

## 4.0 CUMULATIVE IMPACTS

Section 4.0, Cumulative Impacts, of the DEIS provides a definition of cumulative impacts and how such impacts should be analyzed. There are no changes to this section for the FEIS. Refer to this section of the DEIS for this information.

One area of potential cumulative impacts that was not addressed in the DEIS is that of long-term effects on receiving water quality due to an increased wastewater stream. Jackson County Empowerment Zone (EZ) initiatives, in conjunction with an expanded water supply delivered by the proposed action, aim to attract greater amounts of industry and commercial enterprises to the County over the coming decades than would otherwise occur, leading to increased employment and a larger population base. If these efforts succeed, there would be an increase in consumption of potable water, and a concurrent increase in wastewater flows. Most water consumed by residential, commercial, and industrial users is not actually used up in the process, but is returned to surface waters, bringing a wide variety of waste substances to those surface waters.

In general, wastewater flows consist of a mix of domestic and commercial sewage and industrial discharges or inputs to the sewage collection system. If not treated appropriately, substantial volumes of wastewater can pollute or overwhelm the assimilative capacity of receiving waters, which are limited in size or flow. At present, due to its relatively small population and the dispersal of that population, there is very little centralized wastewater treatment in Jackson County. If the County grows as projected, prospective industries, County officials, and State and Federal regulators would have to closely monitor developments to ensure the protection of water quality in those watercourses into which wastewater or effluent discharges would be made. In addition, wastewater treatment technologies of the appropriate size and type would have to be installed. If these measures are undertaken, as required by the Clean Water Act (CWA) and State regulations, the projected growth in wastewater generation should not lead to significant degradation of water quality.

As in the DEIS, the discussion of cumulative impacts is divided into two main subsections: short-term cumulative impacts and long-term cumulative impacts. Refer to Section 4.0, Cumulative Impacts, of the DEIS for a further description of this breakdown. The analysis of cumulative impacts presented in the DEIS considers the short- and long-term impacts of the four alternatives evaluated in the DEIS: the War Fork and Steer Fork, 3.5 mgd dam and reservoir alternative; the Sturgeon Creek, 3.5 mgd and 8.5 mgd dam and reservoir alternatives; and the No Action alternative. Refer to the DEIS for this analysis. The analysis of cumulative impacts presented in this FEIS considers the short- and long-term impacts of the four additional alternatives investigated in this FEIS: the War Fork and Steer Fork, 1.3 mgd and 2.2 mgd dam and reservoir alternatives; the Wood Creek Lake pipeline alternative, and the Lock 14 pipeline alternative.

Due to the fundamental difference between the two types of alternatives evaluated in this FEIS, two tables are provided in each conclusion section to show a summary of the various types of impacts. The first table displays a summary of cumulative impacts resulting from the two additional dam and reservoir alternatives investigated in this FEIS. The second table depicts a summary of cumulative impacts resulting from the two water transmission pipeline alternatives

investigated in this FEIS. For each resource area within the table, the impacts of the alternative are combined with those of past, current, and future actions to derive an estimate of the cumulative effect. Due to the highly complex interactions between the different actions and their associated effects, which vary by resource area, it is not possible to simply add or subtract each adverse impact (denoted by “\*” in the table) and each beneficial or positive impact (denoted by “+”) across a row to obtain a cumulative effect. Two or more effects may be additive, synergistic (multiplicative), or opposing. Thus, the ratings for the cumulative impacts reflect professional judgment as to how the different effects interact.

As in the DEIS, Section 4.1 addresses the potential short-term cumulative effects of the proposed action alternatives. Section 4.2 addresses the long-term cumulative effects of the proposed action alternatives. Section 4.3 provides an overall summary of both types of cumulative impacts.

## **4.1 SHORT-TERM CUMULATIVE IMPACTS**

As in the DEIS, it is estimated that construction of the proposed dam and impoundment of the reservoir for the War Fork and Steer Fork, 1.3 mgd and 2.2 mgd dam and reservoir alternatives would take about three years altogether, within approximately the 2002 to 2005 timeframe. The construction phase of the pipeline alternatives would last somewhat less. The prior year and the following year are included to completely encompass or bracket the potential construction period. Thus, short-term duration is assumed to be approximately five years, between the years 2001 and 2006.

In terms of appropriate geographic boundaries to the analysis, most of the other activities that could potentially lead to short-term cumulative impacts would have to occur in the immediate project vicinity, that is, within the War Fork valley, at Wood Creek Lake, at Lock 14 of the Kentucky River, or along the proposed water transmission line corridors. However, this is not always the case. With regard to water resources, for example, upstream and downstream activities within the watersheds are relevant, and in the case of air quality, all of Jackson County and portions of Laurel and Lee Counties would be relevant. With some resource areas, surrounding counties, the eight counties of the Cumberland Valley Area Development District (ADD), or the entire watershed of the Kentucky River should be included.

To determine potential projects in the area of the affected environment, coordination was made with the Kentucky Highlands Empowerment Zone (EZ/EC), Cumberland Valley ADD, Kentucky River Water Authority, Kentucky Department of Transportation (KDOT), and the Wood Creek Water District. The purpose of this coordination was to determine reasonably foreseeable projects originating from Federal, non-Federal, or private sources.

### **4.1.1 PROPOSED ACTION**

The analysis of short-term cumulative effects of the proposed action considers projects, actions, and trends occurring simultaneously with, and in close proximity to, the construction phase of

each of the alternatives investigated in this FEIS. The analysis evaluates the interaction and significance of these combined impacts.

### **4.1.1.1 Past, Current, and Future Projects and Activities**

There are no changes to this section for the FEIS. Refer to Section 4.1.1.1, Past, Current, and Future Projects and Activities, of the DEIS for a short discussion of past, current, and future projects and activities within the affected area, or the Region of Influence (ROI) for all alternatives. At this time, no other major projects are known that would occur simultaneously and in the same vicinity as the construction phase of the pipeline alternatives, thus potentially interfering or interacting with it.

### **4.1.1.2 Environmental Consequences**

There are no changes to this section for the FEIS. Refer to Section 4.1.1.2, Environmental Consequences, of the DEIS for a discussion of the potential environmental impacts associated with past, current, and future projects and activities within the ROI.

### **4.1.1.3 Conclusion**

#### **Dam and Reservoir Alternatives**

**Table 4.1-3** provides a summary of the potential short-term cumulative environmental impacts resulting from the War Fork and Steer Fork, 1.3 mgd and 2.2 mgd dam and reservoir alternatives and other activities that could be reasonably foreseen in the ROI. Where the environmental effects of the two alternatives differ, the worst case is assumed. Short-term cumulative impacts associated with the War Fork and Steer Fork, 1.3 mgd and 2.2 mgd alternatives are similar to, but somewhat less than, those of the other three dam and reservoir alternatives addressed the DEIS. The three differences of note between these groups of alternatives are in the areas of cultural resources, transportation, and socioeconomics. All War Fork and Steer Fork dam and reservoir alternatives have smaller impacts on cultural resources than the Sturgeon Creek alternatives, as well as short-term, minimal transportation impacts compared to the Sturgeon Creek alternatives. Furthermore, there are no residents within the proposed War Fork reservoir or buffer zone to be relocated.

<b>Table 4.1-3. Summary of the Potential Short-Term Cumulative Impacts of the Reassessed Dam and Reservoir Alternatives</b>			
<b>Resource Area</b>	<b>Dam and Reservoir Alternatives</b>	<b>Past, Current, and Future Actions</b>	<b>Cumulative Impacts</b>
Geology/Soils	**	**	**
Surface and Groundwater Resources	**	*	**
Air Quality	*	*	*
Biological Resources	**	*	**
Noise	*	*	*
Recreation	**	0	**
Cultural Resources	*	0	*
Land Use	**	*	**
Transportation	0	*	0
Waste Management	*	*	*
Human Health and Safety	*	0	*
Socioeconomics	+	+	++
Environmental Justice	+	+	+
Aesthetics	**	*	**
<b>Key:</b>			
<b>Adverse:</b> * Minor Impact ** Moderate Impact *** High Impact			
<b>Beneficial:</b> + Minor Impact ++ Moderate Impact +++ High Impact			
<b>No Impact:</b> 0			

As shown in **Table 4.1-3**, there would be relatively few major short-term cumulative effects associated with the construction of the proposed War Fork and Steer Fork, 1.3 mgd and 2.2 mgd dam and reservoir alternatives in Jackson County. This is due to the general lack of concurrent construction projects, intensive activities, and ongoing negative environmental practices and trends in the vicinity of the three proposed project sites. Short-term socioeconomic impacts would be moderately beneficial. Relatively modest positive impacts would occur because of temporary employment opportunities, additional income, and purchases of construction materials, services, and merchandise. Overall, the potential short-term, adverse cumulative impacts of the War Fork and Steer Fork, 1.3 mgd and 2.2 mgd mgd alternatives would be insignificant.

**Pipeline Alternatives**

**Table 4.1-4** summarizes the potential short-term cumulative effects of the Wood Creek Lake and Lock 14 pipeline alternatives. This table assumes the worst case where the environmental effects of the two water transmission pipeline alternatives differ from each other.

<b>Table 4.1-4. Summary of the Potential Short-Term Cumulative Impacts of the Reassessed Pipeline Alternatives</b>			
<b>Resource Area</b>	<b>Pipeline Alternatives</b>	<b>Past, Current, and Future Actions</b>	<b>Cumulative Impacts</b>
Geology/Soils	*	*	*
Surface and Groundwater Resources	*	*	*
Air Quality	*	*	*
Biological Resources	*	*	*
Noise	*	*	*
Recreation	0	0	0
Cultural Resources	*	0	*
Land Use	0	0	0
Transportation	*	*	*
Waste Management	*	*	*
Human Health and Safety	0	0	0
Socioeconomics	+	+	++
Environmental Justice	+	+	+
Aesthetics	*	*	*
<b>Key:</b>			
<b>Adverse:</b> * Minor Impact ** Moderate Impact *** High Impact			
<b>Beneficial:</b> + Minor Impact ++ Moderate Impact +++ High Impact			
<b>No Impact:</b> 0			

In general, there are fewer short-term cumulative effects associated with either water transmission pipeline alternative than with any of the reservoir alternatives. This is because pipe-laying, which would be a linear construction project largely along existing road rights-of-way, is generally of a smaller magnitude than dam and reservoir construction, with less potential for combining with other ongoing construction projects to produce disruptive consequences on the environment and human activities.

## 4.1.2 NO ACTION

There are no changes to this section for the FEIS. Refer to Section 4.1.2, No Action, of the DEIS for a discussion of the ROI for analyzing the short-term cumulative impacts of the No Action alternative.

### 4.1.2.1 Past, Current, and Future Projects and Activities

There are no changes to this section for the FEIS. Refer to Section 4.1.2.1, Past, Current, and Future Projects and Activities, of the DEIS for a short discussion of past, current, and future projects and activities within the ROI for the No Action alternative.

### **4.1.2.2 Environmental Consequences**

There are no changes to this section for the FEIS. Refer to Section 4.1.2.2, Environmental Consequences, of the DEIS for a discussion of the potential environmental impacts associated with past, current, and future projects and activities within the ROI for the No Action alternative.

### **4.1.2.3 Conclusion**

There are no changes to this section for the FEIS. Refer to Section 4.1.2.3, Conclusion, for a summary of short-term cumulative impacts anticipated to result from the No Action alternative.

## **4.2 LONG-TERM CUMULATIVE IMPACTS**

The construction phase of the proposed action, either one of the dam and reservoir or water transmission pipeline alternatives, has not been scheduled at this point, but is being projected, for the purposes of this study, to occur within the 2002 to 2005 timeframe. Short-term impacts associated with the construction, discussed in Section 4.1, address the past, present, and future actions associated with this construction period. This section addresses the cumulative impacts associated with the operation of the proposed reservoir or water transmission pipeline.

The temporal bounds of this study should encompass the proposed life of the facility, which is anticipated to be fifty years. Therefore, the timeframe associated with the long-term cumulative impacts of the proposed Jackson County Lake Project would be from completion of the proposed impoundment or completion of pipeline construction to the end of the facility lifetime, or between the years 2006 and 2056.

Geographically, the proposed alternative impoundment sites for the Jackson County Lake Project are all located in the Kentucky River watershed. The Lock 14 pipeline alternatives would also withdraw and transport water from the Kentucky River Watershed. Therefore, this watershed should be included in this analysis. However, the Wood Creek Lake pipeline alternative would withdraw and transport water from Wood Creek Lake, which is located in the Cumberland River Watershed to the south. Further, Jackson County is part of the Cumberland River ADD. The boundaries of this district should also be included. Lastly, the counties surrounding Jackson may have a water requirement that may be filled by the yield of a proposed reservoir in Jackson County or by importation of existing sources outside the County. Therefore, the geographic boundaries, or affected environment, of this cumulative impacts discussion will include all of these areas and will be referred to as the ROI.

The ROI for the two water transmission pipeline alternatives includes the sites of water withdrawal at Lock 14 on the Kentucky River or at Wood Creek Lake and the proposed transmission main routes to the JCWA Treatment Plant and/or water distribution system.

To determine potential projects in the area of the affected environment, coordination was made with the EZ/EC, Cumberland Valley ADD, Kentucky River Water Authority, KDOT, Wood

Creek Water District. The purpose of this coordination was to determine reasonably foreseeable projects originating from Federal, non-Federal, or private sources.

## **4.2.1 PROPOSED ACTION**

The analysis of long-term cumulative effects of the proposed action considers projects, actions, and trends occurring in the ROI alongside the operation of the proposed reservoir in Jackson County or the operation of a pipeline originating outside the County. The analysis evaluates the interaction and significance of these combined impacts. Section 4.2.1.1 provides an overview of past, current, and anticipated future projects and activities that will be evaluated with the proposed action for long-term cumulative impacts. Section 4.2.1.2 investigates the environmental consequences of these actions and activities.

### **4.2.1.1 Past, Current, and Future Projects and Activities**

In recent years, Laurel County, to the south of Jackson County, has been growing very rapidly, in part due to its strategic location along the I-75 corridor. From 1990 to 1999, the population of Laurel County grew by 19.7 percent, more than double the Jackson County and the State of Kentucky growth rate (USBC, No date). Associated with this population growth and overall commercial and industrial development is growing water consumption, which in the northern part of the County is supplied by Wood Creek Lake. At present, Wood Creek Lake withdrawals are approximately 4 million gallons a day. The estimated maximum sustainable yield (i.e., withdrawal) of the lake that would keep lake level fluctuation to a tolerable 4 feet in average years and 12 feet in critical years is 10 mgd (Kenvirons, 2000c). At the rate of growth of water demand in the County, this limit will be approached or exceeded within the 50-year period of analysis.

There are no other changes or additions to this section for the FEIS. Refer to Section 4.2.1.1, Past, Current, and Future Projects and Activities, of the DEIS for a short discussion of past, current, and future projects and activities within the ROI.

### **4.2.1.2 Environmental Consequences**

As mentioned just above, in recent years, Laurel County, has been growing very rapidly. Associated with this development have been a number of environmental changes characteristic of formerly rural areas now undergoing swift, relatively low-density development. Among other trends, water needs and withdrawals from Wood Creek Lake have been increasing. At current growth rates, the demand for potable water from Wood Creek Lake will outstrip the sustained yield of the lake by mid-century. At that point, Laurel County and the Wood Creek Water District would have to either look elsewhere for an additional source of water, use water more efficiently, or subject the lake and its recreational users and dock owners to a greater level of water level fluctuation than that currently considered acceptable, or some combination of all of these.

There are no other changes or additions to this section for the FEIS. Refer to Section 4.2.1.2, Environmental Consequences, of the DEIS for a discussion of the potential environmental impacts associated with past, current, and future projects and activities within the ROI.

### 4.2.1.3 Conclusion

#### Dam and Reservoir Alternatives

**Table 4.2-3** provides a summary of the potential long-term cumulative environmental impacts of the proposed War Fork and Steer Fork, 1.3 mgd and 2.2 mgd dam and reservoir alternatives and other activities that could be reasonably foreseen in the ROI. Some resource areas in **Table 4.2-3** have been given dual impacts ratings. These dual ratings indicate that both beneficial and adverse impacts would occur on those resource areas in the long-term.

<b>Table 4.2-3. Summary of the Potential Long-Term Cumulative Impacts of the Reassessed Dam and Reservoir Alternatives</b>			
<b>Resource Area</b>	<b>Dam and Reservoir Alternatives</b>	<b>Past, Current, and Future Actions</b>	<b>Cumulative Impacts</b>
Geology/Soils	**	**	**
Surface and Groundwater Resources	**	**	**
Air Quality	*	*	*
Biological Resources	*, +	*	*, +
Noise	*	*	*
Recreation	+++	++	+++
Cultural Resources	**	*	**
Land Use	**	*	**
Transportation	*	++	+
Waste Management	*	*	**
Human Health and Safety	*	*	*
Socioeconomics	+	++	++
Environmental Justice	++	++	+++
Aesthetics	**, +	*	**, +
<b>Key:</b> <b>Adverse:</b> * Minor Impact    ** Moderate Impact    *** High Impact <b>Beneficial:</b> + Minor Impact    ++ Moderate Impact    +++ High Impact <b>No Impact:</b> 0			

As shown in **Table 4.2-3**, there does not seem to be any major project on the horizon, outside of highway projects, that could overshadow the effects of the proposed War Fork and Steer Fork, 1.3 mgd and 2.2 mgd dam and reservoir alternatives in Jackson County. The additive nature of even some highly speculative developments would not overshadow the effects of the proposed reservoir. Impacts on socioeconomics and environmental justice would be highly beneficial, due to new employment opportunities, increased income, and the introduction of a sufficient public water supply.

There would be effects that cannot be or would be extremely difficult to quantify. The potential development of the proposed reservoir in Jackson County, known highway projects, the speculative nature of commercial and residential development within the area, and the resultant loss of wildlife habitat could affect the rural nature of the region. This potential development could bring about a degree of urbanization, which may be viewed as either a positive or a negative impact.

The two smaller War Fork and Steer Fork dam and reservoir alternatives would likely lead to somewhat smaller cumulative impacts overall than the War Fork and Steer Fork, 3.5 mgd alternative evaluated in the DEIS, both in the vicinity of the impoundment itself, and throughout Jackson County.

**Pipeline Alternatives**

**Table 4.2-4** provides a summary of the potential long-term cumulative environmental impacts of the Wood Creek Lake and Lock 14 pipeline alternatives and other activities that could be reasonable foreseen in the ROI. Some resource areas in **Table 4.2-2** have been given dual impacts ratings. These dual ratings indicate that both beneficial and adverse impacts would occur on those resource areas in the long-term.

<b>Table 4.2-4. Summary of the Potential Long-Term Cumulative Impacts of the Reassessed Pipeline Alternatives</b>			
<b>Resource Area</b>	<b>Pipeline Alternatives</b>	<b>Past, Current, and Future Actions</b>	<b>Cumulative Impacts</b>
Geology/ Soils	*	*	*
Surface and Groundwater Resources	**	**	***
Air Quality	*	*	*
Biological Resources	*	*	*
Noise	*	*	*
Recreation	*	**	***
Cultural Resources	*	*	*
Land Use	*	*	*
Transportation	0	++	++
Waste Management	0	*	*
Human Health and Safety	0	*	*
Socioeconomics	+	++	++
Environmental Justice	++	++	+++
Aesthetics	0	*	*
<b>Key:</b>			
<b>Adverse:</b> * Minor Impact    ** Moderate Impact    *** High Impact			
<b>Beneficial:</b> + Minor Impact    ++ Moderate Impact    +++ High Impact			
<b>No Impact:</b> 0			

As shown by **Table 4.2-4**, the two largest long-term cumulative impacts resulting from the water transmission pipeline alternatives are in the areas of water resources and recreation. These impacts are associated with the Wood Creek Lake pipeline, not the Lock 14 pipeline, which would not incur them. As stated above, even without 1.3 or 2.2 mgd of water exported from Wood Creek Lake to Jackson County, Wood Creek Water District's projected growth in demand is likely to exceed the lake's yield within 50 years. With an additional 1.3 to 2.2 mgd transported to Jackson County, the limit of the lake would be reached much sooner. Water availability and recreation on Wood Creek Lake, a valuable recreational resource, would be compromised. The Kentucky River at Lock 14, in contrast, has a flow large enough to sustain Jackson County's projected withdrawals without creating shortages or problems for recreation.

While the pipeline alternatives would avoid many of the cumulative impacts associated with the construction and operation of a dam and reservoir, by making the same quantity of water available in Jackson County, their overall, county-wide impacts would be almost identical to those of the dam and reservoir alternatives. Moreover, in the case of the Wood Creek Lake pipeline alternative, impacts from Jackson County's water consumption would be transferred to Laurel County in the form of reduced water availability in the future and/or potential impacts on Wood Creek Lake recreation, such as boating and fishing.

## **4.2.2 NO ACTION**

There are no changes to this section for the FEIS. Refer to Section 4.2.2, No Action, of the DEIS for a discussion of the ROI for analyzing the long-term cumulative impacts of the No Action alternative.

### **4.2.2.1 Past, Current, and Future Projects and Activities**

There are no changes to this section for the FEIS. Refer to Section 4.2.2.1, Past, Current, and Future Projects and Activities, of the DEIS for a short discussion of past, current, and future projects and activities within the ROI for the No Action alternative.

### **4.2.2.2 Environmental Consequences**

There are no changes to this section for the FEIS. Refer to Section 4.2.2.2, Environmental Consequences, of the DEIS for a discussion of the potential environmental impacts associated with past, current, and future projects and activities within the ROI for the No Action alternative.

### **4.2.2.3 Conclusion**

There are no changes to this section for the FEIS. Refer to Section 4.2.2.3, Conclusion, for a summary of long-term cumulative impacts anticipated to result from the No Action alternative.

## 4.3 SUMMARY OF CUMULATIVE IMPACTS

Section 4.3, Summary of Cumulative Impacts, of the DEIS presents a general summary of the cumulative impacts anticipated to result from the four alternatives evaluated in the DEIS. Refer to that section for this discussion.

With regard to the four additional alternatives evaluated in this FEIS, in general, site-specific cumulative impacts in both the short-term and long-term would be somewhat less than those associated with the dam and reservoir alternatives evaluated in the DEIS. On a broader geographic scale, county-wide and beyond, cumulative impacts would largely be a function of the quantity of water made available by the project, not whether it is a new impoundment or pipeline connected to an existing source of surface water. The more water that is made available, the more it may help induce long-term changes in the character of Jackson County, bring economic opportunity even development puts more pressure on natural resources.

The Lock 14 pipeline leads to minimal localized cumulative effects, but a pipeline to Wood Creek Lake would have long-term cumulative impacts on that water source and recreational resource.