northeast Alabama along the Tennessee River. Principal structures include two reactor containment buildings, a turbine building, an auxiliary building, a condenser circulating water pumping station, two diesel generator buildings, a river intake pumping station, natural draft cooling towers, a transformer yard, 500-kV and 161-kV switchyards, and a sewage treatment facility.

3.13.1 LAND RESOURCES

For the partially completed reactor site, the representative environmental setting attributes for land use and visual resources are shown in Table 3.13.1–1.

Table 3.13.1–1. Land Resources Attributes of the Partially Completed Reactor Site

Land Use Attributes	
Land Area	600 ha[a]
Land Ownership	Public
Existing Land Use	
Onsite	Industrial
Offsite	Predominately forest and agricultural use; some urban/developed
Land Use Compatibility	Likely
Plans, Policies, and Controls	
Jurisdiction	DOE; other Federal; State; local
Enforcement	Lax to stringent
Conformance	Likely
Visual Resource Attributes	
Landscape Character	
Site	Flat valley; adjacent to large water body
Viewshed	Urban-industrial nodes; low-density residential; agricultural; and forest
Visual Resource	
Sensitivity Level	High
Distance Zones	Foreground, middleground, background, and seldom-seen
BLM VRM Class	5 (developed land)
Degree of Contrast	Weak to none

[a] Land area already dedicated.
Source: TVA 1974a; TVA 1974b; TVA 1995b:1.

Land Use. The partially completed reactor site consists of approximately 600 ha (1,500 acres) of land. However, this land area has already been dedicated; additional land area is not required to complete construction. Land use within the ROI is comprised of predominately forest and agricultural use, with some urban and developed land. Many communities adjacent to the site have corporate limits far exceeding actual developed areas and could accommodate additional development. The nearest town is located approximately 5 km (3 mi) from the site.

Completion of site development for industrial purposes would conform with the proposed land use of the site and its vicinity (urban and industrial development) as designated by the appropriate governmental plans, policies, and controls, and be compatible with adjacent land uses.

Visual Resources. The visual landscape of the partially completed reactor site is characterized by a flat valley adjacent to a reservoir and a river. The visual landscape of the site reflects that of an industrialized facility. The viewshed includes hilly land with urban-industrial nodes surrounded by low-density residential development scattered among agricultural uses and forest lands.

As discussed in Section 3.1.1, a visual resource inventory is composed of three factors: VRM classification, distance zones, and sensitivity levels. Distance zones with viewpoints include foreground, middleground,

background, and seldom-seen. Due to the site location adjacent to a large body of water, the immediate vicinity is likely to be subject to high user volumes associated with recreational use. Because of the proximity to urban development and a high-use recreational area, it is likely that the facilities would be visible from viewpoints with high sensitivity levels. However, since the partially completed reactor site represents an existing condition, contrasts created by new development are considered weak to none. The developed areas of the site are consistent with a VRM classification Class 5.

3.13.2 SITE INFRASTRUCTURE

Baseline Characteristics. The partially completed reactor site has the infrastructure shown in Table 3.13.2–1. The road infrastructure would be needed primarily for personnel access to the site. The railroad infrastructure is required for spent fuel shipments and oversized structural components. The site is situated on a navigable river with a small docking facility to accommodate barge traffic.

Table 3.13.2–1. Partially Completed Reactor Site Baseline Characteristics

Characteristics	Site Availability
Transportation	
Roads (km)	8
Railroads (km)	6
Electrical	
Energy consumption (MWh/yr)	1,100,000
Peak load (MWe)	140
Fuel	
Oil (l/yr)	757,000

Source: LLNL 1996g.

The sub-regional electric power pool for the site has the characteristics depicted in Table 3.13.2–2.

Table 3.13.2–2. Partially Completed Reactor Site Sub-Regional Power Pool Electrical Summary

Characteristics	Energy Production
Type Fuel[a]	
Coal	49%
Nuclear	39%
Hydro/geothermal	11%
Oil/gas	<1%
Other[b]	0%
Total Annual Production	159,842,000 MWh
Total Annual Load	156,987,000 MWh
Energy Exported Annually[c]	2,407,000 MWh
Generating Capacity	33,370 MWe
Peak Demand	28,127 MWe
Capacity Margin[d]	4,550 MWe

[a] Percentage does not total 100 percent due to rounding.
[b] Includes power from both utility and nonutility sources.
[c] Energy exported is not the difference of production and load due to system losses and pumped storage.
[d] Capacity margin is the amount of generating capacity available to provide for scheduled maintenance, emergency outages, system operating requirements, and unforeseen electrical demand.
Source: NERC 1993a.

3.13.3 AIR QUALITY AND NOISE

Meteorology and Climatology. The climate at the representative partially completed reactor site and the surrounding region is characterized as temperate, with warm, humid summers and cool, variable winds. The average annual temperature is 15.7 °C (60.3 °F); average daily temperatures range from a minimum of -1.6 °C (29.2 °F) in January to a maximum of 31.7 °C (89.0 °F) in July (NOAA 1994c:3). The average annual precipitation is approximately 145.3 cm (57.2 in). Higher frequencies of winds are from the southeast, southwest, and northwest (TVA 1974b:1.2-7).

Ambient Air Quality. Ambient air quality conditions at the representative partially completed reactor site were reviewed. The site is located in an area that has been designated attainment with the NAAQS. There is no PSD Class I areas in the vicinity of the site. The site is expected to comply with the ambient air quality standards.

Noise. [Text deleted.] The area near the representative partially completed reactor site is rural in character and is expected to have typically low background sound levels. Typical DNL in the range of 35 to 50 dBA could be expected for such a rural location (EPA 1974a:B-4) where noise sources would include wind, insect activity, aircraft, and agricultural activity.

3.13.4 WATER RESOURCES

Surface Water. Major surface water features at the partially completed reactor site include a large navigable river that has been dammed to create a reservoir with a surface area of about 275 km^2 (106 mi^2) and a total volume of water of approximately 1.2 trillion l (317 billion gal). Average flow at the site is approximately 89 billion liters/day (23.5 billion gal/day). Other surface water features include small streams bordering the site.

Stormwater control retention/drainage ponds are present at the facility. These ponds discharge into the reservoir via Town Creek.

Surface Water Quality. The surface water body in the vicinity of the partially completed reactor site is classified as fresh water suitable for the following: primary and secondary contact recreation; a source of drinking water, after conventional treatment in accordance with State and local requirements; fishing and the survival and propagation of a balanced indigenous aquatic community of flora and fauna; and industrial and agricultural uses. The range of concentrations of typical surface water quality parameters at the site are presented in Table 3.10.4–1.

Surface Water Rights and Permits. Surface water rights concerning the large water body near the partially completed reactor site involve non-impairment of designated uses.

Groundwater. The near-surface aquifer beneath the site occurs under unconfined conditions. Typical aquifer material is highly weathered sedimentary bedrock overlying slightly fractured bedrock with no evidence of major solution channels.

Although the reservoir near the site supplies most of the potable water to nearby users, both private and public uses of groundwater occur in areas surrounding the site. The classification of the aquifer beneath the site is a Class II aquifer, that is, currently being used, or a potential source of drinking water.

Groundwater Quality. Groundwater quality of the near-surface aquifer at the site ranges from good to fair. The range of hydraulic characteristics of the groundwater that might be encountered at the partially completed reactor site is presented in Table 3.10.4–2.

Groundwater Availability, Use, and Rights. Groundwater rights concerning the aquifer(s) near the partially completed reactor site would be associated with the reasonable use doctrine. Under this doctrine, landowners can withdraw groundwater to the extent that they must exercise their rights in accordance with the similar rights of others.

3.13.5 GEOLOGY AND SOILS

Geology. The partially completed reactor site is defined as being located in a flat valley surrounded by an area consisting of alternating valleys and hills. This area could be underlain by rocks composed of dolomite, limestone, and shale of Paleozoic age (225 to 600 million years).

The partially completed reactor site is located in Seismic Zone 1, which suggests there could be minor levels of damage in the event of an earthquake (Figure 3.2.5–1). The nearest potential earthquake with an MMI of V could be located within approximately 8 km (5 mi) from the partially completed LWR site (Table 3.2.5–1). The nearest known epicenter of a damaging earthquake (MMI of VII or greater) could be approximately 80 km (50 mi) from the partially completed reactor site. The partially completed LWR facility is not located in a volcanically active region.

Soils. The partially completed reactor site is located where the predominant soil types range from loamy clays to loamy sands. These soils range from poorly to well drained soils. The erosion potential could range from minor to severe in those areas with slopes greater than 25 percent and that have been eroded in the past. The soil's shrink-swell potential could range from low to severe, which is acceptable for standard construction techniques, depending upon the engineering controls employed. Wind erosion potential could range from minor to severe.

3.13.6 BIOLOGICAL RESOURCES

The representative partially completed reactor site is located within the deciduous forest vegetation type. Biological resources found within this vegetation type are discussed in Section 3.10.6. At a given site, biological resources could vary from those typically associated with the principal vegetation type identified above due to a variety of factors, including previous disturbance by man.

3.13.7 CULTURAL AND PALEONTOLOGICAL RESOURCES

Prehistoric Resources. Prehistoric resources at the representative partially completed reactor site may include sites, districts, or isolated artifacts. Archaeological sites located at the generic site may represent occupation during the Archaic, Woodland, or Mississippian periods, and could include hunting and butchering sites and short occupation campsites, or long-term occupation sites with remains of structures, hearths, and storage pits. They may yield artifacts such as stone tools and associated manufacturing debris, and ceramic potsherds. Some sites may have been determined eligible for inclusion on the NRHP by the SHPO.

Historic Resources. Historic resources may include cemeteries, remains of residential or commercial structures, standing structures, or roads. Some sites may be eligible for inclusion on the NRHP, and some may be listed with the SHPO.

Native American Resources. Native American resources may exist at the site. These resources can include objects, areas, or natural resources that are important to Native American groups for religious or historical reasons. Such resources can include cemeteries, geological or geographical elements such as mountains or creeks, certain species of animals or plants, or trails. There could also be visual impacts to Native American resources.

Paleontological Resources. To date no paleontological resources have been identified for the partially completed reactor site. The site is located on limestone formations. These formations can be fossil-bearing, so some paleontological resources may exist within the site boundaries.

3.13.8 SOCIOECONOMICS

Operation of the representative partially completed reactor site could potentially affect the socioeconomic environment of a given REA or ROI. The characteristics of the REA, ROI, and community depend upon geographic location. For employment and income, the economic area would be based upon industry interaction and linkages in the region. The anticipated residential distribution of project-related employees and their families would determine the ROI. This ROI would contain all principal jurisdictions and school districts for community services likely to be affected by the proposed activity. Local transportation would be the existing principal road, air, and rail networks required to support the project activities.

The representative site is located in a small community approximately 104 km (64.6 mi) from an urbanized area. Statistics for employment and regional economy are presented for the REA that encompasses 12 counties around the representative site. Statistics for the remaining socioeconomic characteristics are presented for the ROI, a three-county area (Counties A, B, and C) surrounding the site.

Regional Economy Characteristics. Selected employment and regional economy statistics for the representative site's REA are given in Figure 3.13.8–1. Between 1980 and 1990, the civilian labor force in the REA increased 20.3 percent to the 1990 level of 430,100. The 1994 unemployment in the REA was 6.1 percent, which was approximately equal to unemployment for the representative State (6.0 percent). The per capita income in 1993 was $17,796, which was similar to the State's per capita income of $17,129.

As shown in Figure 3.13.8–1, farming represented 4 percent and governmental activities 18 percent of the total employment within the site's REA. This compares with the State rates of 3 and 18 percent for farming and government employment, respectively. Nonfarm private sector activities of manufacturing, retail trade, and services were 24, 16, and 21 percent, respectively, of the total regional employment for the representative site's REA. These were slightly different than the representative State's percentages for manufacturing (18 percent), retail trade (16 percent), and services (23 percent).

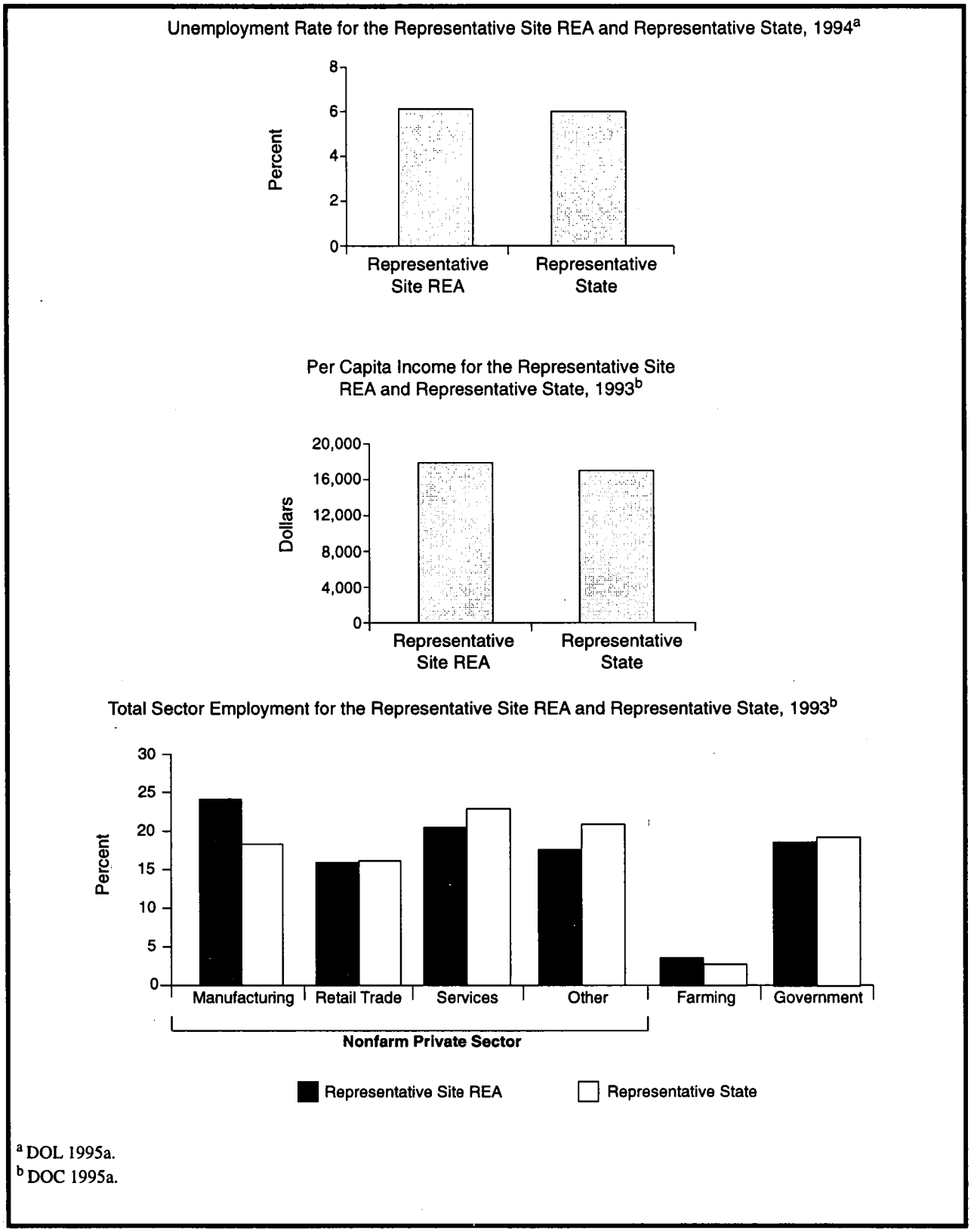
Population and Housing. Population in the ROI increased 20.9 percent from 1980 to 1994, compared to 8.3 percent in the representative State. The number of housing units increased 25.9 percent between 1980 and 1990, which was approximately 10 percent greater than the increase in the number of housing units for the entire State. The 1990 ROI homeowner vacancy rate, 1.9 percent, and the rental vacancy rate, 9.2 percent, were similar to those experienced in the representative State. Population and housing trends are summarized in Figure 3.13.8–2.

Community Services. Education, public safety, and health care characteristics were used to assess the level of community service in the representative ROI. These characteristics are summarized in Figures 3.13.8–3 and 3.13.8–4.

Education. In 1994, six school districts provided public education services and facilities in the representative ROI. As seen in Figure 3.13.8–3, these school districts operated between 69.7-percent and 100-percent capacity. The average student-to-teacher ratio for the ROI was 15.5:1.

Public Safety. City, county, and State law enforcement agencies provided police protection to the residents in the ROI. In 1994, a total of 546 sworn police officers were serving the three-county ROI. The average officer-to-population ratio in the ROI was 1.5 officers per 1,000 persons. Figure 3.13.8–4 compares police force strengths across the ROI.

Fire protection services in the representative ROI were provided by 1,490 paid and volunteer firefighters in 1995. The average firefighter-to-population ratio in the ROI was 4.1 firefighters per 1,000 persons, as indicated in Figure 3.13.8–4.



[a] DOL 1995a.
[b] DOC 1995a.

Figure 3.13.8–1. Employment and Local Economy for the Representative Partially Completed Reactor Site Regional Economic Area and the Representative State.

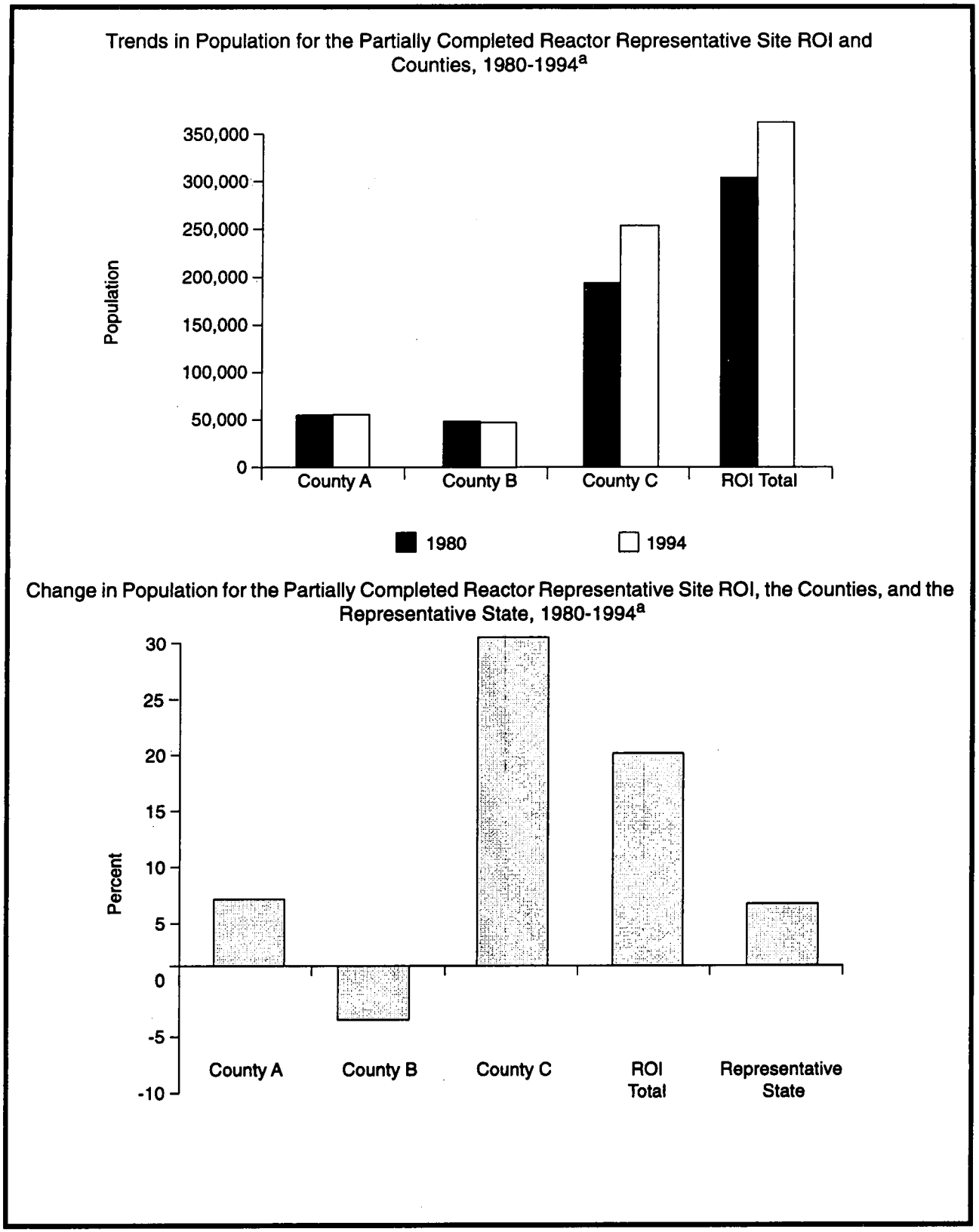
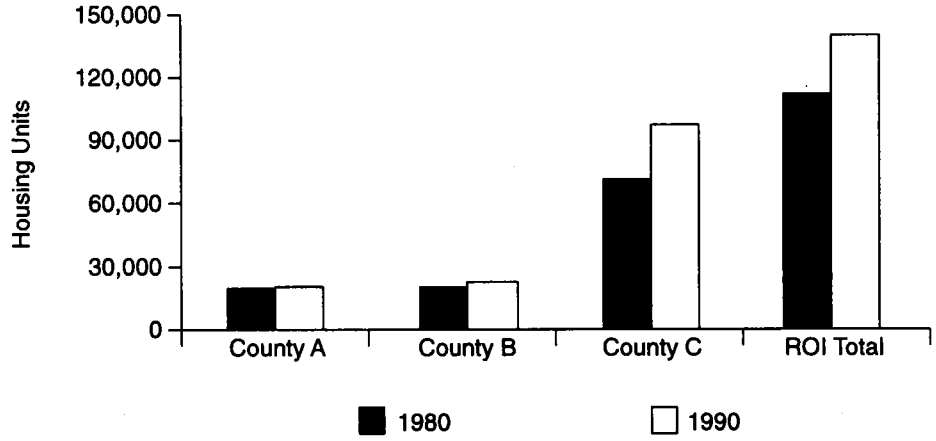
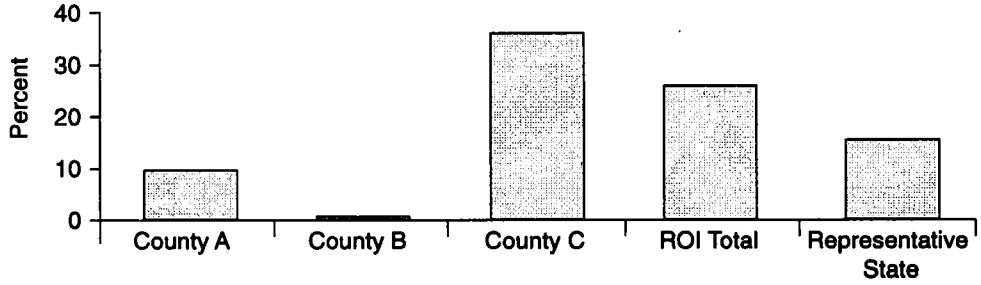


Figure 3.13.8–2. Population and Housing for the Representative Partially Completed Reactor Site Region of Influence and the Representative State.

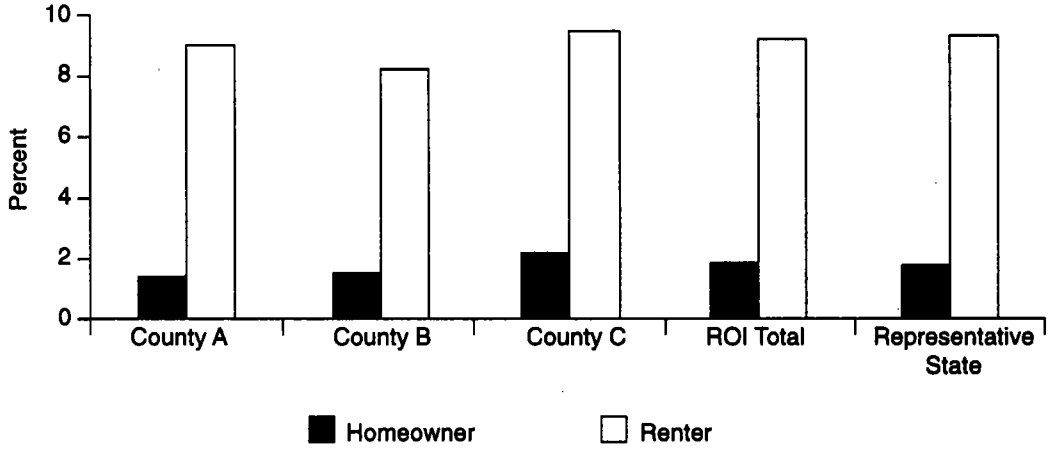
Trends in Housing for the Partially Completed Reactor Representative Site ROI and Counties, 1980-1990[b]



Change in Housing for the Partially Completed Reactor Representative Site ROI, the Counties, and the Representative State, 1980-1990[b]

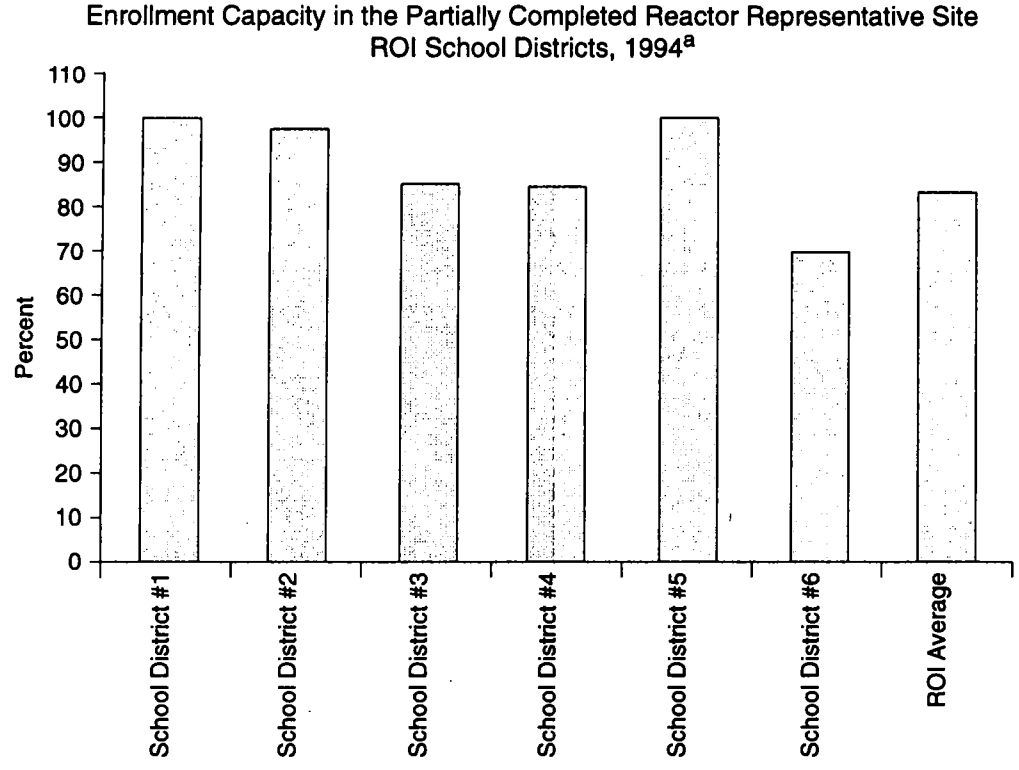


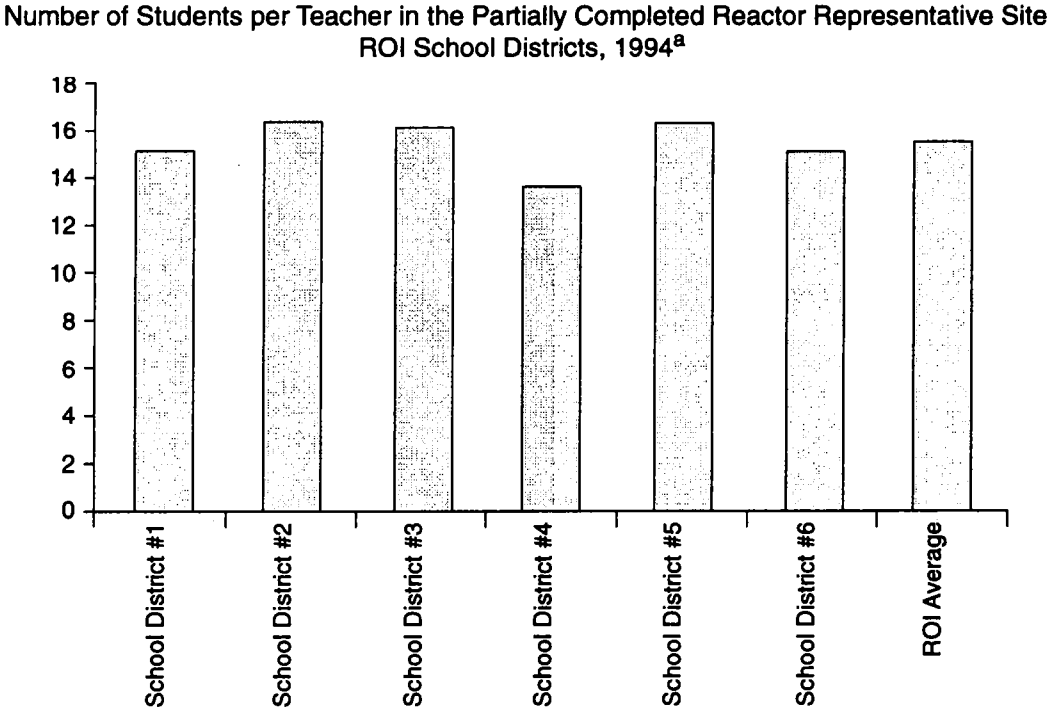
Homeowner and Renter Vacancy for the Partially Completed Reactor Representative Site ROI, the Counties, and the Representative State, 1990[c]



[a] Census 1983j; Census 1995a.
[b] Census 1982q; Census 1991p.
[c] Census 1991p.

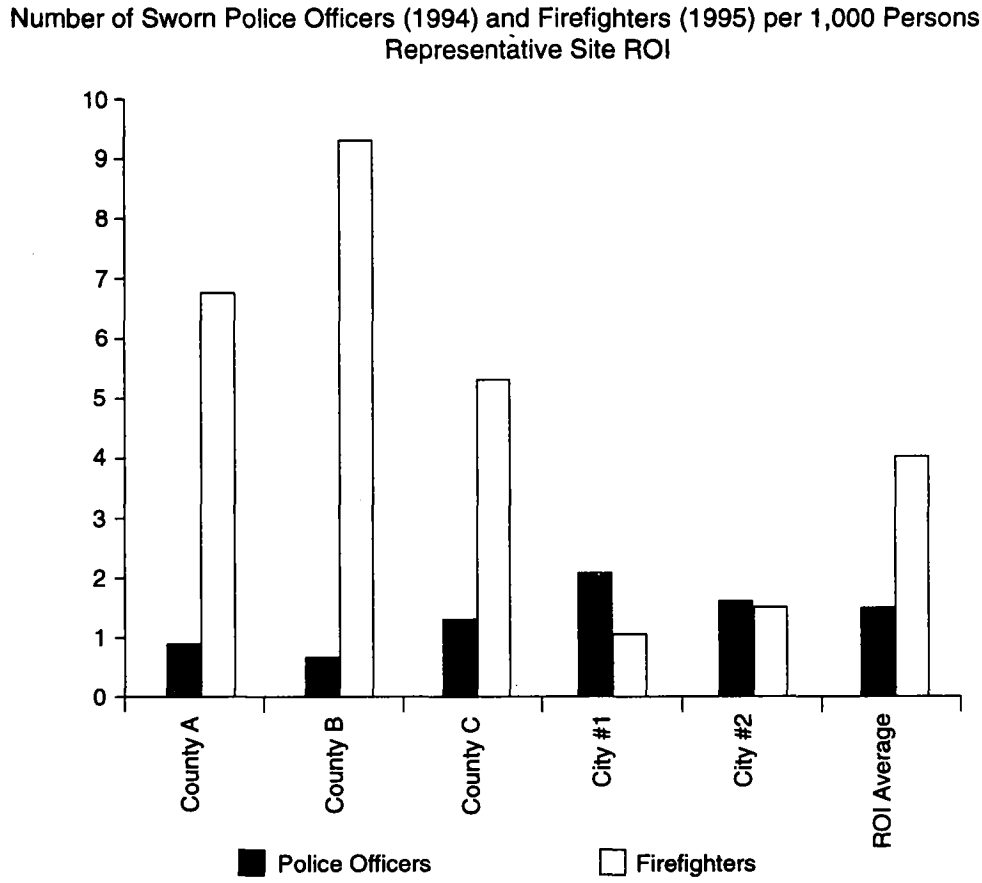
Figure 3.13.8–2. Population and Housing for the Representative Partially Completed Reactor Site Region of Influence and the Representative State—Continued.



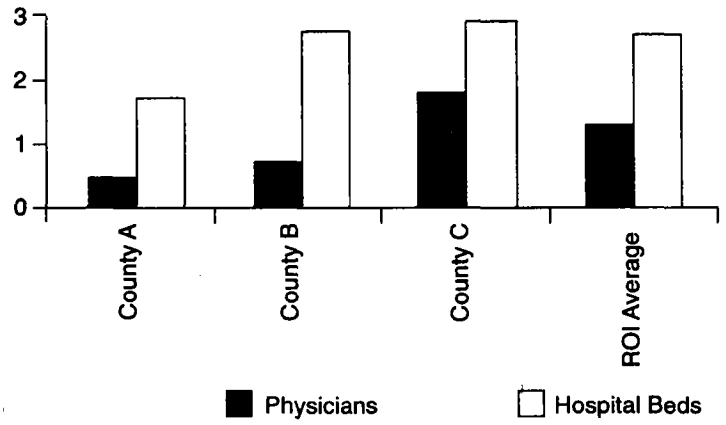


[a]Socio 1996a.

Figure 3.13.8–3. School District Characteristics for the Representative Partially Completed Reactor Site Region of Influence.



Note: Except for ROI cities, city sworn police officers and firefighters are included in county totals.



[a] Census 1993p; Census 1995a; DOC 1994j; DOC 1996a; DOC 1996b; DOJ 1995a; Socio 1996a.
[b] AHA 1995a; AMA 1995a; Census 1995a.

Figure 3.13.8–4. Public Safety and Health Care Characteristics for the Representative Partially Completed Reactor Site Region of Influence.

Health Care. Seven hospitals served the three-county ROI, with all operating below capacity. Figure 3.13.8–4 displays the hospital bed-to-population ratios for the ROI counties. The average ROI hospital occupancy rate was 58.9 percent in 1994, and a total of 525 physicians served the ROI. The average physician-to-population ratio for the ROI was 1.4 per 1,000 persons.

Local Transportation. Local transportation consists of the existing principal road, air, and rail networks required to support the project activities. Transportation networks in the smaller communities would generally be limited. However, due to its proximity to an urbanized area, the transportation networks at the representative site would be more extensive than in a more secluded community.

3.13.9 PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY

Radiation Environment. Major sources and levels of background radiation exposure to individuals in the vicinity of the representative partially completed reactor site (and to any onsite workers) are shown on Table 3.13.9–1. Annual background radiation doses to individuals are expected to remain constant over time. The total dose to the population changes as the population size changes.

Table 3.13.9–1. Sources of Radiation Exposure to Individuals in the Vicinity, Unrelated to Operation at the Partially Completed Reactor Site

Source	Effective Dose Equivalent (mrem/yr)
Natural Background Radiation	
Cosmic radiation[a]	28
External terrestrial radiation[a]	29
Internal terrestrial radiation[b]	39
Radon in homes (inhaled)[b]	200
Other Background Radiation[b]	
Diagnostic x rays and nuclear medicine	53
Weapons test fallout	<1
Air travel	1
Consumer and industrial products	10
Total	361

[a] Derived from information given in EPA 1981b.
[b] NCRP 1987a.
Note: Value for radon is an average for the United States.

Releases of radionuclides to the environment from an operational nuclear reactor site would provide another source of radiation exposure to members of the public. However, because the partially completed reactor has never operated, releases of radionuclides from it, and the resulting doses and health effects, are taken to equal zero for the existing conditions.

Similarly, the nonoperational status of the reactor precludes exposure of workers to radioactivity. The associated doses and health effects to workers are also taken to equal zero for the existing conditions.

Chemical Environment. The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (for example, surface waters during swimming and soil through direct contact or via the food pathway). The baseline data for assessing potential health impacts from the chemical environment are those presented in Section 3.13.3.

Health Effects Studies. Specific locations for the partially completed reactor must be designated before any reviews of epidemiologic studies in the areas can be conducted.

Accident History. Since the reactor has never operated at the site, there is no site accident history.

Emergency Preparedness. Sites that are licensed by the NRC must have an emergency management program that would be activated in the event of an accident. The program must be compatible with all other Federal, State, and local plans and be thoroughly coordinated with all interested groups. The program would have to be developed and approved before operation of the completed reactor.

3.13.10 WASTE MANAGEMENT

This section addresses the management of wastes associated with a representative partially completed reactor site. Because construction of the reactors at the site has been deferred, the only activities currently at the site are maintenance and limited engineering design work.

Spent Nuclear Fuel. No spent nuclear fuel is currently generated by this facility.

High-Level Waste. No HLW is currently generated by this facility.

Transuranic Waste. No TRU waste is currently generated by this facility.

Low-Level Waste. No LLW is currently generated by this facility.

Mixed Low-Level Waste. No mixed LLW is currently generated by this facility.

Hazardous Waste. The representative partially completed reactor is considered a small quantity hazardous waste generator (less than 100 kg/month [220 lb/month]) as defined in 40 CFR 261.5. Hazardous wastes currently generated from maintenance activities include Pb, spent solvents, and used oils. Approximately 454 kg (1,000 lbs) per year is currently generated. Hazardous wastes are packaged and shipped offsite to the TVA hazardous waste storage facility at Muscle Shoals, Alabama. Once sufficient quantities have accumulated, the hazardous wastes are shipped to commercial RCRA-permitted treatment and disposal facilities.

Nonhazardous Waste. Liquid sanitary wastewater from the representative partially completed reactor site is sent to the Hollywood sewer system and eventually treated at the Hollywood Sanitary Treatment Plant. Solid nonhazardous wastes such as desiccants and normal housekeeping trash is collected in dumpsters and transported offsite to a permitted landfill by a commercial contractor. Large desiccants are packaged in drums and transported to a permitted landfill by the commercial contractor.