

Spotsylvania Mall Expansion

Traffic Impact Study

Executive Summary

Vanasse Hangen Brustlin, Inc. (VHB) has been retained by the Spotsylvania Mall Company to evaluate the traffic impacts of a proposed expansion of the existing Spotsylvania Mall development on Route 3 in Spotsylvania County, Virginia. As part of this expansion, a road is proposed that would connect Route 3 to Harrison Road to the south through the mall property, generally in a path parallel to I-95. The purpose of this evaluation is to identify and recommend appropriate measures to ensure that safe and efficient traffic flow is maintained on study area roadways in conjunction with the proposed mall expansion and roadway connector.

Project Description

The Spotsylvania Mall Company proposes to expand the Spotsylvania Mall property with the addition of new commercial development on the southern and eastern side of the site. The development program will consist of the addition of approximately 215,000 s.f. of retail space, 30,000 s.f. of restaurant use, a 300 room hotel, and a multiplex cinema with 18 screens. In addition to the mall expansion, a new public road is proposed that would connect Route 3 at Carl D. Silver Parkway to Harrison Road approximately 2 miles to the south. The new connector road, referred to in the traffic impact as the Harrison Road Connector, will pass through the mall property on the east side of the site and will provide direct access to the mall parking lots. The proposed development will not displace existing commercial facilities on the site. Vehicular access to the site is currently provided by two signalized intersections on Route 3 at Bragg Road and Mall Drive/Central Park Boulevard.

Trip Generation

Project-related trip generation rates developed by ITE were calculated for each of the proposed land uses that are part of the proposed expansion of the Mall: shopping center, hotel, restaurant, and movie theater. The rates calculated for retail space are based on the gross leasable area, hotel rates are based on number of rooms, restaurant trip rates are based on gross floor area, and movie theater rates are based on the number of screens.

The number of vehicle trips expected to be generated by the Spotsylvania Mall Expansion project are presented in Table 1. These volumes are in addition to the traffic already being generated by the present use. The total number of vehicle trips expected to enter and exit the Spotsylvania Mall site as a result of the proposed expansion are 578 and 1,265 during the Friday AM and PM peak hours, respectively, and 1,512 during the Saturday midday peak hour.

Table 1
Spotsylvania Mall Expansion
Trip Generation Summary

Land Use	Size	Friday AM Peak Hour			Friday PM Peak Hour			Saturday Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
Shopping Center	215,000 s.f.	50	32	82	200	217	417	288	266	553
Hotel	300 Rooms	102	66	168	94	83	177	121	95	216
Restaurant*	30,000 s.f.	171	158	328	190	121	311	270	159	428
Movie Theater**	18 screens	0	0	0	216	144	360	227	88	315
Total Trips		323	256	578	700	565	1,265	905	607	1,512

*Saturday restaurant trips were reduced by 25% to represent the lunch peak, which is more indicative of the actual trip generation during the Saturday peak of adjacent streets. In addition, all peak period restaurant trips were reduced by 5% to account for internal traffic.

**Movie Theater trips reduced by 10% to account for internal traffic.

Existing Traffic Conditions

The following summarize the results of the capacity analysis conducted for the existing signalized and unsignalized intersections immediately surrounding the Mall property. The level of service (LOS) and average overall delay were calculated for each intersection and shown below in Table 2 for the Friday AM and PM peak periods, as well as for the Saturday peak period. The Friday peak hours were determined to be 7:45 AM to 8:45 AM and 4:30 PM to 5:30 PM, and the Saturday peak hour was 12:30 PM to 1:30 PM. Observations of traffic flows and operational characteristics of the study area roadway network were made during each peak period.

Table 2
Existing Conditions
Peak Hour Intersection Level of Service

Intersection	Friday AM Peak Hour	Friday PM Peak Hour	Saturday Peak Hour
	LOS (Delay) ¹	LOS (Delay) ¹	LOS (Delay) ¹
Route 3 @ Carl D. Silver Pkwy	B (16.5)	F (83.6)	F (143.1)
Route 3 @ Central Park / Mall Dr	A (7.6)	D (40.0)	F (101.5)
Route 3 @ Bragg Rd	C (25.9)	F (86.2)	E (59.2)
Harrison Rd @ Salem Church Rd	C (22.6)	D (42.8)	D (41.2)
Harrison Rd @ Route 1	F (246.5)	F (234.8)	F (107.0)
*Bragg Rd @ Amos Ln / Mall Ent	N/A	F (WB 119.8)	F (EB / WB >300)
*Bragg Rd @ Maple Grove Dr	N/A	C (EB 19.7)	D (EB 28.2)
*Bragg Rd @ Mall Ring Rd	N/A	A (NB 10.0)	B (NB 12.0)
*Mall Dr @ Mall Ring Rd	N/A	F (EB >300)	F (EB >300)

Notes:

(1) Total delay is being expressed as seconds per vehicle.

* Delay for unsignalized intersections is shown for the critical movement only.

Friday AM Peak Hour

Each of the three signalized intersections along Route 3 operate at LOS C or better. A majority of the traffic on Route 3 during the AM peak period is commuter traffic heading east and west. The mall is not open during the morning commuter peak, so side street traffic volumes are lower since site ingress and egress is minimal. Therefore, more green time can be dedicated to the heavier Route 3 through movements at each intersection, which results in effective operation. All v/c ratios for the critical movements at each intersection on Route 3 are below 1.0. Moderate queuing occurs at the eastbound and westbound approaches at each intersection within the study area.

During the AM peak hour, the Salem Church Road and Route 1 intersections along Harrison Road operate at LOS D and F, respectively. Harrison Road is primarily used by commuter traffic to access Route 1 and the City of Fredericksburg and by residential traffic. The intersection at Harrison Road at Route 1 is operating well over capacity with all but 2 turning movements operating at LOS E or F during the AM peak hour.

Friday PM Peak Hour

During the observed PM peak hour, eastbound and westbound traffic queues at the intersections along Route 3 were relatively long, with vehicles often backing into the adjacent up and/or downstream intersections. Specifically, two of the three intersections on Route 3, Carl D. Silver Parkway and Bragg Road, operate at LOS F and the critical movements are over capacity (v/c > 1.0). In addition, the intersection of Central Park Boulevard/Mall Drive and Route 3 operates at LOS D, but the critical westbound through movement is near capacity with a v/c ratio of 0.98. Three unsignalized side streets that intersect Bragg Road were also evaluated during this

time period. Maple Grove Drive and the southern Mall Ring Road both operate at an acceptable LOS, but the Amos Lane/Mall Entrance and Bragg Road intersection was found to operate at LOS F. Lastly, the Mall Drive and Mall Ring Road intersection, which serves as the primary entrance to Spotsylvania Mall, was analyzed and found to operate at LOS F. At this intersection, the southbound vehicles entering the site flow freely without control. The eastbound and westbound movements are stop controlled along the Mall Ring Road. These eastbound and westbound movements experience significant delays due to the high volume of free-flowing southbound vehicles on Mall Drive, which does not allow many safe opportunities to proceed through the intersection.

During the PM Peak Hour, traffic at the intersection of Harrison Road and Salem Church Road operates at an overall acceptable LOS D, while the intersection of Harrison Road and Route 1 continues to operate at a failing LOS F. Although the intersection at Harrison Road and Salem Church Road is operating at an overall LOS D, the northbound and southbound left turn movements operate at failing levels of service during this time period due to limited left-turn green time.

The intersection at Route 1 and Harrison Road operates at an overall LOS F during the weekday PM peak hour, with a majority of individual movements also operating at LOS F due to heavy commuter traffic volumes.

Saturday Peak Hour

All signalized intersections along Route 3 within the study area operate at LOS E or worse and the critical movements are operating over capacity ($v/c > 1.0$). At the intersection of Route 3 and Carl D. Silver Parkway, the queues in the westbound through- and right-turn lanes extend well beyond the intersection, which causes back ups on the southbound I-95 off-ramp. Eastbound left-turns are the critical movement at the intersection of Route 3 and Central Park Boulevard/Mall Drive. Queues extend well beyond the available storage for the left turns onto Central Park Boulevard, which disrupts eastbound through traffic along Route 3. This intersection operates at LOS F, and the queues at the eastbound and westbound Route 3 approaches often extend into adjacent intersections. Queuing on the northbound approach for traffic exiting the mall extends back into the mall and disrupts the operation of the unsignalized intersection of Mall Drive with Mall Ring Road, especially for internal mall traffic seeking to turn left onto Mall Drive and exit the site. The intersection of Route 3 with Bragg Road operates at LOS E, and queues on the eastbound and westbound through approaches extend into adjacent intersections.

During the Saturday peak hour, the intersection of Harrison Road and Salem Church Road continues to operate at LOS D. Similar to the PM peak hour, the intersection at Harrison Road and Salem Church Road is operating with the northbound and southbound left turn movements at failing levels of service during the Saturday peak.

The intersection of Harrison Road and Route 1 continues to operate at LOS F during this time period due to heavy traffic volumes in all directions.

Recommended Roadway Improvements

Based on iterative analysis of the future traffic conditions, a number of roadway improvements are recommended in conjunction with the expansion of Spotsylvania Mall in order to best accommodate projected traffic volumes. The most significant roadway improvement is the proposed construction of the Harrison Road Connector, which will connect Route 3 to Harrison Road. The other roadway improvements are intended to accommodate an increase in traffic generated by the mall expansion and will also provide overall intersection capacity benefits to the signalized intersections on Route 3 along the mall frontage. The following are detailed descriptions of the recommended roadway improvements that are conceptually illustrated in Figure 1 attached at the end of this summary:

- Construct the Harrison Road Connector which will connect Route 3 at Carl D. Silver Parkway to Harrison Road approximately 2 miles to the south. This new road will consist of a four lane cross-section and is proposed to run along the eastern side of the site and will provide direct access to the mall parking lots.
- The construction of the Harrison Road Connector will require capacity improvements at the intersection of Route 3 and Carl D. Silver Parkway in order to accommodate the traffic diversions that will result from this new roadway. The following improvements are recommended at this intersection:
 - Provide dual westbound left turn lanes from Route 3 onto Mall Court/Harrison Road Connector. These lanes should be constructed to provide 500 feet of storage and should be separated from the through lanes by a concrete median island to prevent motorists from the southbound I-95 off ramp from accessing these turn lanes.
 - Provide an exclusive left turn lane, two through lanes and two right turn lanes for the northbound approach of Mall Court/Harrison Road Connector to this intersection. The dual right turn lanes are recommended to be signal controlled at all times for safety reasons.
 - Provide an additional exclusive southbound through lane on Carl D. Silver Parkway at this intersection to accommodate southbound traffic through this intersection.
- The construction of the Harrison Road Connector will also require capacity improvements at the intersection with Harrison Road. The intersection is recommended to be signalized and consist of dual eastbound left turn lanes and

one eastbound through lane on Harrison Road. In the westbound direction, two through lanes and an exclusive right turn lane is recommended. The southbound approach of the Harrison Road Connector is recommended to consist of one exclusive right turn lane and one exclusive left turn lane.

- Harrison Road is recommended to be widened to a four lane cross-section for the full length between Salem Church Road and the Harrison Road Connector.
- Widen eastbound Route 3 by one lane between the intersections of Central Park Boulevard and Carl D. Silver Parkway to provide a new full lane of storage for left turning vehicles into Central Park, without reducing the number of through lanes on Route 3.
- Widen and restripe the northbound approach to the intersection of Route 3 and Central Park Boulevard/Mall Drive to provide an exclusive left turn lane, two exclusive through lanes, and a single free-flow right turn lane. The widening required would be 12 feet of widening on the eastern side of the roadway for a length of approximately 300 feet to the first driveway to the south.
- Restripe the southbound approach of the intersection of Route 3 and Central Park Boulevard/Mall Drive to provide a single left turn lane, two through lanes, and an exclusive right turn lane.
- Improve the internal mall intersection at Mall Drive and Mall Ring Road by constructing a dual-lane roundabout. This will eliminate long queues and provide for safe and efficient traffic flow through this intersection. This identical improvement may also be needed at the new Harrison Road Connector intersection with the Mall Ring Road. Further study of these roundabouts is suggested to determine design criteria such as size and number of lanes.
- Provide additional eastbound through lane through the intersection of Salem Church Road and Harrison Road to align with the four-lane cross section east of the intersection. This will require the widening of Harrison Road for approximately 400 feet west of the intersection with Salem Church Road.
- Participate in upgrading the traffic signal controllers on Route 3 from Carl D. Silver Parkway to Frye Lane (Route 688) to improve traffic signal coordination and provide for traffic-responsive operations.
- Provide general improvements such as lane striping or the potential provision of right-turn bays for major entrances on Harrison Road between the Harrison Road Connector and I-95 to improve traffic flow and safety.

2009 Future Traffic Conditions

The future conditions traffic capacity analysis was performed in order to compare projected 2009 traffic conditions at intersections surrounding the mall property with and without the proposed expansion of the Spotsylvania Mall. The No-Build analysis results shown in Table 3 summarize anticipated future overall traffic conditions at intersections in 2009 with the opening of Cowan Boulevard, future County improvements on Bragg Road north of Route 3, and regional traffic growth, but no expansion of the Spotsylvania Mall. The Build results in Table 3 present the projected levels of service at intersections with the expansion of the Spotsylvania Mall and the recommended roadway improvements proposed with the expansion, including the Harrison Road Connector.

A discussion of the results for the signalized and unsignalized intersections is presented in the following sections.

**Table 3
Traffic Analysis Comparison**

	Intersection	Friday AM Peak Hour		Friday PM Peak Hour	
		No-Build LOS (Delay) ¹	Build LOS (Delay) ¹	No-Build LOS (Delay) ¹	Build LOS (Delay) ¹
Signalized	Route 3 @ Carl D. Silver Pkwy	B(16.8)	C(26.3)	E(70.5)	E(64.0)
	Route 3 @ Central Park Blvd	A(8.1)	B(11.0)	D(46.0)	C(31.5)
	Route 3 @ Bragg Rd	C(32.2)	C(24.9)	F(92.3)	E(55.0)
	Harrison Rd @ Salem Church Rd	C(26.1)	C(26.8)	D(53.3)	E(59.5)
	Harrison Rd @ Connector	N/A	A(8.2)	N/A	B(18.0)
	Harrison Rd @ Route 1	F(280.3)	F(288.4)	F(203.3)	F(217.1)
Unsignalized	*Bragg Rd @ Mall Ent / Amos Ln	N/A	N/A	F(119.8)-WBL/T	F(238.4)-WBL/T
	*Bragg Rd @ Maple Grove Dr	N/A	N/A	C(19.7)-EBL/R	C(18.5)-EBL/R
	*Bragg Rd @ Mall Ring Road	N/A	N/A	A(10.0)-NBL	B(10.2)-NBL
	*Mall Dr @ Mall Ring Rd ²	N/A	N/A	F(>300)-EBL	B(0.67 v/c)

	Intersection	Saturday Peak Hour	
		No-Build LOS (Delay) ¹	Build LOS (Delay) ¹
Signalized	Route 3 @ Carl D. Silver Pkwy	F(127.3)	F(113.6)
	Route 3 @ Central Park Blvd	F(99.1)	E(77.7)
	Route 3 @ Bragg Rd	E(59.8)	D(52.9)
	Harrison Rd @ Salem Church Rd	D(54.0)	E(65.0)
	Harrison Rd @ Connector	N/A	B(17.9)
	Harrison Rd @ Route 1	F(138.9)	F(165.5)
Unsignalized	*Bragg Rd @ Mall Ent / Amos Ln	F(>300)-WBL/T	F(>300)-EB/WB
	*Bragg Rd @ Maple Grove Dr	D(28.2)-EBL/R	C(23.5)-EBL/R
	*Bragg Rd @ Mall Ring Road	B(12.0)-NBL	B(11.8)-EBL
	*Mall Dr @ Mall Ring Rd ²	F(>300)-EBL	C(0.63 v/c)

Notes:

(1) Total delay is being expressed as seconds per vehicle.

(2) This intersection was analyzed as a roundabout under the build scenario.

* Delay for unsignalized intersections is shown for the critical movement only.

Future Signalized Intersection Analysis

As presented in Table 3 for the weekday AM peak hour, the signalized intersections on Route 3 are projected to continue to operate at LOS C or better due to the fact that retail traffic is much less significant during this peak hour. In addition, the signalized Harrison Road intersections of Salem Church Road and the Harrison Road Connector will also operate at LOS C or better, while the intersection of Harrison Road and Route 1 will operate at LOS F.

During the weekday PM and Saturday peak hours, significant improvements in levels of service are projected for the three signalized intersections on Route 3 as a result of the traffic diversions resulting from the construction of the Harrison Road Connector. Route 3 intersections at Carl D. Silver Parkway/Harrison Road Connector, Central Park Boulevard/Mall Drive, and Bragg Road are projected to operate at an improved overall level of service with comparable or improved v/c ratios for almost all movements over the No-Build condition during the weekday PM and Saturday peak hours. Diversions associated with the Harrison Road Connector, along with recommended improvements at each of these intersections creates sufficient capacity to accommodate the projected additional mall traffic.

In terms of the Harrison Road intersections, Route 1 operates at LOS F during existing conditions, and is projected to continue to operate at this LOS during the Future No-Build and Future Build scenarios as well.

The Salem Church Road intersection is projected to operate at LOS D during the Friday PM and Saturday Future No-Build scenario (with failing movements for the northbound and southbound left turns) and will operate at a failing LOS F during the Future Build scenario without additional road improvements. Therefore, it is recommended that an additional eastbound through lane be added to the intersection as a part of the proposed mall expansion to accommodate the diversion of traffic resulting from the construction of the Harrison Road Connector. This is in addition to a second northbound left turn lane and a second southbound left turn lane which are recommended under the No-Build scenario without the proposed expansion of the mall. These improvements will result in the intersection operating at LOS E during the Friday PM and Saturday Future Build scenario.

Future Unsignalized Intersection Analysis

The unsignalized intersections studied for the Future Build traffic conditions are all located on Bragg Road south of Route 3, with the exception of the internal Mall Ring Road and Mall Drive intersection. The intersection of Bragg Road and Amos Lane/Mall Entrance operates at LOS F during existing conditions, and is projected to continue to operate at this LOS for Future No-Build and Future Build scenarios as well. It should be noted that although the intersection is calculated to operate at LOS F, gaps in traffic on Bragg Road are created by the traffic signal on Route 3,

which helps this intersection operate better than calculated. The proposed expansion only adds a small percentage of additional traffic to this entrance and will continue to operate under similar conditions as it does today. In addition, should delays or queues for outbound traffic from this Mall Entrance become excessive, motorists are expected to divert to the mall entrance further south on Bragg Road.

The unsignalized Bragg Road intersections of Maple Grove Road and Mall Ring Road are projected to operate at LOS C and LOS B, respectively, during both the Friday PM and Saturday midday peak hours under the Future Build scenario due to the reduction in traffic associated with the Harrison Road diversion.

The unsignalized intersection of Mall Drive and the Mall Ring Road operates at LOS F during existing conditions, and is projected to continue to operate at this LOS for Future No-Build and Future Build scenarios as well. To mitigate the operation of this intersection, Mall Drive and the Mall Ring Road was analyzed for the Future Build scenario as a roundabout. The roundabout intersection control is recommended at this location because it will reduce queueing and delays for the congested traffic movements from the Mall Ring Road, while still providing a relatively free-flow condition for inbound traffic from Route 3. With this in mind, this type of intersection control is also recommended at the proposed intersection of the Harrison Road Connector and the Mall Ring Road since the same delays and queuing problems will most likely exist at that intersection as well.

A general analysis of the roundabout demonstrates that the capacity of a dual-lane roundabout will be sufficient for the traffic volumes projected at this intersection. However, further design study of the roundabouts are recommended before implementation of those improvements.

Conclusions

The traffic analysis performed for the proposed expansion of the Spotsylvania Mall reveals that the roadway network surrounding the Mall, with the addition of the Harrison Road Connector and other recommended improvements surrounding the site as described previously, is projected to operate with significantly improved traffic conditions on Route 3 between Carl D. Silver Parkway and Bragg Road, particularly during the weekday PM and Saturday peak traffic hours. This is because the new proposed road connection is projected to divert a significant amount of traffic from the currently congested Route 3 corridor. The additional roadway improvements recommended at other study area intersections surrounding the mall are projected to mitigate the traffic impacts of the additional traffic projected to be generated with the expansion of the Spotsylvania Mall.