Operation and Motorist Usage of Interstate Rest Areas and Welcome Centers in Virginia

MICHAEL A. PERFATER

This study was conducted to examine existing conditions at Virginia's Interstate rest areas and welcome centers and to assess what impact additional services, such as vending machines, might have on the service delivery of these facilities. A selected sample of seven rest areas and four welcome centers were visited in October 1986, May 1987, and August 1987 for a 1- to 2-day period for the purpose of obtaining data. Traffic counts, vehicle occupancy, length of stay, restroom and amenity usage, and parking lot occupancy rates were all recorded. Videotapes were made to record the general condition of the facilities. Stopping motorists were asked to respond to a mailbox survey, and interviews were conducted with rest area custodians. The impact of vending machines, which were installed at seven sites in May 1987, was also assessed. The study generally revealed that the Interstate traveler is dependent on rest areas and welcome centers. It also pointed out the need for the refurbishment of some facilities and the need for additional facilities, especially women's restrooms. Vending machines were found to be enthusiastically received by the public, to generate approximately 30 percent more refuse but little in the way of litter, to incur some vandalism but only while attendants were not on duty, and to generate a substantial amount of revenue for the Virginia Department of Transportation and Virginia State Department for the Visually Handicapped.

The origin of today's rest area system was a provision in the Federal-Aid Highway Act of 1938 that stated "the States with the aid of Federal Funds may include . . . such sanitary and other facilities as may be deemed necessary to provide for the suitable accommodation of the public." The intent of the Act was to increase motorist safety and comfort by providing facilities for stopping and resting. Subsequent Federal-Aid Highway Acts, the Highway Trust Fund, and the Highway Beautification Act of 1965 gave authority, funding, and substance to the rest area program. Ultimately, each state prepared a master plan for the development of rest areas. The primary guidelines used to prepare these plans were the FHWA's "Instructions for Highway Beautification Cost Estimate," the AASHTO guide on safety rest areas (*1*), and FHWA Policies and Procedures Memoranda 80-1 and 90-3.

Using these guidelines, the Virginia Department of Transportation (VDOT) developed a master plan for constructing rest and welcome facilities on Virginia's Interstate highway system. The plan established sites and building designs for these facilities and included amenities such as picnic tables, drinking fountains, trash receptacles, and walkways positioned around brick buildings containing restrooms. At the state borders, these buildings were combined with tourist information centers operated by the Virginia Department of Economic Development's Division of Tourism.

Rest areas and welcome centers in Virginia were designed and constructed to meet the needs of travelers based on 20-year traffic projections. Since most of them were built during the late 1960s or early 1970s, many have been, or very shortly will have been, in operation for 20 years. During this period, traffic speeds and conditions as well as vehicle types and sizes have changed. Driving habits have also changed because of the increased mobility of certain segments of the population, such as senior citizens, the handicapped, and young families. These factors have put increased demands on rest areas and welcome centers. To assess how these facilities are meeting those demands, a study was undertaken to determine baseline conditions for the safe and efficient operation of Virginia's Interstate rest areas and welcome centers. This paper presents the results of that study.

METHODOLOGY

The study consisted, for the most part, of fact-finding visits to a selected sample of Virginia's rest areas and welcome centers. Since manpower and funding limitations did not permit an evaluation of all such facilities in the Commonwealth, a representative sample of the 28 interstate rest areas and 9 welcome centers that are currently in operation was chosen (Figure 1). Mainline traffic volume, geographical location, physical condition, and other site-specific features were used to determine which sites would be selected for study.

Eleven sites were chosen for evaluation, four of which are combination rest areas and welcome centers (Table 1). At each site, the following tasks were performed by a five-member study team between the hours of 8 a.m. and 5 p.m. for a 2-day period in the fall of 1986, for a 1.5-day period during the spring of 1987, and for a 1-day period during the summer of 1987:

1. Length of stay and occupancy rates were documented for vehicles entering the sample sites during daylight hours.
2. Frequency of use of restrooms, picnic tables and grills, telephones, and other site-specific amenities was determined. Hourly occupancy counts were also made of both passenger car and truck parking lots.
3. A videotape was made of each site to record the condition of the grounds and appurtenances. The outside shoulder of the mainline 2 miles downstream from each site was also videotaped to document litter accumulation.

Virginia Transportation Research Council, P.O. Box 3817 University Station, Charlottesville, Va. 22903.

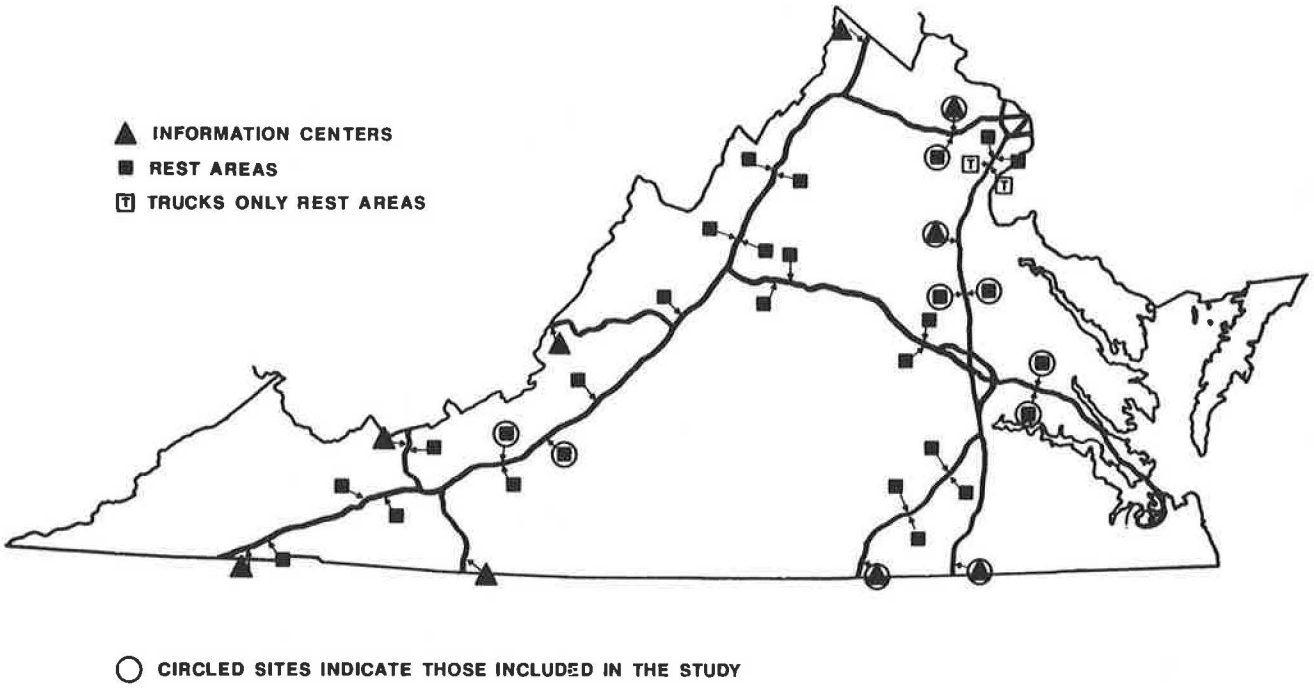

FIGURE 1 Commonwealth of Virginia Interstate rest areas and information centers.

TABLE 1 REST AREA SAMPLE SITES

Site No.	Classification	Year Built	Location[a]
1	Rest area	1968	I-81 SBL 0.8 mi S of Rt. 177 near Radford
2	Rest area	1979	I-81 NBL 0.9 mi N of Rt. 603 near Ironto
3	Welcome center	1965	I-95 NBL 0.1 mi N of Va./N.C. state line
4	Welcome center	1966	I-85 NBL 0.7 mi N of Va./N.C. state line
5	Rest area	1977	I-64 EBL 2.4 mi E of Rt. 609 near New Kent
6	Rest area	1977	I-64 WBL 1.1 mi W of Rt. 155 near New Kent
7	Rest area	1965	I-95 NBL 3.4 mi N of Rt. 207 near Ladysmith
8	Rest area	1965	I-95 SBL 2.6 mi S of Rt. 609 near Ladysmith
9	Welcome center	1968	I-95 SBL 1.8 mi S. of Rt. 17 near Fredericksburg
10	Rest area	1965	I-66 EBL 1.5 mi E of Rt. 234 near Manassas
11	Welcome center	1965	I-66 WBL 0.3 mi W of Bull Run

[a]SBL, southbound lane; NBL, northbound lane; WBL, westbound lane; EBL, eastbound lane.

4. Special problems, special conditions, and any history of vandalism were documented mostly through on-site observation and discussions with custodial staff.

5. Prestamped, mail-back questionnaires were distributed to stopping motorists. They contained both site-specific questions and ones relative to motorists' stopping habits, frequency of use of the rest area system, and overall opinion of it. A copy of the questionnaire is available from the author and can also be found in a published report by the author (*2*).

In addition, 24-hour traffic counts of vehicles entering all rest area and welcome center lots over a 7-day period were made just before each data-gathering visit.

SERVICE DELIVERY CHARACTERISTICS OF SAMPLE SITES

Vehicle Occupancy Rates

Research team members stationed at the exit ramps recorded the occupancy of a sample of the entering vehicles. Table 2 shows the average occupancy rates for these vehicles. (Num-

TABLE 2 OCCUPANCY RATES OF VEHICLES ENTERING REST AREAS AND WELCOME CENTERS

Vehicle Type[a]	Rest Areas[b]	Welcome Centers[b]
Passenger car (10,256)	1.80	1.90
Light truck (455)	1.25	1.30
Tractor-trailer (1,688)	1.05	1.05
Recreational vehicle (424)	2.05	2.10
Bus (50)	24.00	28.60
Motorcycle (74)	1.20	1.30

[a]Numbers in parentheses are no. of vehicles.
[b]Values are no. of occupants per vehicle.

bers in parentheses denote the number of vehicles in the sample.) Occupancy rates for all classes for vehicles were found to be about 15 percent higher during the summer than in the spring and fall.

Length of Stay

To determine the duration of the usual rest area visit, a member of the research team was stationed at the entrance ramp equipped with a lap-top computer into which the license plate number and classification of each entering vehicle and the time of day were entered. Another member of the research team entered the same data as each vehicle left the rest area. Using a computerized method by which license plates of the entering vehicles were matched with those of exiting ones, the duration of the rest area visit by vehicle class was determined. Vehicles that tend to remain the longest at rest areas are the larger ones—tractor-trailers, recreational vehicles, and buses. Tractor-trailers and recreational vehicles tend to remain longer at rest areas than at welcome centers, whereas the opposite is true for passenger cars. All classes of vehicles, with the exception of buses, tend to remain at rest areas and welcome centers longer in the summer than in any other season. For the 6,300 passenger cars for which license plate matches were achieved, the average length of stay was 9.1 minutes. In the summer, this stay was extended to almost 10 minutes. For large vehicles, the average length of stay was about 15 minutes.

In-State: Out-of-State Ratio

The license plate retrieval process also provided a means for gathering information regarding the in-state versus out-of-state mix of vehicles entering rest facilities. Table 3 shows that the ratio of in-state to out-of-state passenger cars is essentially identical for rest areas and welcome centers. Seasonal variations from this trend were minimal for all vehicle types except for passenger cars. During the spring and summer travel seasons, welcome centers had a higher influx of out-of-state users, whereas rest areas tended to attract more in-state passenger cars.

Parking Lot Occupancy

To assess the adequacy of parking facilities at each of the subject sites, the number of spaces in both truck and passenger lots was inventoried, and hourly counts were made of the vehicles occupying these lots. None of the lots was ever found to be full at the time these counts were made. Truck lots were, on average, at 41 percent of capacity, and the passenger car lots were at 32 percent of capacity between 8 a.m. and 5 p.m. on weekdays. Welcome center lots exceeded this average by 4 percent and 10 percent, respectively. As one might expect, summer travel raised these occupancy rates some, especially for the passenger car lots; but these increases also were meager—on average, less than 5 percent.

Although during data-gathering periods all lots were found to be adequate to meet demand, there was some evidence that during certain specified periods, demand exceeded capacity. Photographs taken before 8 a.m. by rest area custodians showed trucks parked both along the exit ramps and, at some sites, on the mainline. Custodians attested that such occurrences were not infrequent, especially between 10 p.m. and dawn, and attributed them to the tendency for truckers to ignore the posted 2-hour parking limitation. Commentary received from truck drivers, motorists, and VDOT staff supported the custodians' claims that truck drivers are reluctant to heed the 2-hour limit, especially at night. Enforcement of this limit is difficult, especially since it does not have a high priority with the Virginia State Police. Increasing or removing the limit completely might only magnify the problem. Although larger truck parking lots or separate trucks-only rest areas are viable options, the availability and cost of land adjacent to the interstate renders either of these alternatives a costly one.

Some overcrowding in the passenger car and truck parking lots also occurred on weekends and holidays. Although data were not gathered during these periods, random visits to selected sites on weekends revealed some parking capacity problems in the passenger car lots. These occurrences appeared to be the result of the number of vehicles entering rest areas during

TABLE 3 IN-STATE VERSUS OUT-OF-STATE PROPORTION OF VEHICLES ENTERING REST AREAS AND WELCOME CENTERS

Vehicle Classification	Welcome Centers (%)		Rest Areas (%)	
	In-State	Out-of-State	In-State	Out-of-State
Passenger car	42.5	57.5	41.5	58.5
Light truck	59.8	40.2	51.5	48.5
Tractor-trailer	16.9	83.1	25.4	74.6
Double trailer	25.0	75.0	0	100.0
Recreational vehicle	9.8	90.2	8.6	91.4
Bus	53.9	46.1	18.2	81.8
Motorcycle	38.6	61.4	46.7	53.3

these peak periods rather than from nonobservance of the 2-hour parking limit. Isolated instances of shoulder parking were observed, and there was some queuing for parking spaces. Although such occurrences did not appear to present a significant safety problem in those areas in which they were observed, the potential does exist for safety problems should the situation worsen.

Amenity Usage

Rest areas and welcome centers provide a variety of amenities for use by the motoring public including restrooms, paved walkways, benches, drinking fountains, and pay telephones. Many include vending machines, recreational facilities, and rest areas for pets, and most include picnic tables (many of which are covered) and cooking grills. In addition, rest areas contain a display of the map of Virginia, whereas welcome centers are staffed by individuals who provide maps and other tourist information.

The amenities used most often by most travelers are the restrooms. On average, about 66 passenger vehicles and 16 trucks and recreational vehicles enter rest areas and welcome centers hourly. Applying the occupancy rates mentioned previously in this report, this amounts to roughly 141 people per hour. Of these, an average of 87 per hour (62 percent) use the restroom facilities. The following data show the system-wide use of restroom facilities for all sites observed:

	Welcome Centers	*Rest Areas*	*Avg*
Males/hr	58.0	44.5	49.3
Females/hr	46.2	33.4	37.9
Total/hr	104.2	77.9	87.2

These frequencies are roughly 40 percent higher during the summer season and on weekends and holidays. As shown above, the greatest percentage of restroom users are males. Nevertheless, observations at most sites revealed that long lines outside women's restrooms were not uncommon during peak stopping periods. Accounts received from rest area custodians and observations by the author on weekends and holidays revealed that this phenomenon becomes pronounced during peak periods. Studies have shown that the length of stay for women in restrooms is typically longer than that for men. Although possibly attributable to a number of factors, the most likely reason for queuing at women's restrooms is that the absence of urinals slows things down. If this is true (and one would assume it is), women's restrooms in rest areas may need to contain more comfort facilities than the men's restrooms. In the late 1960s, the Bureau of Public Roads developed the *Design Guide for Interstate Safety Rest Areas With Comfort Stations*, which, to this writer's knowledge, continues to be used as the principal reference for designing comfort facilities. This guide includes a formula for computing the number of comfort facilities necessary in a rest area. For example, if the formula calls for two urinals and two toilets in the men's restroom, then the adjoining women's restroom will receive four toilets. The longer lines at women's restrooms lead one to believe that this formula may no longer be applicable

All sites visited by the research team contained picnic facilities. On average, 7 percent of these facilities were in use during daylight hours. As expected, usage of these facilities was highest during the summer; but even then, they were never found to be at or near capacity.

Finally, telephone usage was documented at each site in the sample. Each site contained between one and four public pay telephones where, on average, about eight calls per hour were made. In general, more calls were made from rest areas than welcome centers, and the rate of usage was slightly higher in the summer than the spring or fall.

Traffic Volumes

In the rest areas, although passenger car volume averages were highest in the fall of the year, overall volumes were highest during the summer. However, sites 8 (Interstate 95 [I-95 southbound]) and 10 (Interstate 66 [I-66 eastbound]), which are located on commuter-oriented Interstates, actually showed lower volumes in summer than in the fall. The welcome centers showed a similar pattern: traffic volume remained fairly constant at the I-66 welcome center (again a commuter-oriented facility) but was highest at the other sites in the summer. Using average daily mainline traffic counts that are taken periodically by the VDOT as a basis, an average of about 12 percent of the mainline passenger cars can be expected to stop at rest areas. This number will, of course, be dependent on several variables, including proximity to other rest areas, location (welcome centers at state borders tend to attract a slightly higher volume of passenger car traffic), and facilities offered.

The volume of truck traffic also tended to be slightly higher during the summer. The percentage of mainline trucks entering rest areas was found to be higher than that for passenger cars. An everage of 23 percent of the mainline trucks stopped at the 11 sites. This percentage varied from 40.6 percent to 10 percent and was the highest at the I-64 and I-66 sites. High percentages of mainline trucks stopping at these sites could be the result of the lack of commercial truck facilities on these routes.

Staffing and Costs

General maintenance of rest areas and welcome centers is the responsibility of a rotating three-person custodial staff. Each site has at least one custodian on duty between the hours of 6 a.m. and 10 p.m. seven days per week. (These hours vary at some locations.) At certain rest areas in the Commonwealth, the Department employs custodians on a 24-hour basis to help curtail loitering and other undesirable activities. The responsibilities of the custodial staff include cleaning, refuse disposal, repairs, painting, mowing, and general maintenance. At 23 locations, custodians are VDOT employees, whereas at 14 locations, these services are provided by private contractors.

In fiscal year (FY) 1987 (1 July 1986, through 30 June 1987), the cost of operating Virginia's Interstate rest areas and welcome centers was $4,151,949. Figure 2 shows how those expenditures were distributed. Annual expenditures per site averaged $109,261 and ranged from a low of $63,530 to a high of $167,287 for FY 1987. These costs are dependent on a number of site-specific characteristics of the rest area, not the least of which is the sophistication of the water and sewage treatment systems.

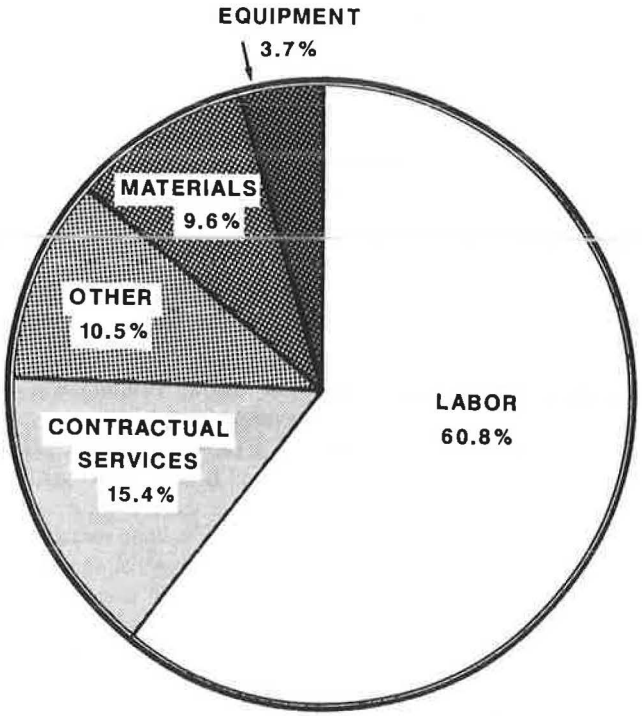

FIGURE 2 FY 1987 rest area expenditures.

Vending Machines

Section 153 of the 1978 Surface Transportation Act authorized the establishment of a Federal Demonstration Project to permit the installation of vending machines in rest areas on the Interstate highway system (*3*). The states of California, Connecticut, Georgia, Kentucky, and Massachusetts were chosen to participate in the project. Each was required to evaluate the project based on public acceptance, possible economic benefits, and any problems related to litter and vandalism. After 1 year of operation, these states reported public reaction to be generally positive toward vending machines and found litter and vandalism problems to be insignificant. Based on these findings, the Surface Transportation Assistanct Act of 1982 allowed states the option of placing vending machines in rest areas and required that the operation of such facilities be offered to the Randolph-Shepard Agencies (RSA) in those states (*4*). To date, 21 states have installed vending machines in at least one rest area, and the RSA participates in the vending machine operation in 19 of these states. In some states, the RSA installs and maintains the machines and receives all of the profits, and in some, the state highway agency installs and maintains the machines and allots some or all of the profits to the RSA.

In 1984, the VDOT entered into an agreement with the state Department for the Visually Handicapped, designating it as the procurement agency for vendors. Profits were to be shared between the two agencies, and it was anticipated that the VDOT's share of the profits would offset the cost of construction, operation, and maintenance of the vending facilities. A sum of $278,000 was appropriated to construct refreshment center buildings at nine rest area and welcome center locations (Figure 3).

Seven of the nine rest facilities containing vending machines were included in this study. An attempt was made to assess the impact of these facilities during the period between installation and the summer data-gathering trip conducted in late August. This assessment included the documentation of litter and refuse accumulation, incidences of vandalism, public acceptance, and vendor performance. This assessment was accomplished through on-site observations, interviews with rest area custodians, and conversations with the resident engineers within whose jurisdictions these particular sites fell.

The public has been enthusiastic about the vending operation. Initially, machines at all sites were kept in operation for 24 hours, and at several sites, vendors remained on duty to fill them continually during the daylight hours. It was not uncommon, especially during the summer, to find many machines empty each morning before the vendor's arrival. During the first 3 months of operation, the machines collected nearly $88,000. After 1 year of operation, enough profits were realized to recoup all the construction costs for the buildings housing the vending machines.

Visits to the sites containing vending machines revealed that a few changes have occurred as a result of the vending installations. Each of these will be discussed briefly.

Litter and Refuse

An examination of videotapes made of sites before and after vending machine installation revealed no substantial accumulation of additional litter. Custodians reported that, generally, refuse increased anywhere from 30 to 50 percent, depending on the site, once vending machines became operational. However, they did not feel that this additional accumulation resulted in substantial additional work at most sites. At several sites custodians reported that tiny cellophane wrappers were being discarded on the grounds and in the parking lots. Retrieval of these wrappers, they said, was time-consuming since they had to be picked up by hand rather than with a litter stick. Anti-litter reminders affixed throughout the rest area grounds and the distribution of automobile litter bags were suggested as means of reducing the accumulation of such litter both within the confines of the rest areas as well as on the interstate mainline.

Use of Other Facilities and Amenities

The impact of the vending services on the use of specific facilities and amenities at rest areas is difficult to assess. Custodians and other residency personnel feel that the vending concession has generated an increase in the use of picnic tables. This occurrence could not be substantiated during this study because of the absence of sufficient before-and-after data during like seasons. Studies in other states have shown some increase in the average length of stay in rest areas after installation of vending machines (*5*, *6*). Whether or not this activity is occurring in Virginia will be verified in a follow-up study to be conducted in late 1988.

Vandalism

Although no occurrences of vandalism were documented during the initial few months of operation, some vandalism began

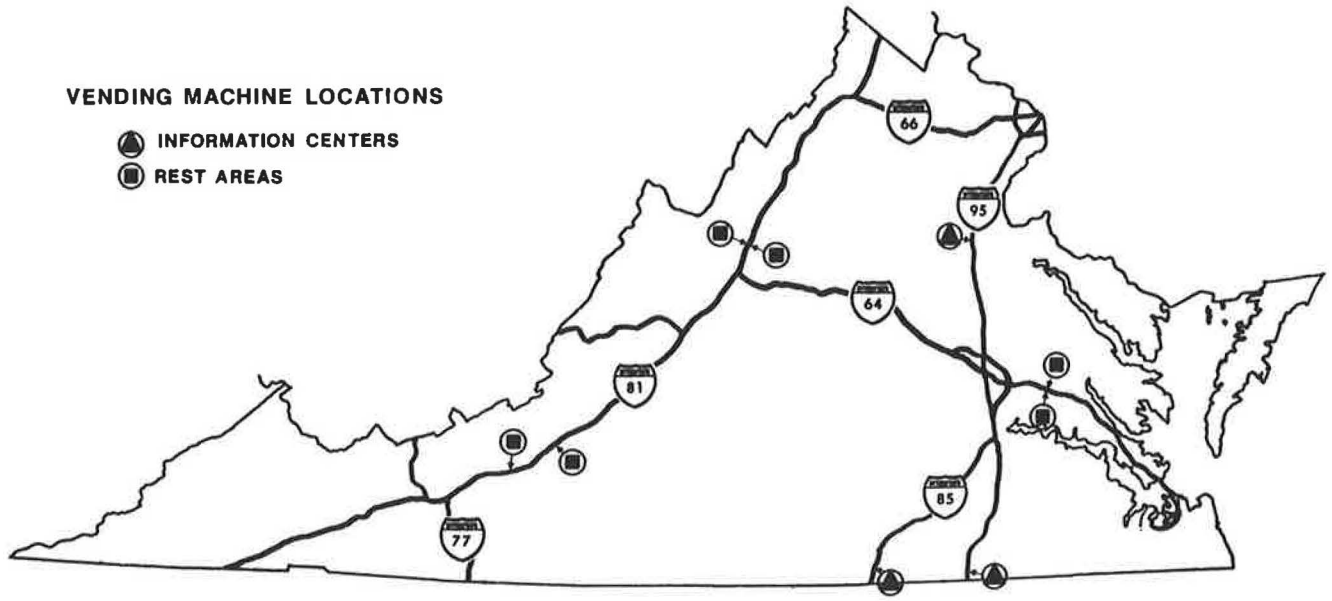

FIGURE 3 Commonwealth of Virginia Interstate rest areas and information centers with vending machines.

to take place at two sites during the fall and winter. It appears that vandalism may be minimal during peak travel seasons when rest areas and welcome centers are at their busiest. As visitation declines, however, the machines may become more vulnerable. Most break-ins occurred at night, which suggests that the presence of an on-duty custodian may be a deterrent to vandalism. Studies in other states corroborate this finding (*2*). Those states either closed the vending machine buildings while an attendant was not on duty or they employed attendants on a 24-hour basis.

VDOT is presently seeking ways to deal with vandalism. At some sites, vending machine buildings are now locked while no attendant is on duty. However, this alternative has resulted in some criticism from motorists who feel that accessibility to the vending machines on a 24-hour basis is important, since it is often during the wee hours of the morning that drivers need a quick pick-me-up.

Miscellaneous Operations

One of the minor problems anticipated at the outset of the vending machine program in Virginia was the method by which change would be made accessible to motorists. The hypothesis was that VDOT custodial and tourism staff would be inundated with requests from motorists to make change. Although the installation of change machines that will take a dollar bill curtailed many such requests, shortly after the installation of the machines, custodial and tourism staff were still frequently requested to make change. The installation of signs stating that employees in the rest areas and welcome centers do not have change have helped eliminate most, but not all, such requests.

A similar concern was anticipated regarding the refunding of money lost in malfunctioning vending machines. In anticipation of the fact that requests for refunds would be made to rest area staff, each vendor posts a sign in the vending machine building containing an address to which refund requests can be made. According to many of the custodians interviewed, the public is not satisfied with this procedure, since postage of $.25 is required to obtain a $.50 refund. This dissatisfaction was at times outwardly leveled at either the custodial staff or the vending machines. A refund method used by the North Carolina Department of Transportation may result in less frustration than the method used in Virginia. Inside each vending machine building is a box provided by the vendor into which refund requests can be placed. These are picked up periodically by the vendor, and refunds are then mailed to the individual making the refund request.

RESULTS OF REST AREA USER SURVEY

Survey Distribution Method

At each of the 11 sample sites, self-addressed, prestamped questionnaires were distributed to stopping motorists. The questionnaires contained 16 questions regarding specific facilities, the rest area system in general, travel behavior, and demographic information. During the spring, summer, and fall visits, 7,543 questionnaires were distributed and 1,945 were returned.

User Profile

The average age of respondents entering the sample sites was 52.73 years, and 38 percent of those responding were 60 years of age or older. Fifty-eight percent were non-Virginians, and 2 percent were classified as local (meaning they resided within the jurisdiction of the subject rest area or welcome center). A question regarding stopping frequency revealed that nearly 70 percent of motorists stop between every 1.5 and 3 hours, with the average stop being made about every 2.5 hours.

TABLE 4 PROFILE OF USE OF REST AREA AND WELCOME CENTER AMENITIES

Amenity Used	Percentage of Respondents[a]
Restroom	97.2
Water fountain	43.7
Travel information	20.2
Parking lot	16.3
Trash cans	15.6
Telephone	11.5
Picnic table	8.6
Paths and grounds	7.2
Pet rest area	4.0
Benches	3.8
Cooking grill	0.3

[a]N = 1,937. A total of 4,423 responses were tabulated because of the allowance of multiple responses to the question; therefore, percentages do not total 100.

TABLE 5 ADDITIONAL REST AREA AMENITIES DESIRED

Amenity	Percentage of Respondents[a]
Vending machines	34.8
Nothing	29.9
Paper towels	19.9
Gas, food, hotel information	14.7
Additional rest rooms	14.5
Better water fountains	10.4
Hot water	8.4
Weather and road condition information	7.4
Larger truck lot	7.0
Larger car lot	5.1
Additional telephones	4.9
Restaurants	4.7
Children's play equipment	4.7
Diapering table	3.9
Pet watering troughs	3.2
Motor home dump stations	2.6
More picnic equipment	2.1
More landscaping	0.9

[a]N = 1,832. Percentages do not total 100 because of multiple responses.

Reason for Stopping and Usage Patterns of Amenities

Respondents were asked their principal reason for stopping at the rest area or welcome center. Eighty-two percent of those stopping at rest areas and 72 percent of those stopping at welcome centers did so principally to use the restrooms. The remainder of the respondents stopped to rest (7 percent), picnic (2 percent), obtain travel information (4.3 percent), make a telephone call (2 percent), or for miscellaneous purposes (3.3 percent).

Survey respondents were asked to indicate the amenities they used during their stop. Table 4 presents a profile of that usage. Although 20 percent of the total sample obtained travel information during their stop, of those stopping at welcome centers, almost half obtained travel information compared to 8 to 10 percent of those stopping at rest areas. Facilities used the least are benches, cooking grills, and pet rest areas.

Respondents were given the opportunity to suggest additional amenities for the rest area at which they stopped or to any other rest area along the interstate system. Table 5 presents a profile of these suggestions.

As the table shows, the additional amenity desired most by the greatest majority of the respondents is vending machines. A significant number of respondents suggested that paper towels be made available in the restrooms. A significant number of respondents also suggested that rest areas include information about the motorist services (gas, food, and lodging) that are available along the interstate route. Finally, a significant number of respondents, the majority of whom were female, pointed out the need for additional restroom facilities.

Survey responses indicate that overall, motorist opinion of rest facilities in Virginia is quite high. Eighty percent of the survey respondents rated them as good or excellent, whereas only about 4 percent rated them as poor.

SUMMARY AND CONCLUSIONS

As part of the effort to improve motorist safety and comfort, the VDOT has constructed 28 rest areas and 9 welcome centers along its interstate system. The first such facility opened in 1964 on Interstate 81 in Botetourt County; the last opened in 1983 on Interstate 95 in Prince William County. Concomitant with its plans for developing additional rest area sites, representatives from the Department's Environmental Division perceived a need for an assessment of the service delivery characteristics of the existing sites, many of which were built more than 20 years ago. This study examined existing conditions at selected sites and assessed what impact the provisions of new services might have on that service delivery. This paper presents the results of that assessment.

On average, 1,600 passenger cars and 421 tractor-trailer trucks or recreational vehicles enter Virginia's rest areas and welcome centers daily. During peak periods, which are typically weekends and holidays, these daily volumes can rise to 2,800 and 650, respectively. At welcome centers, passenger car traffic volumes are about the same as they are at rest areas, whereas truck traffic volumes tend to be roughly 20 percent lower at welcome centers than at rest areas. The highest traffic volume at all sites generally occurs in the summer, and roughly 58 percent of the passenger cars stopping at these facilities are from out of state. The data showed that about 6 to 10 percent of the mainline passenger car traffic and 10 to 12 percent of the mainline truck traffic stop at rest areas and welcome centers. At some sites, especially those on Interstates 64 and 66, as many as 22 percent of the mainline trucks stopped at rest areas on selected days. These occurrences may be due to the absence of commercial truck facilities on both of these routes.

On average, passenger cars and large trucks entering rest areas and welcome centers year-round contain 1.85 and 1.05 occupants, respectively. These rates are slightly higher during the summer. Based on the previously mentioned traffic volumes, this means that, on average, in excess of 3,500 persons can be expected to use rest areas and welcome centers on a typical day. During the summer, on holidays, and weekend peak periods, this number can exceed 7,000. The average duration of stay for these vehicles was found to be 9.1 minutes for passenger cars and about 15 minutes for large trucks and recreational vehicles. The average stopping interval for the latter vehicle class did not include overnight stays. Since data were gathered only during the daylight hours, a precise determination as to the frequency and duration of overnight stays

could not be ascertained. Early-morning observations by the research team as well as reports received from rest area custodial personnel, however, indicated that stays in excess of the 2-hour limit are frequent during nocturnal hours. At some sites, extended stays were found to result in trucks parking along entrance and exit ramps as well as the interstate mainline, thus creating a safety hazard. The VDOT appears to be faced with a dilemma here. The extension or removal of the 2-hour limit might compound the problem. A better solution might be the enlargement of truck parking lots or the construction of additional trucks-only rest areas, or both. The latter alternative has proven successful in one area of the Commonwealth and would likely be welcomed by the trucking industry. Another alternative might be the reduction of the 2-hour limit to, say, 30 minutes, which might be more easily enforced by the Virginia State Police.

Restrooms are the most frequently used amenity at rest areas and welcome centers. Even though the greatest percentage of restroom users are males, the women's restrooms were the ones found to be at or exceeding capacity most often. Length of stay for females in restrooms appears to be longer than that for men. Although this phenomenon might be attributable to several factors, the most likely reason is simply that urinal usage is faster than toilet usage. Consequently, women's restrooms may need more comfort facilities than men's restrooms. In this regard, specifics set forth in the Bureau of Public Roads design guide appear questionable and may need updating.

General maintenance and upkeep of all but 14 of the Commonwealth's rest areas and welcome centers is the responsibility of custodians employed by the VDOT. Each site usually has one custodian on duty between 6 a.m. and 10 p.m.

In late 1987, vending machines operated on a 24-hour basis were installed at nine rest area and welcome center locations. Public acceptance thus far has been enthusiastic. Custodians reported a 30 to 50 percent increase in refuse and some additional accumulation of litter on the rest area grounds but, in most cases, not a sufficient amount to warrant additional manpower. Requests for custodial assistance in making change and recovering money lost in machines were frequent until signs were erected informing patrons that custodians were not responsible for these services.

During the first summer of operation, no cases of vending machine vandalism were documented. However, as peak travel periods subsided, vandalism began to occur at two sites. Since these break-ins occurred when attendants were not on duty, the VDOT has been forced to close the vending buildings at these two locations when attendants are not on duty. This action has resulted in some criticism from the public, who desire 24-hour accessibility to the vending machines. Many alternatives exist for coping with the vandalism of vending machines. Studies in other states have shown that having an attendant on duty for 24 hours seems to help (*5*, *6*). Other alternatives that have been tried include vandal-proof machines, partial or total closure of the vending operation, and alarm systems.

A survey distributed to motorists stopping at rest areas and welcome centers revealed that the typical user is 52 years of age or older and stops about every 2.5 hours. The most common facilities used are restrooms, water fountains, and travel guides. At welcome centers especially, the availability of travel information is very important to the interstate traveler. When asked what additional amenities they would like to see included at rest areas, more than one-third of those responding listed vending machines. Motorists' opinions of Virginia's rest area and welcome center facilities is quite high, and more than one-third of the respondents felt that additional facilities are needed system wide.

The importance of rest areas and welcome centers to the interstate traveler cannot be overstated. They provide an indispensable means for enhancing motorist safety and comfort. Changes in population growth and the diversity of the driving public have resulted in increased demands on these facilities. These demands can be met only if steps are initiated to ensure that these facilities provide the services needed by today's interstate travelers. It is hoped that information gathered during this study will assist decision-makers in initiating such steps.

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