TRAFFIC & PARKING STUDY FOR PROPOSED BIRMINGHAM BOUTIQUE HOTEL

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EXECUTIVE SUMMARY

Lorient Capital LLC is proposing to demolish the two existing one-story office buildings on the northwest corner of Old Woodard and Brown and replace them with a five-story boutique hotel. The first four levels of the hotel (plus a mezzanine) will include 141 guest rooms, two restaurants, two bars, a banquet room, and five meeting rooms. Level 5 will include 17 rental apartments, for which 32 on-site parking spaces will be provided in a one-level underground garage. Preliminary floor plans for all levels are included in the body of this report. Construction and full use of the building is desired within two years.

Access to the hotel's on-site parking garage for apartment residents will be provided via an internal ramp near the building's northeast corner. All other guests will either walk to and from the hotel and/or be served by a valet operation on the hotel's Old Woodward frontage. Valet-serviced guest vehicles will be parked in the City's Pierce or Peabody Street decks or other public places in the general area; those needing to be parked during the peak hours of street traffic are expected to be parked west of Old Woodward in the general vicinity of the new hotel.

This traffic and parking study was prepared by Giffels Webster staff, guided by the City of Birmingham's Traffic Study Questionnaire Form B, comments by the City's traffic engineering consultant, and widely accepted traffic planning and engineering practice for such studies.

The key findings and conclusions developed in this study are as follows:

- ❑ The proposed hotel will feature more-than-adequate underground parking for its rental units. Employees are assumed to self-park in various off-site locations. All other hotel visitors will either walk to and from various off-site locations or be served by valets. The off-site parking needed for valeted vehicles is expected to peak in evening hours at about 130 vehicles, but this is not a site plan requirement due the site's location in the City's downtown parking assessment district.

- ❑ The trip generation forecast in this study depends on several important assumptions, including the key assumption that visitors to the meeting rooms will arrive in the AM peak hour and depart before the PM peak hour, and visitors to the Banquet Room will arrive in the PM peak hour and depart in evening or overnight hours. As in the study's shared parking analysis (used to reach the preceding peak-parking conclusion), reasonable amounts of restaurant, bar, and banquet room visitation have been assumed to occur by patrons already staying in the hotel or walking to and from nearby off-site locations.

- ❑ Queuing analysis of the valet operation estimates that 13-14 valets will be needed in the critical PM peak hour to keep the service bay occupancy limited to six vehicles (at a 95% confidence level, assuming an average valet service time of 4.7 minutes).

- The traffic impacts of the proposed hotel will be minimal and can be easily mitigated. For the future total peak-hour traffic volumes forecasted at the Old Woodward/Brown intersection, very acceptable levels of service of C or better – for all individual movements as well as for the overall intersection – can be achieved with signal retiming.

- Vehicles exiting the hotel's parking garage and valet service bay are expected to experience a level of service of B. On average, southbound backups from the signal at Brown should not materially interfere with egress from the service bay. Drivers attempting to exit that bay will, however, occasionally find it to their advantage to pause until signal-queued vehicles have discharged after receiving the green light.

- No revisions to the currently planned future lanes adjacent to the site are needed to accommodate the proposed hotel. The hotel's garage access and valet service bay will, however, preclude the restoration of angled parking on the frontage.

- Pedestrian benches and bike racks should be provided on the site's Old Woodward frontage, at a minimum, on the nearby intersection "bump-out." Directional signing for the nearest bus stops north and south of the site would also be appropriate.

TRAFFIC & PARKING STUDY FOR PROPOSED BIRMINGHAM BOUTIQUE HOTEL

INTRODUCTION

Lorient Capital LLC is proposing to demolish the two existing one-story office buildings on the northwest corner of Old Woodard and Brown (Figures 1-4) and replace them with a five-story boutique hotel. The first four levels of the hotel (plus a mezzanine) will include 141 guest rooms, two restaurants, two bars, a banquet room, and five meeting rooms. Level 5 will include 17 rental apartments, for which 32 on-site parking spaces will be provided in a one-level underground garage. Preliminary floor plans for all levels are included below (Figures 5-10). Construction and full use of the building is desired within two years.

Access to the hotel's on-site parking garage for apartment residents will be provided via an internal ramp near the building's northeast corner (Figures 5-6). All hotel guests will either walk to and from the building and/or be served by a valet operation on the hotel's Old Woodward frontage. Valet-serviced guest vehicles will be parked in the City's Pierce or Peabody Street decks or other public places in the general area; those needing to be parked during the peak hours of street traffic are expected to be parked west of Old Woodward in the general vicinity of the new hotel.

This study was prepared by the traffic engineering staff of Giffels Webster (GW) (Appendix A), guided by the City's Traffic Study Questionnaire Form B (Appendix B), comments by the City's traffic engineering consultant, and widely accepted traffic engineering practice for such studies.

EXISTING CONDITIONS

Roadway Characteristics

Both Old Woodward and Brown are lighted, 25-mph streets under the jurisdiction of the City of Birmingham. The existing lane configuration of the two streets near their intersection can be seen in Figure 3. This intersection is controlled by a two-phase pre-timed traffic signal now operating on an 80-sec cycle 24 hours a day, seven days a week (see excerpts of timing permit in Appendix C).

Alternative Modes

Given their downtown location, both streets abutting the site are equipped with sidewalks on both sides. All four intersection approaches are equipped with zebra-bar crosswalks and count-down pedestrian signals. There are no public pedestrian benches near the intersection.

SMART offers fixed-route bus service along Old Woodward (Figure D-1), with two bus stops for each direction of travel within one block of Brown. The nearest stops for southbound travel are on the southwest corner of Old Woodward and Merrill (Figures D-2 and D-3) and a short distance south of Daines (Figure D-4 shows that the latter stop is equipped with a shelter). For northbound travel, there are stops opposite both Daines (Figure D-5) and Merrill (Figure C-6) (neither with a shelter). Currently, there are no signed bike lanes or bike routes near the site. Most bicycle parking in the area occurs informally, as there appears to be only one nearby bike rack (Figures D-2 and D-3).

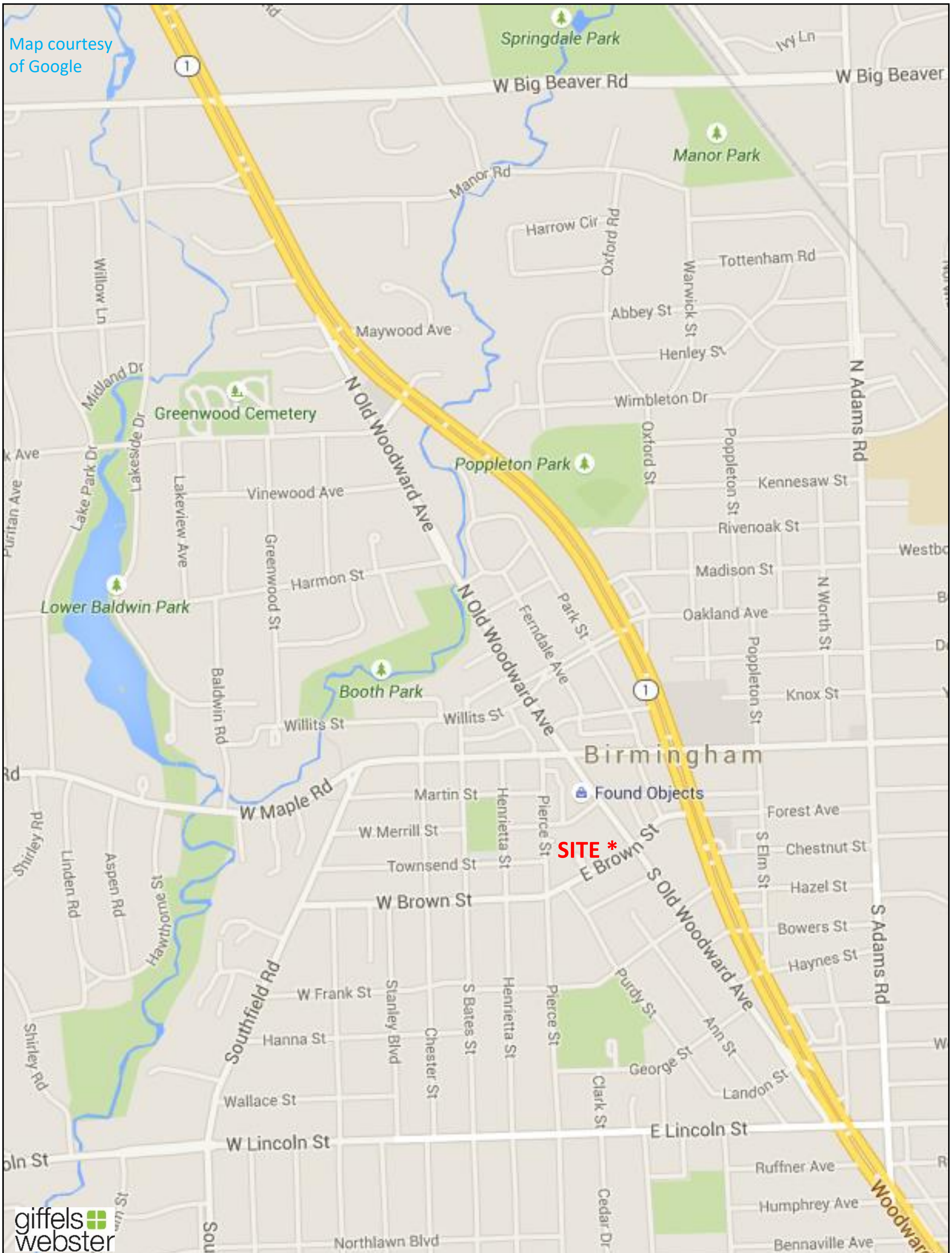


Figure 1. Vicinity Map

Figure 2. Walking Distance, Site to Nearest Two City Parking Decks

Figure 3. Site Aerial

Figure 4. Street-Level View

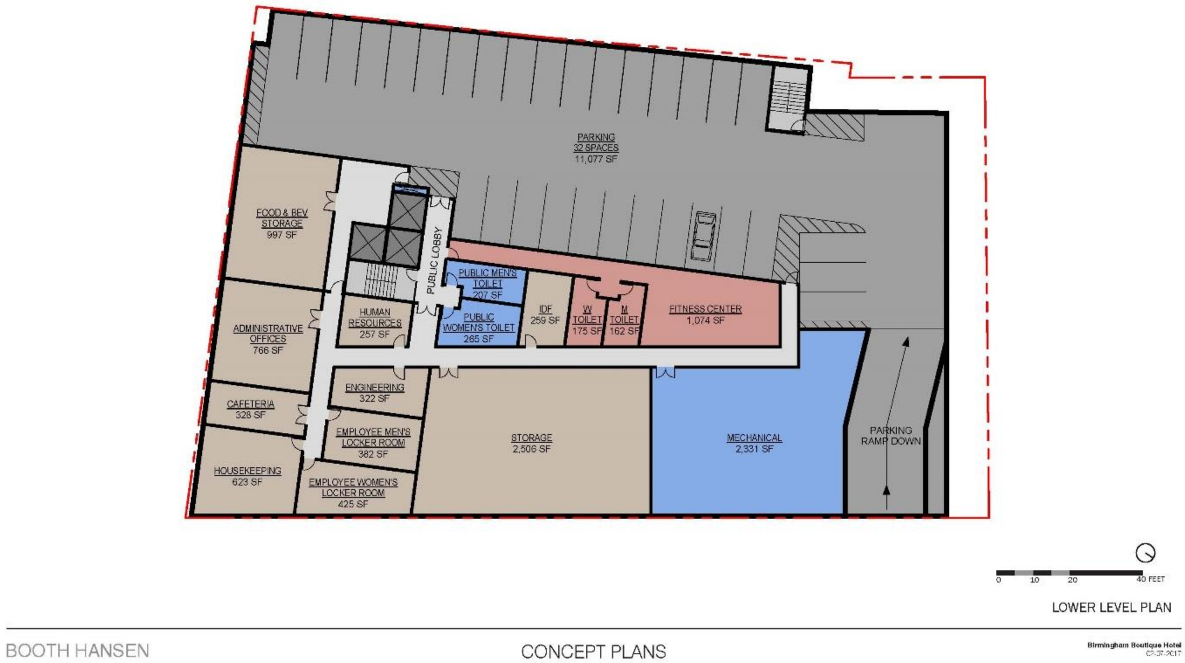


Figure 5. Lower-Level Floor Plan

Figure 6. Ground-Level Floor Plan

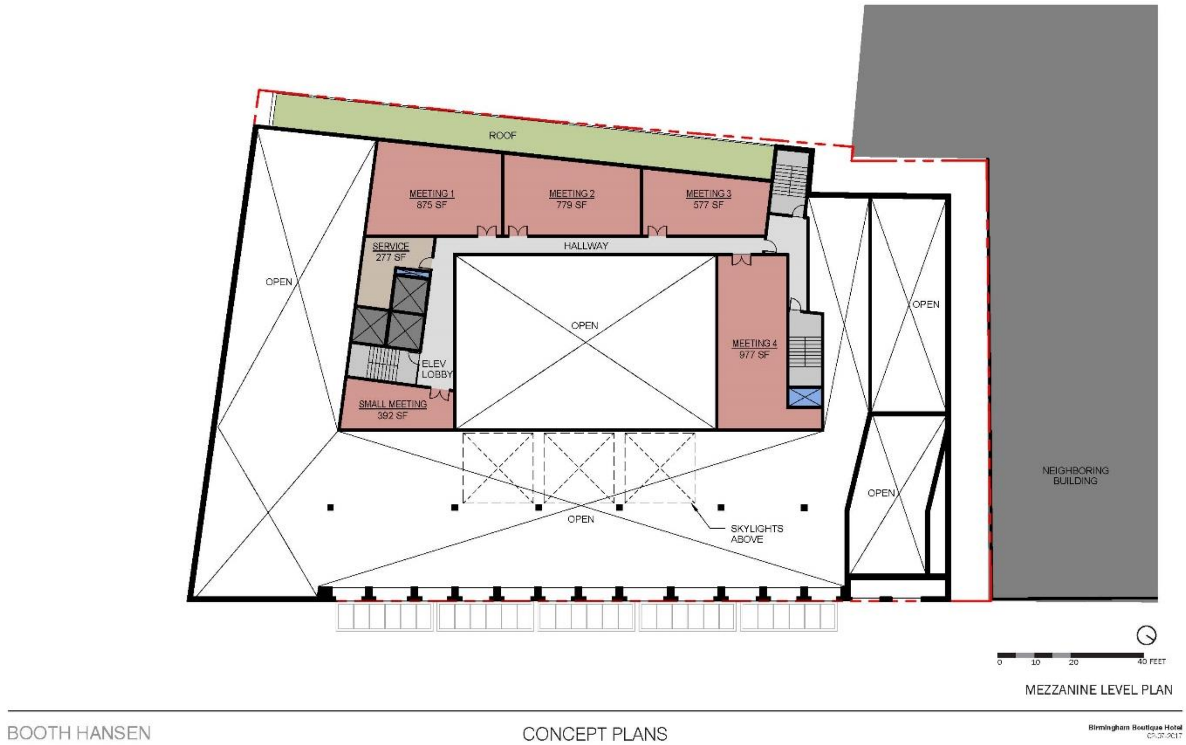


Figure 7. Mezzanine-Level Floor Plan

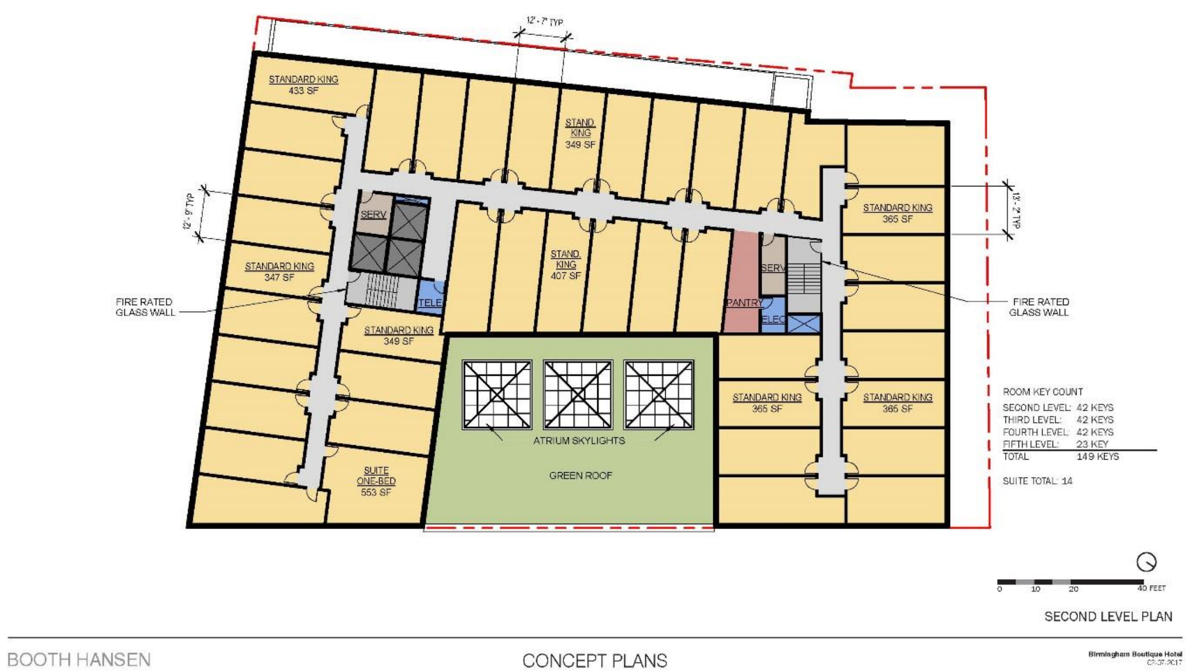


Figure 8. Second-Level Floor Plan

Figure 9. Third- and Fourth-Level Floor Plan

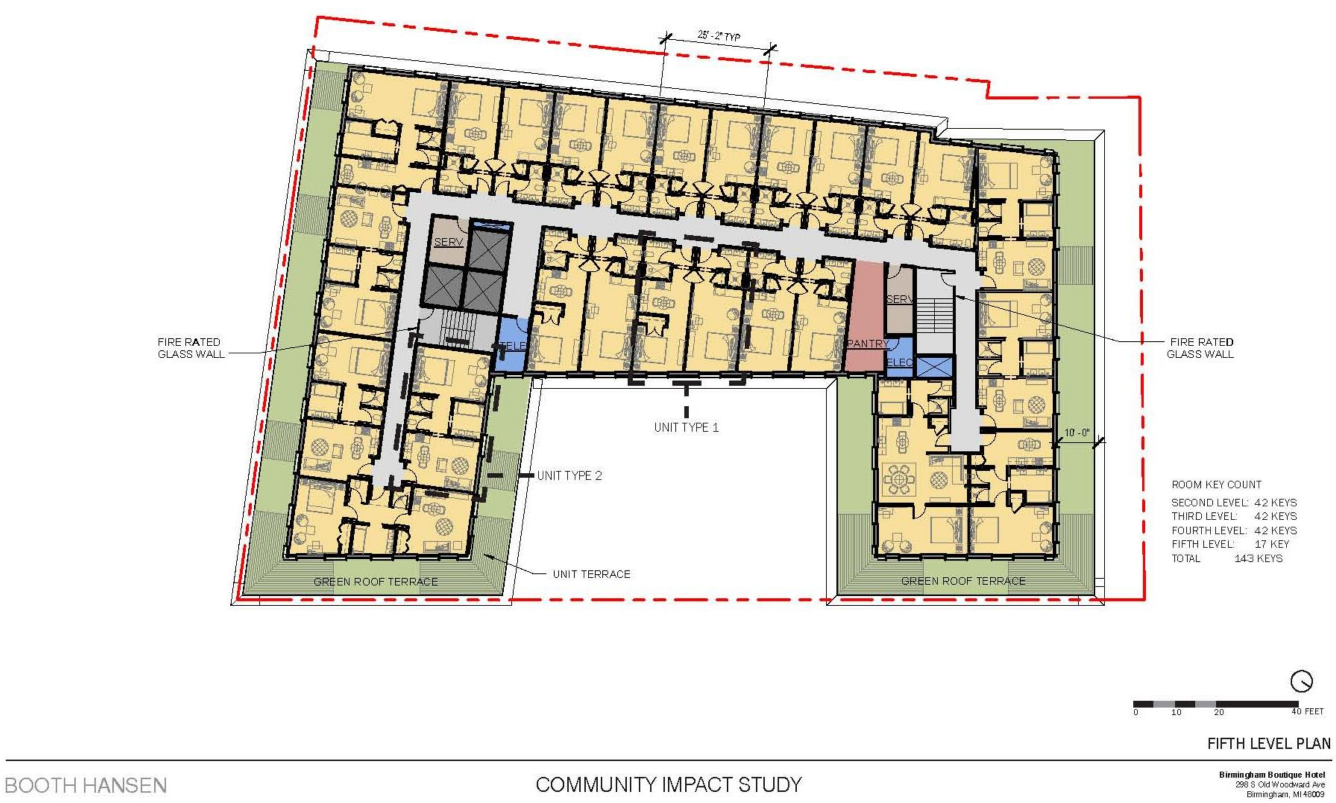


Figure 10. Fifth-Level Floor Plan

Current Use of Pierce and Peabody Street Parking Decks

As indicated in the Introduction, it is expected that the hotel parking valets will primarily utilize the City's Pierce Street and/or Peabody Street parking decks. To determine the prospective parking availability in those decks – as now configured – GW acquired current occupancy data from the deck operator (SP+) for representative weeks in both March 2017 (the present month) and July 2016 (a typical peak month of the year for hotel parking). These data are detailed in Appendix E and summarized in Tables 1 and 2 (below).

If the existing parking availability in the Pierce and Peabody decks is insufficient to handle proposed new developments in the area, one or both decks may have to be enlarged by the City as part of its parking assessment district. Alternatively, other locations for adding parking in the general vicinity may have to be identified by the City. Certain simplifying assumptions in this regard are made in this study, however, in order to reasonably distribute the hotel's valet-related parking traffic (see later section on trip distribution).

Current Traffic Volumes

At the direction of the City's traffic consultant, GW estimated the current (March 2017) peak-hour volumes at the Old Woodward and Brown (shown in Figure 11) by adjusting the May 2016 counts done for the City by Traffic Data Collection (Appendix F). The needed adjustment factor was developed by first estimating the average annual rate of increase in the Annual Average Daily Traffic (AADT) volume on Old Woodward. In searching SEMCOG's on-line data base, the nearest point on that street for which AADT data were found to exist for two different years was north of the site, between Maple and Oak. The two-way AADT volumes on that segment were 10,355 in 2013 and 8,830 in 2007, which indicated an effective annual average rate of increase of 2.7%. Since only 10 months elapsed between May of last year and March of this year, it was then estimated that the increase over this period was likely on the order of (10/12) x 2.7%, or 2.25%. The latter value was applied to the City counts to predict the current volumes. The above method and results were reviewed and approved by the City's traffic consultant.

Assuming that traffic volume in the PM peak hour represents a typical 9% of daily traffic, the estimated current PM peak-hour volumes suggest that the average daily volumes at the subject intersection are approximately 8,200 vehicles on Old Woodward and 10,300 on Brown.

FUTURE CONDITIONS

Background Traffic Volumes

A traffic impact study generally forecasts the future background traffic that can be expected to exist at the time of project build-out, but in its hypothetical absence; this is done to provide a suitable "base case" for evaluating the impacts of adding project-generated traffic. The projected growth in background traffic typically accounts for both regional economic development and the future occupation of approved but as yet unbuilt nearby developments. The City and its traffic consultant confirmed that there are no such developments likely to add significant new traffic to the Old

Table 1. Open Parking Deck Spaces in July 2016

Hour	Pierce Deck		Peabody Deck		Total of Two Decks	
	Weekdays	Saturdays	Weekdays	Saturdays	Weekdays	Saturdays
12:00 AM	609	676	385	146	994	822
1:00 AM	628	679	386	334	1014	1013
2:00 AM	635	682	385	395	1020	1077
3:00 AM	637	682	386	396	1023	1078
4:00 AM	648	684	412	407	1060	1091
5:00 AM	694	696	424	425	1118	1121
6:00 AM	688	690	409	423	1097	1113
7:00 AM	667	684	396	422	1063	1106
8:00 AM	565	673	337	431	902	1104
9:00 AM	395	661	203	399	598	1060
10:00 AM	224	655	86	398	310	1053
11:00 AM	147	651	143	382	290	1033
12:00 PM	98	653	34	353	132	1006
1:00 PM	**61**	650	**30**	325	**91**	975
2:00 PM	75	648	38	311	113	959
3:00 PM	125	648	58	314	183	962
4:00 PM	169	647	76	296	245	943
5:00 PM	232	653	187	280	419	933
6:00 PM	312	662	246	257	558	919
7:00 PM	273	664	268	234	541	898
8:00 PM	257	666	316	209	573	875
9:00 PM	344	668	371	186	715	854
10:00 PM	468	669	391	158	859	827
11:00 PM	558	673	387	155	945	828

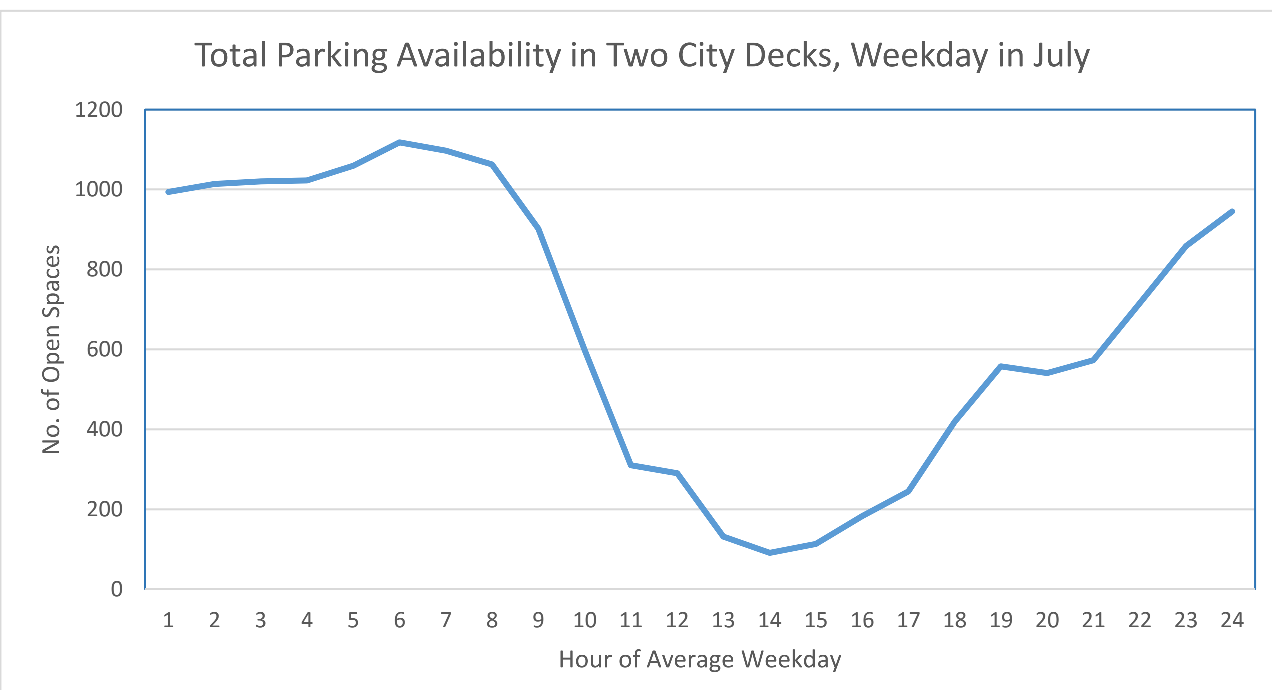
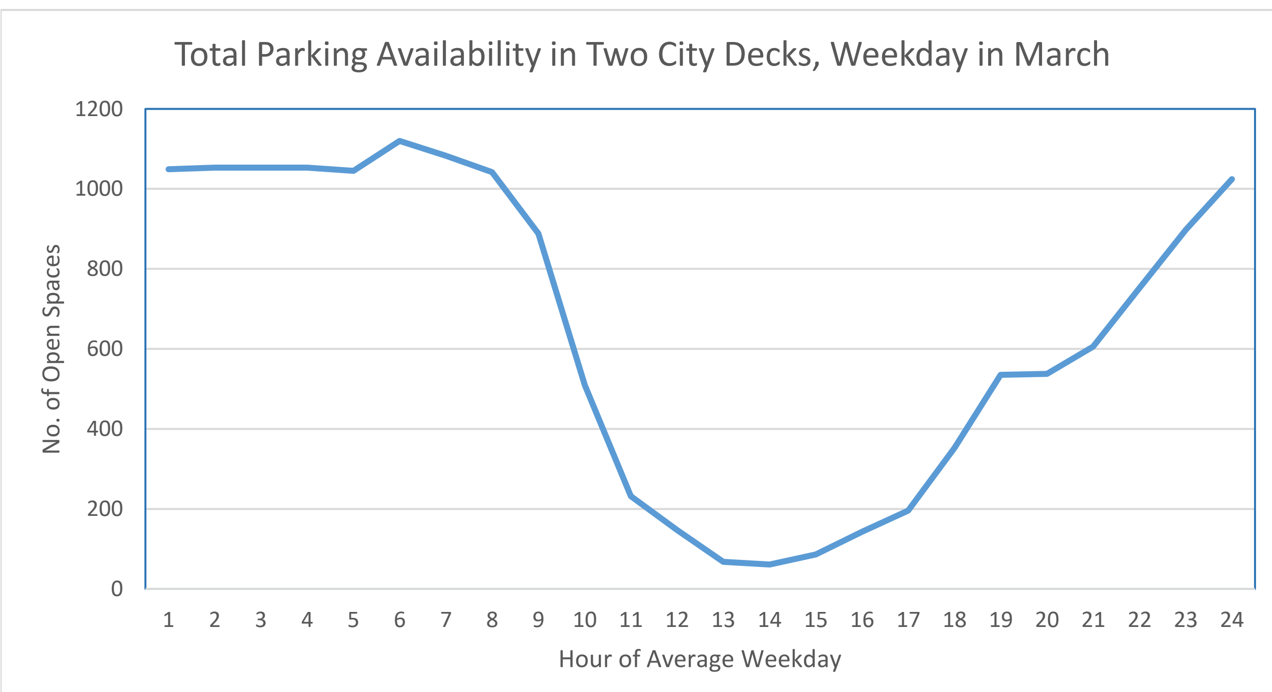
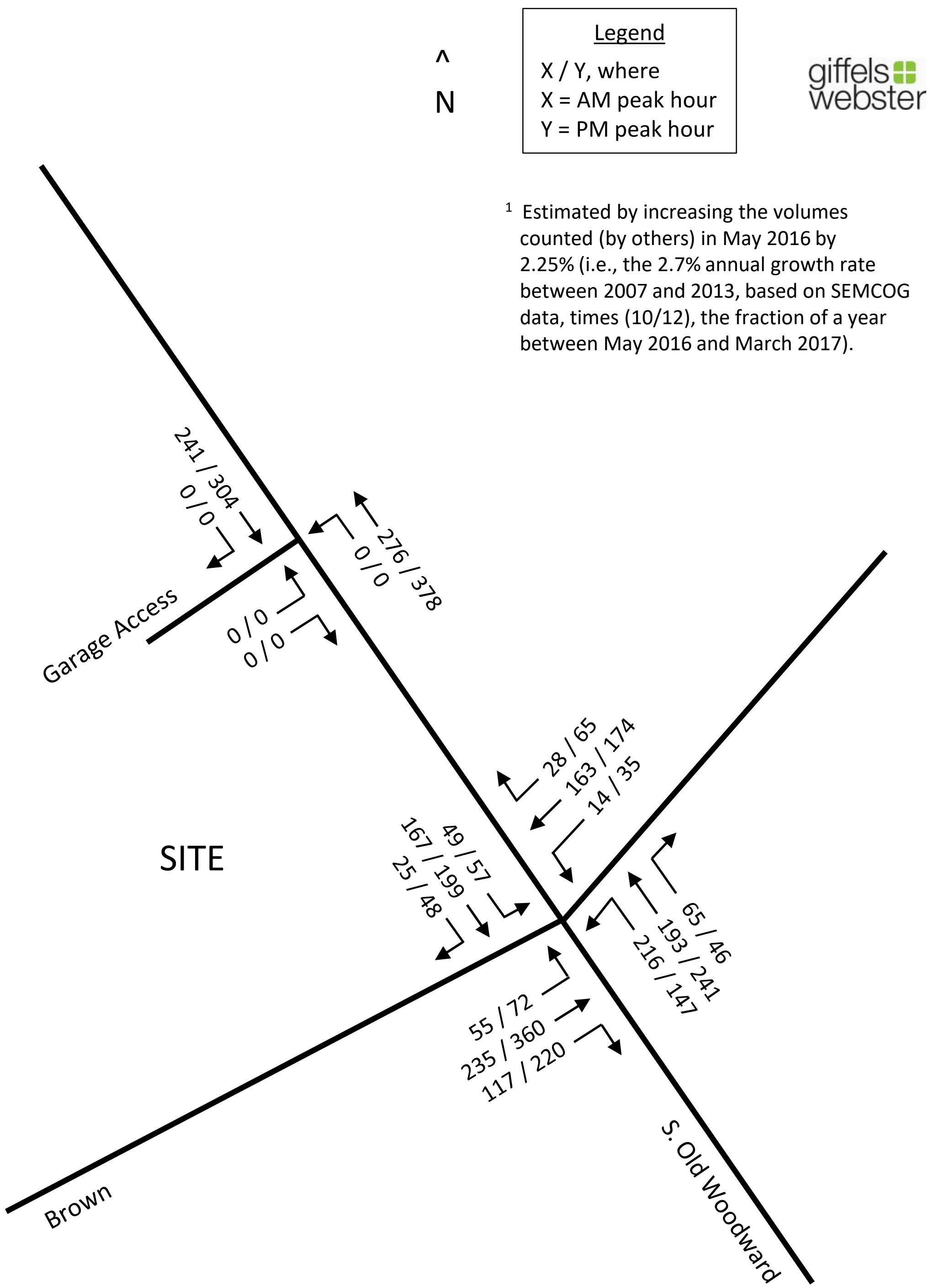


Table 2. Open Parking Deck Spaces in March 2017

Hour	Pierce Deck		Peabody Deck		Total of Two Decks	
	Weekdays	Saturdays	Weekdays	Saturdays	Weekdays	Saturdays
12:00 AM	657	575	392	392	1049	967
1:00 AM	660	624	393	410	1053	1034
2:00 AM	659	646	394	411	1053	1057
3:00 AM	659	648	394	411	1053	1059
4:00 AM	667	654	378	419	1045	1073
5:00 AM	695	694	425	427	1120	1121
6:00 AM	685	689	398	427	1083	1116
7:00 AM	662	676	380	422	1042	1098
8:00 AM	562	640	326	383	888	1023
9:00 AM	361	580	149	326	510	906
10:00 AM	197	480	35	300	232	780
11:00 AM	136	401	11	312	147	713
12:00 PM	60	336	8	291	68	627
1:00 PM	**53**	283	**8**	265	**61**	548
2:00 PM	78	280	8	249	86	529
3:00 PM	128	323	15	294	143	617
4:00 PM	164	358	32	304	196	662
5:00 PM	233	394	120	304	353	698
6:00 PM	320	418	215	307	535	725
7:00 PM	301	379	237	304	538	683
8:00 PM	323	346	283	285	606	631
9:00 PM	423	378	329	274	752	652
10:00 PM	536	439	362	318	898	757
11:00 PM	636	520	388	371	1024	891





[1] Estimated by increasing the volumes counted (by others) in May 2016 by 2.25% (i.e., the 2.7% annual growth rate between 2007 and 2013, based on SEMCOG data, times (10/12), the fraction of a year between May 2016 and March 2017).

Figure 11. Current Peak-Hour Traffic Volumes[1]

Woodward/Brown intersection during this project's assumed two-year buildout period. Hence, the study assumes the above-forecasted 2.7% annual rate of traffic growth, compounded over two years to yield a 5.5% volume increase between 2017 and 2019. Figure 12 shows the expected peak-hour background traffic at the earliest time the hotel is likely to be built and fully occupied.

Hotel Parking

Background – Since the subject site is within the City's downtown parking assessment district, only its residential uses (i.e., apartments) require on-site parking spaces. Thirty-two such spaces are proposed in an underground parking garage, more than required by the Zoning Ordinance for the 17 proposed apartments. The parking demand generated by the other proposed uses can be accommodated off-site in public parking spaces, at a location or locations selected by the applicant.

Since the non-residential uses within the proposed hotel will share the use of an off-site parking supply (via valet service), it is appropriate to estimate the needed total supply with the Urban Land Institute's *Shared Parking Model* (the Second Edition of the *SPM* was released in 2005). This Excel-based model accounts for:

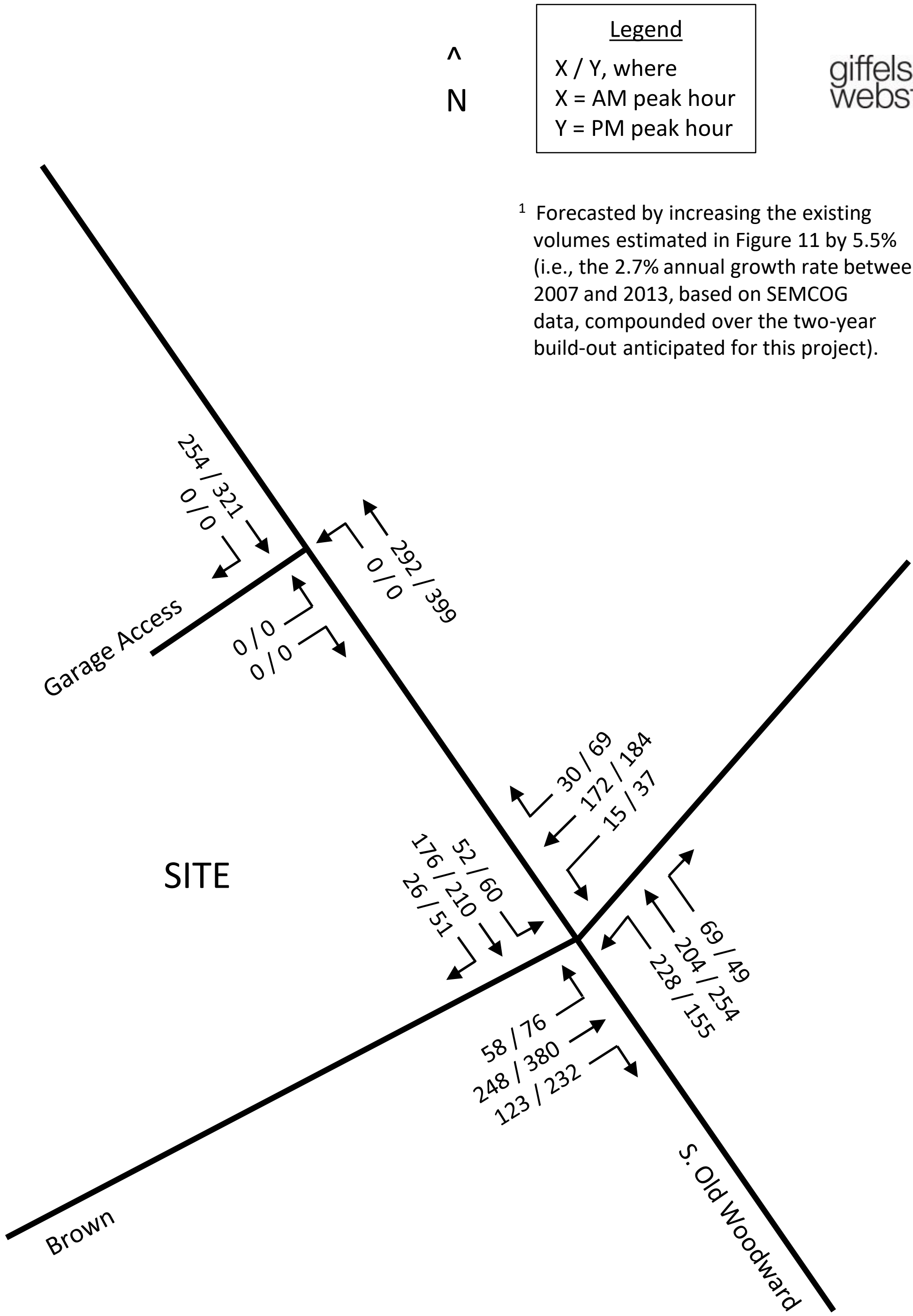
- ❑ Timesharing of parking space use. The *SPM* uses nationally sampled typical variations in parking demand by use, month, type of day (weekday versus weekend day), hour of the day, and type of arrival (visitor versus employee). These time-based variations are represented by a series of embedded tables indicating the percentage of peak parking demand occurring each hour for each arrival type.

- ❑ Capture and mode adjustments. Ordinance-specified parking ratios in most Michigan communities generally reflect a suburban, non-CBD setting. These ratios are intended to establish the peak parking needs of individual land uses as if each use is isolated and operated independently of all other uses. They also assume negligible walking, transit use, and ridesharing. To more realistically estimate the parking needed for a mixed-use development, the *SPM* includes capture and mode adjustments reflecting the reduction in parking due to the use of alternative modes – primarily walking between one site use and another (capture) or between the site and off-site locations (mode adjustment).

Analysis – This study's shared parking analysis – based on the experience and judgment of the development team and widely accepted planning practices – assumes:

1. The Birmingham Zoning Ordinance generally requires parking for non-residential uses as follows: for a hotel, 1 space/room plus 1 space for every 25 rooms (the latter presumably for employees); for an "eating establishment" (assumed here applicable to the hotel's proposed restaurants, bars, and lounges, since they are relatively prominent ancillary features), 1 space for each 75 s.f.; and for the Banquet Room and meeting rooms, 1 space for each 3 persons of capacity.

2. Disregarding the adjustment factors in the *Shared Parking Model* – as well as the site's location within the City's parking assessment district – the preceding ordinance ratios



[1] Forecasted by increasing the existing volumes estimated in Figure 11 by 5.5% (i.e., the 2.7% annual growth rate between 2007 and 2013, based on SEMCOG data, compounded over the two-year build-out anticipated for this project).

Figure 12. Future Background Peak-Hour Traffic Volumes[1]

would require 126 spaces for hotel room guests, 5 spaces for hotel employees, and 72 spaces for the restaurants, bars, and lounges (subtotaling 203 off-site parking spaces).

3. The simultaneous full occupancy of the Banquet Room and meeting rooms is infeasible or at least highly unlikely; accordingly, the maximum parking needed for all such gathering spaces is that associated with the Banquet Room alone (267 persons x 1 parking space/3 persons = 89 spaces).

4. To apply the *Shared Parking Model,* the amount of "conference center-banquet room" space per guest room must be known or assumed; per the preceding assumption, this ratio is (4,004 sf Banquet Room/126 guest rooms=) 31.8 sf/room. (Table G-1 highlights the three use-specific City parking ratios, expressed in spaces/1,000 s.f., used in the model.)

5. Forty percent of the restaurant and bar patrons and 30% of the Banquet Room visitors will be "captive" hotel-room guests not needing additional parking spaces (yielding corresponding "Non-Captive Ratios" for use in the *SPM* of 60% and 70%, respectively). The 40% captive ratio for the restaurants and bars reflects the proposed two restaurants and two bars, and the relatively high "drawing" power of those amenities for overnight hotel guests. The 30% captive ratio for the Banquet Room reflects the expectation that its peak usage will likely be Friday or Saturday night wedding receptions, for which a significant but slightly lower percentage of visitors will be hotel-room guests (many attendees will likely drive from places of worship or homes in the greater Birmingham area).

6. Fifty percent of the hotel-room guests will arrive by taxi, limousine, shuttle, or other vehicles not needing to park (yielding a "Mode Adjustment" for use in the *SPM* of 50%). Based on actual sampling of room occupancy and associated peak parking at several other suburban Detroit hotels, a prior study done for another proposed Birmingham hotel assumed that the percent of hotel guest arriving by alternative modes would be 45%. That percentage has been increased slightly here, to reflect both the upscale nature of the proposed hotel and the expectations (of ABM Parking Services) for a similar hotel (Table G-2).

7. Of those restaurant/bar patrons not walking from guest rooms in the hotel, 30% will walk from nearby off-site land uses (e.g., offices or residential towers); self-parking on nearby streets; or using one of the newer personal transportation services, such as Uber or Lyft (yielding a conservatively high Mode Adjustment of 70%).

8. The ULI *Shared Parking Model* multiplies Non-Captive Ratios and Mode Adjustments to establish their combined effect. Hence, assumptions 5 and 7 above indicate that (0.60 x 0.70=) 42% of all restaurant and bar patrons will need valets to park their vehicles. (This is a conservatively high percentage, since the above-cited ABM study assumed a peak "anticipated drive percentage" for the dining facilities of a similar hotel of 25%.)

9. Of those Banquet Room visitors not walking from guest rooms in the hotel, 10% will self-park in the area, and none will walk from other off-site locations (yielding a Mode Adjustment of 90%). The nature of the anticipated peak event – a wedding reception –

suggests that a large share of these visitors will be driving formally attired, from places of worship or homes and/or not be willing to walk very far to reach the hotel.

10. Assumptions 5 and 9 above indicate that (0.70 x 0.90=) 63% of all Banquet Room guests will need valets to park their vehicles. (This is very conservative, as the above-cited ABM study assumed a peak “anticipated drive percentage” for the ballroom of a similar hotel of 35%.)

11. Accounting for the potential timesharing of parking spaces – along with the above reasonable assumptions regarding “captive” visitors and mode split – the *Shared Parking Model* shows that a total of <u>131 off-site parking spaces</u> will be needed to serve peak non-resident building visitation. This total parking demand reflects a 55% reduction relative to the total (of 292 spaces) otherwise required by the Zoning Ordinance.

The hotel’s peak-month daily parking demand by hour and type of day is charted in Figure 13. Key inputs and other key outputs of the *SPM* appear in Appendix G. These exhibits show that the hotel’s parking demand is expected to peak at 9 p.m. on weekends in June. The peak demand on weekdays that month is also expected to occur in the evenings and would be only one space less.

For the City’s planning purposes, the hotel’s projected summer weekday parking demand by hour is compared in Table 3 to the corresponding deck parking space availability last July. This table shows ample space availability when the hotel demand peaks but modest deficiencies in the midday hours (probably due to downtown business lunches). *It is quite possible that more of the hotel’s off-site parking will consist of self-parking, on-street or in other lots, than assumed here. Again, the reader is reminded that the projected hotel parking demand is not an issue relative to site plan approval; it should be, however, a matter of some concern to the City as it plans its future public parking supply.*

Trip Generation

Table 4 summarizes the study’s trip generation forecast. This forecast assumes the following:

1. The on-site garage will be used only by residents of the 17 apartments and their guests.

2. All hotel/restaurant/bar traffic – forecasted here with a single, nationally accepted trip generation rate – will be served by a valet operation. (All valet parking will occur off-site at a location or locations to be determined.)

3. The seating capacities of the meeting rooms and Banquet Room are the maximum occupant loads permitted by the building code (at 15 net square feet per person).

4. All visitors to the five meeting rooms will arrive during the AM peak hour and depart before the PM peak hour. All visitors to the Banquet Room will arrive during the PM peak hour and depart in the evening/overnight period.

5. Visitors to the meeting rooms and Banquet Room will arrive at an average of three persons per vehicle, consistent with the Zoning Ordinance parking requirement for such facilities.

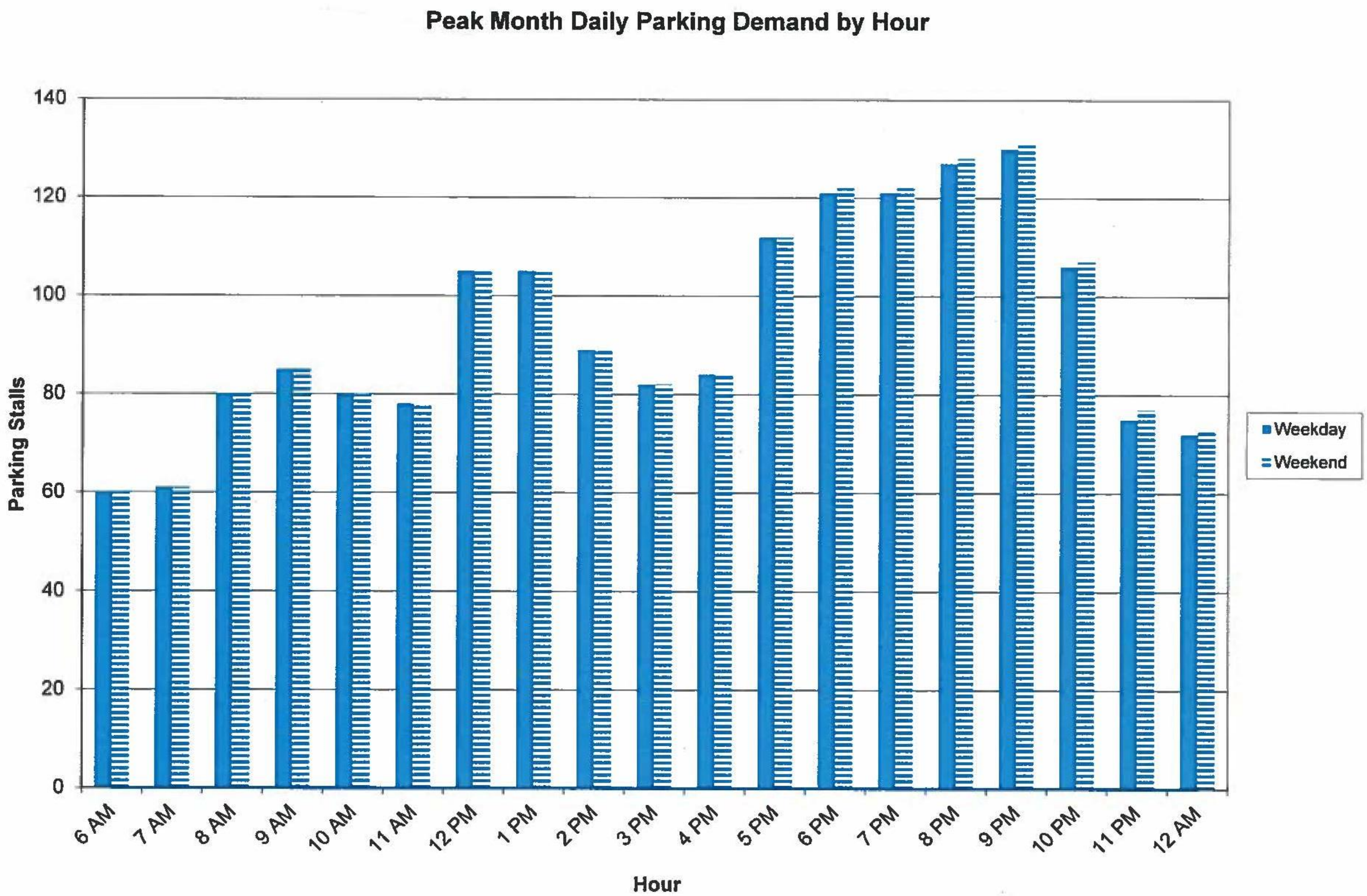


Figure 13. Peak Off-Site Parking Needed for Proposed Birmingham Boutique Hotel

Table 3. Weekday-in-July Parking Space Availability in Two City Decks vs. Potential Hotel Parking Need per Shared Parking Model

Hour	Supply in July 2016 (Table 1)			Hotel Need (Table G-4)	Surplus (Supply - Need)	
	Pierce	Peabody	Total		Both Decks	Pierce
12:00 AM	609	385	994	72	922	537
1:00 AM	628	386	1014	Values not computed by *SPM* .		
2:00 AM	635	385	1020			
3:00 AM	637	386	1023			
4:00 AM	648	412	1060			
5:00 AM	694	424	1118			
6:00 AM	688	409	1097	60	1037	628
7:00 AM	667	396	1063	61	1002	606
8:00 AM	565	337	902	80	822	485
9:00 AM	395	203	598	85	513	310
10:00 AM	224	86	310	80	230	144
11:00 AM	147	143	290	78	212	69
12:00 PM	98	34	132	105	27	-7
1:00 PM	**61**	**30**	**91**	**105**	**-14**	**-44**
2:00 PM	75	38	113	89	24	-14
3:00 PM	125	58	183	82	101	43
4:00 PM	169	76	245	84	161	85
5:00 PM	232	187	419	112	307	120
6:00 PM	312	246	558	121	437	191
7:00 PM	273	268	541	121	420	152
8:00 PM	257	316	573	127	446	130
9:00 PM	**344**	**371**	**715**	**130**	**585**	**214**
10:00 PM	468	391	859	106	753	362
11:00 PM	558	387	945	75	870	483

Table 4. Trip Generation Forecast for Proposed Hotel Site[1]

Land Use	ITE Use #	Size	Vehicle Class	AM Peak-Hour Trips			PM Peak-Hour Trips		
				In	Out	Total	In	Out	Total
Trips to/from Building's Parking Garage									
Apartment	220	17 du	All	2	7	9	7	4	11
Trips to/from (Valet-Operated) Drop-Off/Pick-Up Bay									
Hotel[2]	310	126 rooms	Patrons	40	27	67	39	37	76
			Valets	27	40	67	37	39	76
Meeting Rooms[3]	N/A	240 seats	Both	80	80	160	0	0	0
Banquet Room[3]	N/A	267 seats	Both	0	0	0	89	89	178
Total Potential Hotel-Related Trips			Both	147	147	294	165	165	330
Less Internal/Downtown Capture			Restaurants[4] 5% in AM 20% in PM	3	3	6	15	15	30
			Meeting/ Banquet Rooms[5] 37%	30	30	60	33	33	66
Net Non-Apt. Vehicular Site Visitation			-	114	114	228	117	117	234

1 A trip is a one-directional vehicle movement to or from the site. The apartment and hotel patron forecasts shown in this table are based on trip rates and associated application methodology recommended by the Institute of Transportation Engineers (ITE) in its *Trip Generation Manual – 9th Edition* (2012) and *Trip Generation Handbook – 3rd Edition* (2014), respectively.

2 The hotels sampled by ITE generally include supporting facilities, such as "restaurants, cocktail lounges, meeting and banquet rooms, limited recreational facilities, and/or other retail and service shops." However, for consistency with a prior Birmingham hotel traffic study reviewed and approved by the City's traffic consultant, the current study assumes that the ITE trip rates for a hotel cover all of this hotel's facilities except its banquet and meeting rooms. Given the size of the latter relative to the building's other uses, separate (worst-case) trip forecasts are provided here. The table's trip forecasts are also conservatively high due to the fact that the ITE rates used reflect some peak-hour employee trips to/from the hotel, whereas all employees for this facility are assumed to park off-site and walk to/from the hotel.

3 The seating capacities listed are the maximum occupant loads permitted by the building code (at 15 net sf per person). Since ITE has no trip rates for meeting facilities, the forecasts here assume that all guests arrive within the peak hour at an average of 3.0 persons per vehicle, consistent with the City's parking requirement of one space for each three persons of capacity. Since all arrivals will be served by valets, the number of vehicles departing in the peak hour equals the number of vehicles arriving that hour. All employees are assumed to arrive in earlier hours and park off-site.

4 Comparing trip forecasts for free-standing restaurants to trip forecasts for hotels with the same amount of restaurant space suggests that hotel restaurant trip generation could constitute as much as of 12% (AM) to 48% (PM) of the building's total trip generation. Multiplying these percentages by this study's corresponding Mode Adjustment of 42% predicts that internal/downtown capture for the restaurants within this hotel will reduce the hotel's total trip generation by 5% in the AM peak hour and 20% in the PM peak hour.

5 Potential meeting facility trips are reduced to reflect the combined effect of internal capture (e.g., walking from/to guest rooms) and downtown capture (e.g., walking from/to other downtown buildings). Consistent with the study's shared parking analysis, it is assumed here that internal capture for the meeting facilities will be 30% and downtown capture will be 10%, and the two types of capture should be multiplied to determine their combined effect (as done in the ULI Shared Parking Model). Hence, the percentage of arriving meeting-facility-related trips needing to be parked will be (0.70 x 0.90 =) 63%, yielding a combined capture rate of 37%. *These assumptions likely result in conservatively high forecasts for valet service during the AM and PM peak hours, as walking from self-park locations – by daytime visitors destined for the hotel's meeting and banquet rooms (as well as its restaurants) – may well be higher than the 10% assumed here.*

6. Since all visitor arrivals will be served by valets, the number of peak-hour departures by valet-driven vehicles (in the “Out” column of the table) will equal the number of peak-hour arrivals by visitor-driven vehicles (in the “In” column of the table). Similarly, since all visitor departures will also be served by valets, the number of peak-hour arrivals by valet-driven vehicles will equal the number of peak-hour departures by visitor-driven vehicles.

7. Per table footnote 4 (above), the restaurants and bars within the hotel can be expected to generate somewhat less traffic to and from the front door (than predicted by ITE trip rates) due to internal and downtown capture. Analysis and judgment suggest that trip generation by the restaurants and bars within the proposed hotel could constitute as much as 12% of the forecasted “hotel” trip generation in the AM peak hour and 48% of the forecasted “hotel” trip generation in the PM peak hour. If internal/downtown capture amounts to the 42% estimated in the shared parking analysis, it would reduce total “hotel” trip generation by (0.12 x 0.42=) 5% in the AM peak hour and (0.48 x 0.42=) 20% in the PM peak hour (as shown in the table).

8. Per table footnote 5 (above), the actual trip generation by the meeting facilities will be 37% less than the maximum potential trip generation, due to the combined effect of internal and downtown capture. This is consistent with the shared-parking assumption that 63% of all Banquet Room guests will need valets to park their vehicles (Appendix G).

9. All employees will self-park off-site; hence, the trip generation forecasts shown for the hotel use are artificially high due to their inclusion of some employee traffic that will not actually visit the site.

Valet Service

Figure 14 is a preliminary conceptual design for a valet service bay immediately south of the hotel’s garage entrance. There would be sufficient space in this bay to “stack” at least six vehicles. To determine the number of valets needed to generally keep the single-file queuing of vehicles within the bay, an analysis was performed using methodology outlined on pages 230-231 of ITE’s *Transportation and Land Development (First Edition, 1988).* This analysis assumed Poisson (random) arrivals and negative exponential service times.

To estimate service rate for use in the queuing analysis, several tests were conducted in the field. These tests found that a valet would need about 4.6 minutes to drive from the midpoint of the site’s Old Woodward frontage (approximating the future hotel’s main entrance) to the top level of the Pierce parking deck (via Brown Street) and then walk briskly back to the starting point. It was also found that a valet would need about 5.0 minutes to walk briskly from the future main entrance to the top of the deck and then drive back to the starting point (via Pierce, Merrill, and Old Woodward). Weighting these two round-trip times by the corresponding number of trips in Table 4, it was found that the overall average valet service time would be about 4.7 minutes. Working full-time at peak demand, each valet would be able to service (60/4.7=) 12.8 vehicles per hour.

N.T.S.

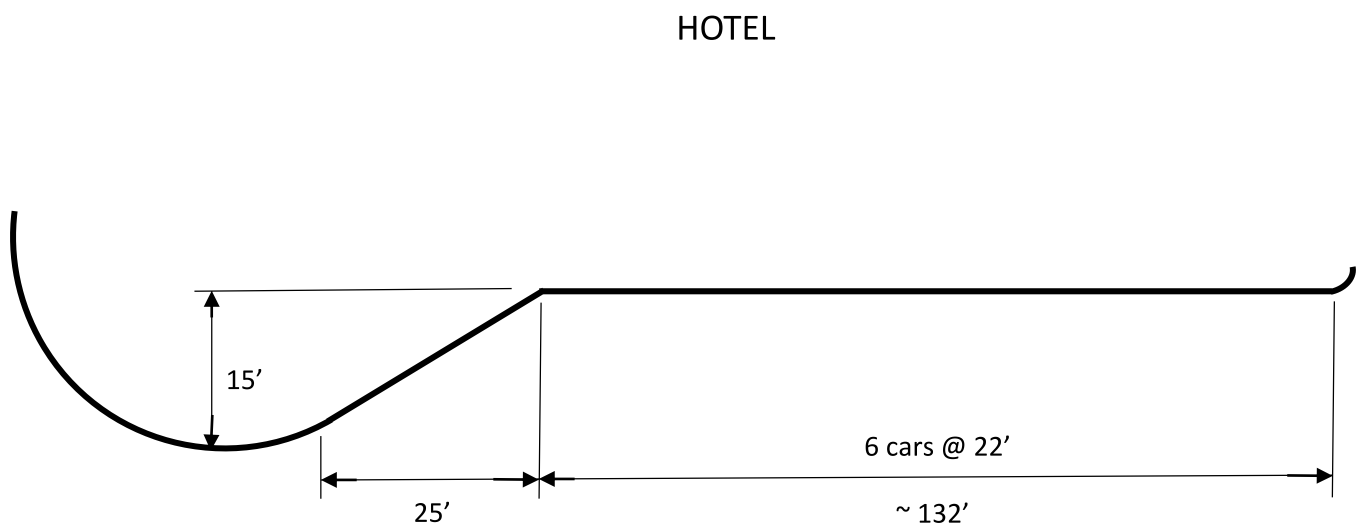


Figure 14. Preliminary Conceptual Design for Valet Service Bay on Old Woodward Frontage

Table 5 shows the total service rate (Q) based on the above per-valet service time and various numbers of assumed valets; the utilization factor (ρ = arrival rate/service rate); and a factor Q_M (equal to the utilization factor for a one-channel queuing system such as this). In the last two columns, the resulting queue size (or stacking requirement) is listed by confidence level (p is the probability of a queue exceeding the size indicated). This table shows that limiting queues to six vehicles would require 13-14 valets at peak operating times.

Table 5. Valet Queuing Analysis for PM Peak Hour[1]

No. of Peak-Hour Valets	Total Service Rate (Q, in vph)	Utilization Factor (ρ = q/Q)	Q_M (=ρ for n=1)	Number of Queued Vehicles by Confidence Level (see p. 231)	
				90% (p=0.10)	95% (p=0.05)
12	153.6	0.7617	0.7617	7	9
13	166.4	0.7031	0.7031	5	7
14	179.2	0.6529	0.6529	4	6
15	192.0	0.6094	0.6094	3	5

[1] For arrival rate q = 117 vph (per Table 4).

Trip Distribution

Figure 15 shows the expected distribution of apartment trips to and from the hotel's underground garage. Consistent with ITE guidelines and GW's normal practice, it is assumed that:

1. The majority movements of residential site trips follow existing traffic patterns, and the minority movements reciprocate (both modeled as percentages). For example, Table 5 forecasts 7 trips in and 4 trips out in the PM peak hour. Since the existing volumes that hour (Figure 11) show through traffic approaching the location of the proposed garage access to be 55% northbound, the corresponding model assumes 55% of the entering site traffic to come from the south and 55% of the exiting site traffic to return to the south.

2. The residential trips at Old Woodward and Brown distribute in proportion to the existing peak-hour movements there. For instance, the 55% of site traffic exiting to the south – cited in the preceding example – will distribute 10% to the east, 35% to the south, and 10% to the west.

The distribution models for trips generated by the hotel guest rooms, restaurants and bars, and meeting facilities assume that all of the needed off-site parking will be located west of Old Woodward, given that:

1. This maximizes the share of exiting traffic able to turn right at Brown, and also avoids requiring both patrons and valets to cross Old Woodward on foot during the busiest traffic hours.

2. The availability of open parking spaces in the City's Pierce Street parking deck – during the AM and PM peak traffic hours in the hotel's peak month of July – was found in this study to be significantly greater than the hotel's projected needs. At 8:00 a.m. on a typical weekday in July 2016, there were 565 open spaces in the deck, or over six times as many as the 91 spaces

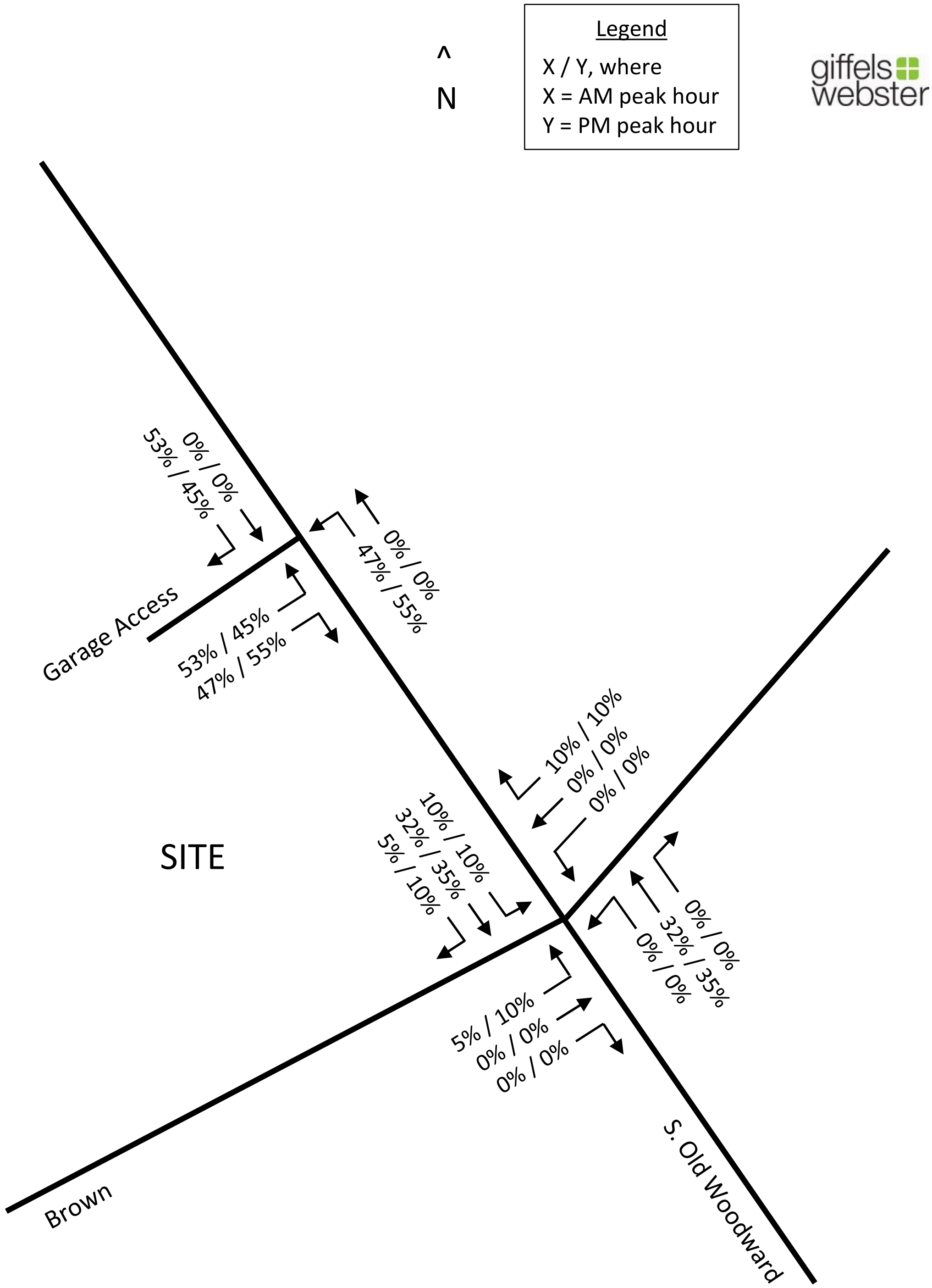


Figure 15. Distribution of Apartment Trips

predicted by ITE methodology to be needed by the new hotel that hour. At 5:00 p.m. on a typical weekday in July 2016, there were 232 open spaces, or some 3.5 times as many as the 66 spaces predicted by ITE methodology to be needed by the new hotel.

For clarity, the distribution models for trips entering and exiting the hotel's Old Woodward (south-bound-only, valet-operated) service bay were split between "hotel arrival trips (patrons in = valets out) and "hotel departure trips (valets in = patrons out)." The arrival model (Figure 16) is based on:

1. Figure 11 showing that the percentage of southbound traffic north of Brown is 47% in the AM peak hour and 45% in the PM peak hour, which are reasonable approximations of the share of hotel traffic arriving from the north (a majority of patron traffic is inbound in both peak hours).

2. The percentages of hotel traffic approaching from the east, west, and south are reasonably approximated by the relative numbers of vehicles at Old Woodward and Brown that are now approaching the site's Old Woodward frontage via right turns from Brown, left turns from Brown, and through movements on Old Woodward, respectively.

3. Given that U turns will not be permitted to enter or exit the service bay, Figure 16 shows – for example – that the 5% of hotel traffic approaching from the east, along with the 37% of hotel traffic approaching from the south, will have to pass the site on westbound Brown and use other streets west of Old Woodward to reach a southbound site approach on Old Woodward.

The departure model (Figure 17) is based on:

1. Figure 11 showing that current traffic volumes departing the Old Woodward/Brown intersection in the AM peak hour are 26% eastbound, 31% westbound, 21% northbound, and 22% southbound. Corresponding percentages in the PM peak hour are 28%, 22%, 23%, and 27%.

2. The percentages of hotel patron traffic departing east on Brown or south on Old Woodward beyond Brown will equal the preceding values for those directions.

3. Given that exiting U turns will not be permitted from the service bay, drivers desiring to go north are expected to make southbound right turns at Brown and "go around the block" to reach northbound Old Woodward (e.g., via Pierce and Merrill).

Traffic Assignment

The above three trip distribution models were applied to the corresponding trip generation values from Table 5, and the resulting three sets of traffic assignments are detailed in appendix Figures H-1, H-2, and H-3. Figure 18 (below) sums total site-generated peak-hour traffic. Finally, Figure 19 adds the site traffic from Figure 18 to the future background traffic forecasted in Figure 12.

(continued)

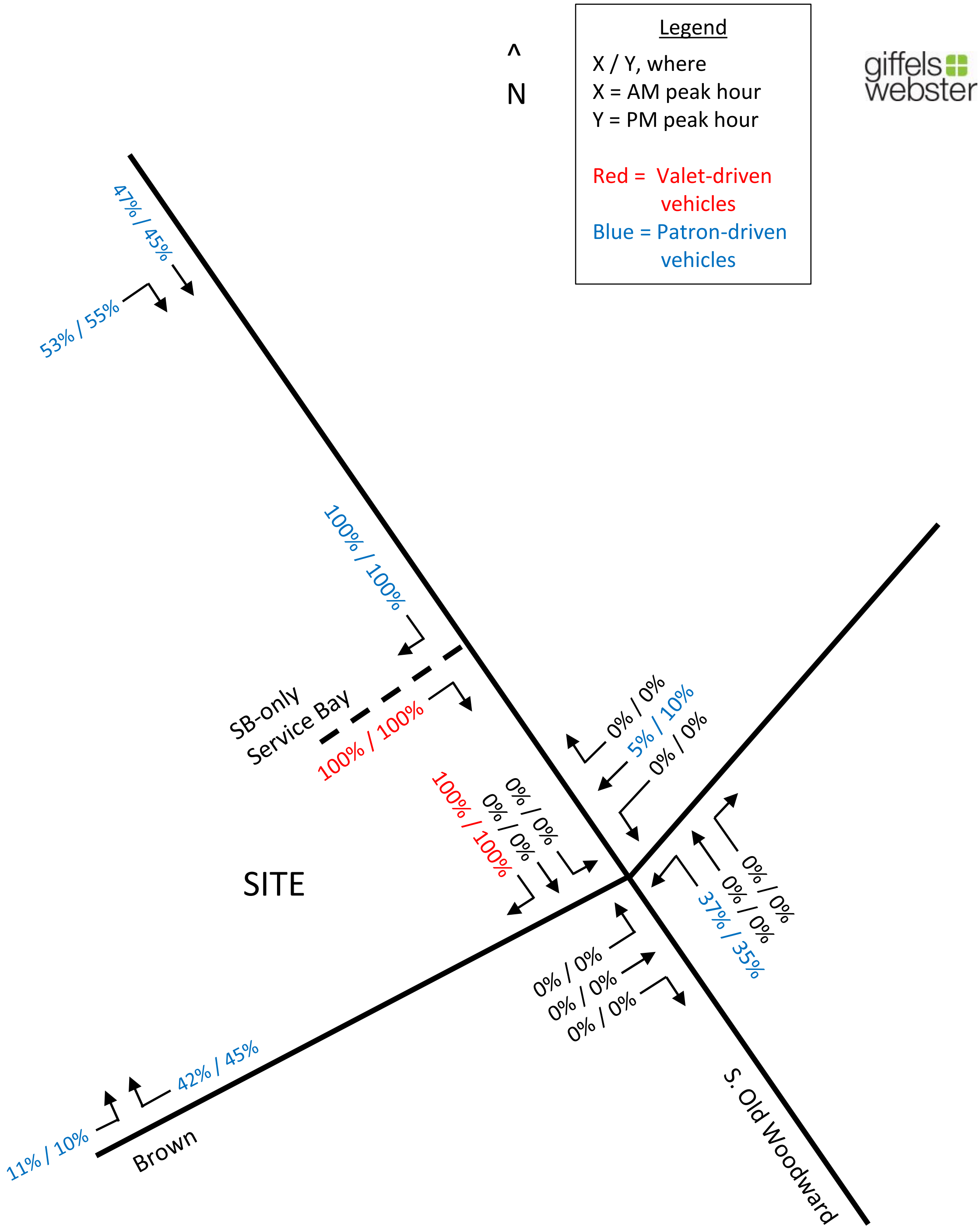


Figure 16. Distribution of Hotel Arrival Trips (Patrons In & Valets Out)

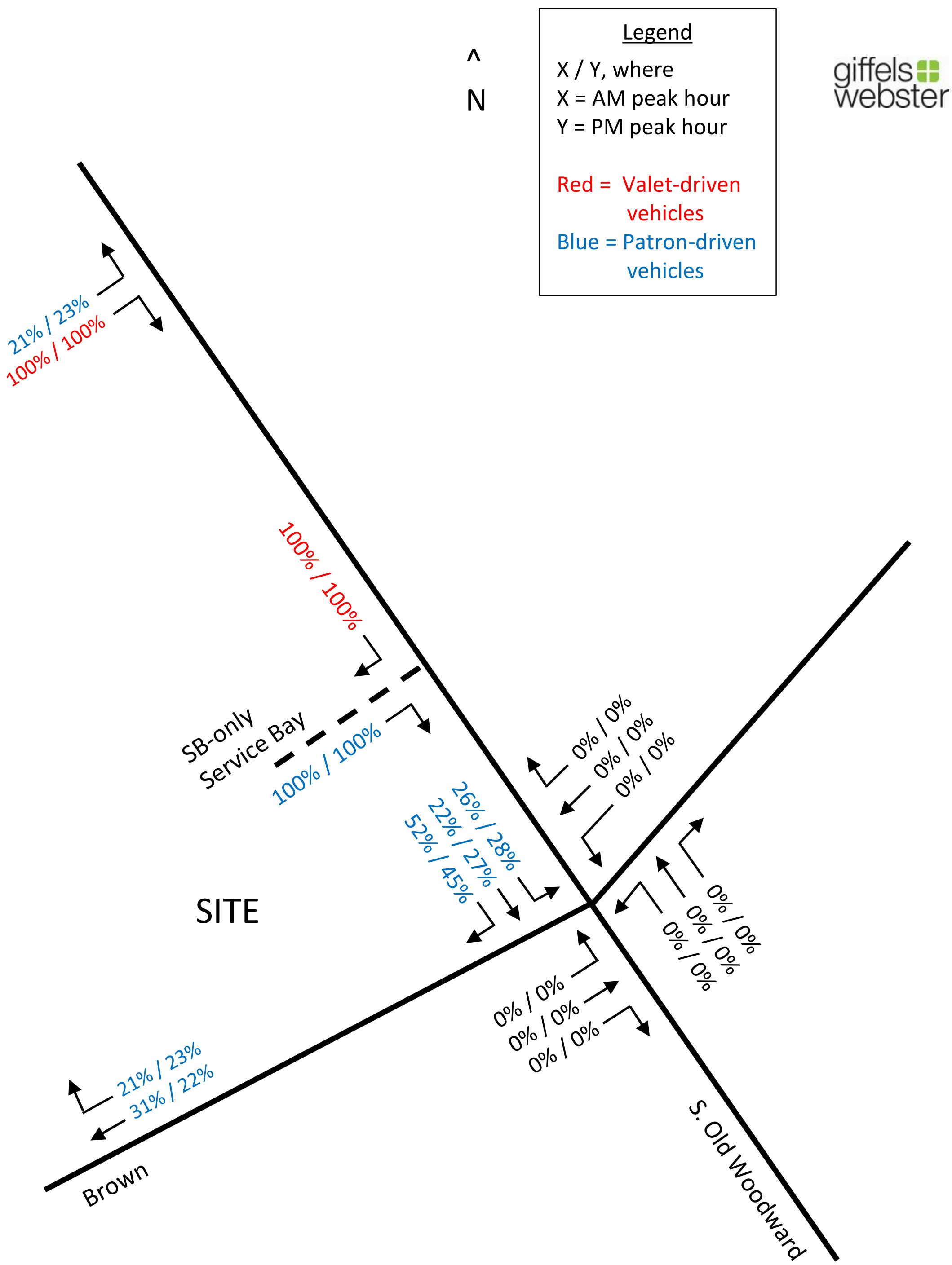
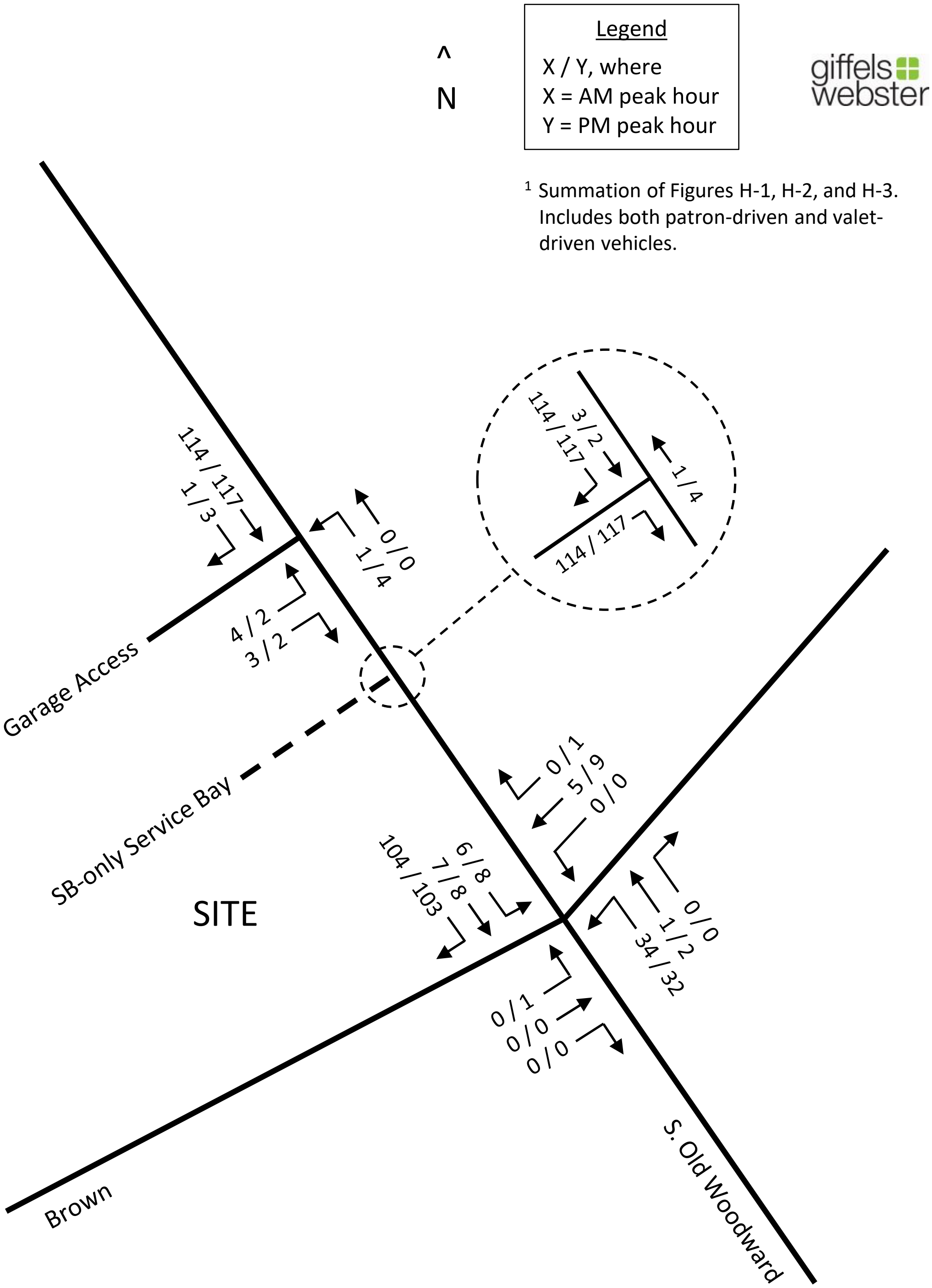


Figure 17. Distribution of Hotel Departure Trips (Valets In & Patrons Out)



[1] Summation of Figures H-1, H-2, and H-3. Includes both patron-driven and valet-driven vehicles.

Figure 18. Site-Generated Trips[1]

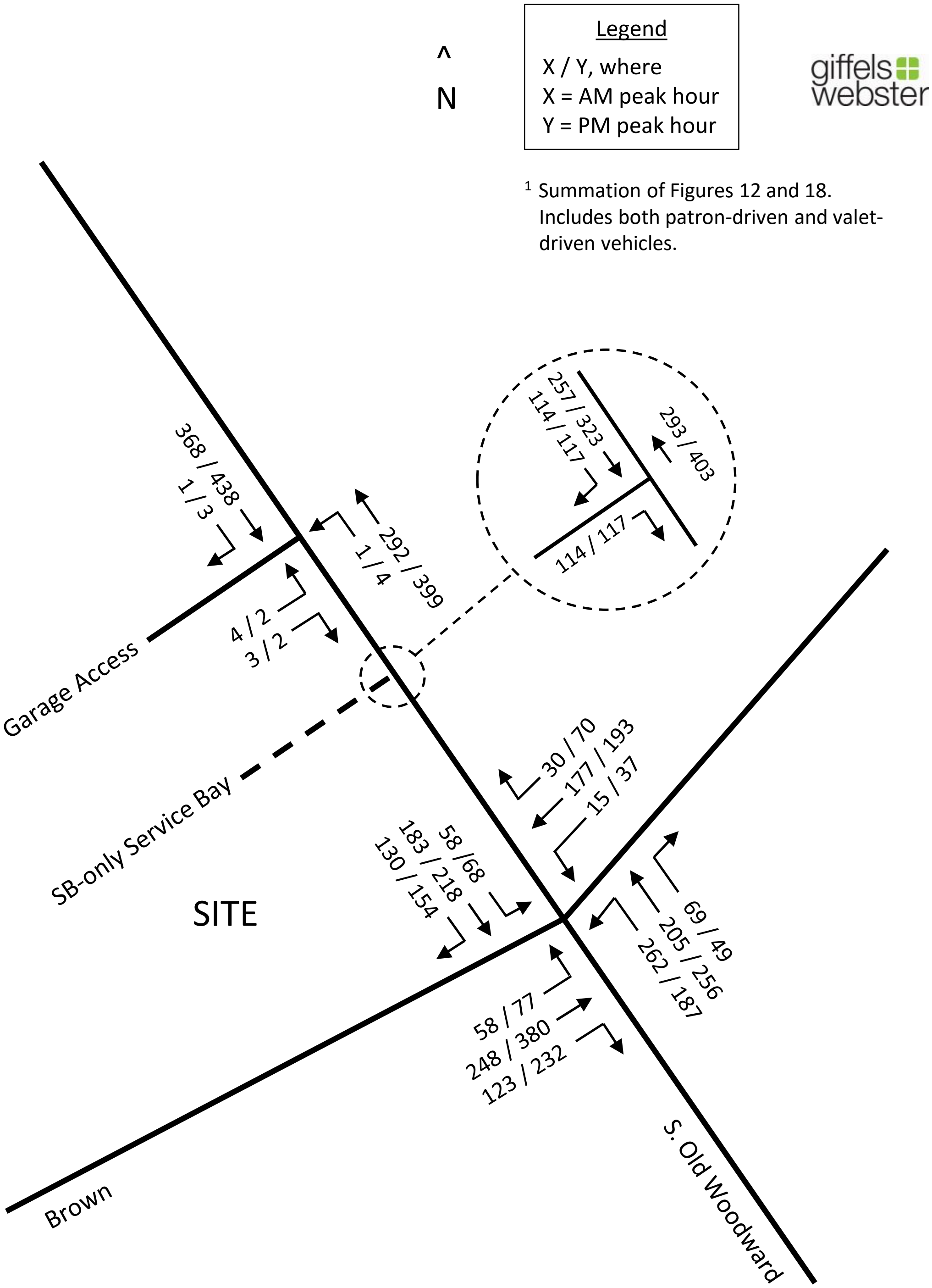


Figure 19. Future Total Peak-Hour Volumes[1]

IMPACT ANALYSES

Levels of Service

Method and Criteria – Capacity analyses were conducted using the *Synchro 9 Light* computerized traffic model, based on methodologies contained in the Transportation Research Board's 2010 *Highway Capacity Manual.* The primary objective of such analyses is to determine the *level of service,* a qualitative measure of the "ease" of traffic flow based on vehicular delay. Analytical models are used to estimate the average control delay for specific vehicular (through or turning) movements – and in the case of all-way stop-controlled and signalized intersections – each approach and the overall intersection as well. The models account for lane configuration, grade (if any), type of traffic control, traffic volume and composition, and other traffic flow parameters.

Level of service (LOS) is expressed on a letter grading scale, with A being the highest level and F being the lowest level. Achieving an overall intersection and/or approach LOS of D or better is the normal objective in an urban or suburban area; however, LOS of E or worse may be unavoidable for some turning movements onto heavily traveled roads, especially when those movements are controlled by stop signs as opposed to signals.

Table 6 defines LOS, in terms of average control delay per vehicle, for signalized intersections and unsignalized intersections, respectively.

Table 6. Level of Service Criteria

Level of Service	Control Delay per Vehicle (sec)	
	Signalized Intersections	Unsignalized Intersections
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Unmitigated Results – *Synchro* was used to evaluate AM and PM peak-hour traffic conditions at the intersection of Old Woodward and Brown under current, future background, and future total traffic volumes, and at the valet bay and garage access under future total traffic. The corresponding *Synchro* printouts appear in Appendix I. The estimated average delays and associated levels of service are summarized in Tables 7-9 (below). All of these "unmitigated" results assume no changes to lane use or signal timing at the Old Woodward/Brown intersection.

Table 7 shows that only NB left turns will experience a future LOS of D or worse, as follows:

- ❑ Background traffic growth alone will decrease the movement's PM peak-hour LOS to a D from the current C; however, a D would still be acceptable and would be due to an increase in average delay of only 2.4 sec (7%).

Table 7. Unmitigated Levels of Service at Old Woodward and Brown

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume	Delay (sec)	LOS	Volume	Delay (sec)	LOS
Current Traffic							
Intersection		1,327	20.2	C	1,664	20.9	C
EB	L	55	20.6	C	72	16.5	B
	T + R	352	20.9	C	580	17.4	B
WB	L	14	22.6	C	35	21.3	C
	T + R	191	19.6	B	239	14.3	B
NB	L	216	25.3	C	147	34.1	C
	T	193	13.4	B	241	20.1	C
	R	65	12.2	B	46	16.9	B
SB	L	49	25.1	C	57	33.0	C
	T + R	192	22.2	C	247	29.2	C
Future Background Traffic							
Intersection		1,401	20.8	C	1,757	21.6	C
EB	L	58	21.3	C	76	17.3	B
	T + R	371	21.3	C	612	18.0	B
WB	L	15	23.2	C	37	22.4	C
	T + R	202	19.9	B	253	14.5	B
NB	L	228	26.9	C	155	36.5	D
	T	204	13.5	B	254	20.4	C
	R	69	12.2	B	49	17.0	B
SB	L	52	25.6	C	60	33.8	C
	T + R	202	22.4	C	261	29.7	C
Future Total (Background + Site) Traffic							
Intersection		1,558	21.5	C	1,921	24.6	C
EB	L	58	21.5	C	77	17.8	B
	T + R	371	21.3	C	612	18.1	B
WB	L	15	23.2	C	37	22.5	C
	T + R	207	20.1	C	263	14.7	B
NB	L	262	39.1	D	187	**67.8**	**E**
	T	205	13.6	B	256	20.4	C
	R	69	12.2	B	49	17.0	B
SB	L	58	16.4	B	68	25.4	C
	T + R	313	15.9	B	372	27.1	C

Table 8. Levels of Service at Old Woodward and Valet Service Bay

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume	Delay (sec)	LOS	Volume	Delay (sec)	LOS
Future Total (Background + Site) Traffic							
EB	R	114	11.2	B	117	12.0	B

Table 9. Levels of Service at Old Woodward and Hotel Parking Garage Driveway

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume	Delay (sec)	LOS	Volume	Delay (sec)	LOS
Future Total (Background + Site) Traffic							
EB	L + R	7	13.8	B	4	14.2	B
NB	L	1	8.1	A	4	8.3	A

Table 10. Mitigated Levels of Service at Old Woodward and Brown

Approach	Movement	AM Peak Hour			PM Peak Hour		
		Volume	Delay (sec)	LOS	Volume	Delay (sec)	LOS
Future Total (Background + Site) Traffic							
Intersection		1,558	20.9	C	1,921	24.3	C
EB	L	58	32.2	C	77	34.2	C
	T + R	371	30.3	C	612	28.5	C
WB	L	15	30.7	C	37	32.9	C
	T + R	207	27.5	C	263	21.5	C
NB	L	262	23.6	C	187	32.2	C
	T	205	9.4	A	256	14.1	B
	R	69	8.5	A	49	11.9	B
SB	L	58	11.4	B	68	17.6	B
	T + R	313	10.9	B	372	17.4	B

Table 11. Future Queuing on SB Old Woodward Approach to Brown (feet)

Lane	Type of Queue	AM Peak Hour	PM Peak Hour
L	Average	28	36
	95^{th}-Percentile	66	70
T + R	Average	57	70
	95^{th}- Percentile	91	85

- The further addition of site-generated traffic would – without any signal timing changes – decrease the LOS for NB left turns by one more grade in each peak hour: in the AM, from a background C to a future total D, and in the PM, from a background D to a future total E. The latter change would be undesirable and should be mitigated if possible.

Tables 8 and 9 (above) show that site traffic exiting both the valet bay and garage access drive would experience a level of service of B in both peak hours. Entering left turns at the garage drive would enjoy a LOS of A in both peak hours.

Mitigated Results – Given the LOS of E predicted for northbound left turns in the PM peak hour, *Synchro* was used to hypothetically optimize signal timing for the forecasted future AM and PM peak-hour volumes; basically, this involved borrowing some green time from Brown to decrease delays on Old Woodward (maintaining the current 80-sec signal cycle). Table 10 (above) shows that this mitigation would yield a LOS of C or better for all individual movements as well as the overall intersection.

Signal-Related Queuing

The City's traffic consultant asked that this study evaluate signal-produced traffic backups potentially affecting site access. The only such affected "access" will be the proposed valet service bay, and possibly the proposed garage access drive, both on Old Woodward. It is assumed that use of the hotel's loading dock on Brown can be limited to off-peak hours and thus not present a significant concern with respect to signal-related queuing.

SimTraffic, a companion microsimulation based on *Syncho* inputs, was used to forecast the extent of the peak-hour traffic backups on the SB Old Woodward approach to Brown, assuming that the signal timing is optimized. These simulated queuing results are detailed in Appendix I and summarized in Table 11 (above).

On average, the predicted SB queues on Old Woodward are not expected to materially interfere with egress from the valet service bay. Ample times for egress should be available near the end of each signal cycle's green phase, if not sooner.

Transportation Standards

When the abutting section of Old Woodward is rebuilt in the near future, it will include a narrow two-way left-turn lane. Although not warranted at the proposed garage access due to the very low entering left-turn volumes at that location, this new center lane will be of some benefit.

There are generally no existing right-turn lanes along Old Woodward, even at Maple, and their addition – at Maple or elsewhere – would be inconsistent with the City's future design concept for the street (e.g., such lanes lengthen crosswalks). Adding a right-turn lane for the proposed garage access would be clearly unwarranted, given the very modest entering right-turn volumes there. Adding a right-turn lane for the proposed valet service bay would be inappropriate as well, since it could result in visibility-blocking vehicle stacking north of the garage access drive. Vehicles entering that bay should use the opening provided by the garage access drive as a taper area.

At a minimum, the clear line of sight to and from the north for vehicles exiting the hotel parking garage should be sufficient for through drivers on Old Woodward to stop from an assumed 25 mph approach speed. From a viewing point 10 feet (minimally) to 14.5 feet (desirably) west of the through lane, exiting drivers should be able to see the center of the southbound through lane at least 155 feet to the north; this may require some curtailment in the on-street parking north of the proposed driveway.

Non-Vehicular Access

Once rebuilt, Old Woodward will feature "sharrow" markings reminding drivers to share the road with bicyclists. In recognition of the increased bicycle riding thus encouraged, bike racks should be added – at a minimum, on the proposed intersection "bump-outs" (aka "curb extensions"), including the new bump-out to be built on the hotel's corner.

As noted earlier in this report, there are existing bus stops on Old Woodward for each direction of travel, all about a block north and south of the hotel. To encourage bus ridership by hotel guests as well as employees, it would be advisable to provide some related directional signing for pedestrians exiting the hotel's main entrance.

KEY FINDINGS AND CONCLUSIONS

The key findings and conclusions developed in this study are as follows:

- The proposed hotel will feature more-than-adequate underground parking for its rental units. Employees are assumed to self-park in various off-site locations. All other hotel visitors will either walk to and from various off-site locations or be served by valets. The off-site parking needed for valeted vehicles is expected to peak in evening hours at about 130 vehicles, but this is not a site plan requirement due the site's location in the City's downtown parking assessment district.

- The trip generation forecast in this study depends on several important assumptions, including the key assumption that visitors to the meeting rooms will arrive in the AM peak hour and depart before the PM peak hour, and visitors to the Banquet Room will arrive in the PM peak hour and depart in evening or overnight hours. As in the study's shared parking analysis (used to reach the preceding peak-parking conclusion), reasonable amounts of restaurant, bar, and banquet room visitation have been assumed to occur by patrons already staying in the hotel or walking to and from nearby off-site locations.

- Queuing analysis of the valet operation estimates that 13-14 valets will be needed in the critical PM peak hour to keep the service bay occupancy limited to six vehicles (at a 95% confidence level, assuming an average valet service time of 4.7 minutes, as measured in a series of field tests to and from the top level of the Pierce Street parking deck).

- The traffic impacts of the proposed hotel will be minimal and can be easily mitigated. For the future total peak-hour traffic volumes forecasted at the Old Woodward/Brown intersection, very acceptable levels of service of C or better – for all individual movements as well as for the overall intersection – can be achieved with signal retiming.

- ❑ Vehicles exiting the hotel's parking garage and valet service bay can be expected to experience a level of service of B. On average, southbound backups from the signal at Brown should not materially interfere with egress from the service bay. Drivers attempting to exit that bay will, however, occasionally find it to their advantage to pause until signal-queued vehicles have discharged after receiving the green light.

- ❑ No revisions to the currently planned future lanes adjacent to the site are needed to accommodate the proposed hotel. The hotel's garage access and valet service bay will, however, preclude the restoration of angled parking on the frontage.

- ❑ Pedestrian benches and bike racks should be provided on the site's Old Woodward frontage, at a minimum, on the nearby intersection "bump-out." Directional signing for the nearest bus stops north and south of the site would also be appropriate.