

NPS – Great Smoky Mountains National Park
U.S. Department of the Interior



Infrastructure Inventory Elkmont GMP Amendment/ Environmental Assessment

Prepared by:



T N & Associates, Inc.
124 Jefferson Circle
Oak Ridge, TN 37830

November 8, 2002

Contents

List of Acronyms	ii
1.0 Introduction.....	1
2.0 Roads.....	3
3.0 Bridges	5
4.0 Utility Systems.....	11
4.1 Electrical System	11
4.2 Sanitary Sewer System	11
4.3 Water System	16
5.0 Summary.....	19

List of Tables and Figures

Table 1. Roads Servicing EHD	3
Table 2. Bridge Summary	8
Table 3. Effluent Limitations	15
Figure 1. Elkmont Historic District Boundaries	2
Figure 2. Elkmont Historic District Roads	4
Figure 3. Elkmont Road over Laurel Branch	5
Figure 4. Elkmont Road over Little River	5
Figure 5. Elkmont Campground Road over Little River	6
Figure 6. Cabin Area over Jakes Creek	6
Figure 7. Bridge on Abandoned Road over Little River	7
Figure 8. Bridge on Abandoned Road over Little River (from Downstream).....	7
Figure 9. Elkmont Historic District Bridge Locations.....	10
Figure 10. Water Supply and Wastewater Treatment Plant	13
Figure 11. Average Daily Discharge.....	14
Figure 12. Average Monthly Discharge	14
Figure 13. Wonderland Septic System.....	18

List of Acronyms

BOD	Biological Oxygen Demand
EHD	Elkmont Historic District
NPS	National Park Service
RV	Recreational Vehicle
SCES	Sevier County Electric System

1.0 Introduction

This report provides an overview of existing infrastructure in the Elkmont Historic District (EHD). Roads, bridges, and utility systems (electrical, sewage, and water) in EHD are outlined in the following sections.

EHD includes structures along Jakes Creek and Little River (Appalachian Clubhouse complex) and on the ridge south of Catron Branch (Wonderland Hotel complex), as well as the Elkmont Campground (see Figure 1).

The Elkmont Campground accommodates recreational vehicles (RVs) and tent sites. The campground has 220 campsites located in a wooded area on the Little River floodplain. The campground has 12 restrooms but no showers. There are no electrical, water, or sewer hookups at the RV sites. The campground sees peak use from May through October.

The structures in EHD consist of two hotel buildings, a social clubhouse, and more than 60 dwellings and outbuildings.

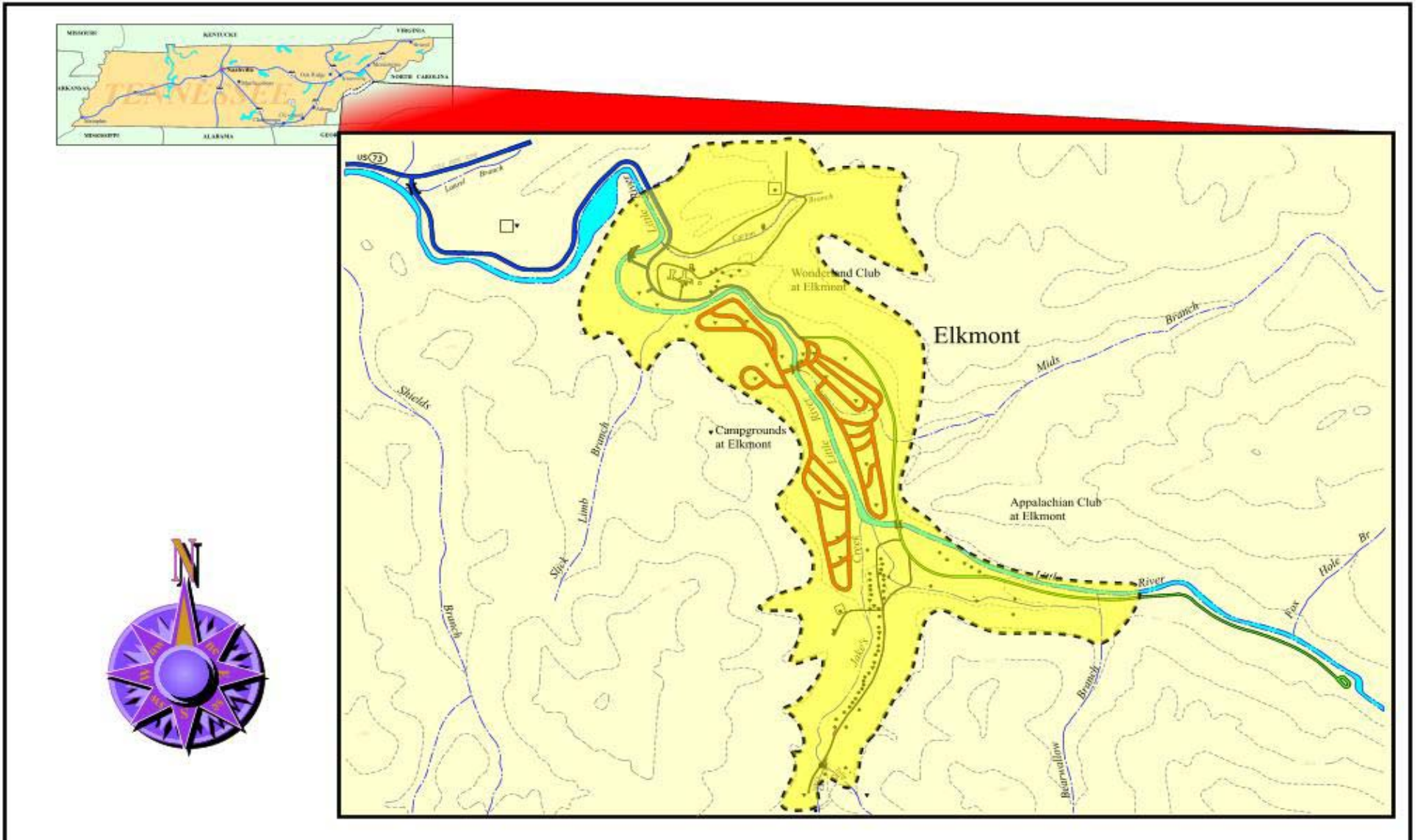


Figure 1. Elkmont Historic District Boundaries

2.0 Roads

The paved roads that access EHD are in fair to good overall condition. However, narrow, one-way roads running through the cabin areas are deteriorating and in need of resurfacing.

The main road leading into Elkmont is National Park Service (NPS) Route 18, Elkmont Road, which extends from SR-73 (Fighting Creek Gap Road) to the Elkmont campground. Elkmont Road is a 2-lane, paved road 1.46 miles long. The road has one 3,055-square-foot parking area. The road surface is in fair condition with minimal cracking and some rutting. Roadway drainage is good.

NPS Route 233, the campground loop from the end of Elkmont Road, is approximately 6.92 miles long and in good overall condition. The road surface is in good condition with minimal cracking.

NPS Route 133 (Little River Road) is 1.64 miles from Elkmont Road to the Little River Trail trailhead. Approximately half (0.79 mile) of this road is unpaved. One parking area of approximately 1,936 square-feet is located along this road. The road surface is in fair condition with minimal cracking and some rutting. Roadway drainage is good.

NPS Route 134 (Jakes Creek Road) also accesses EHD; it is 0.71 miles long from where it begins at NPS Route 133. The road surface is in fair condition with some cracking and rutting. Roadway drainage is good. See Table 1 for a summary of the roads servicing EHD and Figure 2 for road locations.

Table 1. Roads Servicing EHD

Route No.	Route Name	Route Description	Condition	Paved Miles	Unpaved Miles	Total Miles
018	Elkmont Road	From Route SR-73 to campground	Fair	1.47	0	1.47
133	Little River	From Route 018 to trailhead	Fair	0.85	0.79	1.64
134	Jakes Creek Road	From Route 133 to gate	Fair	0.71	0	0.71
233	Elkmont Campground	From Route 018 to end of loop	Good	6.92	0	6.92

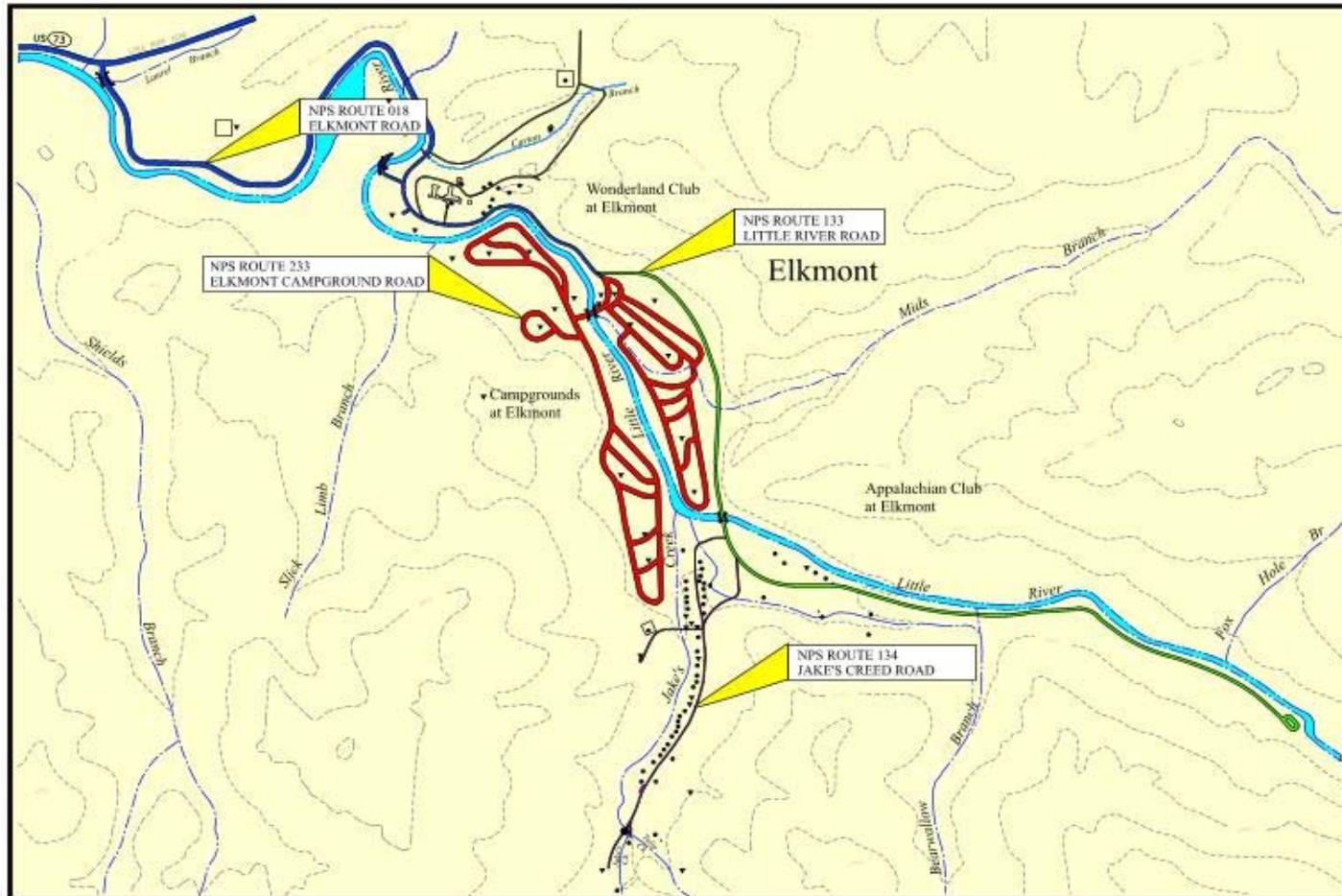


Figure 2. Elkmont Historic District Roads

3.0 Bridges

Four bridges provide public access in EHD. These bridges are in good condition and have a life expectancy of 20 to 40 years under current loading conditions. Three of the four bridges are on Elkmont Road and have paved decks (see Figures 3, 4, and 5). The fourth bridge is located in the cabin area and spans Jakes Creek. This bridge has a timber deck and is open to the public (see Figure 6).

Figure 3. Elkmont Road over Laurel Branch



Figure 4. Elkmont Road over Little River



Figure 5. Elkmont Campground Road over Little River



Figure 6. Cabin Area over Jakes Creek



A fifth bridge within EHD is in poor condition and in need of rehabilitation; however, the bridge is located on a closed road (see Figures 7 and 8). The bridge spans the Little River and has a timber deck. Problems include widespread, severe rusting of structural steel, several damaged members and missing connectors, a damaged lower chord splice plate, separation of the southeast wingwall from the abutment, scour at the east pier that undermines the footing, and moderate settlement and erosion at the east approach.

Figure 7. Bridge on Abandoned Road over Little River



Figure 8. Bridge on Abandoned Road over Little River (from Downstream)



Additionally, there are four timber-decked bridges in EHD that are on unpaved roads closed to the public. All four of these bridges are in good condition.

Table 2 is a summary of bridge type, location, structure numbers, construction date, inspection date, and conditions. Figure 9 shows bridge locations within EHD.

Table 2. Bridge Summary

Bridge	Structure Number	Location	Deck Type	Year Constructed	Date Inspected	Structure Evaluation Summary
Little River Trail over Lost Creek	5460-070S	3.6 mi. south from NPS Route 18 (Elkmont Road)	Wood/Timber	1984	06/06/2000	The bridge is in good overall condition. With regular maintenance, a useful life of approximately 25–30 years can be expected for this structure under current loading conditions.
Upper Elkmont Road over Huskey Branch	5460-067S	2.1 mi. south from NPS Route 18 (Elkmont Road)	Wood/Timber	1956	06/06/2000	The bridge is in fair condition. With corrective action, this bridge can be in service 30–35 years.
Little River Trail over Groundhog Branch	5460-069S	3.2 mi. south from NPS Route 18 (Elkmont Road)	Wood/Timber	1984	06/06/2000	The bridge is in good overall condition. With regular maintenance, a useful life of approximately 25–30 years can be expected for this structure under current loading conditions.
Elkmont Campground Road over Little River	5460-048P	0.1 mi. from NPS Route 18 (Elkmont Road)	Concrete	1965	06/06/2000	The bridge is structurally sound but has some problems that need correcting in the near future. With corrective action and regular maintenance, a useful life of approximately 35–40 years can be expected.
Elkmont Road over Little River	5460-047P	0.1 mi. north from NPS Route 133	Not Applicable	1938	06/06/2000	The bridge is in fair to good overall condition. With corrective action, a useful life of approximately 25–30 years can be expected.
Abandoned Road over Little River	5460-076S	0.1 mi. from NPS Route 18 (Elkmont Road)	Wood/Timber	1959	06/06/2000	The bridge is in poor condition and in need of rehabilitation. The bridge is not open to vehicular traffic, use will continue to be restricted.
Residential road over Jakes Creek	5460-077S	0.1 mi. from Jakes Creek Road; turn right on gravel road after mailboxes	Wood/Timber	1984	06/06/2000	The bridge is in good overall condition. With regular maintenance, a useful life of approximately 25–30 years can be expected for this structure under current loading conditions.

Table 2. Bridge Summary (continued)

Bridge	Structure Number	Location	Deck Type	Year Constructed	Date Inspected	Structure Evaluation Summary
Jakes Creek Road over Jakes Creek	5460-049S	0.6 mi. from NPS Route 18 (Elkmont Road), 200 feet past Jakes Creek Trailhead	Wood/ Timber	1982	06/06/2000	The bridge is in good overall condition. With regular maintenance, a useful life of approximately 25–30 years can be expected for this structure under current loading conditions.
Elkmont Road over Laurel Branch	5460-046P	1.5 mi. north from Elkmont Ranger Station	Not Applicable	1947	06/06/2000	The bridge is in good overall condition. With corrective action and regular maintenance, a useful life of approximately 35–40 years can be expected for this structure under current load conditions.
Little River Trail over Little River.	5460-068S	2.6 miles south from NPS Route 18 (Elkmont Road).	Wood/ Timber	1956	06/06/2000	This bridge is structurally sound but requires rehabilitation to prevent possible loss of load-carrying capacity. With corrective action and regular maintenance, a useful life expectancy of approximately 30–35 years can be expected for this structure under current loading conditions.

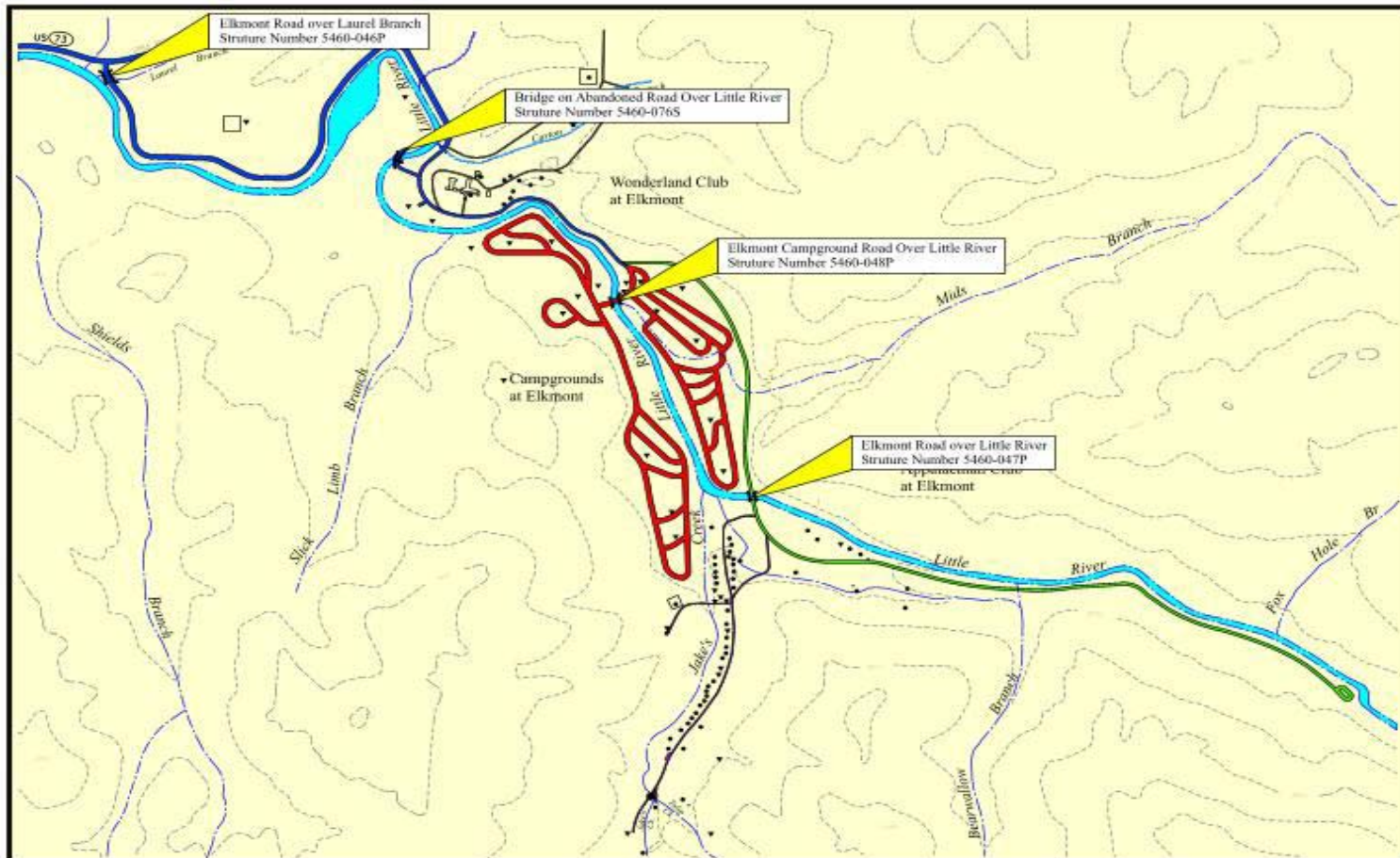


Figure 9. Elkmont Historic District Bridge Locations

4.0 Utility Systems

4.1 Electrical System

The Sevier County Electric System (SCES) provides electrical power to this portion of the Great Smoky Mountains National Park. SCES owns and maintains the power poles, lines, and transformers. A single-phase line capable of providing 800 kilowatts of power supplies power to EHD. Portions of the power line are buried while other portions are overhead. Currently the only usage is from the campground, residences, wastewater treatment plant, and water pump. There are no substations in EHD. Many of the existing line and poles are old and in need of replacement. SCES has scheduled removal of approximately 1,000 feet of main primary line and individual service lines to cabins on Little River Trail.

4.2 Sanitary Sewer System

A sewage treatment plant serves Elkmont campground (see Figure 10). At the present operating capacity, the plant runs 24 hours a day but with operators at the plant for one shift only. The campground and plant is shut down from December through March. A chlorine treatment method is used to treat sewage from the campground. The sewage is aerated in a 35,000-gallon aeration-tank before being sent through a clarifier. Clarification tanks have a 17,500-gallon capacity. Next the water is sent through a filter. Sodium hypochlorite is then added to treat the water. Prior to discharge, sodium sulfate is used to dechlorinate the treated water.

Currently the plant discharges approximately 10,000 gpd during peak season. The flow rate during peak flow is approximately 17,000–18,000 gpd during peak flow. Figures 11 and 12 demonstrate average daily and average monthly flow rates. The plant operates at approximately 90 percent capacity during peak flows. Under existing conditions the plant can operate at 20,000 gallons per day. The surge of solids during peak flow coupled with the lack of a flow equalization basin (holding-tank) limits the plant capacity. The filter and pumps are designed for a maximum capacity of 35,000 gallons per day.

Solids are hauled off site for disposal. During the peak season, 5,000–7,500 pounds of solids are disposed of per month. The sewage treatment plant has a National Pollutant Discharge Elimination Permit (Permit No. TN0022349), which allows it to discharge 35,000 gallons per day into the Little River. NPS has applied for a permit renewal from the State of Tennessee. The permit states that the wastewater discharge must be disinfected to the extent that viable coliform organisms are effectively eliminated. There shall be no distinctly visible floating scum, oil, or other matter contained in the wastewater discharge. The wastewater discharge must result in no other materials in concentrations sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream. The permit requires monitoring of Biological Oxygen Demand (BOD), suspended solids,

flow, fecal coliform, total chlorine, settleable solids, dissolved oxygen, and pH. Table 3 shows the permit effluent limitations.

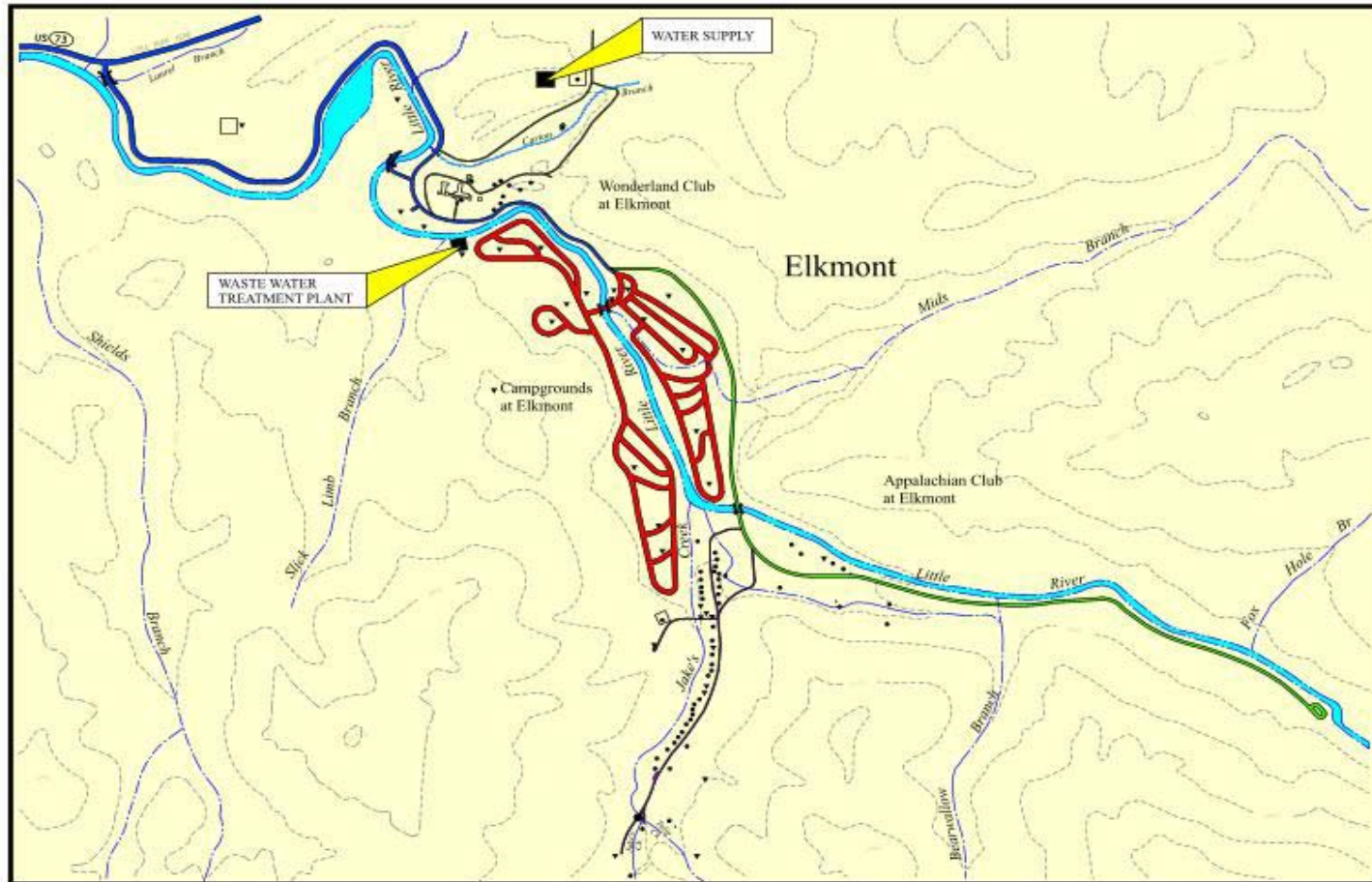


Figure 10. Water Supply and Wastewater Treatment Plant

Figure 11. Average Daily Discharge

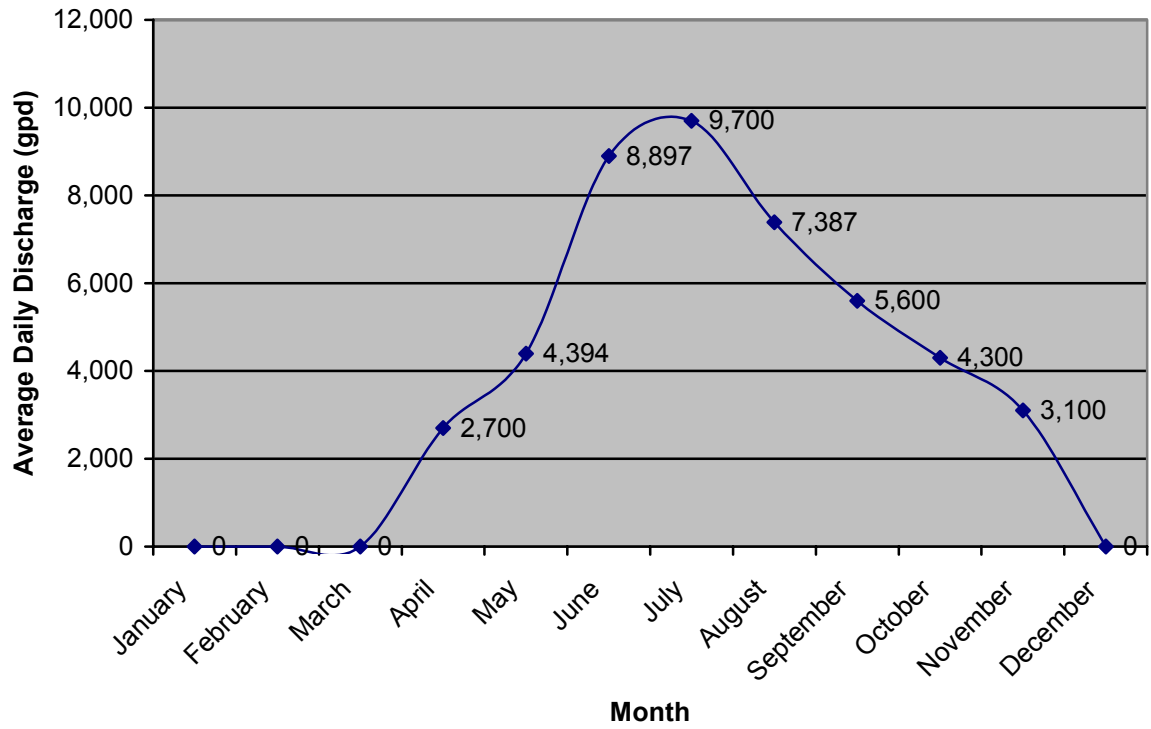


Figure 12. Average Monthly Discharge

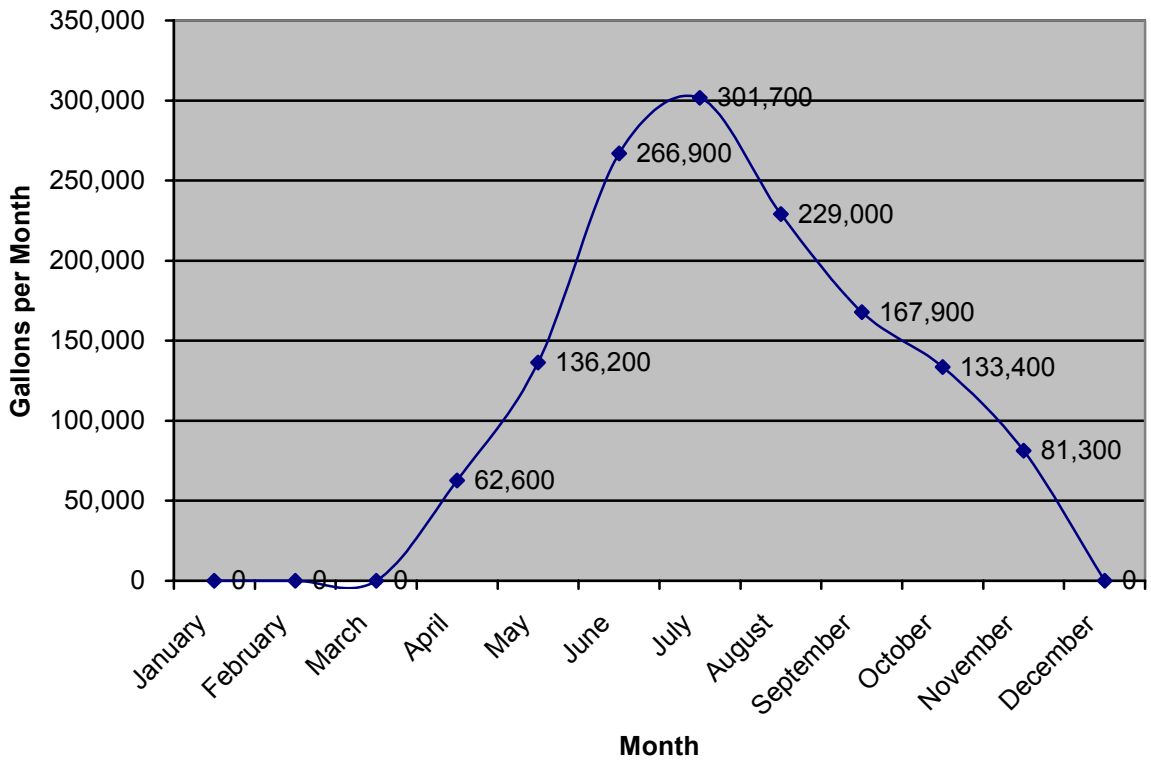


Table 3. Effluent Limitations

Effluent Characteristics	Effluent Limitations		
	Monthly Average Concentration (mg/l)	Weekly Average Concentration (mg/l)	Daily Maximum Concentration (mg/l)
BOD	30	-	45
Suspended Solids	30	-	45
Flow (MGD)	Report	-	Report
Fecal Coliform	200/100 ml*	-	1000/100 ml*
Total chlorine residual	-	-	2.00
Settleable solids	-	-	1.00
Dissolved oxygen	-	1.00	-
PH (Standard Units)	-	6.00	9.00

* Non-compliance with established fecal coliform limits shall be reported by the permittee only when the concentration exceeds 1000 colonies per 100 ml or when the average of two or more samples exceeds 200 colonies/100 ml.

The U.S. Environmental Protection Agency and Tennessee State Water Quality regulations require surface waters to be classified into three categories, Tiers 1, 2, and 3.

- Tier 1 waters are those of "average" quality. Degradation of Tier 1 water can occur as long as existing uses of water can be maintained. A Tier 1 designation is a minimum water quality standard for all water.
- Tier 2 waters are those of "higher" quality. Tier 2 water quality may not be degraded unless an appeal is made.
- Tier 3 waters are surface waters of exceptional quality that may never be degraded. No appeal for exemption from water quality standards is permitted for surface waters of Tier 3 status.

The Little River has been designated as an Outstanding National Water Resource by the State of Tennessee Department of Environmental Conservation.

Under this designation, no expansion of discharge into the river will be allowed.

The addition of a 15,000–35,000-gallon flow equalization basin (holding-tank) may enable the plant to treat and discharge at the permitted volume of 35,000 gallons per day. The maximum capacity of the plant (with the addition of a holding-tank) is 35,000 gallons per day.

According to *Standard Handbook of Environmental Engineering*, edited by Robert A. Corbitt in 1990, the addition of recreational cabin connections to the sewage treatment system would increase the volume through the plant by about 50 gallons per person per day. The addition of a hotel to the system would increase the volume by 60 gallons per person per day. With the sewage treatment plant upgraded to

operate at 35,000 gpd, the plant could possibly handle an additional 300 people connected to the system by seasonal cabins, or 250 additional people connect by the hotel. The addition of a restaurant in the hotel and/or the installation of showers at the campground will increase the load on the sewage system and decrease the number of connections the system can handle.

A 1,000-gallon septic tank and leach field services the Wonderland Hotel, annex, and cabins in EHD (see Figure 13). The septic system at the Wonderland has not been used in many years and specific condition of the septic tank and pipes can not be determined without excavating the pipes and septic tank. However, the general condition of the system can be inferred from historical records. These systems have proven to be inadequate. Many leaks and overflows have occurred in these septic systems over time. In 1984, NPS rejected a plan to add five bathrooms to the Wonderland Hotel, stating that the septic system was incapable of handling the additional load.

The Appalachian Clubhouse and cabins were connected to a separate septic system. The Appalachian Clubhouse system was removed and/or disconnected sometime after 1992. The NPS did not maintain the Appalachian Clubhouse septic system and little information is available concerning the condition or capacity.

4.3 Water System

A well above Elkmont Cemetery provides water to the Elkmont campground, four apartments and one residence house (see Figure 10). A 5-horsepower pump delivers water into three nearby holding-tanks. The pump is capable of delivering 60 gallons per minute to the holding tanks. A 45,000-gallon concrete tank and two 27,800-gallon fiberglass tanks store water. The water is treated with chlorine prior to distribution to the campground. Approximately 30 gallons per month of chlorine is used to treat the water supply. During peak season approximately 22,240 gpd is distributed to the campground and residence. The water plant operates year round.

Water is gravity-fed to the campground and residences from the storage tanks via an underground piping system. The piping system crosses underneath the Little River. The 6-inch-diameter water pipe is buried 2 feet below the streambed. A 1993 memorandum from the NPS Denver Service Center indicates that the entire water conveyance system is in severe need of repair and replacement. The memo states that approximately 9,000 linear feet of conveyance need to be replaced. An inspection conducted by the Tennessee Department of Environment and Conservation in 2001 found the inside of the concrete water tank to deteriorating. Consequently the inside of the water tank was refinished in May 2002. Other deficiencies noted in the inspection were a major leak of unknown origin and the need for a backflow prevention valve in the equine water trough. Each of these deficiencies have been addressed. The refinishing of the tank interior and the addition of the fiberglass tanks are the only major improvements to the system since 1993.

According to *Wastewater Engineering: Treatment Disposal Reuse*, published in 1979 by McGraw-Hill Inc., typical rates for water use for recreational cabins is 32–53 gallons per person per day, and 53–106 gallons per person per day for hotel. The existing water distribution system is capable of providing approximately 86,000 gpd to the campground and residences but only distributes approximately 22,240 gpd during peak season. Therefore the water distribution system is capable of distributing an additional 63,760 gpd. This equals an additional 600–1200 people per day that can be served by the existing system, not accounting for the addition of showers in the campground or restaurant services in the hotel.

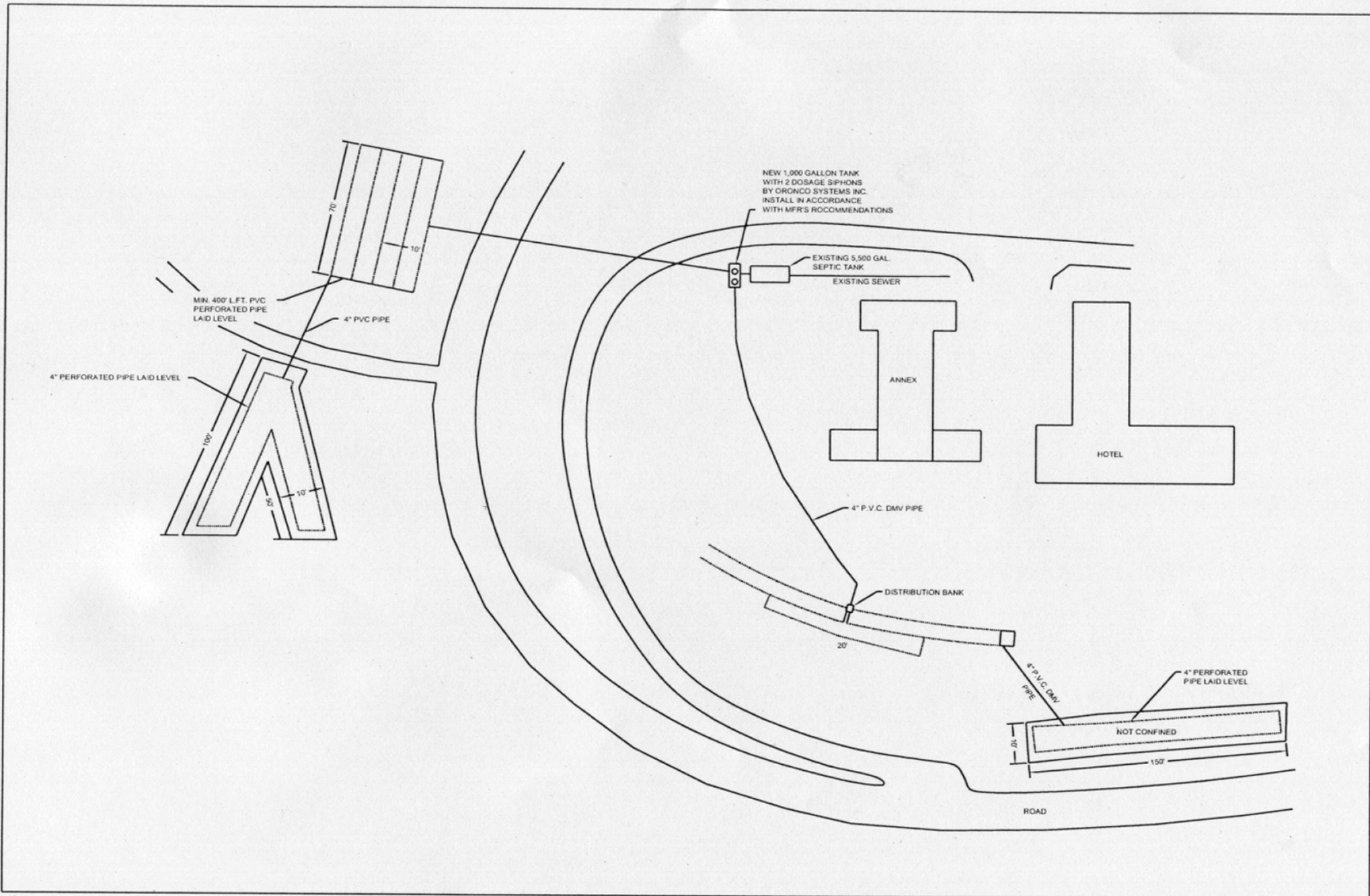


FIGURE 13 - WONDERLAND SEPTIC SYSTEM

5.0 Summary

Roads and bridges in EHD are generally paved and in fair to good overall condition. A total of 9.95 miles of paved roads, including the 6.92-mile campground loop, access the Elkmont area.

Power is provided to the area by SCES. A single-phase power line provides 800 kilowatts of power to EHD. The line is underground in some areas and above ground in other areas. Unused poles and power lines are scheduled to be removed from EHD.

Water is supplied to the campground by groundwater. Water is stored in three tanks with a total capacity of 100,600 gallons. The water conveyance systems consist of approximately 9,000 linear feet of pipe with one stream crossing. The existing system is capable of providing approximately 86,000 gpd to the campground and residences but only distributes approximately 22,240 gpd during peak season. Therefore the water distribution system is capable of distributing an additional 63,760 gpd. This equals an additional 600–1200 people per day that can be served by the existing system, not accounting for the addition of showers in the campground or restaurant services in the hotel. A 1993 NPS report states that the system is in need of repair. Other than refinishing the concrete holding-tank interior, no major repairs have been made on the water conveyance system since 1993.

A sewage treatment plant at Elkmont handles sewage from the campground. The treatment plant is permitted to discharge 35,000 gallons per day into the Little River, but plant capacity is limited by the amount of sewage holding capacity. Upgrading the plant by installing a holding tank may enable the plant to operate at 35,000 gpd. This would allow an addition 250–300 persons to be connected to the system. The septic system at the Wonderland Club has proven to be inadequate. Much of the Appalachian Clubhouse septic system has been removed. A detailed investigation needs to be conducted in order to determine the existing condition and capacity of the Wonderland Club and Appalachian Club septic systems.