CHAPTER 4
Environmental Consequences

4.1 Introduction

This chapter describes the anticipated environmental consequences, both adverse and beneficial, that would result from the various alternatives. The chapter is organized around the same environmental and socioeconomic resources described in Chapter 3. For each of the resource areas, the impacts are described separately for the various alternatives. The various Regenesys™ energy storage facility sites are, where appropriate, treated separately as options associated with Alternative 1 and Alternative 2.

4.2 Air Quality

Alternative 1 – Buffalo Mountain Windfarm Expansion

Impacts During Construction

Windfarm Expansion

Impacts to air quality during windfarm construction would primarily result from the exhaust emissions from internal combustion engines in stationary equipment and in motor vehicles used to transport materials to the site and to construct the windfarm, from site clearing activities, and from fugitive dust raised during construction activities. Exhaust emissions are primarily PM, NO_x, carbon monoxide (CO), volatile organic compounds (VOCs), and sulfur dioxide (SO_2). These are an unavoidable consequence of windfarm construction, and would have negligible effects on local air quality.

Trees and brush cleared from the windfarm site could be disposed of by open burning. This would have a minor effect on local air quality, and the necessary permits would be acquired in advance of any open burning. Site clearing, excavation, and vehicle movement, both on the windfarm site and on gravel access roads, would raise fugitive dust. The largest size fraction (greater than 95 percent by weight) of fugitive dust emissions would be re-deposited within the construction site boundaries or adjacent to roads. Smaller fugitive dust particulate matter would be subject to transport over a longer distance. Construction areas and access roads will be sprinkled with water as necessary to reduce fugitive dust emissions. Because of the remoteness of the site, fugitive dust would not impact nearby residents.

Regenesys™ Facility

The construction of the Regenesys™ facility at any of the four sites would result in similar air quality impacts. The air quality impacts would be similar to those resulting from windfarm construction, except that there would be little to no open burning of cleared trees and brush, and fugitive dust emissions would be much more localized at the construction site. Open construction areas and unpaved roads will be sprinkled with water as necessary to control fugitive dust. Impacts to off-site air quality would be minimal and would be well below the level of any ambient air quality standard.

Impacts During Operation and Maintenance

Windfarm Expansion

The operation of the Buffalo Mountain windfarm expansion would have a positive impact on air quality in the TVA region because wind turbines have no air emissions and can offset the use of other electrical generating plants that emit air pollutants. In fiscal year 2000, about 63 percent of the electrical power produced by TVA came from the burning of fossil fuels coal, diesel fuel, used oil, and natural gas. A small quantity of renewable fuels, wood and landfill gas, were also burned. Based on TVA's system

average air emissions for the year 2000, the Buffalo Mountain windfarm expansion would offset the annual release of about 107 tons of NO_x, 270 tons of SO_2, and 40,300 tons of CO_2.

Regenesys™ Facility

Operation of the Regenesys™ facility at any of the four sites would result in similar, negligible impacts on air quality. There would be three emission sources: a cooling tower, a primary stack for bromine releases, and a secondary stack to discharge hydrogen. A notification letter will be submitted to the State of Tennessee Department of Environment and Conservation (TDEC) which will detail the project scope for both construction and operation of this facility. Should TDEC require TVA to apply for a construction permit, the application will be submitted and a permit obtained, prior to commencement of construction. For an identical facility in Mississippi, a permit was not required as the State found that emissions were below the de minimus level that warrants a permit.

The cooling tower would remove heat from the process and power conversion equipment. It would be rated at 3,000 kW (10,000,000 BTU) per hour. Potable water would be used for makeup water, and suspended solids in the makeup water would be a source of particulate emission in the cooling tower drift. Drift eliminators would be installed in the cooling tower to reduce drift to 0.005 percent of circulation water. The estimated emission rate for PM_{10} would be 0.125 lb per hour, or 0.55 tons per year.

Bromine would be generated within the storage tank and elsewhere in the facility from the charged sodium bromide electrolyte. Air vented from the tank due to thermal breathing and air vented from the process building would thus contain trace quantities of bromine. An air extraction system would operate continuously, with two carbon-bed adsorbers mounted in series to remove bromine from the air before venting the gases through 67-foot-high stack. Under normal operation, the annual bromine emission would be less than 10 lb per year.

The sodium bromide would need to be conditioned to maintain efficiency of the energy storage facility. On its return trip from the modules to the storage tank, a small quantity of the sodium bromide passes through an Electrolyte Management System (EMS, see Appendix A for a more detailed description) where the bromine level is reduced, the pH adjusted, and by-product sodium sulfate is removed. In the process, hydrogen would be emitted at a rate of 5.5 lb per hour, or 24 tons per year. Hydrogen is very light and disperses rapidly in the air. Although not an air pollutant, hydrogen can be explosive at concentrations between 4 and 75 percent in air. Consequently, discharged gas would be maintained at a concentration well above its explosive limit prior to being released. This gas would then pass through a water trap. The stack and piping would be purged with nitrogen prior to and following operation of the EMS system to remove any air that could dilute hydrogen to its explosive limit.

TVA has determined that these slight emissions of the operating Regenesys™ facility would have an insignificant impact on air quality.

Alternative 2 - Stone Mountain Windfarm

Impacts During Construction

The impacts on air quality during construction of both the windfarm and an associated Regenesys™ facility in the Stone Mountain would be essentially the same as those described under Alternative 1. Construction areas and access roads will be sprinkled with water as necessary to control fugitive dust. Impacts to off-site air quality would be minimal and should be well below the level of any ambient air quality standard.

Impacts During Operation and Maintenance

Windfarm
The operation of the Stone Mountain windfarm would have a positive impact on air quality in the TVA region because wind turbines have no air emissions and can offset the use of other electrical generating plants that emit air pollutants. In the fiscal year 2000, about 63 percent of the electrical power produced by TVA came from the burning of fossil fuels; coal, diesel fuel, used oil, and natural gas. A small quantity of renewable fuels, wood and landfill gas, were also burned. Based on TVA's system average air emissions for the year 2000, the Stone Mountain windfarm would offset the annual release of about 122 tons of NO_x, 308 tons of SO_2, and 46,000 tons of CO_2.

Regenesys™ Facility
The impacts on air quality during operation and maintenance of the Regenesys™ facility in the Stone Mountain would be essentially the same as those described under Alternative 1, and would be the same regardless of which site in the Stone Mountain area is selected. As described under Alternative 1, TVA will submit a notification letter for construction of the Regenesys™ facility to the State of Tennessee Department of Environment and Conservation (TDEC). This letter will detail the project scope for both construction and operation of this facility. Should TDEC require TVA to apply for a construction permit, the application will be submitted and a permit obtained, prior to commencement of construction. TVA has determined that the slight emissions from the operating Regenesys™ facility would have an insignificant impact on air quality.

Alternative 3 – No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Therefore, no project-related air quality impacts, adverse or beneficial, would occur. In order to expand its Green power Switch program, TVA would need to seek other sources of renewable power. If the Green Power Switch program is not expanded, the air quality benefits resulting from operation of the proposed windfarm would be lost.

4.3 Socioeconomic Resources

Alternative 1 - Buffalo Mountain Windfarm Expansion

Windfarm Expansion
Construction employment for the windfarm and associated substation, access road, and transmission line would be small and temporary, resulting in a small, positive, but not significant impact on the local economy. Any noticeable impacts on housing, roads, or other community services would be minimal,

short-lived, and not significant. Local purchases of materials and supplies could have very small positive impacts on local income, but they would not be significant.

Although much of the operation of the wind turbines would be from a remote site, one or two full-time maintenance workers would probably be employed. These workers would likely be based in the local community. Windfarm operation and maintenance would have very minor impacts on local employment.

The TVA in lieu of tax payments to the state of Tennessee and to the county or counties in which the proposed facilities would be located would increase slightly, the actual amount depending on whether TVA owns the windfarm. The total investment for the windfarm and Regenesys™ facility is estimated to be about $55 million, resulting in an increase of about $125,000 in payments to the state. Of this, about $1,100 would be redistributed by the state to the appropriate county or counties if TVA owns the windfarm and about $500 if TVA does not own the windfarm. In the latter case, the windfarm developer would pay local property taxes,

Due to the remote location of the site, it is not likely that any noticeable impact on property values would occur if the windfarm is located at this site.

Regenesys™ Facility
The local socioeconomic impacts of the Regenesys™ facility would be essentially the same regardless of the site chosen. Construction of the Regenesys™ plant is expected to peak at 75 workers, with total duration of about 12 months, which would be followed by 6 months of commissioning. This peak employment level, which would be of short duration, represents about two-tenths of one percent of the labor force of Anderson County. While this would not be a significant addition to the labor force of the county or the area, it could result in some minor localized impacts of a temporary nature to local housing markets or to some community services. Specific local roads or some businesses might experience noticeable temporary increases in usage. However, these impacts would not be significant in the overall context of the local economy. Local purchases of materials and supplies could have small positive impacts on local income, but they would not be significant.

During commissioning, employment would be about 20, resulting in a small positive, but insignificant impact on the local economy. After commissioning, there may be a temporary very small work force; however, it is anticipated that the plant will eventually be automated and controlled from TVA facilities elsewhere. Therefore there would be no noticeable impact on the local economy from plant operations employment.

The construction of the Regenesys™ facility would likely occur after construction of the windfarm, and the combined employment and income impacts would be insignificant.

The TVA in lieu of tax payments to the state of Tennessee and to Anderson County would increase slightly, the actual amount depending on whether TVA owns the windfarm. The total investment for the windfarm and Regenesys™ facility is estimated to be about $55 million, resulting in an increase of about $125,000 in payments to the state. Of this, about $1,100 would be redistributed by the state to the county if TVA owns the windfarm and about $500 if TVA does not own the windfarm. In the latter case, the windfarm developer would pay local property taxes.

Alternative 2 - Stone Mountain Windfarm

Windfarm
Construction employment for the windfarm and associated substation, access road, and transmission line would be small and temporary, resulting in a small, positive, but not significant impact on the local economy. Any noticeable impacts on housing, roads, or other community services would be minimal, short-lived, and not significant. Local purchases of materials and supplies could have very small positive impacts on local income, but they would not be significant.

Although much of the operation of the wind turbines would be from a remote site, one or two full-time maintenance workers would probably be employed. These workers would likely be based in the local community. Windfarm operation and maintenance would have very minor impacts on local employment.

The TVA in lieu of tax payments to the state of Tennessee and to Johnson County would increase slightly, the actual amount depending on whether TVA owns the windfarm. The total investment for the windfarm and Regenesys™ facility is estimated to be about $55 million, resulting in an increase of about $125,000 in payments to the state. Of this, about $1,100 would be redistributed by the state to the county if TVA owns the windfarm and about $500 if TVA does not own the windfarm. In the latter case, the windfarm developer would pay local property taxes.

For the Stone Mountain site, it is possible that the value of some properties located near the site could be negatively impacted. Few studies have been conducted to investigate the relationship between views and property values, especially views of windmills or windfarms. However, the existing studies have generally found that property values can be diminished by obtrusive changes in scenic quality, especially for properties near the changes (see Appendix F). The magnitude of this impact could vary depending on the extent to which the view is obtrusive, and cannot be readily quantified..

Regenesys™ Facility
The local socioeconomic impacts of the Regenesys™ facility would be essentially the same regardless of the site chosen. Construction of the Regenesys™ plant is expected to peak at 75 workers, with total duration of about 12 months, which would be followed by 6 months of commissioning. This peak employment level, which would be of short duration, represents about 1.1 percent of the labor force of Johnson County. Due to the short duration of the peak, this would not be a significant addition to the labor force of the county or the area; however, it could result in some small localized impacts of a temporary nature to local housing markets or to some community services. Specific local roads or some businesses might experience noticeable temporary increases in usage. In addition to Johnson County, workers would be drawn from surrounding counties, especially Sullivan and Washington. Any who might move to the area would locate temporarily in commuting range, but not necessarily in Johnson County. Therefore, these impacts would not be significant in the overall context of the local and area economy. Possible local purchases of materials and supplies could have small positive impacts on local income, but they would not be significant.

During commissioning, employment would be about 20, resulting in a small positive, but insignificant impact on the local economy. After commissioning, there may be a very small work force temporarily; however, it is anticipated that the plant would eventually be automated and controlled from TVA facilities elsewhere. Therefore there would be no noticeable impact on the local economy from plant operations employment.

The construction of the Regenesys™ facility would likely occur after construction of the windfarm, and the combined employment and income impacts would be insignificant.

The TVA in lieu of tax payments to the state of Tennessee and to Johnson County would increase slightly, the actual amount depending on whether TVA owns the windfarm. The total investment for the windfarm and Regenesys™ facility is estimated to be about $55 million, resulting in an increase of about $125,000 in payments to the state. Of this, about $1,100 would be redistributed by the state to the county if TVA owns the windfarm and about $500 if TVA does not own the windfarm. In the latter case, the windfarm developer would pay local property taxes.

Alternative 3 - No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Therefore, no project-related socioeconomic impacts, adverse or beneficial, would occur in the project areas. Socioeconomic impacts could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

4.4 Groundwater and Geological Resources

Alternative 1 - Buffalo Mountain Windfarm Expansion

Impacts During Construction

Windfarm Expansion
Construction activities potentially affecting groundwater resources would include foundation excavation dewatering, excavation of acid-forming materials (AFM), and accidental contaminant releases.

Wind turbine foundations would extend to depths of up to 35 feet, depending on subsurface conditions. Turbine foundations are not expected to encounter significant groundwater given their elevated topographic position atop Buffalo Mountain. Therefore, no groundwater control would be required. Blasting may be required to achieve required foundation depths under certain conditions. Blasting is not expected to affect the performance or water quality of neighboring water wells since the closest wells are located more than one mile from the windfarm (Figure 3-1).

Bedrock at the windfarm is predominantly composed of shales associated with the Cross Mountain Formation (Figure 3-1). Whether the shale bedrock that might be encountered in foundation excavations contains problematic acid-forming materials, such as pyrite, is currently unknown. However, such shales are known to exist regionally within the Pennsylvanian Age strata. Any AFM encountered in the wind turbine foundation excavations would be segregated and handled so as to minimize impacts to local water quality. Rock core samples collected during geotechnical drilling at tower sites would be examined for evidence of pyritic shales. Laboratory analyses would be performed on samples showing evidence of pyrites to determine pyritic sulfur content. Special disposal techniques would be applied to excavated materials known to contain more than 0.5% pyritic sulfur. Disposal methods would generally involve mixing of AFM with acid-neutralizing material, such as lime, and burial of treated AFM in a clay-capped pit to minimize contact with infiltrating precipitation.

Appropriate best management practices including runoff and erosion controls would be implemented to prevent degradation of any springs located downgradient of construction sites and access roads. Additional measures would be applied to prevent and mitigate potential contaminant releases associated with equipment-related fuels, oils, or solvents.

Regenesys™ Facility
Excavations associated with construction of the Regenesys™ facility at any of the four sites would be 8 feet or less in depth, and are therefore expected to require little or no groundwater control. If excavation dewatering is required, the impact on neighboring wells is expected to be insignificant due to the relatively short duration of foundation construction. Best management practices would be implemented to prevent and mitigate potential contaminant releases associated with equipment-related fuels, oils, or solvents.

Impacts During Operation and Maintenance

The potential for groundwater resource impacts during the operational phase of the windfarm and associated Regenesys™ facility is very limited. No water would be required for the windfarm facility. Plant process and potable water for the Regenesys™ facility, amounting to approximately 0.01 MGD, would be purchased from the local utility district.

The only aspect of project operations having the potential to affect groundwater would be the application of herbicides along the transmission line right-of-ways (ROWs) associated with the windfarm and the Regenesys™ facility. In the event that herbicides are used for maintenance of ROWs, only EPA-registered herbicides, labeled for ROW use, would be selectively applied by licensed personnel so as to minimize public exposure and water resource contamination. In particular, areas surrounding any wells or springs along the ROWs would be avoided in herbicide applications.

Alternative 2 - Stone Mountain Windfarm

Impacts During Construction

Construction impacts to groundwater resources and users associated with this alternative and its associated options would be similar to those described for Alternative 1 with the following exception.

The proposed windfarm is partially sited on the Erwin Formation and partially on the Unicoi Formation (Figure 3-2). Both of these geologic formations reportedly contain only minor amounts of shale. Whether the shale bedrock that might be encountered in turbine foundation excavations contains problematic acid-forming materials (AFM), such as pyrite, is currently unknown. However, a pyrite mine located in the Stony Creek valley west of the project area, developed in the Helenmode member of the Erwin (Rodgers, 1953), suggests the possibility that pyritic shales might exist beneath wind turbines sited over the Erwin Formation. Any AFM encountered in the turbine foundation excavations would be segregated and handled so as to minimize impacts to local water quality. Rock core samples collected during geotechnical drilling at turbine sites would be examined for evidence of pyritic shales. Laboratory analyses would be performed on samples showing evidence of pyrites to determine pyritic sulfur content. Special disposal techniques would be applied to excavated materials known to contain more than 0.5% pyritic sulfur. Disposal methods would generally involve mixing of AFM with acid-neutralizing material, such as lime, and burial of treated AFM in a clay-capped pit to minimize contact with infiltrating precipitation.
Appropriate best management practices including runoff and erosion controls would be implemented to prevent degradation of any springs located downgradient of construction sites and access roads. Additional measures would be applied to prevent and mitigate potential contaminant releases associated with equipment-related fuels, oils, or solvents.

Impacts During Operation and Maintenance

Operational impacts to groundwater resources and users associated with this alternative and its associated options would be similar to those described for Alternative 1 - Buffalo Mountain Windfarm Expansion.

Alternative 3 - No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Therefore, no project-related impacts to groundwater resources or users would result. Such impacts could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

Mitigation

Should foundation excavation dewatering associated with the Regenesys™ facility result in a temporary loss of productivity of neighboring well or spring water supplies, the affected well or spring owner(s) would be provided an alternative water supply during the period of construction dewatering operations. Otherwise, well or spring water supplies determined to be permanently damaged by project construction or operation would be either be restored or replaced with an alternate water source. The method of compensation would be determined on a case-by-case basis.

Rock core samples from the Buffalo Mountain and Stone Mountain windfarm sites will be tested for the presence of pytitic sulfur, and special disposal techniques will be used for excavated materials with more than 0.5% pyritic sulfur.

4.5 Wetlands

There would be no impacts to jurisdictional wetlands associated with either the Coal Creek or Braden Field Regenesys™ sites. Any impacts to wetland resources at the Oliver Springs Substation Regenesys™ site can avoided through the proper placement of the access road from Paterson Road. Potential impacts to jurisdictional wetlands at the Ahler Regenesys™ site may be avoided if sufficient acreage exists on the western end of the property, thus avoiding the wetland entirely. If avoidance is not possible, the potential direct and indirect impacts to the wetland must be minimized through implementation of appropriate Best Management Practices. Federal Section 404 permits and state Aquatic Resource Alteration Permits would be required prior to conducting activities in the wetland.

Impacts to the wetland resources along either existing or proposed transmission line routes should be insignificant. Siting of specific pole locations has not been developed, but where possible poles would be placed outside of wetland areas and / or wetlands would be spanned. Where wetland impacts are unavoidable, specific Section 404 permits will be obtained from the U.S. Army Corps of Engineers, and permit specifications followed to minimize impacts to wetlands.

There would no impacts to jurisdictional wetlands associated with the Stone Mountain action alternative, or the no-action alternative.

4.6 Floodplains

Alternative 1 – Buffalo Mountain Windfarm Expansion

Windfarm Expansion
The proposed windfarm expansion would have no effect of floodplains.

Option 1 - Braden Field Regenesys™ Site
The Braden Field site is located within the 100-year floodplain of Poplar Creek. Under Executive Order (EO) 11988, it would be necessary to evaluate alternatives to the proposed floodplain location that would either identify a better site or document that there is no practicable alternative to locating facilities within the limits of the 100-year floodplain. Under this EA, several alternative sites are being evaluated. Therefore, by completing this EA, TVA will also be complying with EO 11988. Either another site will be selected at the completion of this EA or support will be obtained for construction of the Regenesys™ facility within the limits of the 100-year floodplain at this location. To minimize adverse floodplain impacts, all portions of the Regenesys™ facility would be located above or flood-proofed to the 500-year flood elevation 790.2 feet.

Based on the project description in Section 2.2.1, construction of the transmission line could involve the location of support structures in the 100-year floodplain. Under EO 11988, an overhead power line is considered to be a repetitive action in the floodplain. The placement of support structures in the floodplain would not be expected to result in any increase in flood hazard either as a result of increased flood elevations or changes in flow carrying capacity of the streams being crossed. To minimize adverse impacts on natural and beneficial floodplain values, the right-of-ways would be re-vegetated where natural vegetation is removed and the removal of unique vegetation would be avoided. BMPs would be used during construction activities.

Portions of the underground water and sewer lines would be constructed within the 100-year floodplain. Under EO 11988, an underground pipeline is considered to be a repetitive action in the floodplain that would not result in adverse floodplain impacts because the area would be returned to pre-construction conditions, after completion of the project.

Option 2 - Coal Creek Regenesys™ Site
Development of the Regenesys™ facilities at the Coal Creek site would not involve construction within the 100-year floodplain and would be consistent with EO 11988.

Construction of the transmission line could involve the location of support structures in the 100-year floodplain. Under EO 11988, an overhead powerline is considered to be a repetitive action in the floodplain. The placement of support structures in the floodplain would not be expected to result in any increase in flood hazard either as a result of increased flood elevations or changes in flow carrying capacity of the streams being crossed. To minimize adverse impacts on natural and beneficial floodplain values, the right-of-ways would be re-vegetated where natural vegetation is removed, and the removal of unique vegetation would be avoided. BMPs would be used during construction activities.

Option 3 - Ahler Property Regenesys™ Site
A portion of the Ahler Property site could be located within the approximate 100-year floodplain of an unnamed Tributary to Indian Creek. Under EO 11988, it would be necessary to evaluate alternatives to the proposed floodplain location that would either identify a better site or document that there is no practicable alternative to locating facilities within the limits of the 100-year floodplain. Alternative sites are evaluated in this EA. Therefore, by completing this EA, TVA will also be complying with EO 11988.

Either another site would be selected at the completion of this EA or support would be obtained for construction of the Regenesys™ facilities within the limits of the 100-year floodplain at this site.

Construction of the transmission line could involve the location of support structures in the 100-year floodplain. Under EO 11988, an overhead powerline is considered to be a repetitive action in the floodplain. The placement of support structures in the floodplain would not be expected to result in any increase in flood hazard either as a result of increased flood elevations or changes in flow carrying capacity of the streams being crossed. To minimize adverse impacts on natural and beneficial floodplain values, the right-of-ways would be re-vegetated where natural vegetation is removed, and the removal of unique vegetation would be avoided. BMPs would be used during construction activities.

Option 4 - Oliver Springs Substation Regenesys™ Site
Development of the Regenesys™ facilities at the Oliver Springs Substation site would not involve construction within the 100-year floodplain and would be consistent with EO 11988.

Construction of the transmission line could involve the location of support structures in the 100-year floodplain. Under EO 11988, an overhead powerline is considered to be a repetitive action in the floodplain. The placement of support structures in the floodplain would not be expected to result in any increase in flood hazard either as a result of increased flood elevations or changes in flow carrying capacity of the streams being crossed. To minimize adverse impacts on natural and beneficial floodplain values, the right-of-ways would be re-vegetated where natural vegetation is removed, and the removal of unique vegetation would be avoided. BMPs would be used during construction activities.

Alternative 2 – Stone Mountain Windfarm

Windfarm
The proposed windfarm would have no effect of floodplains.

Option 1 - Johnson County Industrial Park Regenesys™ Site
Development of the Regenesys™ facilities and associated utility connections at the Johnson County Industrial Park site would not involve construction within the 100-year floodplain and would be consistent with EO 11988.

Option 2 - Shouns Substation Regenesys™ Site
The Shouns Substation site is located within the approximate 100-year floodplain of Town Creek. Under EO 11988, it would be necessary to evaluate alternatives to the proposed floodplain location that would either identify a better site or document that there is no practicable alternative to locating facilities within the limits of the 100-year floodplain. Alternative sites are evaluated in this EA. Therefore, by completing this EA, TVA will also be complying with EO 11988. Either another site would be selected at the completion of this EA or support would be obtained for construction of the Regenesys™ facilities within the limits of the 100-year floodplain at this location.

Portions of the underground water and sewer lines would be constructed within the 100-year floodplain. Under EO 11988, an underground pipeline is considered to be a repetitive action in the floodplain that would not result in adverse floodplain impacts because the area would be returned to pre-construction conditions after completion of the project.

Option 3 - Mountain City Industrial Complex Regenesys™ Site
The Mountain City Industrial Complex site is located within the approximate 100-year floodplain of Town Creek. Under EO 11988, it would be necessary to evaluate alternatives to the proposed floodplain

location that would either identify a better site or document that there is no practicable alternative to locating facilities within the limits of the 100-year floodplain. Alternative sites are evaluated in this EA. Therefore, by completing this EA, TVA will also be complying with EO 11988. Either another site would be selected at the completion of this EA or support would be obtained for construction of the Regenesys™ facilities within the limits of the 100-year floodplain at this site.

Portions of the underground water and sewer lines would be constructed within the 100-year floodplain. Under EO 11988, an underground pipeline is considered to be a repetitive action in the floodplain that would not result in adverse floodplain impacts because the area would be returned to pre-construction conditions after completion of the project.

Alternative 3 - No Action
Under the No Action Alternative, the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Therefore, no project-related impacts to floodplains would occur. Such impacts could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

4.7 Managed Areas and Ecologically Significant Sites

Alternative 1 – Buffalo Mountain Windfarm Expansion

Windfarm Expansion
Because the proposed windfarm and its associated substation and transmission line connection are not located within or immediately adjacent to any Managed Areas or Ecologically Significant Sites, no direct impacts as a result of the construction and operation of these elements are anticipated.
The proposed wind turbines would be visible from portions of Frozen Head State Natural Area, particularly from trails and roads leading to Frozen Head fire tower, and from the fire tower itself. One of the expectations of visitors to this state natural area is a wilderness experience, although panoramic views from Frozen Head already include disturbed landscapes. This visual impact is further discussed in Section 4.12 - Visual Resources.

Impacts to the Frozen Head segment of the Cumberland Trail are expected to be the same as those to all trails within Frozen Head State Natural Area. No direct impacts to the proposed route (including the existing trail within Frozen Head) of the Smoky Mountain segment of the Cumberland Trail are anticipated as a result of the proposed action.

The access road to the windfarm crosses through the Cumberland Forest Public Hunting Area (PHA). Because this existing road would undergo only minor upgrades, potentially improving access for hunters, no impacts to the Cumberland Forest PHA are anticipated as a result of the proposed road upgrades.
Regenesys™ Facility Sites
None of the four sites being considered for the proposed Regenesys™ facility are located within or immediately adjacent to any Managed Areas or Ecologically Significant Sites. Similarly, none of the access roads or associated utility connections to the four potential Regenesys™ sites are within or adjacent to any Managed Areas or Ecologically Significant Sites. No impacts to such areas are anticipated from the construction and operation of the Regenesys™ facility at any of the proposed sites.

Transmission Line Connections
None of the proposed transmission line connection routes are located within or immediately adjacent to any Managed Areas or Ecologically Significant Sites. No impacts to such areas are anticipated from the construction or upgrading of transmission lines in existing ROWs.

Alternative 2 – Stone Mountain Windfarm

Windfarm
The proposed windfarm, as well as the associated access roads, project substation, and transmission line connection, is located within the proclamation boundary for the Cherokee National Forest. However, because these facilities would not be not on USFS lands, no impacts to this or other Managed Areas or Ecologically Significant Sites are anticipated as a result of the construction and operation of the windfarm.

The proposed wind turbines would be visible from portions of the Appalachian National Scenic Trail, mainly from intermittent open areas on ridge-tops. Hikers may see the safety strobe lights flashing at night. These visual impacts are further discussed in Section 4.12 - Visual Resources**.**

Regenesys™ Facility Sites
All three potential Regenesys™ sites, as well as their access roads and associated utility connections, are located within the proclamation boundary of the Cherokee National Forest, but are not located on USFS tracts. Therefore, no impacts to this or other Managed Areas or Ecologically Significant Sites are anticipated as a result of the construction and operation of these elements

Alternative 3 – No Action

Under the No Action Alternative, neither the windfarm expansion at Buffalo Mountain nor the windfarm at Stone Mountain, nor the associated facilities, would be constructed. Thus, no immediate impacts to any Managed Areas or Ecologically Significant Sites would occur as a result of adopting the No Action Alternative.

4.8 Cultural Resources

4.8.1 Archaeology

Alternative 1 - Buffalo Mountain Windfarm Expansion

Windfarm Expansion
An archaeological survey of the wind farm site identified three isolated artifacts. None of these is considered eligible for listing in the National Register of Historic Places. An additional archaeological survey of the transmission line corridor will be conducted once design details are available. It is anticipated that any archaeological sites within the corridor can be avoided by changing pole locations or making other modifications. Therefore, development of this site would not affect any archaeological resources eligible for listing in the National Register.

Option 1 - Braden Field Regenesys™ Site
An archaeological survey identified no archaeological resources at this location. Therefore, development of this site would not affect any archaeological properties eligible for listing in the National Register.

Option 2 – Coal Creek Regenesys™ Site
A surface reconnaissance of this tract by TVA identified no archaeological resources. Most of this tract has been severely disturbed by strip mining. Although a low sandstone outcrop on backlying property contains some small overhangs, this area would not be affected by the proposed development. Therefore no archaeological properties eligible for listing in the National Register would be affected by development of this site.

Option 3 – Ahler Property Regenesys™ Site
An archaeological survey conducted by TVA identified no archaeological resources at this location. Therefore, no archaeological properties eligible for listing in the National Register would be affected by development of this site.

Option 4 – Oliver Springs Substation Regenesys™ Site
An archaeological survey conducted by TVA identified no archaeological resources at this location. Therefore, no archaeological properties eligible for listing in the National Register would be affected by development of this site.

In a letter dated April 22, 2002, the Tennessee State Historic Preservation Officer concurred with TVA's determination that implementation of Alternative 1 would not affect archaeological properties eligible for listing in the National Register.

Alternative 2 - Stone Mountain Windfarm

Windfarm
Because of the relatively undisturbed condition of the Stone Mountain site, there is a good potential for significant archaeological resources to be present. However, no archaeological resources were identified during a survey of the site in February and March, 2002. An archaeological survey of this site is given further consideration, an archaeological survey will be conducted on all areas of potential disturbance. If this location is selected for development, any significant archaeological sites that would be affected will be treated pursuant to the ACHP's regulations.

Option 1 - Johnson County Industrial Park Regenesys™ Site
Development of this site would not affect any archaeological resources as long as all development activities are confined to the previously disturbed portions of the site.

Option 2 - Shouns Substation and Regenesys™ Site
One prehistoric archaeological site was identified on this parcel. This site was determined to be potentially eligible for listing in the National Register of Historic Places (NRHP). If this parcel is given further consideration for development of the Regenesys™ facility, additional evaluation of the archaeological resource will need to be done to determine its NRHP eligibility status.

Option 3 - Mountain City Industrial Complex Regenesys™ Site
One archaeological site was identified on this potential Regenesys™ site. The archaeological site is not considered eligible for listing in the NRHP, and development of this area would therefore not significantly impact archaeological resources.

Alternative 3 - No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility, and associated utility connections would not be constructed. Therefore, no project-related impacts to archaeological resources

would occur. Impacts to archaeological resources could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

4.8.2 Historic Structures

Alternative 1 - Buffalo Mountain Windfarm Expansion

Windfarm Expansion
The windfarm expansion on top of Buffalo Mountain would create visual impacts both during the day with the approximate 300-foot structures and at night with flashing lights. Portions of the site are already void of trees because of the former strip mining. The existing three wind turbines offer visual images for judging the impact of an expanded windfarm. These wind turbines can be seen on clear days from a few accessible sites in the line of view at distances of six and more miles. However at these distances they appear relatively small and probably would not be a visual impact on any historic structures.

The number of existing historic structures eligible for listing on the NRHP is minimal within in the Area of Potential Effect. A known potentially eligible site is the former Air Force base and it is nearly eight miles from the windfarm site. The visual impact on this site would not be adverse because of the considerable distance from the windfarm. The potentially historic remaining coal mining features down the south face of Windrock Mountain are under the steep slope of the mountain; the windfarm at the crest of Buffalo Mountain would not be in the viewshed of these mining features.

Option 1 - Braden Field Regenesys™ Site
No known historic structures eligible for listing on the NRHP occur within the Area of Potential Effect of a Regenesys™ facility at this site. Therefore, construction and operation of the Regenesys™ facility at this site would not impact historic structures. The short transmission line connection from the facility to the TVA grid would not impact historic structures.

Option – 2 Coal Creek Regenesys™ Site
This site is on a former strip mine shelf and is screened from the highway by foreground trees. No structures over 50 years old appear to be in the visual impact area. The transmission line interconnect to either the Coalfield or Oliver Springs substation is along existing transmission line right-of-ways. This line would not impact historic structures.

Option – 3 Ahler Property Regenesys™ Site
This site will be in view from Highway 61 through this valley of rural residential development. Directly across from the site up the other side of the valley is a historic farm house and barn which will require historic structures review by the State Historic Preservation Officer (SHPO). Because of the prominent visual impact of this proposed facility, there could be other potentially eligible historic structures effected along Highway 61. The transmission line from the turbines to this facility is along existing right-of-ways for existing lines. The transmission line interconnect to either the Coalfield or Oliver Springs substation is also along existing right-of-ways for existing lines. These lines should not adversely impact historic structures.

Option - 4 Oliver Springs Substation Regenesys™ Site
This area is wooded rolling terrain with extensive residential development along the surrounding roadways. There is a nearby frame farmhouse on the knoll overlooking Patterson Circle and a brick house on Mcghee Street which will require historic structures review by the SHPO. These however

probably will not be adversely impacted. The transmission line from the turbines to this facility is along existing right-of-ways for existing lines. This line should not adversely impact historic structures.

Prior to initiation of any construction activities associated with this alternative, TVA will seek concurrence from the Tennessee State Historic Preservation Officer that the proposed action will not adversely impact historic structures eligible for listing on the National Register.

Alternative 2 - Stone Mountain Windfarm

Windfarm
The wind turbines would line the top of Stone Mountain and would be highly visible from the valleys on both sides of the mountain (see Figure 4-3 in Section 4.12 - Visual Resources). These relatively broad valleys with relatively gentle sloping mountain bases are 1-1/2 to 3 miles from the proposed wind turbines.

The surrounding valleys are an early settlement area with many existing historic farms and communities close to the windfarm site. There is a relatively high density of rural settlement with many structures over 50 years old. Many of these historic structures are probably eligible for listing on the NRHP and are within the windfarm's Area of Potential Effect. Portions of the valley may even be eligible as a historic rural landscape.

The proposed windfarm would constitute an adverse impact on these historic resources. If further consideration is given to this site, a survey and documentation of the historic resources followed by consultation with the Tennessee and North Carolina State Historic Preservation Officers (SHPO) would be required under Section 106 of the National Historic Preservation Act. Because of the adverse impact, TVA would enter into a Memorandum of Agreement with the SHPO to either modify the proposed windfarm to reduce its visual impact on the eligible historic resources or to mitigate the effect.

Option 1 - Johnson County Industrial Park Regenesys™ Site
This site is in the historic Doe Creek Valley, an early settlement area. There are historic structures eligible for listing on the NRHP within the facility's Area of Potential Effect. The immediate area of the Regenesys™ site has a state prison facility and an industrial park containing several single story metal sided industrial structures, all of which diminish the historic integrity of the area. However because of its considerable height, the proposed Regenesys™ facility adds a greater impact. Historic sites along Highway 67 are already adversely visually impacted by the existing prison, industrial park and mobile home park. Some of these structures are located between the site of the proposed Regenesys™ facility and the historic sites, which are along Route 67. TVA has therefore concluded that the construction of the proposed facility at this site would not cause additional adverse visual impacts.

Option 2 - Shouns Substation Regenesys™ Site
This site is in the historic Roan Creek Valley, an early settlement area. There are historic structures eligible for listing on the NRHP within the facility's Area of Potential Effect, in particular to the south-west along Highway 167. The proposed Regenesys™ facility would have an adverse visual impact on these eligible sites. This adverse impact is primarily due to the 60-foot height of the relatively large Regenesys™ structure. The facility would also be close to the main roadway through the valley, making it readily visible. It may be possible to reduce the facility's visual effect by screening it with plantings, but it is unlikely this screening would be adequate to eliminate this effect altogether. Of the three potential Regenesys™ sites associated with Alternative 2, this site has the greatest potential for adverse effects to historic structures. If this site is given further consideration, consultation with the SHPO would be necessary to minimize adverse impacts through measures identified in a Memorandum of Agreement.

Option 3 - Mountain City Industrial Complex Regenesys™ Site
This site, just across Town Creek from the Shouns Substation site, is also in the historic Roan Creek Valley. The proposed Regenesys™ facility, though somewhat less visible than a facility on the Shouns Substation site, would still have an adverse visual impact on these eligible sites. As with a facility on the Shouns Substation site, it would be difficult to eliminate the facility's visual effect by screening it with plantings. Option 3 would have a lesser impact than Option 2 because it is set back off the main road. As with Option 2, if this site is given further consideration, coordination with the SHPO would be necessary to minimize adverse impacts.

Alternative 3 - No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility, and associated utility connections would not be constructed. Therefore, no project-related impacts to historic structures would occur. Impacts to historic structures could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

4.9 Terrestrial Ecology

4.9.1 Vegetation

Alternative 1 - Buffalo Mountain Windfarm Expansion

As stated in Section 3.9.1 (Terrestrial Ecology - Vegetation), no plant communities which are ranked by The Nature Conservancy (2001) as critically imperiled globally (G1) or imperiled globally (G2) occur on the projected easement for the Buffalo Mountain windfarm site, the four proposed Regenesys™ sites, or the proposed transmission line connections associated with this Alternative. With respect to vegetation, no other sensitive terrestrial ecological resources are associated with the Buffalo Mountain Alternative. Impacts associated with forest fragmentation are expected to be insignificant if this Alternative is selected.

Land clearing and soil disturbance activities during construction could expose buried seeds which might include invasive, exotic pest plant species. In order to mitigate the potential for spread of invasive plant species, TVA will commit to use re-seeding mixes that are certified to be free of invasive, exotic plant seeds when replanting disturbed areas.

Provided that this commitment is met, impacts to vegetation and plant communities of the region are expected to be insignificant as a result of this Alternative.

Alternative 2 - Stone Mountain Windfarm

As stated in Section 3.9.1 (Terrestrial Ecology - Vegetation), no plant communities which are ranked by The Nature Conservancy (2001) as critically imperiled globally (G1) or imperiled globally (G2) occur on the projected easement for the Stone Mountain windfarm site, the three proposed Regenesys™ sites, or the transmission line connection between Stone Mountain and Shouns substation. However, selection of this alternative would result in some fragmentation of the high-elevation forest cover on Stone Mountain. Because of the small area affected, and because some forest fragmentation has already occurred on the northern end of the Stone Mountain site , the resulting forest fragmentation impacts are expected to be insignificant as a result of adopting this Alternative.

Land clearing and soil disturbance activities during construction could expose buried seeds which might include invasive, exotic pest plant species. In order to mitigate the potential for spread of invasive plant species, TVA will commit to use re-seeding mixes that are certified to be free of invasive, exotic plant seeds when replanting disturbed areas.

Provided this commitment is met, impacts due to vegetation and plant communities of the region are expected to be insignificant as a result of adopting this Alternative.

Alternative 3 - No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility, and associated utility connections would not be constructed. Therefore, no project-related impacts to vegetation and plant communities would occur. Impacts to terrestrial vegetation could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts would vary according to the source of replacement energy. If, for example, the replacement energy is generated from surface-mined coal, about 1.4 to 1.6 acres (depending on the windfarm site) would be disturbed annually. This estimate is based on the current heat rate of TVA's fossil plants, an average coal energy content of 12,000 BTU/pound, 30% energy recovery efficiency, and 3-foot coal seam thickness.

Mitigation

In order to minimize the potential impacts to native plant communities, TVA will commit to using re-seeding mixes that are certified to be free of invasive, exotic plant seeds when replanting disturbed areas.

4.9.2 Wildlife

Alternative 1 - Buffalo Mountain Windfarm Expansion

Impacts During Construction

Construction of the proposed windfarm expansion and the associated roads, substation, transmission line connection, Regenesys™ facility, and other utility connections would result in loss of a few acres of shrubby and forested habitats. This would displace, or perhaps destroy, some small animals that occur on the site. Habitat fragmentation from development of the windfarm site is expected to be minimal, because the site is already comprised of a mix of woodlots and open areas. Some forested tracts would remain on the windfarm site, while others would be cleared and replaced by wind turbines and associated facilities. Some impacts at the windfarm site would be temporary, as some areas cleared during construction would eventually revegetate to shrubland and forest.

The small wetlands on Buffalo Mountain provide valuable wildlife habitat. To minimize impacts to these wetlands and the wildlife populations they support, TVA will, to the maximum extent practicable, avoid ponds and wetlands in or adjacent to woodlands during construction of the Buffalo Mountain Windfarm expansion, and maintain an undisturbed buffer at least 50 feet wide around these areas.

The wildlife habitats and wildlife populations on the windfarm site are not uncommon from a state or regional perspective, therfore impacts from construction would be very local and insignificant.

Regenesys™ Sites and Transmission Line Connections

Construction of any of the proposed Regenesys™ sites at Braden Field, Coal Creek, Ahler Property or the Oliver Springs Substation or along the proposed transmission line connections would disturb marginal quality wildlife habitat. Because the majority of the area encompassed within these sites has been disturbed by land use activities and because the wildlife habitats that occur on the sites are common from a state or regional perspective, impacts to terrestrial animals and these habitats are expected to be insignificant with a selection of any of the Regenesys™ sites or sub-alternative transmission line connections.

Impacts During Operation and Maintenance

The impacts from operation and maintenance of the Buffalo Mountain windfarm and associated facilities on wildlife populations other than birds and bats are expected to be minimal and insignificant. Habitat conditions for some species would likely improve as some areas cleared during construction would revegetate to shrubland and forest.

Bird Populations

Some bird mortality from collisions with turbines and meteorological tower guy wires is an unavoidable consequence of the proposed windfarm development. Erickson et al. (2001) report bird mortality rates at windfarms throughout the U.S., adjusted for search efficiency and carcass scavenging, ranging from 0 to 4.45 birds/turbine/year, and averaging 2.19. Only two studies conducted in the eastern U.S., at Searsburg, Vermont and Somerset County, Pennsylvania, were included in this compilation. Neither of these short-term studies reported any bird mortality. Diurnal raptors made up 34% of reported bird mortality, and were concentrated at California windfarms (Erickson et al., 2001).

Bird mortality at the 3 existing wind turbines at Buffalo Mountain, on 3 nearby control plots, and at a nearby meteorological tower, was monitored from late September, 2000 through November, 2001. Carcass searches were conducted on 50 m radius circular plots by a 2 or 3 person crew, who systematically walked parallel lines about 13 to 23 feet apart back and forth across the plot. Searches were conducted twice a week during September, October, April and May, once a week during November, March, June, July and early August, and twice a month during December, January, and February.

A total of 21 dead birds were found during the first 14 months of searches at the Buffalo Mountain windfarm. No bird carcasses were found on the control plots. Thirteen birds were found around the turbines; 11 of them were passerines of 10 different species. The remaining two were a Virginia rail and a yellow-billed cuckoo. Seven bird carcasses, representing seven species of passerines, were found around the meteorological tower. No diurnal raptor mortality was observed at Buffalo Mountain.

The observed, unadjusted (i.e., not accounting for search efficiency and carcass scavenging) bird mortality rate at the Buffalo Mountain windfarm resulting from turbine collisions is 3.7 birds/turbine/year. If this rates is adjusted using conservative search efficiency rates and scavenging rates reported elsewhere (i.e., 40% recovery rate, and carcasses persisting longer than the average interval between searches, Strickland et al. (2001)), the true mortality is probably about 9.3 birds/turbine/year. The is rate is considerably higher than the national average. Compared to other U.S. windfarms, protected passerines made up a higher proportion of the bird mortality at Buffalo Mountain (85% vs. 32%), as did likely nocturnal migrants (100% vs. 20% nationwide and 60% excluding California). These differences are probably due, at least in part, to the location of the Buffalo Mountain in an area with

higher numbers of migrating songbirds than most other U.S. windfarms. An additional 6 birds/year were likely killed by colliding with the meteorological tower and/or its guy wires. After adjusting for a 40% recovery rate, the true mortality rate from collisions with the meteorological tower is about 15 birds/year.

The expected total annual mortality resulting from the construction of an additional 13 or 14 wind turbines is at least 48 to 120 birds (3.7 to 9.3 birds/turbine/year) based on the observed mortality rate at Buffalo Mountain. The cumulative annual mortality for the existing and proposed windfarm would be at least 65 to 163 birds, including meteorological tower fatalities. These estimates assume the mortality rate for the proposed 1.5 MW turbines is the same as that of the smaller Vestas V-47 660-kW turbines. Whether this is assumption is valid is unknown, and studies comparing mortality rates of these different turbine types in similar settings are not available. Compared to the 1.5 MW turbines (Table 2-1), the Vestas V-47 turbines have a considerably smaller rotor-swept area (18,772 ft^2), faster operating rotor speed (28.5 rpm), and similar maximum blade tip speed (157 mph). The majority of the expected avian mortality is expected to be passerines migrating at night. This level of mortality is not expected to result in population level impacts to any bird species. Based on their flight behavior in the windfarm area, and observations at Buffalo Mountain and other windfarms in the central and eastern U.S., little to no mortality to diurnal raptors or other groups of non-passerine birds is expected.

According to Federal Aviation Administration (FAA) regulations, aircraft warning lights will be required on the wind turbines because of their height. Lights on towers can attract birds migrating at night, resulting in higher mortality levels than might otherwise occur. Whether lights will be required on all of the proposed wind turbines is unknown at this time, and will be determined in consultation with the FAA. In order to minimize this potential cause of bird mortality, TVA will use the minimum number of lights allowed by FAA regulations, and will, to the extent allowed by FAA regulations, follow the U.S. Fish and Wildlife Service guidelines for lighting on communication towers.

Bat Populations

Bat mortality rates have been reported at windfarms in Oregon, Minnesota, Wyoming, Vermont, New York, and Pennsylvania. Reported mortality rates range from 0 at Searsburg, Vermont (Kerlinger, pers. comm.) to 2.48 bats/turbine/year at Foote Creek Rim, Wyoming (Strickland, 2001). The red bat and hoary bat represented over 80% of the dead bats collected in these studies.

Bat mortality at the Buffalo Mountain Windfarm was monitored by searching for bat carcasses during the bird carcass searches described above. A total of 32 dead bats were found around the wind turbine towers; none were found at the meteorological tower. Twenty-one of the 32 dead bats found at the turbines were red bats. The next most frequently occurring species was the eastern pipistrelle (8), followed by the big brown bat, hoary bat, and silver-haired bat (1 each). Most of the dead bats were found during July (9), August (10), and September (8). None were found during the months of December through April. Two shallow, semi-permanent ponds located less than 100 yards from the wind turbines may attract bats to the area, and thus increase their vulnerability to collisions. Studies are underway to determine whether bat activity is concentrated around these ponds, or whether bat activity is more uniformly distributed over the windfarm area.

The unadjusted bat mortality rate for the 15-month period (October 2000 – December 2001) is 8.53 bats/turbine/year, considerably higher than the rates reported at other windfarms. If this mortality rate is applied to the proposed windfarm expansion, the expected total bat mortality, unadjusted for search efficiency and carcass scavenging, would range from 136 bats/year after the construction of 13 new wind turbines, to 162 bats/year after the construction of 16 new turbines. These mortality rates could negatively impact local bat populations.

Alternative 2 - Stone Mountain Windfarm

Impacts During Construction

Construction of the proposed windfarm and the associated roads, substation, transmission line connection, Regenesys™ facility, and other utility connections would result in loss of shrubby and forested wildlife habitats. Most of the disturbance would occur along the crest of Stone Mountain, where 20 to 30 acres of mostly forested habitats would be cleared. This clearing would displace, or perhaps destroy, some small animals that occur on the site. Except for clearing associated with transmission line and access road work, the sides of Stone Mountain would remain undisturbed and forested. The windfarm development would result in some increased forest fragmentation on Stone Mountain.

Development of the site has the potential to disrupt the local terrestrial ecology, because the majority of the site provides wildlife habitat that has the potential to support a variety of bird, reptile, amphibian, mammal and invertebrate fauna. Overall, development is expected to have insignificant effects on the conservation of similar terrestrial animal communities in Blue Ridge Mountain Province, because relatively few acres would be disturbed.

Regenesys™ Sites and Transmission Line Connections

The proposed Regenesys™ sites at Mountain City Industrial Complex, Shouns Substation, and at Johnson County Industrial Park have been previously disturbed and provide very limited wildlife habitat. The sites are described as agricultural use, maintained field, and graded lot, respectively. Because the majority of the area encompassed within these sites has been disturbed by land use activities and because the wildlife habitats that occur on the sites are common from a state or regional perspective, impacts to terrestrial animals and these habitats are expected to be insignificant with the selection of any of the Regenesys™ sites alternatives. No transmission line connections were reviewed for this alternative.

Impacts during Operation and Maintenance

The impacts from operation and maintenance of the Stone Mountain windfarm and associated facilities on wildlife populations other than birds and bats are expected to be minimal and insignificant. Habitat conditions for some species would likely improve as some areas cleared during construction would revegetate to shrubland and forest.

Bird Populations
Assuming the avian mortality rate observed at Buffalo Mountain is applicable to Stone Mountain, the annual mortality from the construction of 13 or 14 wind turbines would be at least 48 to 120 birds. An additional 6 to 15 birds would likely die from collisions with a meteorological tower supported by guy wires. Use of a self-supporting meteorological tower without guy wires would likely result in somewhat lower bird mortality. Because the number of migrating songbirds present in the fall at Stone Mountain appears to be greater than at Buffalo Mountain, the overall collision mortality rate at Stone Mountain could also be greater. The level of mortality, however, is not expected to result in population level impacts to any bird species.

Based on their flight behavior in the windfarm area, and observations at Buffalo Mountain and other windfarms in the central and eastern U.S., little to no mortality to diurnal raptors or other groups of non-passerine birds is expected.

According to Federal Aviation Administration (FAA) regulations, aircraft warning lights will be required on the wind turbines because of their height. Lights on towers can attract birds migrating at night, resulting in higher mortality levels than might otherwise occur. Whether lights will be required on all of the proposed wind turbines is unknown at this time, and will be determined in consultation with the FAA. In order to minimize this potential cause of bird mortality, TVA will use the minimum number of lights allowed by FAA regulations, and will, to the extent allowed by FAA regulations, follow the U.S. Fish and Wildlife Service guidelines for lighting on communication towers.

Bat Populations
If the bat mortality rate observed at the Buffalo Mountain Windfarm is applied to the proposed Stone Mountain windfarm, the expected total bat mortality, unadjusted for search efficiency and carcass scavenging, would range from 111 bats/year after the construction of 13 wind turbines, to 136 bats/year after the construction of 16 turbines. These mortality rates could negatively impact local bat populations.

Alternative 3 - No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Therefore, no new project-related impacts to wildlife would occur, and the current impacts resulting from operation of the Buffalo Mountain Windfarm would continue. Impacts to wildlife could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts would vary according to the source of replacement energy. As described above in Section 4.8.1, reliance on surface-mined coal for the replacement energy would disrupt wildlife populations on about 1.4 to 1.6 acres per year.

Mitigation

In order to minimize the potential impacts to small wetlands and the wildlife populations they support, TVA will, to the maximum extent practicable, avoid ponds and wetlands in or adjacent to woodlands during construction of the Buffalo Mountain Windfarm expansion and associated utility routes, and maintain an undisturbed buffer at least 50 feet wide around these areas.

In order to reduce mortality of birds migrating at night, TVA will use the minimum number of aircraft warning lights on the wind turbines allowed by FAA regulations. TVA will also, to the extent allowed by FAA regulations, follow the U.S. Fish and Wildlife Service guidelines for lighting on communications towers.

4.10 Aquatic Ecology

Alternative 1 - Buffalo Mountain Windfarm Expansion

Windfarm Expansion
With the exception of road and transmission line work, most project activities would be located atop Buffalo Mountain and would not affect small streams in the area. Appropriate Best Management Practices (BMPs) such as those in Muncy (1999) will be implemented during site clearing, and road, wind turbine, substation, and transmission line construction to prevent or minimize potential adverse effects to streams. Appropriate BPMs would also be used during any future maintenance activities. Potential impacts to aquatic life would be insignificant.

Regenesys™ Facility
With the implementation during construction of appropriate BMPs to control erosion runoff from the site and transmission connections, and to prevent the entry of petroleum products or other pollutants into surface waters, potential effects to aquatic life in Poplar Creek, Geise Creek, Indian Creek, and other surface waters would be insignificant. Additional precautions would be required at the Ahler Property site to protect the unique spring habitat; protection and avoidance of the spring would also prevent problems associated with saturated ground on the site during construction and operation. Operational impacts would also be insignificant with appropriate control of site runoff and handling and disposal of chemical components.

Alternative 2 - Stone Mountain Windfarm

Windfarm
With the exception of road and transmission line work, most project activities would be located atop Stone Mountain and would not directly impact small streams in the area. Appropriate BMPs will be implemented during road, generator, substation, and transmission line construction to prevent or minimize potential adverse effects to streams. Impacts to aquatic life would be insignificant.

Regenesys™ Facility
With the implementation during construction of appropriate BMPs to control erosion runoff from the site, access roads, and associated transmission line connections, and to prevent the entry of petroleum products or other pollutants into surface waters, impacts to aquatic life in Doe Creek, Town Creek, Roan Creek, and other nearby surface waters would be insignificant. Operational impacts would also be insignificant with appropriate control of site runoff and handling and disposal of chemical components.

Alternative 3 - No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Therefore, no new project-related impacts to aquatic ecology would occur. Impacts to aquatic ecology could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

4.11 Threatened and Endangered Species

4.11.1 Threatened and Endangered Plants

Alternative 1: Buffalo Mountain Windfarm Expansion

As stated in Section 3.11.1 (Threatened and Endangered Species - Plants), field surveys did not reveal the presence of federally listed or state-listed plant species or their habitats in the vicinity of the projected locations of the various windfarm components, including the Regenesys™ facility. At the time of this environmental review, no impacts are expected to rare plant species as a result of adopting this Alternative. This determination will be verified prior to initiation of any construction activities.

Alternative 2: Stone Mountain Windfarm

As stated in Section 3.11.1 (Threatened and Endangered Species - Plants), a stand of Fraser fir, Tennessee state-listed as threatened, occurs toward the northern end of the project site immediately adjacent to proposed locations for some wind turbines. TVA will work to avoid impacting this stand of fir. In the

event avoidance of this stand is not possible, it should be noted that these fir were planted 30-35 years ago likely to serve as a source of Christmas trees and wreath foliage. Also, the seed source of these fir is unknown and therefore these fir may not even be native to the immediate region. No other state-listed plants, and no federally listed plants or their habitats were identified on Stone Mountain or at the potential Regenesys™ facility sites. At the time of this environmental review, no additional impacts to rare plant species are anticipated as a result of adopting this Alternative. This determination will be verified prior to the initiation of any construction activities.

Alternative 3 - No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Therefore, no new project-related impacts to threatened or endangered plants would occur. Impacts to threatened and endangered plants could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

4.11.2 Threatened and Endangered Terrestrial Animals

Alternative 1 - Buffalo Mountain Windfarm Expansion

Impacts During Construction

Four state-listed terrestrial animals, the golden-winged warbler, cerulean warbler, Cooper's hawk, and peregrine falcon, are known to occur on the windfarm site. In addition, potential suitable habitat for the four-toed salamander and potential foraging habitat for the Indiana bat also occurs on the site.

Development of the site would eliminate small amounts of habitat used by golden-winged, cerulean warblers, and Cooper's hawks. In order to minimize the long-term effects on golden-winged warblers, TVA would commit to restoring the species' habitat by replanting as much of the disturbed area as possible with a mixture of native shrubs and trees. With restoration of suitable habitat, long-term effects on this species would be insignificant. Effects to cerulean warblers are expected to be minimal, because the amount of suitable habitat that would be affected is small and due to the abundance of similar habitat nearby. Cooper's hawks in the vicinity would likely experience only temporary disturbances. The mobility of these species will allow them to establish nesting territories in nearby suitable habitat. Impacts to these birds are expected to be isolated and minimal, and therefore, insignificant.

Peregrine falcons have been reported migrating over the windfarm site. This species is unlikely to nest, forage or roost on the site. Therefore, no impacts to this species are anticipated as a result of construction activities.

If four-toed salamanders occur on the windfarm site, they are likely restricted to areas near small wetlands. In order to avoid potential impacts to this species TVA would commit to establishing a protective buffer at least 50 feet wide around each wetland in or adjacent to woodlands. This would protect habitat suitable for this species as well as provide benefits to other species of wildlife in the vicinity. Consequently, no impacts to four-toed salamanders are expected to result from the proposed activities.

Indiana bats may forage over waterholes at the site. If present, this species may encounter minor disruptions of foraging activities during construction. Any impacts to this species are expected to be minor and temporary, and therefore, insignificant.

Regenesys™ Facility and Transmission Line Connections

Due to the nature of site disturbance, no protected terrestrial animals or their habitats are expected to occur on the Regenesys™ sites at Braden Field, Coal Creek, Ahler Property or the Oliver Springs Substation. Therefore, no impacts to state-or federal -protected terrestrial animals or their habitats, caves or heron colonies are expected as a result of the construction of any of the Regenesys™ sites.

Three protected species may find suitable habitat along the Buffalo Mountain transmission line connection: four toed salamander, cerulean warbler, and golden-winged warbler. Impacts to these species will be avoided, minimized or otherwise mitigated to a level of insignificance by implementing the guidelines mentioned under *Impacts During Construction* and *Mitigation*.

Impacts During Operation and Maintenance

Operation of the Buffalo Mountain windfarm is not anticipated to result in any impacts to the four-toed salamander, golden-winged warbler, or cerulean warbler beyond those resulting from construction. Following the completion of construction activities, some cleared areas would revert to forest, improving local habitat conditions for these species.

The Cooper's hawk and peregrine falcon would be at some risk of collision with the operating wind turbines. Monitoring studies at other windfarms have not reported any deaths of either Cooper's hawks or peregrine falcons from collisions (Erickson et al., 2001), and the likelihood of such mortality at the Buffalo Mountain windfarm is very low. The impacts to regional Cooper's hawk and peregrine falcon populations from windfarm operation are expected to be insignificant.

Alternative 2 - Stone Mountain Windfarm

Impacts During Construction

Five listed terrestrial animals have been reported from the proposed windfarm site. These are Weller's salamander, Cooper's hawk, peregrine falcon, common raven, and yellow-bellied sapsucker. In addition, the site contains potential suitable habitat for the common shrew, smoky shrew, southeastern shrew, eastern big-eared bat, Indiana bat and golden-winged warbler.

Construction of the Stone Mountain windfarm could result in direct, indirect, and cumulative impacts to Weller's salamanders. Direct impacts could occur as individual salamanders are destroyed as a result of site clearing. Indirect impacts could occur as current habitat conditions are modified. For example, barriers to salamander movements may be created by the construction of access roads or the moisture or temperature conditions in adjacent microhabitats may be altered by the removal of forest canopy.

According to NatureServe (2001), Weller's salamander is considered to be "critically imperiled" in Tennessee and "imperiled" in North Carolina and Virginia. Globally, this salamander is considered "vulnerable to extirpation or extinction." An estimated 20 to 30 populations of the species are known to exist. Therefore, loss of the Stone Mountain population would have a measurable cumulative impact on Weller's salamander populations. In order to minimize the effects on Weller's salamander populations,

TVA would commit to developing a monitoring and mitigation plan before construction activities begin. The plan would identify locations on the site where the salamander currently exists, delineate both suitable and optimal habitat, and identify appropriate monitoring and mitigation measures necessary to avoid adverse impacts to the Weller's salamander populations.

Construction of the windfarm would remove some habitat used by Cooper's hawks. Cooper's hawks nest and forage in edge and open habitats and would likely experience only temporary disturbances. The mobility of this species will allow it to establish nesting territories in nearby suitable habitat. Impacts to this bird are expected to be isolated and minimal, and therefore, insignificant.

Peregrine falcons have been reported migrating over the site. It is unlikely that this species nest, forages, or roosts on the site. No impacts to this species are anticipated to result from construction of the windfarm.

Construction of the Stone Mountain windfarm would not affect nesting habitat for the common raven. Ravens eat a wide variety of foods and forage in a wide variety of habitats. Therefore, the forest clearing during construction would have little effect on raven foraging habitat.

The yellow-bellied sapsucker often nests in forests characterized by early successional tree species and some canopy openings. Windfarm construction would remove some suitable breeding habitat for this woodpecker. The amount of forest to be cleared is a small portion of the suitable habitat on Stone Mountain, and the overall impacts to the species are expected to be insignificant. In order to minimize disturbance during the nesting season, TVA will avoid clearing forests on the crest of Stone Mountain between April 1 and July 15.

If common, smoky and southeastern shrews occur within the project area, some individuals may be destroyed by construction activities. Because each of these small mammals have relatively broad habitat requirements and have a wide geographic distribution, the proposed action is not expected to adversely affect their populations. Based on the proposed location of the windfarm facilities at Stone Mountain, there would be minor effects on potential golden-winged warbler habitat, and the potential impacts on this species would be minor and insignificant.

Some potential foraging habitat for the Indiana bat would likely be lost during construction activities. This species, however, probably does not regularly occur on Stone Mountain. Eastern big-eared bats that may occur on the site would lose a small amount of habitat; much suitable habitat would remain in the adjacent forested areas. Any potential impacts to these two species are expected to be minimal and temporary, and therefore, insignificant.

Regenesys™ Facility and Transmission Line Connections

The proposed Regenesys™ sites at Mountain City Industrial Complex, Shouns Substation, and at Johnson County Industrial Park have been previously disturbed and provide very limited wildlife habitat. The sites are described as agricultural use, maintained field, and graded lot, respectively. No protected terrestrial animals are expected to occur on any of the Regenesys™ sites. Therefore selection of any of the proposed Regenesys™ sites would not result in adverse impacts to federal- or state-protected terrestrial animals or their habitats, caves, or heron colonies. No transmission line connections were reviewed for this alternative.

Impacts During Operation and Maintenance

Operation of the Stone Mountain windfarm is not anticipated to result in any impacts to the Weller's salamander, the golden-winged warbler, or to the common, smoky, and southeastern shrews beyond those resulting from construction. Following the completion of construction activities, some cleared areas would revert to forest, improving local habitat conditions for the yellow-bellied sapsucker.

The Cooper's hawk, peregrine falcon, and common raven, would be at some risk of collision with the operating wind turbines. Monitoring studies at other windfarms where common ravens regularly occur have shown a fairly low level of raven mortality (Erickson et al., 2001). These studies have not reported any deaths of either Cooper's hawks or peregrine falcons from collisions, and the likelihood of such mortality at the Stone Mountain windfarm is very low. The impacts to regional Cooper's hawk, peregrine falcon, and common raven populations from windfarm operation are expected to be insignificant.

Alternative 3 - No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Therefore, no new project-related impacts to threatened or endangered terrestrial animals would occur. Impacts to threatened and endangered terrestrial animals could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

Mitigation

In order to minimize the long-term effects on golden-winged warblers, TVA would commit to restoring the species' habitat by replanting as much of the disturbed area as possible on Buffalo Mountain with a mixture of native shrubs and trees.

In order to avoid potential impacts to four-toed salamanders, TVA would commit to establishing a protective buffer at least 50 feet wide around wetlands in or adjacent to woodlands on Buffalo Mountain.

In order to minimize the effects on the Weller's salamander population at Stone Mountain, TVA will develop a monitoring and mitigation plan before construction activities begin. Mitigation efforts may include but would not be limited to the protection of suitable habitat for the species, placement of culverts under access roads to allow salamanders to move freely among habitat patches, or the purchase of suitable habitat nearby on a 1:1 basis to mitigate the loss of suitable habitat resulting from the development of the windfarm facilities at Stone Mountain.

In order to minimize disturbance of yellow-bellied sapsuckers during the nesting season, TVA will avoid clearing forests on the crest of Stone Mountain between April 1 and July 15.

4.11.3 Threatened and Endangered Aquatic Animals

Alternative 1 - Buffalo Mountain Windfarm Expansion

No impacts to the Tennessee dace, the ashy darter, the emerald darter, or any other listed aquatic species, are expected to result from the construction of the windfarm and its associated substation, access road, and transmission line connection. Impacts to the Tennessee dace in Poplar Creek and its tributaries could result from site grading, access road construction, and construction of a buried electrical connection for the Regenesys™ facility at the Braden Field.

All construction activities related to the windfarm, the substation, connecting transmission line, and various Regenesys™ facility options would be carried out using Best Management Practices (BMPs) to minimize potential impacts to waterways in the project area. These BMPs would include measures to prevent silt and other construction-related run-off from entering streams in the area. Appropriate spill and run-off containment facilities would also be employed at the substation and Regenesys™ facility. With implementation of these measures, impacts to listed aquatic species are expected to be minor and insignificant.

Alternative 2 - Stone Mountain Windfarm

Because no sensitive aquatic animal species are reported from the vicinity of the proposed Stone Mountain windfarm and associated Regenesys™ facility sites, no impacts to sensitive aquatic animals are likely to result from any construction activities associated with this project regardless of the construction option chosen.

Alternative 3 - No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Therefore, no new project-related impacts to threatened or endangered aquatic animals would occur. Impacts to threatened and endangered aquatic animals could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

4.12 Visual Resources

Visual consequences are examined in terms of visual changes between an existing landscape and proposed actions, how visible those changes are, the sensitivity of viewing points available to the general public, and their viewing distances. In this assessment scenic character is described using t erms such as contrast, variety, unity, coherence, harmony, and tranquillity. Scenic integrity indicates the degree of intactness or wholeness of the landscape character. These measures help identify changes in visual character based on commonly held perceptions of landscape beauty and the aesthetic sense of place. The foreground viewing distance is from 0 to 1/2 mile, middleground is 1/2 mile to 4 miles, and background beyond 4 miles.

To assist the visual impacts analysis, TVA used digital elevation data (USGS, 2001) and land cover data (Vogelmann et al., 2001) to model the visual impact area. The data sets were combined using ArcGIS geographic information system software to produce three dimensional models of the windfarm areas. Wind turbines were placed at likely locations at each windfarm site. The resulting models show areas

surrounding the proposed windfarms from which the wind turbines would be visible, as well as the simulated views of the windfarms from selected vantage points.

Alternative 1 - Buffalo Mountain

Windfarm Expansion
Construction and operation of the windfarm facilities would permanently alter the visual landscape character resulting in a moderate visual impact. The appearance would change from a strip mined mountain top and existing small windfarm to a larger windfarm of similar character extending about 2 miles along the ridge. Visible construction would include about an acre of ridge top vegetative clearing around each turbine along with excavation, airborne dust, cranes and structure erection, crushed stone parking and fabrication areas, material stockpiles, other temporary facilities, fencing, and site reclamation. Where visible, these elements would add further visual discord and adverse contrast while reducing scenic attractiveness. Revegetation would take 15 years or more to restore the pre-construction appearance of tree cover.

The completed facility would include a total of 16 to 19 wind turbine generators, a substation, and minor related features. The height and vertical form of the turbines would be visually dominant and substantially out of scale with the surrounding landscape character. The substation would be located adjacent to the line of turbines, with underground electrical connections linking them. The turbines would extend at least 250 feet above tree lines and generally be seen against the sky. The turbine color would be in a range of pale cool gray to gray-white with a flat non-reflective finish, selected for compatibility with the light sky background. The linear facility would add discordant contrast and adverse variety to the rural landscape, which would be further accentuated by the ridge top location.

An overhead electrical connection would replace the existing line from the turbines down the mountain along Windrock Road and by Tupperville to SR 62, as described in Chapter 2 The existing ROW would be widened from 45 feet to between 75 and 100 feet, and the wood poles would likely be replaced with larger ones up to100 feet tall. The adverse visual impact would be relatively minor, with the greatest discord seen during construction. It would be visible to passing motorists and the small number of residents along the route.

Like other tall structures, wind turbines would cast a shadow when the sun is visible. In locations very close to turbines a flickering (blinking) effect may be noticeable as the blades chop the sunlight while the rotor is in motion. The shadow flicker may be annoying to some people. At distances of a half mile or more the blades would not seem to be chopping the light, and the turbine would look like a stationary object with the sun behind it. Since no homes would fall within a half mile of a turbine on Buffalo mountain, shadow flicker was not considered further.

Flashing strobe lights on the turbines would provide a pulsating, disruptive contrast along the ridge and would reduce visual tranquillity of the night sky where they could be seen. Substation lighting would be similar that at the Oliver Springs or Coalfield substations. The substation and any night time construction would increase brightness seen on the ridge and in the night sky. The level of added brightness has not been determined but would be greatest for the residents and traffic nearest the site. Together the line of turbines and other facilities would further reduce the scenic attractiveness, integrity, and harmony of the rural setting, which would adversely change the aesthetic sense of place.

Viewshed studies and field reviews indicate the wind turbines would be seen in middleground and background views from various locations around the City of Oak Ridge and other nearby communities (Figure 4-1). Since the line of turbines would run parallel to most lines of sight the group would seldom be seen all together from any viewing location. The arrangement of steep ridges and valleys would limit the number of locations where the windfarm would be fully visible from nearby communities. Only a few

new turbines would be visible from Oak Ridge, since most would be located north of the existing units and would be screened by another ridge. Although some discordant contrast would be visible on the mountain, it would be less noticeable from the city due to longer viewing distances and existing visual congestion seen in the surrounding urban area. The turbines would also be seen occasionally from the ridge-tops of Frozen Head State Natural Area about 6 miles away. Figure 4-2 shows a simulation of the windfarm view from the fire tower at Frozen Head, which is available to the public when the park is open. At this distance the structures would appear relatively small, but would still provide an identifiable adverse contrast that would reduce visual integrity along the ridge. Similar views may be seen occasionally from the proposed ridge-top route of the Cumberland Trail at distances of 3-5 miles.

Comparing the 2 proposed windfarm locations, this alternative would have less visual impact due to the previously disturbed ridge lines, the viewing angles, greater viewing distances, relatively fewer distinct views, and the visual distractions of surrounding development.

Option 1 - Braden Field Regenesys™ Site
Construction of a plant at this site would replace up to 4 acres of pasture with an industrial facility, which would adversely contrast with the small rural valley. Construction would include excavation, airborne dust, structure and tank erection, crushed stone parking and fabrication areas, material stockpiles, other temporary facilities, and site reclamation. Material delivery trucks and construction force traffic would increase visual congestion on the country road. The visual impact of construction activities would be substantial but temporary, lasting a year or more until site cleanup and reclamation were complete. The adjacent rural airstrip would remain in operation.

The operating plant would negatively change the visual character of the pastoral landscape. The mass and form of the process building and screen wall would be visually dominant and out of scale with the few homes and barns nearby. They would create adverse contrast and visual discord while reducing scenic attractiveness, integrity, and tranquility. The screen wall would hide most of the industrial process features that would otherwise increase the adverse impact. Metal halide lighting would be provided for yard and parking areas which could increase night-sky brightness, and would increase the light seen across the landscape at night. Shielded “dark sky” fixtures would be used to help minimize the impact. The facility would be seen from the scattered homes, and by motorists on the rural roads to the north and south.

An electrical connector line, probably located underground, would run east from the plant to the adjacent transmission line. A ROW would be cleared several hundred feet through the woodland, but the opening probably wouldn’t be noticeable due to the limited direction of public view.

Option 2 - Coal Creek Regenesys™ Site
Construction of a plant at this site would replace up to 4 acres of reclaimed and partially wooded strip mine land with an industrial facility, which could visually contrast with the surrounding wooded hillsides. Construction activities would be the same as described for Sub-Alternative 1 but the visual impact could be less, assuming vegetation along the steep roadside would remain undisturbed.

The operating plant may be screened somewhat depending on where it is sited on the terrace. The mass and form of the process building and screen wall would be dominant visual elements which would add discordant contrast where visible above the treetops. The screen wall would hide most of the industrial process features that could otherwise increase the adverse impact. Light or bright-colored building materials and finishes could substantially increase adverse contrast with the surrounding woodland. Finishes in a range of medium-dark gray tones would reduce the contrast and help blend with the deciduous trees. Visual integrity and scenic attractiveness would be reduced in proportion to the adverse contrast. Metal halide lighting would be provided for yard and parking areas which could increase night-sky brightness, and would increase the light seen across the landscape at night. Shielded “dark sky”

fixtures would be used to help minimize the impact. The facility would be visible to eastbound traffic on S. R. 61 both above and through the trees. Most views from westbound traffic would be obscured by the elevation difference, travel direction, and existing trees. There may also be incidental views from a few homes to the east. Over time, plant visibility would be affected by the management of adjacent woodland.

An overhead electrical line would connect the plant to the windfarm and one of two substations along the routes as described in Chapter 2. The existing ROW would be widened from 45 feet to between 75 and 100 feet for either route, and the wood poles would likely be replaced with larger ones up to 100 feet tall. The adverse visual impact would be relatively minor, but Option 2 may be less noticeable after construction due to the greater number of existing lines and other visual congestion along the 4-lane highway. Proposed changes along these routes would have the same public visibility as described in Section3.12.

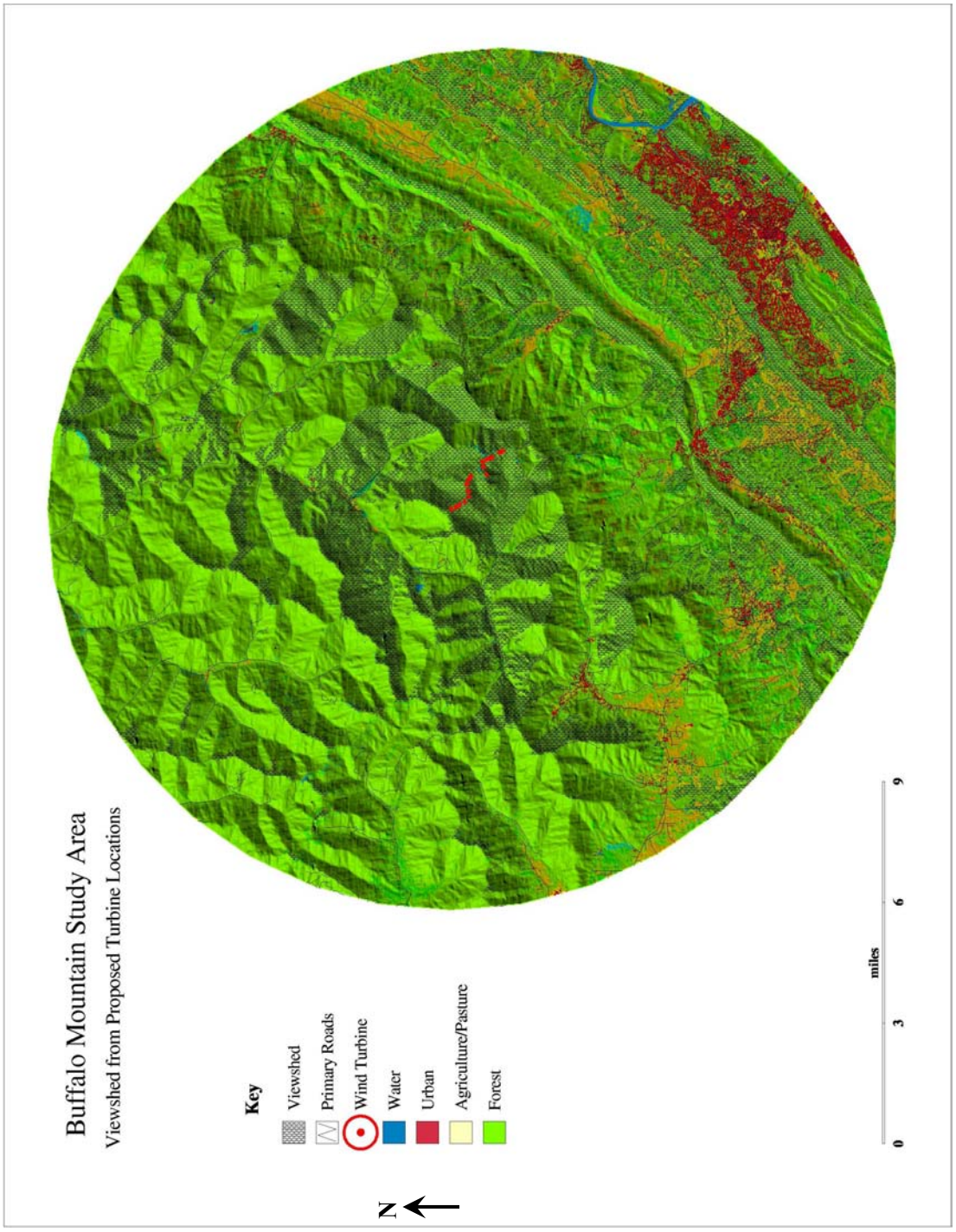


Figure 4-1. Map of area surrounding the Buffalo Mountain Windfarm, showing locations within a 10-mile radius of the windfarm from which the turbines would be visible.

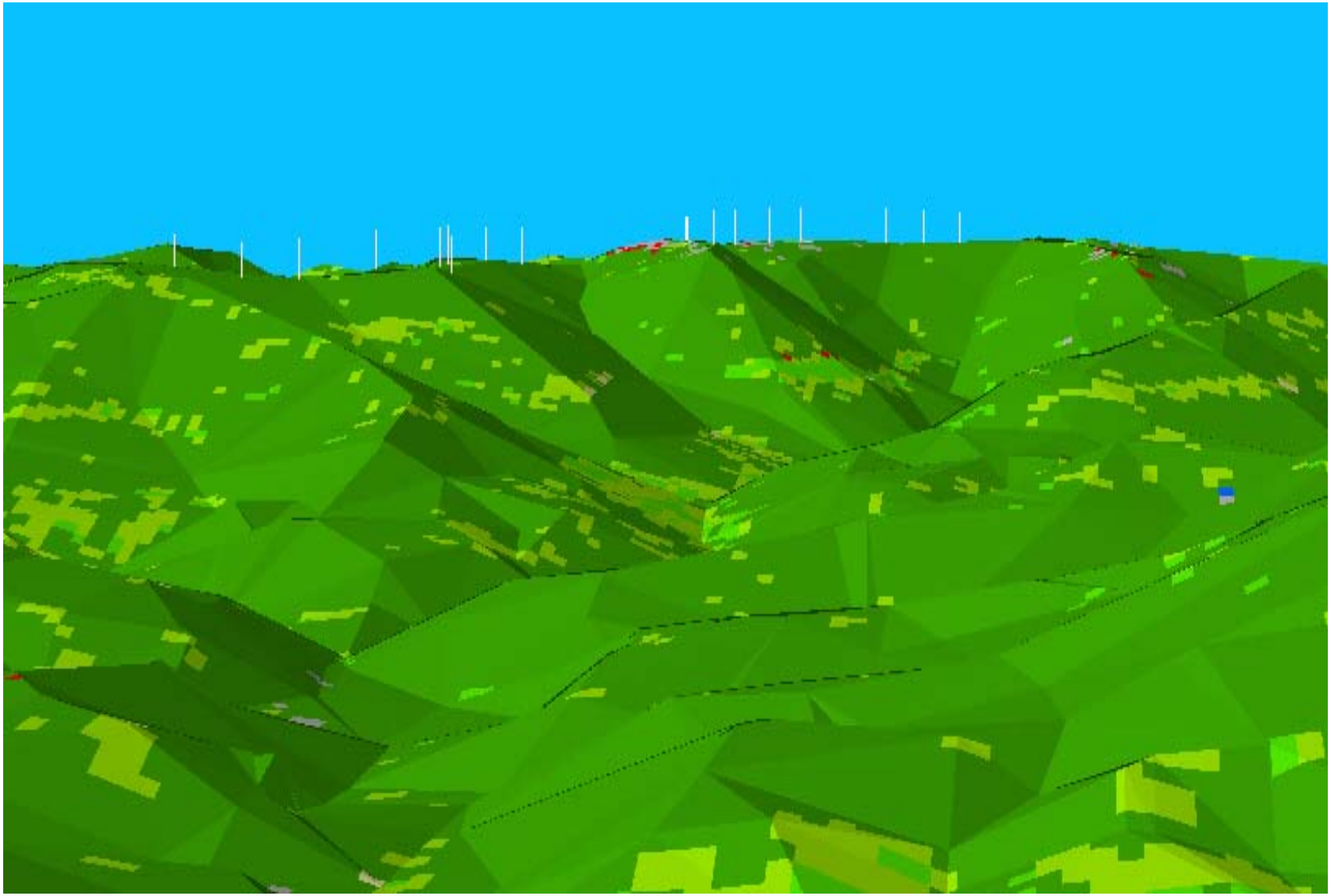


Figure 4-2. Simulated view of the proposed windfarm expansion on Buffalo Mountain looking east from the fire tower in Frozen Head State Park.

Option 3 - Ahler Property Regenesys™ Site
Construction and operation of the proposed plant at this site would replace up to 4 acres of open grass with an industrial facility, which would adversely contrast with the rural valley and relatively small scale residential structures. Construction would include excavation, airborne dust, structure and tank erection, crushed stone parking and fabrication areas, material stockpiles, other temporary facilities, and site reclamation. Material delivery trucks and construction force traffic would increase visual congestion on S. R. 61. The visual impact of construction activities would be substantial but temporary, lasting a year or more until site cleanup and reclamation were complete.

The operating plant would negatively change the visual character of the pastoral landscape. The mass and form of the process building and screen wall would be visually dominant and out of scale with nearby homes. They would create adverse contrast and visual discord while reducing scenic attractiveness, integrity, and tranquility. The screen wall would hide most of the industrial process features that would otherwise increase the adverse impact. The building materials and colors could lessen or worsen the contrast. Metal halide lighting would be provided for yard and parking areas which could increase night-sky brightness, and would increase the light seen across the landscape at night. Shielded "dark sky" fixtures would be used to help minimize the impact. The facility would be seen from the surrounding homes and by motorists on the rural highway.

An overhead electrical line would connect the plant to the windfarm and a the nearby transmission line as described in Chapter 2. The existing ROW would be widened from 45 feet to between 75 and 100 feet for either route, and the wood poles would likely be replaced with larger ones up to 100 feet tall. The adverse visual impact would be relatively minor since other utility lines are also located along this route. The line would be visible from homes, churches, and other development along the highway, as well as by passing motorists.

Option 4 - Oliver Springs Substation Regenesys™ Site
Plant construction at this site would replace up to 4 acres of woodland with an industrial facility, and would adversely contrast with the surrounding rural residential area. Construction activities would be about the same as described for Sub-Alternative 3 above, but construction-related traffic on the narrow streets would create noticeably greater visual congestion.

The operating plant would be located along a railroad track where the transmission line and substation already provide elements of a utility character. The mass and form of the process building and screen wall would be visually dominant and out of scale with the residential setting. They would add discordant contrast to the area. Visual integrity and scenic attractiveness would be reduced. The screen wall would hide most of the industrial process features that would otherwise increase the adverse impact. The building materials and colors could lessen or worsen the contrast. Metal halide lighting would be provided for yard and parking areas which could increase night-sky brightness, and would increase the light seen in the area at night. Shielded "dark sky" fixtures would be used to help minimize the impact. The facility would be seen both above and through the trees from the nearby homes, local streets, and possibly from more distant homes. It may also be visible above the trees from S. R. 62 and the two schools about a half-mile eastward. Over time, plant visibility would be affected by the management of the surrounding woodland.

An overhead electrical line would connect between the plant and adjacent substation, then on to the windfarm link following the same route described for Coal Creek Option 2 and described in Chapter 2. The line would create the same visual changes, minor impacts, and public visibility along the highway described for Option 2, and would also be seen from several homes around the substation.

Comparing the proposed locations, a Regenesys™ plant at the Coal Creek site would have the least visual impact. That location has the lowest scenic attractiveness and public visibility. The completed plant

would be seen from very few if any homes, and generally by only one direction of rural highway traffic. Sensitive planning and design could make the building and access road less noticeable in that location than at the others. An electric connection along the Option 2 route would be the least noticeable.

Alternative 2 - Stone Mountain

Windfarm
Construction and operation of the windfarm facilities would permanently alter the visual landscape character resulting in a significant visual impact. The appearance would change from a seemingly natural wooded mountain to a moderate-scale wind turbine facility stretching along a 2 mile section of the rural ridge top. Visible construction would include at least an acre of ridge top tree clearing for each turbine along with excavation, airborne dust, cranes and structure erection, crushed stone parking and fabrication areas, material stockpiles, other temporary facilities, fencing, and site reclamation. These elements would create substantial visual discord and adverse contrast while reducing scenic attractiveness and tranquility. Some of the construction discord would be temporary and last until site cleanup and reclamation was complete. Revegetation would take 15 years or more to restore the pre-construction appearance of tree cover.

The completed windfarm facility would include a line of 13 to 16 turbine generators, a substation, and minor related features. The height and vertical form of the turbines would be visually dominant and substantially out of scale with the surrounding landscape character. The turbines would be seen against the sky extending at least 250 feet above tree lines. The turbine color would be in a range of pale cool gray to gray-white with a flat non-reflective finish, selected for compatibility with the light sky background. The shadow flicker of a wind turbine was described in Alternative 1. Since almost no homes would fall within a half mile of a turbine on Stone Mountain, it was not considered further for this alternative. The linear facility would add discordant contrast and adverse variety to the rural landscape, which would be further accentuated by the ridge top location.

Flashing strobe lights on the turbines would provide a pulsating disruptive contrast along the ridge, and substantially reduce visual tranquility of the night sky. They would particularly detract from the mountain silhouette background seen at dusk and dawn. Substation lighting would be similar to lighting at the existing Shouns substation. The substation and any nighttime construction would further increase brightness seen on the ridge and in the night sky. The level of added brightness has not been determined, but would be greatest for the residents and traffic closest to the site. Together the line of turbines and other features would significantly reduce the overall scenic attractiveness, visual coherence, tranquillity, and harmony of the rural setting, which would adversely change the aesthetic sense of place.

The project would also include construction of a transmission line at least 3 1/2 miles long, that would run up the west side of the mountain to the substation. This transmission line would likely follow the route of an existing line from the Shouns substation. The 45 foot cleared right-of-way would be widened to between 75 and 100 feet, and, larger wood poles up to 100 feet tall may be used. The widened clearing and larger structures would add more adverse vertical contrast to the landscape, and would further reduce visual harmony and integrity. A diagonal route, or one with a switch-back could help minimize the visibility of cleared ROW running up the mountainside.

Viewshed studies and field reviews indicate the turbines would be seen in most middleground views from the valleys on each side of the mountain (Figure 4-3). Figure 4-4 shows a simulation of the view of the windfarm from Mountain City. The linear turbine location would run perpendicular to the lines of sight from the valleys so all the turbines would probably be seen together from most viewing locations. They may be seen from somewhat fewer locations on the eastern side due to the arrangement of more highly

dissected terrain and the narrower valley corridor of the scenic highway. The impact would be about the same or greater than on the western side since the viewing distances would generally be half as far. The turbines would also be seen occasionally from the Appalachian Trail over 10 miles away and another trail somewhat closer. At these distances the structures would appear small, but would still provide an identifiable adverse contrast to the natural ridge top character. Figure 4-5 shows a simulation of the windfarm viewed from the Appalachian Trail at an overlook near Vanderventer trail shelter. The location is on Iron Mountain about 4.1 miles trail miles north of Watauga Dam. Figure 4-6 shows another simulated view from the top of Beech Mountain, North Carolina**.** The view from Roan Mountain, Tennessee/North Carolina, would be similar to the Beech Mountain view except that the wind turbines would appear considerably smaller because of the greater distance to Roan Mountain. The contrast of turbines visible from these points would be greater than from the valleys, because the light-colored structures would be seen against a dark woodland background rather than the sky. If a dark color were selected to blend with the woodland, it would create a more severe adverse contrast when seen against the light sky from the valley locations which are much closer.

Comparing the two proposed windfarm locations, this alternative would have greater visual impact due to the undisturbed ridge lines, clear views from the adjacent valleys, closer viewing distances, and absence of other features that disturb the visual harmony of the tranquil countryside.

Option 1 - Johnson County Industrial Park Regenesys™ Site
Construction of a plant at this graded vacant industrial site would have little long-term visual impact. Construction would include excavation, airborne dust, structure and tank erection, crushed stone parking and fabrication areas, material stockpiles, other temporary facilities, and site reclamation. These activities would create moderate visual discord and adverse contrast that would be temporary, lasting a year or more until site cleanup and reclamation were complete. The construction would be visible along Highway 67 and from surrounding residences. Material delivery trucks and construction force traffic would increase visual congestion on the country road.

The mass and form of the process building would be somewhat larger but visually compatible with the adjacent industrial buildings seen in the immediate foreground. Storage tanks and related industrial process features would be screened by a wall around the east side of the building. The building height would similar to the top of the elevated storage tank nearby, but less than the evergreen woodland behind the site. Assuming a metal-sided building, a dark shade of green or gray siding would minimize any adverse color contrast and blend with the evergreen background. Metal halide lighting would be provided for yard and parking areas which could increase night-sky brightness, and would increase light seen in the area at night. Shielded “dark sky” fixtures would be used to help minimize the impact.
An overhead electrical connection to the existing transmission line nearby would have little if any visual impact.

The completed facility would be visible in the foreground from mobile homes to the north, motorists on Highway 67, and from the mixed residential area west of the road. Although the facility would increase the number of visible industrial buildings, it would have little impact on the visual character of the area and would not change the aesthetic sense of place. Comparing the 3 locations, a Regenesys™ facility would have the least visual impact at this site.

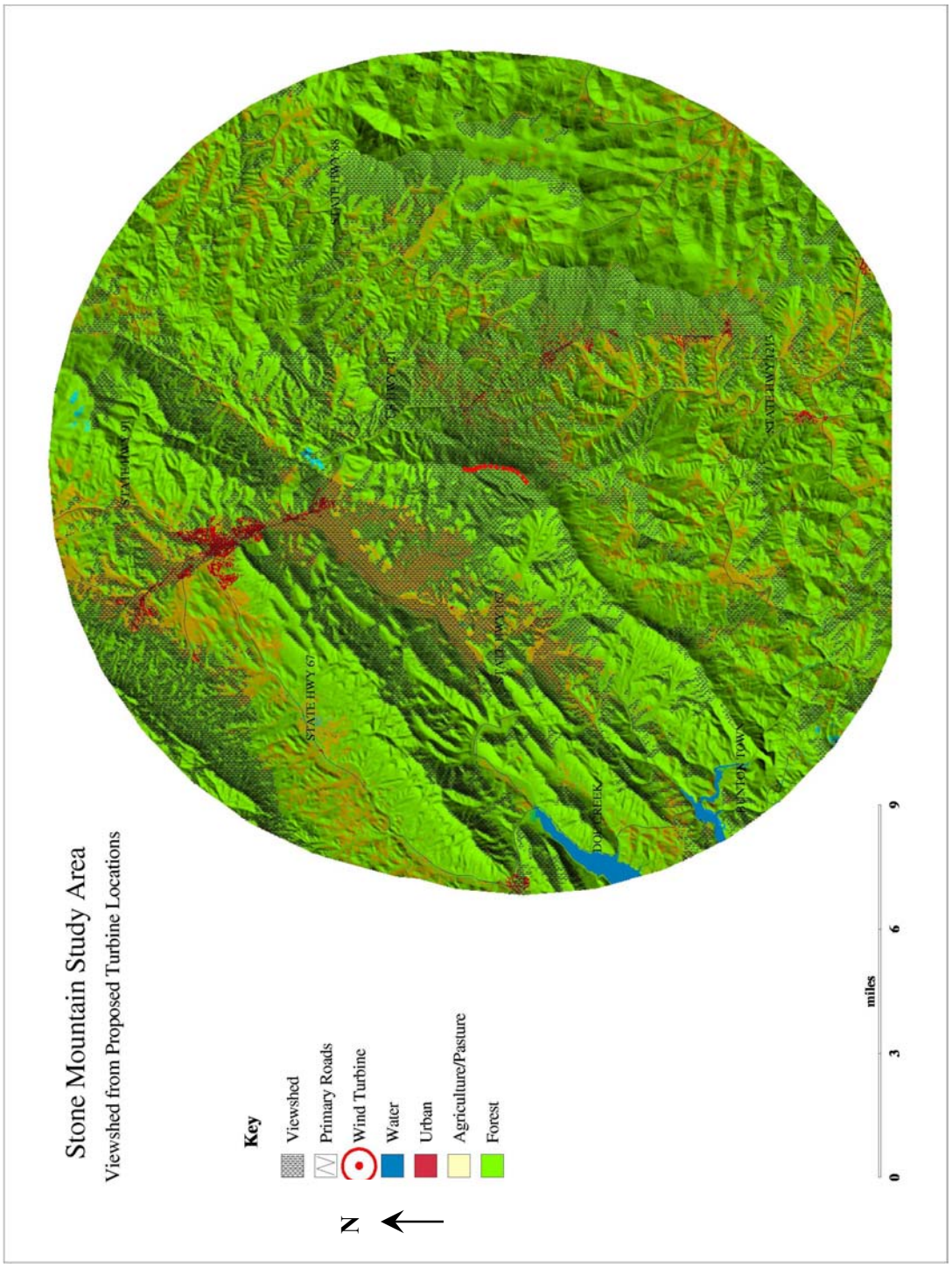


Figure 4-3. Map of area surrounding the Stone Mountain Windfarm, showing locations within a 10-mile radius of the windfarm from which the turbines would be visible.

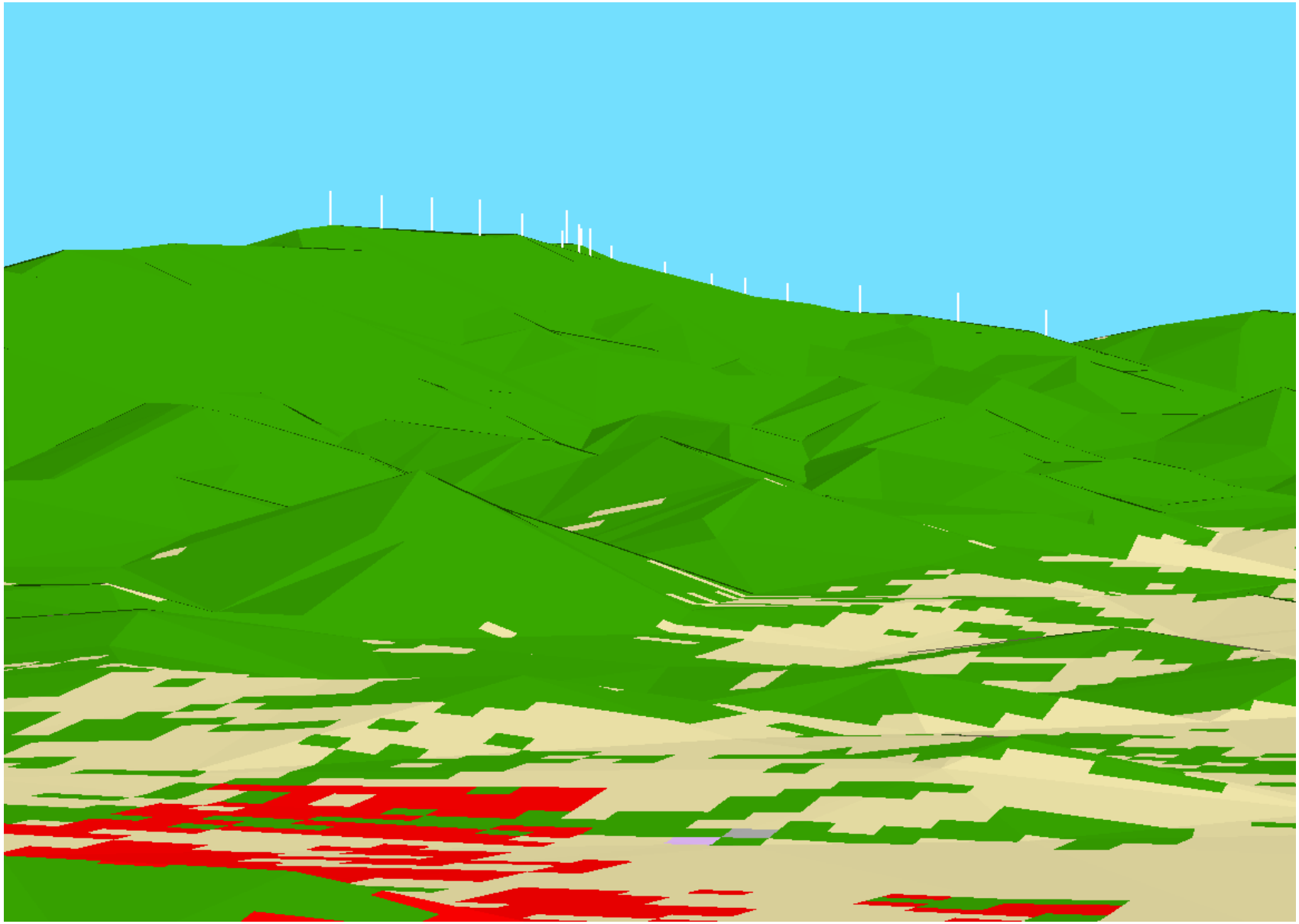


Figure 4-4. Simulated view of the proposed Stone Mountain windfarm looking south from Mountain City, TN

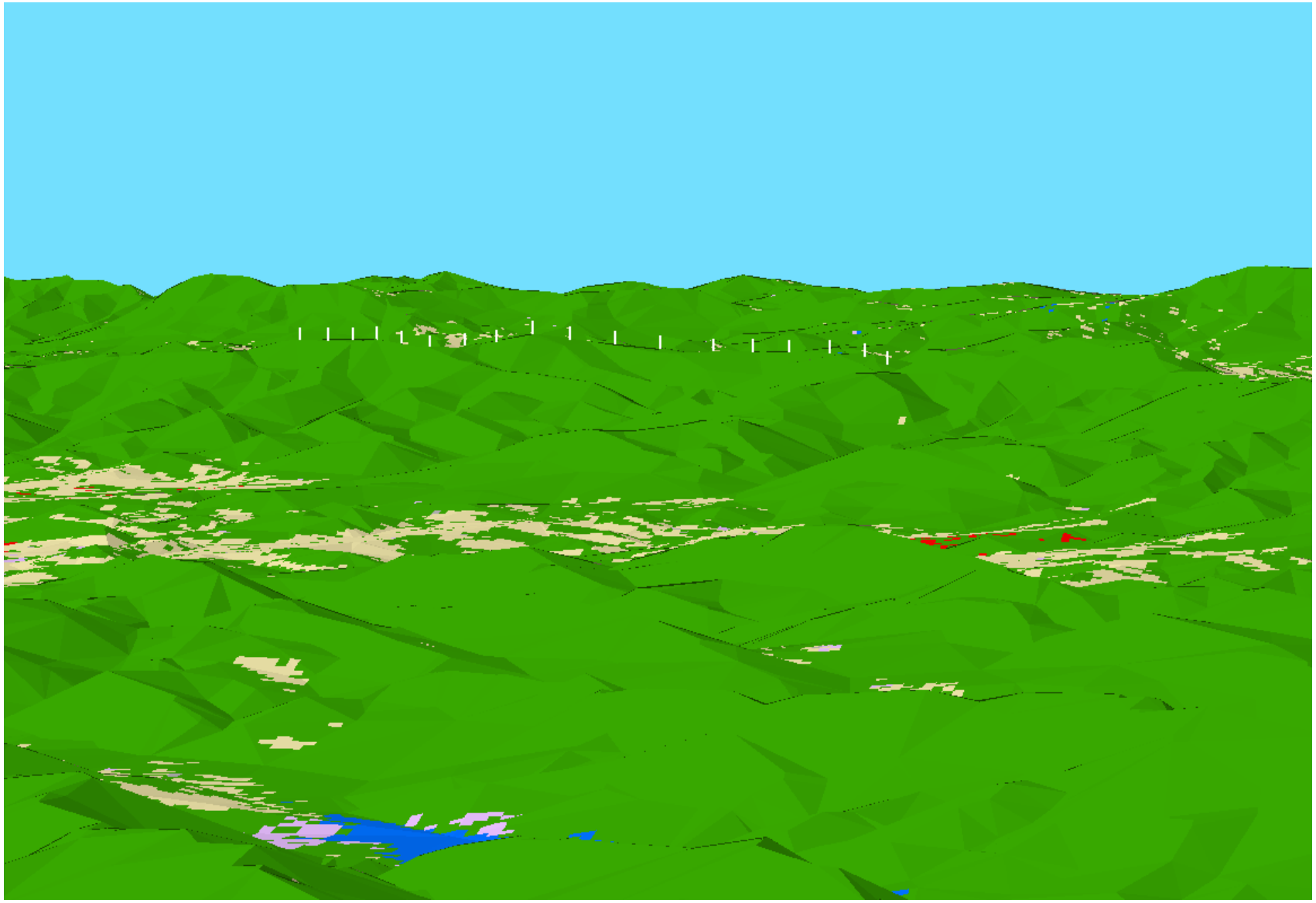


Figure 4-5. Simulated view of the proposed Stone Mountain windfarm looking east from near Vanderventer trail shelter on the Appalachian Trail, Iron Mountain, TN.

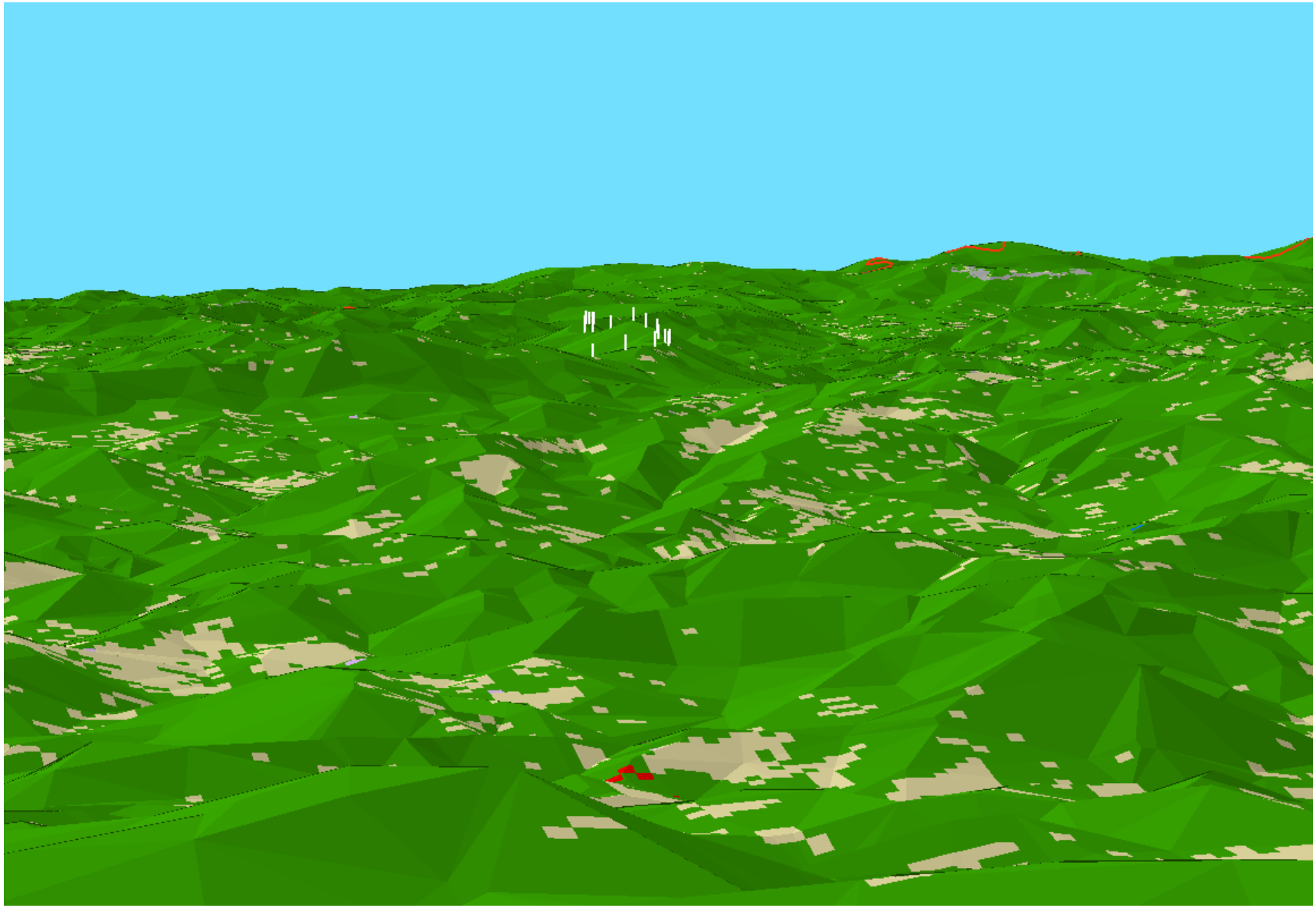


Figure 4-6. Simulated view of the proposed Stone Mountain windfarm looking north east from the top of Beech Mountain, North Carolina.

Option 2 - Shouns Substation Regenesys™ Site
Construction of a plant at this site would replace up to 4 acres of open grass with a roadside industrial facility, which would adversely contrast with the pastoral landscape. Construction activities would be the same as described for Sub-Alternative 1 and would create substantial visual discord and adverse contrast. Most of it would be temporary, lasting a year or more until site cleanup and reclamation were complete.

The mass and form of the completed process building and screen wall would be visually dominant and out of scale with the homes and farmsteads nearby. They would contribute adverse variety and discordant contrast, while reducing scenic attractiveness, integrity, and tranquility in this part of the valley. The screen wall would hide most of the industrial process features that would otherwise increase the adverse impact. The choice of building materials and colors could lessen or worsen the contrast. Metal halide lighting would be provided for yard and parking areas which could increase night-sky brightness, and would increase light seen in the area at night. Shielded "dark sky" fixtures would be used to help minimize the impact. The visual impact of an overhead electrical connection to the adjacent substation would be negligible.

The facility would be seen in the foreground by motorists on Highway 167, a few homes to the north, a couple farmsteads to the south, and above treetops from sparse residential areas southeast of Town Creek. Plant visibility from the southeast would be affected by the management of the adjacent woodland. Comparing the 3 locations, a Regenesys™ facility would have the greatest visual impact at this site.

Option 3 - Mountain City Industrial Complex Regenesys™ Site
This site is a transition area with residential and light industrial facilities to the north and east, along with residential and farmsteads to the south and southeast. Construction of a plant at this location would replace up to 4 acres of corn field with an industrial facility, which would moderately contrast with the surrounding landscape. Construction activities would be the same as for Sub-Alternative 2 but would be somewhat less visible from the highway.

The mass and form of the process building and screen wall would be similar to the textile plant further east, but would be visually dominant and out of scale with the homes and farmsteads nearby. They would contribute adverse variety and discordant contrast, while reducing scenic attractiveness, integrity, and tranquility in this part of the valley. The screen wall would hide most of the industrial process features that would otherwise increase the adverse impact. The choice of building materials and colors could lessen or worsen the contrast. Metal halide lighting would be provided for yard and parking areas which could increase night-sky brightness, and would increase light seen in the area at night. Shielded "dark sky" fixtures would be used to help minimize the impact. An overhead electrical connection from the plant to the adjacent substation would have little if any visual impact.

The facility would be visible in the foreground from a few homes to the north, a couple farmsteads to the south, and above treetops from sparse residential areas southeast of Roan Creek. Motorists on Highway 167 would see the facility above and through the trees along Town Creek. Plant visibility over time would be affected by the management of surrounding woodlands. Comparing the 3 locations, a Regenesys™ facility this site would have somewhat less impact than at Option 2 but substantially more than at Option 1.

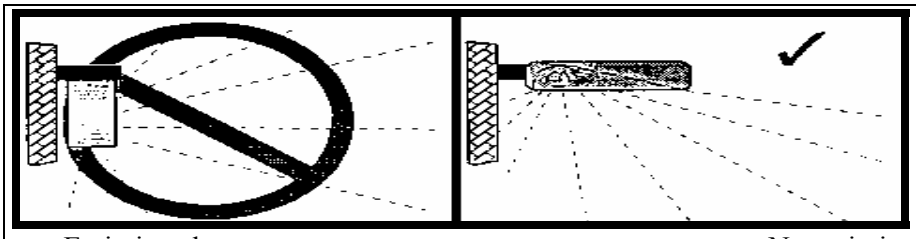
Alternative 3 - No Action

If the wind turbines, related facilities, and energy storage plant were not built there would be no visual consequences at any of the sites. Visual impacts could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

Mitigation

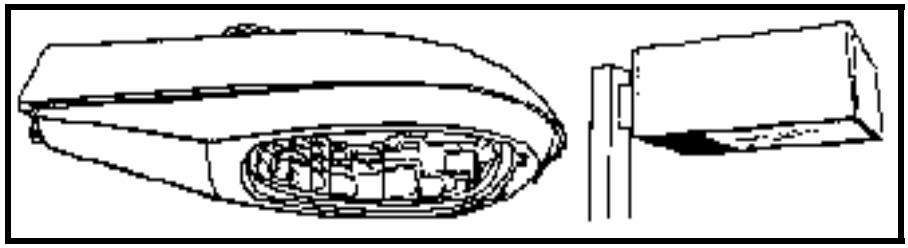
In order to reduce the night-time visual impact at either windfarm, TVA would use the minimum level of lighting on the wind turbines that is consistent with FAA regulations and U.S. Fish and Wildlife Service guidelines on communication towers. TVA would also use the minimum lighting needed for security and operation of the ridge-top substation.

Shielded "dark sky" lighting would be used at the Regenesys™ plant to help minimize increased night-sky brightness and additional light seen across the landscape at night. Shielded lighting would effectively reduce the number of waste light lumens by at least 35%. All lights, including pole and structure-mounted floodlights, would be fully shielded or have internal low-glare optics such that no light is emitted from the fixture at angles above the horizontal. Upward light transmission would be eliminated with properly shielded fixtures as shown below.

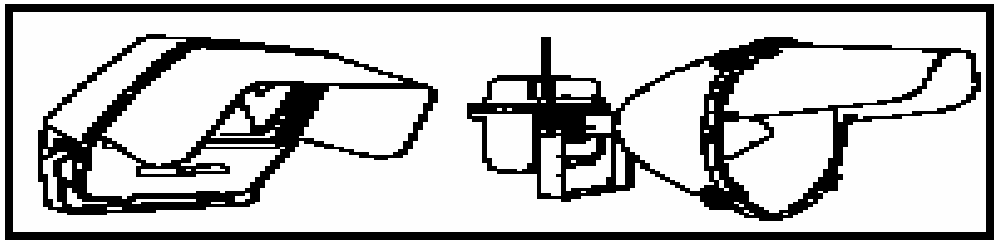


Emission above the horizontal

No emission above the horizontal



Fixtures with Low-Glare Optics



Shielded Floodlights

Source: International Dark-Sky Association and the Illuminating Engineering Society of North America

Figure 4-7. Shielded "Dark sky" lighting techniques

4.13 Noise

Impacts From Construction

The noise produced by the construction of the windfarm and Regenesys™ facility would be similar at any of the proposed sites, and would be typical of a light industrial construction project. Road construction and foundation excavation for the windfarm would likely require a bulldozer, rock drill, backhoe, and excavator. Excavation for the wind turbine foundations may require blasting. Site preparation for the Regenesys™ facility would require a grader, pan scraper, backhoe, excavator and a roller. Wind turbine erection and steel erection for the Regenesys™ facility would require the use of cranes, fork lift, compressor and/or welding machines. Table 4-1 shows expected noise levels for construction equipment at 50 feet from the source. Since noise generally decreases by 6 dB per doubling of distance from the source, the construction noise would be considerably less further from the site. Construction would only occur during daylight hours and is expected to last less than one year. Site-specific noise impacts are discussed below.

Alternative 1 - Buffalo Mountain Windfarm Expansion

Windfarm Expansion

There are no sensitive receptors near the Buffalo Mountain windfarm site. Construction noise would not cause any adverse impacts off-site. If blasting is necessary, it may result in a temporary intermittent increase in noise, but will not cause an adverse impact. Occasional blasting presently occurs during mining operations in the surrounding area.

Table 4-1. Construction Equipment Noise Levels.

Type of Equipment	Noise at 50 feet (dBA)
Rock drill	98
Bulldozer	80
Grader	85
Pan scraper	88
Backhoe	85
Roller	76
Crane	82
Compressor	81
Welding machine	80
Fork lift	78

Noise from Construction Equipment and Operation, Building Equipment, and Home Appliances, U.S. EPA, NTID300.1, 1971 (EPA, 1971).

Option 1 - Braden Field Regenesys™ Site

The nearest residence is approximately 600 feet from the proposed Regenesys™ site. Noise from construction equipment would be up to 66 dBA 600 feet from the source. Assuming construction activities occurred for 9 hours a day, this would result in a DNL of approximately 62 dBA as well as a $Leq_{(24)}$ of 62 dBA. This noise would not exceed EPA's guideline of $Leq_{(24)}$ less than or equal to 70 to protect from hearing loss. Studies have shown that only about 9% of people are highly annoyed by noise at this level (FICON, 1992). Since residential structures have usual noise reductions levels of about 20 dBA, the noise is not expected to interfere with speech indoors. Since construction will be limited to daylight hours, construction noise will not interfere with sleep. Long-term exposure to noise at this outdoor level could cause adverse impacts, but short-term exposure to this level during temporary construction activities would not have a significant adverse impact at this site.

Option 2 – Coal Creek Regenesys™ Site
The nearest residence is approximately 300 feet from the proposed Regenesys™ site. Noise from construction equipment would be up to 72 dBA 300 feet from the source. Assuming construction activities occurred for 9 hours a day, this would result in a DNL of approximately 68 dBA as well as a $Leq_{(24)}$ of 68 dBA. This noise would not exceed EPA's guideline of $Leq_{(24)}$ less than or equal to 70 to protect from hearing loss. Studies have shown that approximately 18% of people are highly annoyed by noise at this level (FICON, 1992). Since residential structures have usual noise reductions levels of about 20 dBA, the noise is not expected to interfere with speech indoors. Since construction will be limited to daylight hours, construction noise will not interfere with sleep.

This site is also approximately 150 feet from two businesses. Noise from construction equipment would be up to 78 dBA 150 feet from the source. Assuming construction activities occurred for 9 hours a day, this would result in a DNL of approximately 74 dBA as well as a $Leq_{(24)}$ of 74 dBA. This noise would exceed EPA's guideline of $Leq_{(24)}$ less than or equal to 70 to protect from hearing loss, but a DNL of less than 75 dBA is considered by HUD as "normally acceptable" for commercial land use.

Long-term exposure to noise at these outdoor levels could cause adverse impacts, but short-term exposure to these levels during temporary construction activities would not have a significant adverse impact at this site.

Option 3 – Ahler Property Regenesys™ Site
The nearest residence is approximately 300 feet from the proposed Regenesys™ site. Noise from construction equipment would be up to 72 dBA 300 feet from the source. Assuming construction activities occurred for 9 hours a day, this would result in a DNL of approximately 68 dBA as well as a $Leq_{(24)}$ of 68 dBA. This noise would not exceed EPA's guideline of $Leq_{(24)}$ less than or equal to 70 to protect from hearing loss. Studies have shown that approximately 18% of people are highly annoyed by noise at this level (FICON, 1992). Since residential structures have usual noise reductions levels of about 20 dBA, the noise is not expected to interfere with speech indoors. Since construction will be limited to daylight hours, construction noise will not interfere with sleep. Long-term exposure to noise at this outdoor level could cause adverse impacts, but short-term exposure to this level during temporary construction activities would not have a significant adverse impact at this site.

Option 4 – Oliver Springs Substation Regenesys™ Site
The nearest residence is approximately 75 feet from the proposed Regenesys™ site. Noise from construction equipment would be up to 84 dBA 75 feet from the source. Assuming construction activities occurred for 9 hours a day, this would result in a DNL of approximately 80 dBA as well as a $Leq_{(24)}$ of 80 dBA. This noise would exceed EPA's guideline of $Leq_{(24)}$ less than or equal to 70 to protect from hearing loss. Studies have shown that approximately 54% of people are highly annoyed by noise at this level (FICON, 1992). Even with the typical building noise reduction of about 20 dBA, some indoor speech interference would be expected. Since construction will be limited to daylight hours, construction noise will not interfere with sleep. Construction noise at this site would cause a temporary adverse impact. However, because this exposure would be short-term, no significant adverse impact is expected from the construction activities at the site.

Alternative 2 - Stone Mountain Windfarm

Windfarm
The nearest residence to the proposed Stone Mountain site is approximately one-half mile away. At that distance, construction noise is expected to be up to 64 dBA. Assuming construction activities occurred for 9 hours a day, this would result in a DNL of up to 60 dBA as well as a $Leq_{(24)}$ up to 60 dBA. This noise would not exceed EPA's guideline of $Leq_{(24)}$ less than or equal to 70 to protect from hearing loss. Studies have shown that only about 7% of people are highly annoyed by noise at this level (FICON, 1992). Since residential structures have usual noise reductions levels of about 20 dBA, the noise is not expected to interfere with speech indoors. Since construction will be limited to daylight hours, construction noise will not interfere with sleep. Additionally, blasting may be necessary. Construction noise would result in a temporary intermittent increase in noise, but would not cause an adverse impact. Nearby residences would be notified in advance of any blasting.

Option 1 - Johnson County Industrial Park Regenesys™ Site
The nearest residence is approximately 450 feet from the proposed Regenesys™ site. Noise from construction equipment would be up to 69 dBA 450 feet from the source. Assuming construction activities occurred for 9 hours a day, this would result in a DNL of approximately 65 dBA as well as a $Leq_{(24)}$ of 65 dBA. This noise would not exceed EPA's guideline of $Leq_{(24)}$ less than or equal to 70 to protect from hearing loss. Studies have shown that only about 12% of people are highly annoyed by noise at this level (FICON, 1992). Since residential structures have usual noise reductions levels of about 20 dBA, the noise is not expected to interfere with speech indoors. Since construction will be limited to daylight hours, construction noise will not interfere with sleep. Long-term exposure to noise at this outdoor level could cause adverse impacts, but short-term exposure to this level during temporary construction activities would not have a significant adverse impact at this site.

Option 2 - Shouns Substation Regenesys™ Site
The nearest residence is approximately 150 feet from the proposed Regenesys™ site. Noise from construction equipment would be up to 78 dBA 150 feet from the source. Assuming construction activities occurred for 9 hours a day, this would result in a DNL of approximately 74 dBA as well as a $Leq_{(24)}$ of 74 dBA. This noise would exceed EPA's guideline of $Leq_{(24)}$ less than or equal to 70 to protect from hearing loss. Studies have shown that approximately 33% of people are highly annoyed by noise at this level (FICON, 1992). Since residential structures have usual noise reductions levels of about 20 dBA, the noise is not expected to interfere with speech indoors. Since construction will be limited to daylight hours, construction noise will not interfere with sleep. Construction noise at this site would likely cause a temporary adverse impact.

Option 3 - Mountain City Industrial Complex Regenesys™ Site
The noise impacts at this site would be very similar to those at the nearby Shouns Substation site.

Alternative 3 - No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Therefore, no new project-related noise impacts would occur. Noise impacts could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

Mitigation

If blasting is used during construction of the Stone Mountain windfarm, nearby residences would be notified in advance.

Impacts From Operation and Maintenance

Wind Turbine Noise
Each proposed wind turbine would generate approximately 100 to 104 dBA each depending on the actual model selected. There would be 13 to 16 new turbines spread out over two miles of ridge top approximately 800 to 1000 feet apart. The noise from one turbine would be only 45 dBA 800 feet away. When adding multiple noise sources with more than 10 dB difference in the levels, the result is equal to the noise from the louder source. So for a listener at the base of one turbine, the noise from the next closest turbine would be indistinguishable. Therefore, the noise from fourteen turbines spaced 800 to 1000 feet apart is no greater than the noise from a single turbine, though fourteen turbines would impact a larger area than one turbine. Since the numbers and types of turbines which would be used are the same for both sites, so operating noise generated would be similar at either location.

Regenesys™ Facility Noise
The Regenesys™ facility would have few exterior noise sources: a two-fan cooling tower, a transformer, and four stacks of two direct current (DC) smoothing reactors. Noise from the cooling tower would be reduced by installing an acoustic enclosure around the tower. This acoustic enclosure would be open at the bottom with an offset secondary barrier and open top to handle air flow. Inside surfaces would have noise-absorbing material and remaining noise would be directed upward. This is expected to lower emitted noise by 5 to 8 dBA. The expected noise levels of these sources are given in Table 4-2.

Plant operating hours are also important in assessing the impacts of plant noise. Typical summer operating hours would be noon to 8 p.m. and typical winter hours would be 5 a.m. to 10 a.m. for peaking power. As a backup power source, operating hours would be non-routine and unpredictable. This facility also emits an equivalent noise level during the recharging cycle that would normally begin around 11 p.m. and could last up to 8 hours. Noise between 10 p.m. and 7 a.m. is generally considered more annoying than noise during the day due to the potential for sleep disruption. This plant would likely operate during these sensitive hours.

Table 4-2. Sound Power Levels of Exterior Operating Systems.

Exterior Noise Source	Quantity	Sound Power Level of Each Source (dBA)	Total Sound Power (dBA)	Total Sound Power with 8 dBA Reduction due to Enclosure (dBA)
18.5 kW cooling tower fan	2	99	102	94
17.75 MVA transformer	1	88 (add 5 dBA for cooling fans)	93	93
DC smoothing reactors	8	72	81	81

Electric Power Plant Environmental Noise Guide, 2nd edition, Edison Electric Institute, Washington, D.C., 1984. (EEI, 1984).

Alternative 1 - Buffalo Mountain Windfarm Expansion

Windfarm Expansion
There are already three wind turbines operating at this site. The noise from the proposed additional wind turbines would be similar to the noise from the existing turbines. There are no sensitive receptors in the area. If a wind turbine emitted 104 dBA, the noise 800 feet from the source would be only 45. Even if the turbines operated 24 hours a day, the DNL at 800 feet from the turbine would be 51 dBA. This level is below the EPA's guideline for the nearest residence, even though there are no residences in the area. Therefore, there will be no adverse impact on the noise environment at this location.

Option 1 - Braden Field Regenesys™ Site
The nearest residence is approximately 600 feet from the proposed Regenesys™ site. Noise from operation of the cooling tower is estimated to be approximately 44 dBA 600 feet from the source. This includes 6 dBA for the reflection from the electrolyte storage tank and a reduction of 8 dBA for the acoustic enclosure. This noise is not expected to be heard over background noise during the day, though it would be heard over background noise at night. The DNL at the nearest residence would vary depending on the hours of operation, but it is expected to be about 51 dBA. This does not exceed EPA's guideline of 55 dBA and is not more than a 3 dBA increase (as per the FICON recommendation) from the estimated existing DNL of 50 dBA. Therefore, there will be no adverse impact on the noise environment at this location.

Option 2 – Coal Creek Regenesys™ Site
The nearest residence is approximately 300 feet from the proposed Regenesys™ site. Noise from operation of the cooling tower is estimated to be approximately 50 dBA 300 feet from the source. This includes 6 dBA for the reflection from the electrolyte storage tank and a reduction of 8 dBA due to the acoustic enclosure. This noise is not expected to be heard over background noise during the day, though it would be heard over background noise at night. The DNL at the nearest residence would vary depending on the hours of operation, but it is expected to be about 56 dBA. This exceeds EPA's guideline of 55 dBA and is more than a 3 dBA increase (as per the FICON recommendation) from the estimated existing DNL of 50 dBA.

This proposed site is approximately 150 feet from two businesses, a hardware store and a used car lot. Noise from operation of the cooling tower is estimated to be approximately 56 dBA 150 feet from the source. This includes 6 dBA for the reflection from the electrolyte storage tank and a reduction of 8 dBA due to the acoustic enclosure. This noise level would be heard over background noise during the day and night. The DNL at the businesses would vary depending on the hours that the Regenesys™ was operating, but it is expected to be about 62 dBA. This does not exceed HUD's guideline for commercial development, HUD considers a DNL less than 65 dBA to be "clearly acceptable" and a DNL between 65 and 75 dBA to be "normally acceptable" for commercial development. However, it is more than a 3 dBA increase (as per the FICON recommendation) from the estimated existing DNL of 50 dBA.

If this site is selected, further noise assessment would be done to determine if additional mitigation is necessary to minimize noise impacts to an insignificant level. Potential mitigation measures are listed below.

Option 3 –Ahler Property Regenesys™ Site
The nearest residence is approximately 300 feet from the proposed Regenesys™ site. Noise from operation of the cooling tower is estimated to be approximately 50 dBA 300 feet from the source. This includes 6 dBA for the reflection from the electrolyte storage tank and a reduction of 8 dBA due to the acoustic enclosure. This noise level is expected to be heard over background noise at night, but not during

the day. The DNL at the nearest residence would vary depending on the hours of operation, but it is expected to be about 56 dBA. This exceeds EPA's guideline of 55 dBA and is more than a 3 dBA increase (as per the FICON recommendation) from the estimated existing DNL of 50 dBA. If this site is selected, further noise assessment would be done to determine if additional mitigation is necessary to minimize noise impacts to an insignificant level. Potential mitigation measures are listed below.

Option 4 –Oliver Springs Substation Regenesys™ Site
The nearest residence is approximately 75 feet from the proposed Regenesys™ site. Noise from operation of the cooling tower is estimated to be approximately 62 dBA 75 feet from the source. This includes 6 dBA for the reflection from the electrolyte storage tank and a reduction of 8 dBA due to the acoustic enclosure. This noise level is expected to be heard over background noise during the day and night. The DNL at the nearest residence would vary depending on the hours of operation, but it is expected to be about 68 dBA. This is well above EPA's guideline of 55 dBA and is considerably more than a 3 dBA increase (as per the FICON recommendation) from the estimated existing DNL of 50 dBA. Therefore, there would be an adverse impact on the noise environment at this location. Further studies would be required to determine whether this impact can be successfully mitigated.

Alternative 2 - Stone Mountain Windfarm

Windfarm
The nearest residence to the proposed Stone Mountain site is approximately one-half mile away. If a wind turbine emitted 104 dBA, the noise 800 feet from the source would be only 45 dBA. Even if the turbines operated 24 hours a day, the DNL at 800 feet from the turbine would be approximately 51 dBA. This level is below the EPA's guideline for the nearest residence, even though the nearest residence is much further away. At one-half mile from the turbines, the noise would be 35 dBA which would only be heard above background noise at night. The DNL one-half mile from the turbine would be approximately 42 dBA, well below EPA's guideline for the nearest residence. Therefore, there would be no adverse impact on the noise environment at this location.

Option 1 -Johnson County Industrial Park Regenesys™ Site
The nearest residence is approximately 450 feet from the proposed Regenesys™ site. Noise from operation of the cooling tower would be approximately 46 dBA 450 feet from the source. This includes 6 dBA for the reflection from the electrolyte storage tank and a reduction of 8 dBA due to the acoustic enclosure. This noise level is expected to be heard over background noise during the day and night. The DNL at the nearest residence would vary depending on the hours of operation, but it is expected to be about 52 dBA. This does not exceed EPA's guideline of 55 dBA, though it is considerably more than a 3 dBA increase from the estimated existing DNL of 40 dBA. If this site is selected, further noise assessment would be done to determine if additional mitigation is necessary to minimize noise impacts to an insignificant level. Potential mitigation measures are listed below.

Option 2 - Shouns Substation Regenesys™ Site
The nearest residence is approximately 150 feet from the proposed Regenesys™ site. Noise from operation of the cooling tower would be approximately 56 dBA 150 feet from the source. This includes 6 dBA for the reflection from the electrolyte storage tank and a reduction of 8 dBA due to the acoustic enclosure. This noise level is expected to be heard over background noise during the day and night. The DNL at the nearest residence would vary depending on the hours of operation, but it is expected to be about 62 dBA. This exceeds EPA's guideline of 55 dBA and is considerably more than a 3 dBA increase from the estimated existing DNL of 42 dBA. If this site is selected, further noise assessment would be done to determine if additional mitigation is possible to minimize noise impacts to an insignificant level. Potential mitigation measures are listed below.

Option 3 - Mountain City Industrial Complex Regenesys™ Site
The nearest residence is approximately 150 feet from the proposed Regenesys™ site. Noise from operation of the cooling tower would be approximately 56 dBA 150 feet from the source. This includes 6 dBA for the reflection from the electrolyte storage tank and a reduction of 8 dBA due to the acoustic enclosure. This noise level is expected to be heard over background noise during the day and night. The DNL at the nearest residence would vary depending on the hours of operation, but it is expected to be about 62 dBA. This exceeds EPA's guideline of 55 dBA and is more than a 3 dBA increase from the estimated existing DNL of 42 dBA. If this site is selected, further noise assessment would be done to determine if additional mitigation is possible to minimize noise impacts to an insignificant level. Potential mitigation measures are listed below.

Alternative 3 - No Action

Under the No Action Alternative, there would be no changes to the local noise environment in the Buffalo Mountain or Stone Mountain resulting from the operation of the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Noise impacts could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

Mitigation

No noise mitigation would be required for the operation of the wind turbines. Preliminary estimates of the noise produced by operation of the Regenesys™ facility at all but two of the proposed sites exceeds EPA's guideline of DNL of 55 dBA at the nearest receptor and all but one of the proposed sites exceeds the 3 dBA threshold increase over the estimated existing DNL. Actual noise will depend on the placement of the cooling towers at the site and the precise distance to the nearest residence. If a site other than Braden Field is selected, further noise analysis will be done after specific site plans are available to determine if additional mitigation is necessary. Noise levels at Shouns Substation, Mountain City Industrial Complex and Oliver Springs Substation would need further mitigation to minimize noise impacts to an insignificant level. Potential mitigation measures include changes in the plant orientation relative to nearby noise receptors, installation of acoustic enclosures, and installation of noise-absorbing materials.

4.14 Solid and Hazardous Waste Management

The amounts of solid and hazardous wastes produced under Alternative 1 and Alternative 2 are expected to be similar, as are the procedures for handling these wastes. The discussion of these two alternatives is therefore combined in this section.

4.14.1 Solid Waste

Alternative 1- Buffalo Mountain Windfarm Expansion

Windfarm Expansion
Solid waste produced during windfarm construction would consist mostly of packing materials. TVA will recycle as much of this material as possible. Material that cannot be recycled would be deposited at one of the nearby landfills described below. There would no discernible solid waste produced at the windfarm during operation.

Regenesys™ Facility
The analysis of potential impacts associated with the proposed construction and operation of the Regenesys™ facility was based on the following assumptions:

- Approximately four pounds of construction debris would be generated for each square foot of floor area for new structures (TVA, 2001).
- The approximate rate of solid waste generation per person would be 3.0 lb per day for every calendar day (TVA, 2001).
- Construction debris would be deposited in the landfill approximately 260 days during the 11-month construction period.
- Volume of a typical transport vehicle used in conjunction with transfer facilities is 100 cubic yards (Tchobanoglous, 1993).
- Specific weight of collected solid waste is 1,000 lbs per cubic yard (TVA, 2001).

Approximately 91 tons of construction debris would be produced during construction of the facility. Based on 260 days of waste hauling in the 11-month construction period, approximately 0.4 tons of construction debris would be disposed of daily. Approximately 45 tons of solid waste would be generated by construction personnel and dependents during the construction period or approximately 0.2 tons per day. This material would be deposited in the Chestnut Ridge Landfill. This would be an insignificant increase of 0.03 percent in the current daily deposition rate. The total waste generated by construction activities would be about 136 tons during the 11-month period. This volume of solid waste would occupy less than 0.001 percent of the remaining capacity of Chestnut Ridge Landfill and would therefore be an insignificant impact. In order to further reduce waste disposal impacts, TVA will recycle as much material as possible.

The solid waste produced by an operating Regenesys™ facility consists only of waste generated by personnel stationed at the site. An estimated staff of four people will be required to operate the facility. The amount of waste produced by this small group would be approximately two tons per year and would therefore cause no significant impact.

Alternative 2 - Stone Mountain Windfarm

Windfarm
The impacts during construction and operation of the windfarm in the Stone Mountain would be essentially the same as those described under Alternative 1.

Regenesys™ Facility
The solid waste generation rate would be the same as for a Buffalo Mountain area facility. Solid waste would be temporarily stored in the Johnson County Solid Waste Transfer Station and then transported to the Iris Glenn Landfill in Johnson City, Tennessee. At 1,000 pounds per cubic yard of solid waste, the additional 0.6 tons of solid waste produced per day during the construction period would require 1.2 cubic yards of storage area. This equates to less than 2 percent of a typical solid waste transfer trailer. The total tonnage produced during construction would occupy less than 0.002 percent of the remaining capacity in Iris Glen Landfill. Thus, the impacts due to construction would be extremely low. In order to further reduce waste disposal impacts, TVA will recycle as much material as possible.

Alternative 3 – No Action

Under the No Action alternative, no solid waste would be produced by the construction and operation of the windfarm and Regenesys™ facility. Solid waste could be produced from the generation of an alternative source of power. The amount of solid waste that would be produced is unknown at this time.

4.14.2 Hazardous Materials and Waste

Alternative 1- Buffalo Mountain Windfarm Expansion *and* Alternative 2 - Stone Mountain Windfarm

Impacts During Construction

Windfarm
Construction of the windfarm could generate small amounts of hazardous waste such as waste paints, solvents, and oils. These wastes would be handled in accordance with all federal, state, and local laws and regulations. The volumes of such wastes are expected to be very small.

Regenesys™ Facility
Any hazardous waste, such as waste paints, solvents, oils, and glues, generated during construction of the facility would be handled in accordance with all federal, state, and local laws and regulations, including RCRA requirements for waste management and Department of Transportation requirements for waste transport. Contractors would be required to maintain all records of waste determinations, including appropriate results of analysis performed, substances and sample locations, date and time of collection, and other pertinent data as required by 40 CFR Part 280, Section 74 and 40 CFR, Part 262, Subpart D. If hazardous wastes were produced, the volumes are expected to be in low and insignificant.

Impacts During Operation and Maintenance

Windfarm
Operation of the windfarm could generate small amounts of hazardous waste such as waste paints, solvents, and oils. These wastes would be handled in accordance with all federal, state, and local laws and regulations. The volumes of such wastes are expected to be very small.

Regenesys™ Facility
The Regenesys™ Energy Storage Facility would store or release electrical energy by means of a reversible electrochemical reaction between two salt solution electrolytes. In the uncharged state, electrolytes used in the Regenesys™ system would be concentrated solutions of sodium bromide and sodium polysulfide. Sodium polysulfide is a caustic substance with a pH of 10. In the charged state, sodium bromide has the potential to release bromine gas when exposed to the atmosphere.

Bromine is classified as an extremely hazardous substance. Sodium bromide would be delivered to the facility in the uncharged state and pose no atmospheric impacts if released.

A detailed description of the Regenesys™ system is given in Appendix A. The two electrolytes would be stored in double-walled tanks. The sodium-bromide tank would hold 475,000 gallons, and the sodium-polysulfide tank, 570,000 gallons. During commissioning of the energy storage facility, solutions would be delivered in tanker trucks and transferred to the electrolyte storage tanks. Following the initial tank filling, electrolyte deliveries would only be required to replenish losses arising from spills, sulfate

removal, and maintenance activities. Electrolyte deliveries are expected to be an infrequent activity following commissioning.

While the Regenesys™ system is charging or discharging, electrolytes would be pumped through a series of supply headers through the modules which are located in the process building. During charging and discharging operations, each electrolyte would be pumped at a rate of approximately 5,000 gpm. The pumps, supply headers, and associated piping would all be located in the process building to ensure any losses are contained within the building. Electrolyte supply piping from storage tanks to the process building would be double piped to contain any electrolyte losses. The contained losses would then be directed back into the tank annulus. Electrolyte-return piping would have secondary containment as well. External piping lengths would be minimized to limit the potential for releases. During normal operation, there would be no releases of either electrolyte to the surrounding environment.

Sodium Bromide- The process is estimated to emit less than three pounds of bromine per year. This is based on continuous operation for 8,760 hours per year. Actual operating time is expected to be considerably less. The maximum concentration of bromine at ground level near the facility under the most severe meteorological conditions is not expected to exceed 3 $\mu g/m^3$ (air quality impacts are discussed in Section 4.2).

For the purpose of short- and long-term occupational exposure, and for emergency planning, air concentration levels have been established for bromine. The short-term (15-minute) exposure level is 2 mg/m^3 and the 8-hour exposure threshold is 0.7 mg/m^3. Expected increase in bromine concentration due to operation of the energy storage facility would be significantly less than occupational thresholds.

During charging and discharging, the electrolyte level in the main storage tanks would change due to a fluid shift in the process. The level of one electrolyte would always increase proportionally to a decrease in level of the other. To balance pressure in tanks and minimize emissions, tanks would be vented to each other via a packed column scrubber, provided in the vent balancing line linking the tanks, to prevent bromine vapor from entering the sodium polysulfide. This is done because a loss of bromine into the polysulfide solution would represent an efficiency loss in the process. In the packed column, bromine vapor would be absorbed by sodium-bromide solution. If pressure in either tank were sufficient enough to open the pressure-relief valve, released air would be directed by continuous-duty fans to two carbon-bed adsorbers arranged in series. The carbon-bed adsorbers are designed to reduce bromine concentration in the exhaust air to 0.04 mg/m^3.

Sodium Polysulfide - Sodium polysulfide solution is less concentrated than sodium bromide solution. It does not emit vapors that pose an inhalation risk. Under normal operating conditions, the electrolytes would cause no impact to the environment.

The process building would be designed so that electrolyte releases would be conveyed to a containment sump located in the ground floor. In the unlikely event that sodium bromide was released, it would flow to the sump where it would be pumped into a chemical effluent tank and neutralized to prevent the evolution of bromine. Once in the tank, the electrolyte would not be returned to the system for reuse and become a waste product.

An aqueous waste with a pH less than or equal to 2, or greater than or equal to 12.5, is considered hazardous waste due to its corrosiveness and assigned an EPA hazardous waste number of D002. Sodium polysulfide has a pH of 10. Small quantities of this electrolyte could occasionally be released through a leak or spill inside the process building and would accumulate in the chemical effluent tank. At most, the facility would likely be a small quantity hazardous-waste generator that would generate less than 1,000 kg

(2,200 lb) of hazardous waste per month, and accumulate less than 6,000 kg (13,228 lb) in 180 days. More likely, the amount of hazardous waste generated would be well below the 100 kilogram monthly maximum for conditionally exempt small-quantity generators. Under normal operation the chemical effluent tank would remain empty.

Storage and disposal would be accomplished in accordance with TDEC's hazardous waste regulations.

Alternative 3 – No Action

Under the No Action alternative, no hazardous materials or waste would be produced by the construction and operation of the windfarm and Regenesys™ facility. Such material could be produced from the generation of an alternative source of power. The amount of this material that would be produced is unknown at this time.

4.15 Land Use

Alternative 1 - Buffalo Mountain Windfarm Expansion

Windfarm Expansion
The windfarm expansion would change the land use on a portion of the site to industrial. This land use would be compatible with adjacent land uses. No zoning regulations apply to the site, and no prime farmland would be affected. Impacts of the windfarm expansion on land use would be insignificant.

Option 1 – Braden Field Regenesys™ Site
The construction of the Regenesys™ facility at this site would change the land use agricultural to industrial. The acreage affected is relatively small, and this change would be unlikely to promote industrial development on adjacent lands. No zoning regulations apply to the site. A portion of the site which is prime farmland would be converted to non-agricultural use, essentially precluding farming in the foreseeable future. The Farmland Protection Policy Act (FPPA) of 1981 requires federal agencies to evaluate land use prior to permanently converting an area to a non-agricultural land use. The FPPA requires federal agencies considering such a conversion to complete Form AD 1006, "Farmland Conversion Impact Rating" for areas larger than a certain threshold. The Braden Field site does not meet this threshold requirement, and the impacts on prime farmland, as well as other land uses, would be insignificant.

Option 2 – Coal Creek Regenesys™ Site
Construction of the Regenesys™ facility on this site would result in a change of land use. Commercial areas adjoin the site, and the change to industrial use would be compatible with adjacent areas. No zoning regulations apply to the site, and no prime farmland would be affected. Overall land use impacts would be insignificant.

Option 2 – Ahlers Property Regenesys™ Site
Construction of the Regenesys™ facility on the Ahlers site would result in a change of land use from agricultural to industrial. A portion of the adjoining land is commercial/industrial, and impacts on area land uses would be insignificant. No zoning regulations apply to the site. The portion of the site that is prime farmland would be converted to non-agricultural use; because of the small area that would be converted, impacts on prime farmland would be insignificant.

Option 2 – Oliver Springs Regenesys™ Site
The present forestry land use on this site would be changed to industrial if it is selected for construction of the Regenesys™ facility. This land use would be compatible with the railroad tracks and substation north of the site. Because of the relatively small acreage involved and wooded buffers in the area, the effect on nearby rural residential areas would be insignificant. Prime farmlands would not be impacted.

Alternative 2 – Stone Mountain Windfarm

Stone Mountain Windfarm
Construction of the windfarm on Stone Mountain would change the site's land use from forest management to industrial. Other portions of Stone Mountain are presently being converted from forest management land use to low to moderate density residential. The windfarm would contribute to this shift away from forest management, but with overall insignificant impacts to land use. No zoning regulations apply to the site, and no prime farmland would be affected. As discussed in Section 3.15 - Land Use, the Mountain Ridge Protection Act of Johnson County would likely not apply to the proposed windfarm.

Option 1 – Johnson County Industrial Park Regenesys™ Site
This site is located in an existing industrial park. No impacts to land use, including to prime farmland, would occur if it was selected as the site for the Regenesys™ facility.

Option 2 – Shouns Substation Regenesys™ Site
The present land use on this site is agricultural, and surrounding land uses are agricultural, residential, and, at the adjacent substation, industrial. A small industrial park occurs a short distance west of the site. A portion of the site is prime farmland, which, if this option is selected, would be converted to non-agricultural uses. Because of the small acreage (less than four acres) involved, the effects on prime farmland would be insignificant, as would effects on other land uses.

Option 3 – Mountain City Industrial Complex Regenesys™ Site
This site is in a small industrial site, and the conversion from agricultural use to industrial use resulting from construction of the Regenesys™ facility would be a compatible land use change. The conversion of the four acres of prime farmland to non-agricultural uses would, because of the small area involved, have insignificant impacts.

4.16 Transportation

Alternative 1- Buffalo Mountain Windfarm Expansion *and* Alternative 2 - Stone Mountain Windfarm

The construction and operation of the windfarm and Regenesys™ facility would generate additional traffic on adjacent roadways. Additional traffic would result primarily from construction forces at the plants. The construction period is temporary and peak work forces would be less than 100 people. Additional construction traffic would be generated from the delivery of construction materials and equipment, including the wind turbine components and crane at the windfarm, and the initial chemical delivery for the Regenesys™ plant. The initial delivery of electrolytes would require approximately 100 tanker truck deliveries. Delivery is expected to occur over a 15 day period at 7 trucks per day.

Construction of these facilities would require travel of unusually heavy, long, and wide transport vehicles and construction equipment. The delivery of these components, equipment, and construction equipment would occur over a route predetermined by the transport company. It is normal engineering practice for

the transport company to define the route and obtain necessary permits for hauling heavy loads, meet all safety standards, and comply with all federal, state, and local ordinances. Load paths and restrictions on bridge and culvert crossings shall also be coordinated with respective governing agencies. TVA would work with the appropriate parties during the permitting process to mitigate any potential circumstances.

The state routes are in fairly good condition for access and would be adequate to support the traffic requirements during both construction and operation of the facility. The additional traffic generated by either alternative would be insignificant. The major state routes would provide a higher capacity level and increases in traffic would be less noticeable on these higher volume roadways. Direct access would be via a constructed or upgraded road to the Regenesys™ facilities. Design considerations would be taken into account in addressing truck turning movements and radii tolerances. Safety would also be considered at any possible railroad crossings. The location of the plant entrance would allow for good sight distance and smooth vehicle traffic flow movement. A 16' wide gravel access road would be constructed along the row of wind turbines to provide access along the windfarm. Access roads to the windfarm sites would be widened, graded, and surfaced as necessary to be capable of supporting the unusually heavy loads required for transport to the site. As a minimum, roadways would be compacted well with crushed stone, graded to drain with a minimum slope of 2-5%, and free of excessive ruts, dips, or bumps. Also, roadways would have widths of 15 feet wide or 20 feet in turns and have a curve radius of 200 feet.

In general, associated with the extra long trailer truck delivery would be some traffic congestion due to slow acceleration, increase in vehicular noise (acceleration, cruising, and braking), vehicular air emissions, dusting, roadway wear, etc. The truck delivery is a single event that will be an inconvenience to the roadway user for a very short period of time. The overall transportation effect will be insignificant to roadway users in the vicinity of the sites.

Commuter traffic generated during operation of the facilities would be minimal due to a small workforce. Operational truck deliveries would include occasional delivery of spare parts for maintenance of the plants, delivery of electrolyte solutions and removal of treated chemical waste at the Regenesys™ facility. After initial tank filling, tanker deliveries of electrolyte solution to the Regenesys™ plant would be required only to replace any losses arising from maintenance activities or small equipment failures. These infrequent deliveries are estimated at one truck per quarter. Sodium sulfate would be produced during this process as a byproduct. This would be packed in bulk containers and one truck load hauled offsite approximately once per quarter. These operational traffic increases to/from the site would be negligible.

New transmission lines would also need to be constructed to interconnect the facilities to the electric grid. This construction work is generally accomplished with small-sized crews that are transitory in the nature of their work and poses no significant impact to the transportation network.

Alternative 3 – No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Therefore, project-related transportation impacts would occur. Transportation impacts could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

4.17 Environmental Justice

Alternative 1 - Buffalo Mountain Windfarm Expansion

As discussed in Chapter 3, Anderson, Morgan, and Roane Counties and the Census Tracts in which the farm and the alternative Regenesys™ sites might be located all have lower minority populations than the state as a whole. Minority populations in the Census Tracts are all lower than the average of the county in which each tract is located. However, in Anderson County, poverty rates are higher in the Census Tracts than in the county as a whole or in the state. Poverty rates in the Census Tracts in Morgan and Roane Counties are lower than in the corresponding county, although the rate for Tract 1104 in Morgan County is higher than the state. Population in and around the impact areas is sparse. Construction of the windfarm would of short duration, and few environmental impacts are expected. Construction of a Regenesys™ facility would take somewhat longer, but would result in few environmental impacts. Therefore, no disproportionate impacts to disadvantaged populations are expected.

Alternative 2 - Stone Mountain Windfarm

As discussed in Chapter 3, Johnson County and the Census Tracts in which the windfarm and the alternative Regenesys™ sites are all located have lower minority populations than the state as a whole. Two of the three Census Tracts have lower minority populations than the county, the exception being Tract 9561, where Option 1 (Johnson County Industrial Park) is located. Poverty rates in the Census Tracts are about the same as in Johnson County, but much higher than in the state. Population in and around the impact areas is sparse. Construction of the windfarm would of short duration, and few environmental impacts are expected. Construction of a Regenesys™ facility would take somewhat longer, but would result in few environmental impacts. Therefore, no disproportionate impacts to disadvantaged populations are expected.

Alternative 3 - No Action

Under the No Action Alternative, the proposed windfarm, Regenesys™ facility and associated utility connections would not be constructed. Therefore, no new project-related environmental justice impacts would occur. Such impacts could potentially occur in the future from the development of replacement sources of energy for TVA. The magnitude of these impacts is unknown at this time.

4.18 Water Supply and Wastewater

Alternative 1 – Buffalo Mountain Windfarm Expansion

Impacts During Construction

Windfarm Expansion
The main demand for water during windfarm construction would be for mixing concrete used for wind turbine foundations. The volume of water required is relatively low and would not impact local water supply systems. Portable toilets would be used on-site during construction to handle employee sanitary sewage, and wastewater from these portables would be trucked off-site to an approved treatment facility. Water demand and wastewater production during windfarm operation would be minimal.

Regenesys™ Facility
Water Supply - To conservatively estimate the maximum impacts during construction, it is assumed that 120 new residents would move to the Oliver Springs area. This number includes a maximum of 75 construction workers and the family members who may relocate with some of the workers. At an average use rate of 147 gallons per person per day (TVA, 2001), this would result in an additional 0.018 mgd (million gallons per day) of potable water use. In addition, water may be needed for dust control during construction for about 115 days of the 11-month construction period. Assuming a rate of 0.0035 mgd of water per acre distributed over 4 acres, 0.014 mgd of water would be needed for dust control. Total maximum water use would be about 0.032 mgd.

The maximum of 0.032 mgd of water used for construction when added to the current usage rate of 0.353 mgd for Oliver Springs, would result in 0.385 mgd needed by the city's supply. This represents about 48 percent of design capacity. The Oliver Springs water supply is capable of meeting this level of demand. Based on the availability of temporary housing in the Oliver Springs area, many workers would likely stay in larger nearby communities such as Oak Ridge, where the additional water demand would be negligible.

Wastewater Treatment - Portable toilets would be used on-site during construction to handle employee sanitary sewage, and wastewater from these portables would be trucked off-site to an approved treatment facility. Hence, this wastewater may go to the Oliver Springs wastewater treatment plant (WWTP) or another system. Regardless of the system that would treat the wastewater, impact to the wastewater treatment system would be insignificant due to the small volume.

The temporary workers and their families would generate about 102 gallons of wastewater per person per day (TVA, 2001), or a total of 0.012 mgd of wastewater. Assuming all of the temporary workers and their families stayed in Oliver Springs, this additional volume equates to a four percent increase in wastewater volume at the Oliver Springs WWTP and is well within the plant's capacity. Based on the availability of temporary lodging in the Oliver Springs area, it is likely that many workers would stay in larger, nearby communities such as Oak Ridge, where the additional wastewater production would be negligible.

Impacts During Operation and Maintenance

Windfarm Expansion
During operation, the expanded windfarm would no impacts on water supply or waste waterwater.

Regenesys™ Facility
Water Supply – About 20 employees would operate the facility during an initial six-month commissioning phase. Their water usage would be about a quarter of the amount used during construction, and have a very minor impact on local water supply systems. After plant commissioning, employee water use would be negligible.

In addition, about 5 gallons per hour of potable water would be used during operation of the Regenesys™ facility for cooling. Facility operation is estimated to be 5000 hours per year, or 14 hours per day resulting in an additional water usage rate of 0.004 mgd. This represents a negligible proportion of the Oliver Springs water system design capacity, and the demand could be easily met.

Wastewater Treatment - Wastewater generation would be greatest during the initial six-month facility commissioning, when there would be about 20 workers. In addition, the facility cooling system would produce about 5 gallons of wastewater per minute. Facility operation is estimated to be 14 hours per day,

resulting in about 0.004 mgd of wastewater. The total amount of wastewater, about 0.01 mgd, would be a negligible increase in volume at the Oliver Springs WWTP. No pre-treatment would be necessary for the facility wastewater.

Alternative 2 – Stone Mountain Windfarm

Impacts During Construction

Windfarm
The main demand for water during windfarm construction would be for mixing concrete used for wind turbine foundations. The volume of water required is relatively low and would not impact local water supply systems. Portable toilets would be used on-site during construction to handle employee sanitary sewage, and wastewater from these portables would be trucked off-site to an approved treatment facility. Water demand and wastewater production during windfarm operation would be minimal.

Regenesys™ Facility
Water Supply – The water usage for construction of a Regenesys™ facility in the Stone Mountain area would be the same as for one in the Buffalo Mountain area. The total maximum water usage would be approximately 0.032 mgd. Assuming this is all supplied by the Mountain City system, the current usage of 0.44 mgd would increase to 0.472 mgd of water, about 21 percent of the system's capacity. The Mountain City water supply system is capable of meeting this level of demand.

Wastewater Treatment – Portable toilets would be used on-site during construction to handle employee sanitary sewage, and wastewater from these portables would be trucked off-site to an approved treatment facility. Hence, this wastewater may go to the Mountain City WWTP or another system. Regardless of the system that would treat the wastewater, impact to the wastewater treatment system would be insignificant due to the small volume.

Residential wastewater generated by workers with families temporarily moving to Mountain City would be treated at the Mountain City WWPT. It is estimated that each of these persons would generate wastewater at a rate of 102 gallons per day (TVA, 2001)**.** This would result in an additional 0.012 mgd of wastewater, which equates to less than one percent of system capacity. This rate conservatively includes wastewater generated by the employees while working at the site. Adding this volume to Mountain City's current baseline daily load of 0.7 mgd, average daily use would become 0.712 mgd. This represents less than 55 percent of plant capacity. The Mountain City WWTP is capable of meeting this level of demand.

Impacts During Operation and Maintenance

Windfarm
During operation, the windfarm would no impacts on water supply or wastewater.

Regenesys™ Facility
Water Supply – About 20 employees would operate the facility during an initial six-month commissioning phase. Their water usage would be about a quarter of the amount used during construction, and have a very minor impact on the Mountain City water supply system. After commissioning, employee water use would be negligible.

In addition, about 5 gallons per hour of potable water would be used during operation of the Regenesys™ facility for cooling. Facility operation is estimated to be 5000 hours per year, or 14 hours per day

resulting in an additional water usage rate of 0.004 mgd. This represents a negligible proportion of the Mountain City water system design capacity, and the demand could be easily met.

Wastewater Treatment – Wastewater generation would be greatest during the initial six-month facility commissioning, when there would be about 20 workers. In addition, the facility cooling system would produce about 5 gallons of wastewater per minute. Facility operation is estimated to be 14 hours per day, resulting in about 0.004 mgd of wastewater. The total amount of wastewater, about 0.01 mgd, would be a negligible increase in volume at the Mountain City WWTP. No pre-treatment would be necessary for the facility wastewater.

Alternative 3 – No Action

Under the No-Action Alternative, the additional demand for water supply or wastewater treatment in the project areas would not occur.