Chapter 4: Alternate Scenarios and Constructability Issues

The purpose of this study was in part to review all available options for future use of the Foothills Parkway right-of-way. These options include completing the construction of the full 72.1-mile roadway as originally planned, constructing one or more of the three remaining sections but not the full route, developing the remaining sections of the corridor to accommodate mass transit movement (traditional rail, monorail or rubber tired transit), halting any future roadway construction on the remaining sections but developing the right-of-way with a system of non-motorized trails, and halting all future construction of any kind within the right-of-way.

These future development options must be reviewed not only in relation to their ability to meet the 1944 vision but also to physical implementation. Matters such as the environmental impacts, cost of construction and cost effectiveness of the various options are also of prime importance.

4.1 Alternate Scenarios

The following paragraphs describe each of the options listed above. Also included is a discussion of each option relative to environmental impact, cost estimate/cost effectiveness, traffic analysis, viewshed analysis, Gateway area impact and the level of visitor experience/relationship to the mandate.

4.1.1 Build Section B Roadway

Description

As proposed, Section B is 14.1 miles in length, extending from an interchange with U.S. 321 at the terminus of the previously completed Section A at Cosby in Cocke County to an interchange with S.R. 416 in Pittman Center. Much of the alignment is along the southerly slope of Webb Mountain, thus providing a significant number of viewsheds into the park. The 1968 *Foothills Parkway Master Plan* also includes a 1.2-mile access road to the summit of Webb Mountain near Cosby, from which a spectacular 360 degree view of the area is available.

Under this option, Sections C and D would not be constructed. The Parkway would then consist of a 19.7-mile combination of Sections A and B to the northeast of the Gateway area and a 33.0-mile section to the southwest, a combination of Sections E, F, G and H.

Environmental Impact

Oak Ridge National Laboratory compiled the draft *Foothills Parkway Section 8B Final Environmental Report* in July 1999. This review and report included a public scoping process and provides a detailed description of the

environmental setting and impacts relative to geology and soils, water resources, aquatic ecology, terrestrial resources, meteorology and air quality, socioeconomics, traffic and noise, aesthetics resources and cultural resources. From this report and more recent discussions with representatives of the National Park Service, Tennessee Department of Environment and Conservation (TDEC) and the U.S. Army Corps of Engineers (USACOE), there are significant concerns about the need to cross more than 30 streams, general drainage patterns from the Parkway onto adjacent properties, stream stability and runoff rates, discharge to the Little Pigeon River which is a "National Resource Water," the rugged terrain and resulting steep slopes, possible pyritic rock deposits, a butternut tree grove near the Pittman Center interchange, potential archaeological sites within the right-of-way and cultural heritage of the Emerts Cove area of Pittman Center.

It should be noted that the draft *Final Environmental Report* describes several alternate design/construction scenarios within the section. These include elimination of the S.R. 416 interchange, relocation of this interchange a short distance south to U.S. 321, construction of a tunnel in the area east of S.R. 416 to eliminate extensive cut of a ridgeline, and elimination of the Webb Mountain access road.

Environmental regulators note that the approval process will be especially challenging given the above concerns and that extensive mitigation efforts will be required. It is their collective opinion, however, that given currently available information, the required construction permits can be granted.

Cost Estimate/Cost Effectiveness

The current construction cost estimate for this section is $7.1M per mile. This cost reflects the mountainous terrain and the extraordinary environmental mitigation requirements. The additional cost associated with the Webb Mountain overlook, including the access road, is estimated to be $8.5 million.

Describing the cost effectiveness of this project is difficult in that it is not subject to the typical cost/benefit analysis as the "need" is not based on accommodating a projected traffic volume. Rather, the Parkway is an extension of Great Smoky Mountains National Park and the primary "need" is the desire to provide a quality visitor experience. In fact, a volume of traffic high enough to provide a positive cost/benefit ratio may be counterproductive to a positive visitor experience. It can be said that the cost of construction of this section is moderate in comparison to other build options and alternate usage scenarios.

Traffic Analysis

Traffic analysis (Chapter 3) indicates a projected volume of 4,400 vpd in Year 2030. This is a substantial yet manageable traffic volume, which should not be detrimental to the visitor experience.

Analysis also indicates that the availability of this roadway will have a positive effect on the regional roadway network. Specifically, projected Year 2030 traffic on the section of U.S. 321

between Cosby and Pittman Center is 21,600 vpd with the Parkway in place and 23,800 vpd without the Parkway.

Analysis indicates that Section B of the Parkway has no relationship to traffic on existing Park roads in that traffic volume on Park roads will not change as a result of Section B being built or not built.

Viewshed Analysis

As noted in Chapter 2, there are a substantial number of viewsheds associated with Section B. A total of 22 viewsheds with a total quality value of 85.37 were found to be available. This total is substantially greater than either of the other two incomplete sections. All viewsheds within Section B include the Park as well as acreage outside the Park. If only Park views are considered, the quality value is slightly higher, 86.89.

Gateway Area Impact

As noted, inclusion of Section B in the regional transportation network will reduce projected traffic growth on the parallel section of U.S. 321. In fact, if the Parkway were in place today it might forestall the widening of U.S. 321 to a multilane facility. However, given that the Parkway will not be complete in the near future and is not intended to carry high volumes of traffic, the need to provide additional corridor capacity will persist.

The northeastern terminus of the Parkway including Section A and a portion of Section B is located within Cocke County. Officials there are very supportive of completing Section B and the balance of the Parkway, citing the potential for economic development associated with increased tourism and better connectivity to the region.

The Town of Pittman Center has expressed concern about the impact of the S.R. 416 interchange with respect to additional traffic on roadways within the Town and also on the cultural resources of the Emerts Cove area. As a result, the Town has offered two recommendations for consideration. First is that the Parkway alignment be revised to allow an interchange with U.S. 321 rather than S.R. 416; this was considered as an option in the ORNL environmental review.

More recently, the Town has suggested that the Parkway be combined with U.S. 321 using the existing U.S. 321 alignment but that it retain the access control aspect of the Parkway. This would have the effect of eliminating construction within the Parkway right-of-way, but would require reconstruction of U.S. 321 as a 4-lane facility. The Town is concerned about the potential commercialization of the U.S. 321 corridor and believes that its transformation to an access controlled Parkway will minimize future development. For the purpose of this report, this proposal is referred to as “Section B Alternate” and is reviewed in detail in the following report section.

Level of Visitor Experience/ Relationship to Mandate

The level of visitor experience afforded by Section B is considered very good. The viewshed value is 86.89 Park

only/85.37 total, substantially greater than the other studied sections, and the projected 4,400 vpd traffic volume is not considered a detriment to visitor experience. Construction of Section B is clearly consistent with the Congressional mandate and does much to achieve its stated goals.

4.1.2 Build Section B Alternate Roadway

Description

This alternate as proposed by the Town of Pittman Center and several individuals at the public meetings would eliminate construction within the existing right-of-way of the Foothills Parkway. Rather, it would co-designate the existing parallel section of U.S. 321 as "Foothills Parkway", and the existing roadway would be reconstructed/ enhanced with Parkway features including access control. Detailed analysis and functional planning has not been undertaken for this alternate, however, the following considerations are pertinent:

- Analysis indicates Year 2030 traffic volume in the corridor of in excess of 20,000 vpd. This suggests the need for a multi-lane facility, which is inconsistent with the *Foothills Parkway Master Plan.*
- Being currently designated as a U.S. highway, commercial traffic is permitted. This is inconsistent with a "Parkway" designation, so that the regulation would either have to be waived or commercial traffic prohibited on the route.
- Access control of the Parkway carries with it the need to purchase access rights from all adjacent properties and typically to provide an alternate form of access to them. This is commonly done with parallel frontage roads and outlets via crossroads.
- Co-designation would likely suggest a higher design speed for the "Parkway" and certainly a wider roadway template to accommodate the multiple lanes and frontage roads.

Environmental Impact

No studies are available or have been undertaken to review this matter.

Cost Estimate/Cost Effectiveness

The cost of this option is expected to be substantially higher than construction of Section B as currently planned given the substantially wider roadway template and the significant right-of-way cost including payment for loss of access. The cost is roughly estimated at $10M per mile.

The cost effectiveness of Section B Alternate is obviously not as good as the currently proposed Section B.

Traffic Issues

As previously noted, the projected Year 2030 traffic volume for U.S. 321 without Section B of the Parkway is 23,800 vpd. Extreme operational and safety problems will result unless the roadway is widened and upgraded to accommodate the heavy volume. As is the case with Section B, Section B Alternate has no traffic related relationship to existing Park roads.

Viewshed Analysis
Existing U.S. 321 is located in a valley between Webb Mountain and the uplands within the Park boundary. Consequently, a parkway in this location will not have many viewsheds. Four viewsheds were identified along existing U.S. 321, and they provided a viewshed score of 17.14. Two of these viewsheds were into the Park, and they yielded a score of 7.92. These scores are compared to 85.37 (total) and 86.89 (Park only) for the currently proposed Section B.

Gateway Area Impact
The stated objective of proponents of Section B Alternate is to minimize impact on the Gateway area. The Town of Pittman Center is concerned that construction of the Parkway will encourage development within the Town that is inconsistent with its goals. The Town's expectation is that construction of Section B Alternate will minimize that possibility. Cocke County officials, while preferring Section B, have indicated a willingness to accept Section B Alternate, feeling that it addresses their goal of improved economic development opportunity through better connectivity and increased tourism.

Level of Visitor Experience/ Relationship to Mandate
The visitor experience afforded by Section B Alternate is poor:

- Viewshed analysis indicates a score of 7.92 Park only/17.14 total.
- Traffic analysis indicates a daily traffic volume which requires a multilane, high-speed roadway.

These attributes are inconsistent with the goals of the Congressional mandate.

4.1.3 Build Section C Roadway

Description
Section C is 9.6 miles in length, extending from an interchange in the U.S. 321/S.R. 416 area of Pittman Center to the "Spur" which connects the Parkway to Pigeon Forge and Gatlinburg. It traverses less difficult terrain than the other sections.

Under this option, Sections B and D would not be built. Consequently, the Parkway would consist of three disjointed sections: Section A (5.6 miles) at Cosby, Sections E,F and G (33 miles) connecting U.S. 321 at Wears Valley to U.S. 129 in Blount County, and Section C (9.6 miles). In fact, Section C could function independently as a "bypass" of Gatlinburg's center city given its termini at the Spur and in Pittman Center.

Environmental Impact
No formal environmental review has previously been conducted on Section C. Recent discussions with National Park Service, TDEC and USACOE staff, however, provide a basic knowledge of the area from an environmental perspective and resulted in the following general observations.

- This area is more "built-up" than the other sections. A considerable amount of permanent and visitor housing is located along this section of the corridor.
- There are numerous stream crossings but no compliance studies or records are available.
- As is the case with Section B, runoff from a portion of the Section C will

reach the Little Pigeon River, a "National Resource Water."
- The topography of Section C is similar to the other sections although the terrain is not as steep.
- There may be fewer threatened and endangered species than in other sections given the more "urban" character.
- Impact on cultural resources can be anticipated.

Cost Estimate/Cost Effectiveness
The estimated construction cost of Section C is $5M per mile. Though challenging, this cost per mile is indicative of construction in somewhat better terrain. It should be noted that this cost estimate does not include the interchanges at either end of the section, as these are included in the cost of adjacent sections. Consideration of Section C construction as a stand-alone facility, however, must include appropriate interchange access to S.R. 416/U.S. 321 and the Spur. The estimated construction cost of these interchanges based on current design concepts is $500,000 and $7M respectively.

Traffic Analysis
Constructing Section C irrespective of Sections B or D is rational, since it connects with the existing regional roadway network on both ends, essentially serving as a northeasterly bypass around Gatlinburg much like the existing southwesterly bypass that provides access to the Park from the Spur and was a part of the *Foothills Parkway Master Plan*.

Analysis indicates that Section C, if constructed without B or D, would carry a projected 7,600 vpd in Year 2030. This is a moderate traffic volume in comparison to the roadway capacity but high enough to cause a detrimental effect on recreational visitor experience.

Traffic analysis also indicates a positive effect on the existing regional roadway network. Under this option, the traffic volume on the Spur between the Parkway and Gatlinburg and on the section of U.S. 321 east of downtown Gatlinburg is projected to be 1,500 vpd less in Year 2030 if Section C is constructed. Construction of Section C appears to have no effect on existing Park roads other than the Spur.

Viewshed Analysis
As noted in Chapter 2, there are a total of 10 viewsheds associated with Section C. Seven of these 10 viewsheds include the Park and provide a viewshed quality score of 24.41. Three additional viewsheds of non-Park lands are also available, and when taken into account, provide a total viewshed quality score of 35.40.

Gateway Area Impact
As noted, Section C will serve as a northeasterly bypass around the central city area of Gatlinburg. The Parkway will serve to reduce traffic on both the Spur and U.S. 321 east of downtown. It will provide an alternate route for both local and visitor traffic destined for east Gatlinburg, Pittman Center and points east of Gatlinburg on U.S. 321. Section C terminates at S.R. 416 in the Town of Pittman Center. Should Section C be constructed without Section B, through traffic will impact

S.R. 416 and the Town.

Level of Visitor Experience/ Relationship to Mandate

The viewshed score for Section C, 24.41 Park/ 35.40 total, is considered good but certainly not as good as Section B. This section also traverses a built-up area of Gatlinburg, and several of the viewsheds include a relatively high density of structures (see Table 2) within their boundaries.

Traffic volume is estimated at 7,600 vpd in Year 2030. As noted in Chapter 3, traffic volume in excess of 4,500 is considered increasingly problematic in terms of its effect on visitor experience. Consequently, the projected traffic volume will clearly have a detrimental effect on visitor experience during peak season and on peak days throughout the year.

Construction of Section C is consistent with the Congressional mandate and does much to achieve its stated goals.

4.1.4 Build Section D Roadway

Description

Section D is 9.8 miles in length, extending from an interchange with the Spur which connects the Parkway to Pigeon Forge and Gatlinburg to U.S. 321 in Wears Valley. It traverses the most difficult terrain of the three remaining sections. It follows the steep northerly slope of Cove Mountain for several miles before extending through the ridge in a 1,000 ft. long tunnel near the Spur.

Section D also provides access to Wear Cove, proposed to be the most extensively developed recreation area along the Parkway. Proposed visitor facilities include a staffed orientation station, campground, picnic areas and an amphitheater. Wear Cove also provides direct access to Metcalf Bottoms and the Park.

Under this option, Sections B and C would not be built. Consequently, the Parkway would consist of two sections; Section A (5.6 miles) at Cosby, and Sections D, E, F and G (42.8 miles) connecting the Spur (U.S. 441) to U.S. 129 in Blount County. Combined with Sections E and F, Section D also provides a 25.9-mile direct link from the heart of Sevier County to U.S. 321 in the Walland area of Blount County and thereby with easy access to the regional airport and to Interstate Highways 40 and 75 in the west Knox County/ northeast Loudon County area.

Environmental Impact

Section D presents the greatest known environmental challenges of the three remaining sections. The previously described draft *Final Environmental Impact Statement* and more recent interviews with National Park Service staff and environmental regulators provide the following concerns:

- The alignment crosses the West Prong of the Little Pigeon River at the Spur;
- The roadway may aggravate existing stormwater runoff problems in the Gnatty Branch and Kings Ridge areas;
- Extreme cuts and fills are required;
- There are several caves and

sinkholes located within the right-of-way;
- The caves provide habitat for plant and animal life;
- There is potential impact on cultural resources although no properties within the corridor are listed on the National Register of Historic Places; and
- Twenty-five acres of wetlands near Cove Creek are potentially affected.

Environmental regulators note that the approval process will be especially challenging given the above concerns and that extensive mitigation efforts will be required. It is their collective opinion, however, that required construction permits can be granted based on current knowledge.

Cost Estimate/Cost Effectiveness
The estimated cost of Section D is $10M per mile including the Spur interchange and the tunnel. This represents the highest per mile cost, however, this section is projected to carry the highest ADT of the remaining sections by a wide margin. Development of the proposed Wear Cove recreation area which is accessed from Section D is not included in the above cost estimate.

Traffic Analysis
Constructing Section D exclusive of Sections B or C is rational since it connects with the regional transportation network at both termini and via Sections E and F forms a very important link to Blount County. Given these connections, the Year 2030 traffic volume is projected to be 10,300 vpd, a traffic volume which approaches the capacity of this 2-lane roadway and which is clearly a detriment to visitor experience.
Analysis indicates that construction of Section D has a positive effect on the regional transportation network. The projected traffic volume on the section of U.S. 321 between Wears Valley and Pigeon Forge is 17,100 vpd with Section D in place and 18,100 vpd without Section D. In addition, analysis indicates that Section D will reduce the volume of traffic on Little River Road, an existing Park road, by 6,100 vpd in Year 2030. The projected 3,700 vpd for Year 2030 is actually less than the existing volume on this roadway.

Viewshed Analysis
Section D rises from the floor of Wears Valley and then extends along the steep northerly slope of Cove Mountain for several miles, thus providing panoramic views of Wears Valley and points north but no views into the Park until it exits the tunnel near the Spur. Though these views to the north are picturesque, they do not include the Park and therefore are not considered as meeting the letter of the Congressional mandate.

As noted in Figures 2, 3 and 6 in Chapter 2, Section D provides a significant number of viewsheds. A total of 11 viewsheds were identified and the total viewshed quality score was 39.90. There are three viewsheds east of the tunnel that include the Park, and the viewshed quality value specifically associated with the Park is 11.71.

Gateway Area Impact
Section D in combination with Sections E and F provides a very positive impact

on the Gateway area of Sevier and Blount Counties but is of little value to Cocke County. As noted, inclusion of Section D in the regional transportation network will reduce projected traffic growth on the parallel section of U.S. 321.

One of the primary transportation-related recommendations of a recent visioning process conducted by the Gatlinburg Gateway Foundation was the need for a more direct route from Gatlinburg to the regional airport in Blount County. If constructed, this section of the Foothills Parkway in conjunction with currently proposed improvements to the regional network in Blount County would serve that need.

The Blount County/Walland/Townsend approach to the Park is becoming increasingly important as the S.R. 66/U.S. 441 corridor becomes more congested. Townsend, which bills itself as the "Quiet Side of the Smokies," desires that the Foothills Parkway corridor be in place to accept part of the visitor traffic. Officials there view the Section F/E/D approach to Sevier County as the best means of insulating that area from visitors who do not have a Townsend or Cades Cove destination.

Level of Visitor Experience/ Relationship to Mandate

Analysis indicates a viewshed quality score of 11.71 specifically associated with the Park. This score increases to 39.90 when enhanced by vistas to the north. When combined with Sections E, F, G and H, a 42.8-mile section of the Parkway is made available. Since the eastern terminus is on the Spur between Pigeon Forge and Gatlinburg, the Parkway becomes convenient and easily accessible to the primary visitor population.

Unfortunately, this easy accessibility coupled with location and multiple connections to the regional roadway network results in a projected traffic volume that clearly will be a detriment to quality visitor experience during peak seasons and peak days throughout the year. It may become necessary to implement traffic management techniques to minimize negative impact on visitor experience.

Construction of Section D is consistent with the Congressional mandate in several respects. It affords the visitor opportunities to view the Park as well as providing access to the large Wears Cove recreation complex. Through Wears Cove, direct access to Metcalf Bottoms and the Park is also available. In addition, Section D, coupled with other completed sections to the southwest, will reduce traffic congestion on several sections of the regional transportation network as well as on Little River Road within the Park.

4.1.5 Full Build Roadway

Description

Under this option all three remaining sections, Sections B, C and D, would be constructed. Coupled with previously completed Sections A, G and H and Sections E and F where construction is now in progress, the full 72.1-mile Foothills Parkway would be completed in accordance with the 1944 mandate and the 1968 *Foothills Parkway Master*

Plan. As described in the *Plan*, the Foothills Parkway would parallel the northerly Great Smoky Mountains National Park boundary, extending from I-40 near Cosby in Cocke County, through Sevier County to a terminus at U.S. 129 in the Chilhowee area of Blount County. The Parkway would include seven interchanges, thus providing excellent connections to the regional transportation network while restricting secondary access to preserve the integrity of the Parkway setting. As envisioned by the *Plan*, several recreation areas would also be developed within the right-of-way to further enhance the visitor experience.

Environmental Impact

The proposed Parkway is located in a mountainous area that is known for its diverse natural resources and rich cultural heritage. Developing a roadway in this area presents significant challenges in both physical construction and mitigation of environmental impacts.

These challenges are detailed section by section in the above paragraphs and consequently will not be further discussed here. Based on current information, environmental regulators advise that given close adherence to proper procedures and implementation of strict construction practices and mitigation requirements, permits can be obtained and construction allowed.

Substantial environmental impact assessment remains, so it is still a possibility that conditions may be determined in the future that will render one or more sections impractical to construct.

Cost Estimate/Cost Effectiveness

The total estimated cost of completing Sections B, C and D in accordance with the 1968 *Foothills Parkway Master Plan* is approximately $7.5M per mile. This cost does not include development of visitor recreation areas at Webb Mountain or Wear Cove.

As previously noted, describing the cost effectiveness of this project is difficult in that it is not subject to the typical cost/benefit analysis as justification is not based on accommodating a projected traffic volume. Rather, the Parkway is an extension of Great Smoky Mountains National Park and the primary “need” is the desire to provide a quality visitor experience. In fact, a volume of traffic high enough to provide a positive cost/benefit ratio may be counterproductive to a positive visitor experience.

Traffic Analysis

A detailed traffic analysis of the completed parkway is provided in Chapter 3. Key points include:

- Projected Year 2030 summer weekday traffic volumes on the completed Parkway vary from 4,400 on Section B to 9,500 on Section C to 10,300 on Section D.
- The Parkway will have a significant impact on the regional transportation network, (Chapter 3, Figure 15). It is anticipated that the Parkway will absorb part of the growth in visitor and local traffic, thus lessening the impact on the existing network.
- Sections D, E and F in combination will substantially reduce traffic on Little River Road within the Park.

Viewshed Analysis
A total of 31 viewsheds with a composite quality score of 123.01 specifically associated with the Park were identified along the corridor. When enhanced by non-Park viewsheds, the total increases to 43 and the quality score to 160.67. Chapter 2 provides a more detailed discussion of this subject.

Gateway Area Impact
The impact of Foothills Parkway on the surrounding Gateway area has been described for the individual Sections B, C and D. The "Full Build" option cumulatively incorporates those impacts. In general, the Parkway is expected to have a positive effect on traffic operations of parallel facilities inside and outside the Park.

Townsend, Pigeon Forge and Gatlinburg will all benefit from reduced traffic as the Parkway will provide a more direct route to destinations, thus eliminating the need for circuitous trips through one or more of the cities.

Residents and officials of the Town of Pittman Center, although somewhat supportive of Parkway construction have expressed reservations about potential negative impacts on this community. In particular, there is concern that the Parkway will bring pressure for more intense commercial development, especially along the parallel U.S. 321 corridor. However, it should be realized that with or without the Parkway, commercial development will continue unless local government acts to restrict development through stricter zoning regulations or other land use control measures. An alternate proposal of the Town to designate and improve U.S. 321 itself as the Parkway does not seem to meet the goals of the mandate.

Cocke County officials strongly support completion of the Parkway, especially Section B. They expect a very positive impact in the form of economic development opportunities generated by increases in tourism and improved connectivity to the regional transportation system

Level of Visitor Experience/ Relationship to Mandate
The viewshed analysis described in Chapter 2 indicates that each of the remaining three sections provides views of the Park; a total of 31 viewsheds were identified along the Section B/C/D corridor. These sections of the Parkway also provide 12 non-Park viewsheds. The composite viewshed quality score is 123.01 Park/160.67 total for this composite section. Given that there are a substantial number of quality views of the Park throughout its length, the mandate of providing a facility with views of the Park is met by the Parkway at its proposed location throughout its length, section by section.

The analysis documented in Chapter 3 projects Year 2030 traffic flow on a completed Parkway in the range of 4,400 vpd on Section B on a typical summer day to 9,500 on Section C and 10,300 on Section D. Chapter 3 also notes that volumes exceeding approximately 4,500 vpd have an increasingly detrimental effect on visitor experience. Consequently, it may be necessary to institute some form of traffic management for the Parkway

during higher traffic periods of the year in order to provide a good experience for Parkway users.

4.1.6 Other Roadway Build Options

Since the three remaining sections of the Parkway can be constructed and function independent of the others, there are three additional build options. These are:

- Build Sections B and C but not D;
- Build Sections B and D but not C; or
- Build Sections C and D but not B.

The impacts and effects of these options are readily apparent from the information provided above and therefore will not be further detailed.

4.1.7 Provide Exclusive Mass Transit

Description
There is an array of available and proven technologies that could provide scenic experiences of Great Smoky Mountains for visitors along the Foothills Parkway right-of-way in Sections B, C and D. The alternatives discussed are identical in route length, number of visitor stops and stations and the location of required auxiliary parking areas. The difference among alternatives is in the type of mass transit technology that would be employed. These alternatives include:

- Motorized trams;
- Motor buses;
- Scenic railway;
- Light rail transit (LRT); and
- Monorail.

Under all alternatives, the Parkway would be closed to general traffic and transit usage would be mandatory. Motorized trams and buses would require the construction of a suitable roadway surface within the Parkway right-of-way. A scenic railway or LRT system would require preparation of the right-of-way for construction of track and bridges necessary to support surface operation of standard or narrow gauge trains and light rail vehicles. An elevated monorail would require the construction of a new guideway system. The LRT and monorail systems would require construction of an electrical power supply system for the guideways including substation buildings as well as overhead catenary wires and support poles for the LRT system. LRT and monorail systems would also require a service roadway for maintenance.

Auxiliary parking areas would be required at appropriate locations along the right-of-way and/or in the Gateway communities.

Environmental Impact
The environmental impact associated with implementation of any of these alternate modes is similar to the roadway construction options previously discussed. The motorized tram or bus option requires construction of essentially the same roadway as previously described, thus causing the same impacts. A scenic railway (traditional steel-wheeled trains) requires flatter grades than for a roadway, hence cuts and fills would be greater and environmental impact

likewise. LRT and monorail requires service roadways in addition to the guideways and involve more visual impact from overhead facilities.

Cost Estimate/Cost Effectiveness

Motorized trams or buses require a roadway of essentially the same design as previously described, so that the infrastructure cost is similar, however additional costs are involved in purchasing, operating and maintaining a transit fleet. It is difficult to justify the roadway construction expense with a transit only restriction, since a considerable percentage of visitors who might otherwise travel along the Parkway would not be expected to do so if required to use mass transit.

Given the terrain, more stringent vertical and horizontal alignment standards, and the need for ancillary facilities, the cost of the rail options are projected to be in the order of magnitude of $35M per mile. The cost effectiveness is extremely questionable, since it is in the range of three to five times the cost of the roadway option.

The monorail system of transportation technology consists of vehicles supported and guided by a single guideway (rail or beam), usually elevated. There are two basic types. In a supported monorail, vehicles straddle the beam or are laterally supported by it. In a suspended monorail, vehicles hang directly below the guideway. Hanging systems can be either symmetrically suspended or asymmetrically suspended when supports are to one side of the beam.

Table 7, which follows, provides basic information about monorail systems currently in use in the United States.

USA Monorail Systems
Characteristics and Capital Costs

System	Year	Length (miles - km)	Stations	Daily Riders	Capital Cost ($ millions)	Cost per Mile ($ millions)
Disneyland	1959	2.5 mi – 4.00 km	2	Unk	NA	NA
Seattle	1964	0.9 mi – 1.40 km	2	9,500	NA	NA
Walt Disney World	1976	10.3 mi – 16.5 km	6	110,000	NA	NA
Newark Airport	1996	1.9 mi – 3.04 km	7	38,000	$ 354.0	$ 186.32
MGM/Bally's	1996	0.7 mi – 1.20 km	2	18,000	$ 25.0	$ 35.71
Jacksonville	1997	2.5 mi – 4.00 km	9	3,000	$ 184.0	$ 73.60
Mandalay Bay Tram	1999	0.5 mi – 0.84 km	2	15,000	$ 20.0	$ 40.00
Las Vegas	2004	3.8 mi – 6.08 km	7	≈54,000	$ 350.0	$ 92.11

Source: ASCE 8th Annual Automated People Conference and Wilbur Smith Associates.

Table 7. Monorail Systems Size and Location

Of note is that all these systems are rather short and operate in urban or recreational environments. Also, capital costs are extremely high in comparison to standard rail construction and several times higher than roadway construction. Cost considerations suggest that monorail is not a practical alternative in this corridor.

Traffic Analysis

These alternative transportation modes have essentially unlimited ability to accommodate visitors within this corridor. Should public transit be abailable on the Parkway, it seems likely that Year 2030 traffic on the regional transportation network and the Park roads would be somewhat less than that projected without Foothills Parkway construction (Chapter 3, Figure 15).

Viewshed Analysis

The number and quality of viewsheds available to the visitor via these alternative transportation modes is consistent with that available through roadway construction. The exception is traditional steel-wheeled rail which must operate on a very flat slope. Achieving these flat slopes would likely restrict several of the viewsheds.

Gateway Area Impact

The positive effects of Parkway construction on the regional roadway network and within the Gateway communities will likely not be realized if the Parkway right-of-way is utilized for an alternative transportation mode. In addition, parking facilities would be needed at appropriate locations.

Level of Visitor Experience/ Relationship to Mandate

The level of visitor experience provided by these alternative transportation modes (with the possible exception of traditional rail) should be excellent. The number and quality of views of the Park should be consistent with that previously described for each roadway section, and the visitor will experience no driving distractions due to congested traffic. The mandate requirements are likewise effectively met, however the associated goals relative to improved traffic operations will likely not be achieved.

4.1.8 Trails

Description

The Foothills Parkway right-of-way could accommodate non-motorized trails for hiking and biking if the roadway is not constructed in one or more sections. These trails could follow the lay of the land in similar fashion to existing trails within the Park; however, they would be very steep at many locations. Although the Americans with Disabilities Act's (ADA) standards have not been formalized, AASHTO standards and other best practice designs can be followed. Given the mountainous terrain, the practicality of meeting ADA standards is uncertain.

Environmental Impact

Intuitively, construction and operation of trails should cause little impact to the environment. Areas of special concern could be avoided given the very wide right-of-way available for trail construction. It should be noted,

however, that trail development would be subject to the NEPA requirements and appropriate environmental review and documentation must precede construction. Construction to current ADA requirements for pedestrian facilities could substantially increase impact on the environment, however, as extreme measures might be required in some areas to meet maximum permissible grade.

Cost Estimate/Cost Effectiveness
The cost of trail construction is typically modest in comparison to other transportation facilities, however ADA requirements offer the potential for substantial cost escalation.

Traffic Analysis
This option involves no vehicular traffic considerations for the Parkway itself. Further, the effect of this option on the regional roadway network and Park roads is negligible.

Viewshed Analysis
The previously described analysis was conducted under the assumption that the viewers eye level would be a few feet above the proposed roadway elevation. This analysis is not fully applicable to trails as different horizontal and vertical geometrics would be utilized, thus requiring a new review of viewsheds for the chosen alignment.

Gateway Area Impact
Negligible impact, positive or negative, is anticipated. It will be necessary, however, to provide parking either in close proximity to the trails or at other locations within the Gateway area with shuttle service being provided to the trail(s).

Level of Visitor Experience/ Relationship to Mandate
A primary concern of this option is the relatively low number of visitors expected to take advantage of the opportunity to view the Park. Only those with good physical ability could be accommodated even if ADA design standards are fully achieved, and for those, a lesser number of viewsheds will be available than with other options.

Neither the spirit nor letter of the mandate is achieved by this option. The facility will not by definition be considered a “parkway.” Further, the viewsheds will be less in number and available to only a small percentage of the visitor population.

4.1.9 No Build

Description
With this option, no further construction would be undertaken. Sections B, C and D would be abandoned. The disposition of the right-of-way is not clear, as it was purchased by the State of Tennessee and conveyed to the Federal Government under a contract binding the Federal Government to build the Parkway.

Environmental Impact
If the right-of-way remains under National Park Service control, environmentally sensitive areas that would be impacted by construction would remain undisturbed.

Cost Estimate/Cost Effectiveness
There is essentially no cost associated with the no build option.

Traffic Analysis
No modifications of otherwise prevalent

traffic flow will result from this option. As a result, there will be no benefit to either the regional or Park roadway network.

Viewshed Analysis
This option would eliminate the opportunity of the visitor to view the Park from the vantage points provided by the Parkway.

Gateway Area Impact
The no build alternative offers no additional benefit to the Gateway area beyond minimizing impact on environmentally sensitive areas. The attraction of potential viewsheds cannot be made available to the visitor and related to this, potential economic development from extended visits will be lost.

Experience/ Relationship to Mandate
The no build option ignores the mandate and provides no visitor experience beyond that provided by the currently completed sections.

4.2 Operation and Maintenance Costs

The continuing cost of operations and maintenance must also be considered as a part of the decision making process. Included in this category are costs associated with maintenance of the pavement surface, the drainage system, and traffic signs and markings. Also included is the cost of ranger patrols, roadside mowing, litter pickup and exotic plant control.

Based on an analysis conducted by an interdisciplinary team of National Park Service and Federal Highway Administration personnel in 1998 (see Figure 11, *Foothills Parkway – A Technical Paper for Future Strategies*, 1998), the estimated annual cost of operation and maintenance associated with each of the roadway construction alternatives is as follows:

Section	Est. Annual O&M Costs (cost/mile)	Est. Annual O&M Costs (thousands)
B	**$** 6,100	$ 86
B alternate	24,000	338
C	6,700	64
D	17,300	170
Full Build (B, C, D)	9,500	320
No Build	0	0

These estimated 2001 costs were derived by increasing the 1998 estimates by a 4% annual inflation factor. Also, these costs are related only to the roadway environs, and do not include operation and maintenance costs of the associated recreation areas.

The annual operation and maintenance costs associated with transportation system options other than roadway alternatives cannot be measured simply as a cost per mile. The unit of measure is typically expressed as a cost per vehicle mile or train mile. Costs per vehicle mile in the following table are derived from the National Transit Database.

Alternate	O&M Costs (cost per vehicle mile)
Motorized Trams or Buses	**$** 8.00
Conventional Rail	10.00
Light Rail Transit (LRT)	12.50
Monorail	17.50

The annual cost is derived by multiplying the unit cost by the numbers of vehicle or train miles operated during a year. To provide some basis for comparison, the estimated annual operating and maintenance cost for providing alternative transportation the full length of the sections B, C, and D is shown in the table below. These estimates are based on one vehicle trip per hour over a ten-hour day for 300 days per year.

These costs may be compared to the operation and maintenance cost of the "full build" option ($320,000).

Alternate	O&M Costs B, C, and D (millions)
Motorized Trams or Buses	**$** 1.5 – 2.5
Conventional Rail	2.0 - 3.0
Light Rail Transit (LRT)	2.5 – 3.5
Monorail	3.5 – 4.5

It is apparent that the operation and maintenance costs associated with alternative transportation systems far exceed that for roadways. This is due in large measure to costs associated with vehicle ownership and operation (fuel, maintenance, etc.) and with labor (drivers, mechanics, and so forth).