



WELLS & ASSOCIATES, LLC

TRAFFIC, TRANSPORTATION, and PARKING CONSULTANTS

TO: Kenneth Jordan
KRJ, LLC

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FROM: Michael J. Workosky
Catherine Proot
Wells & Associates, LLC

DATE: March 10, 2005

SUBJECT: Haven Road Property Preliminary Traffic Evaluation;
Washington County, Maryland

Introduction

This memorandum presents a preliminary transportation evaluation for the Haven Road property, located northwest of the City of Hagerstown, in Washington County, Maryland. The site is located west of Pennsylvania Avenue (U.S. Route 11), east of MD Route 81, with vehicular access via Crestwood Drive and Haven Road, as shown on Figure 1.

The site consists of approximately 53 acres and is currently zoned RM (Residential Multi-Family). The developer, KRJ, LLC proposes to annex the property into the City of Hagerstown and rezone the site to R-3, allowing the development of 450 townhouses.

This memorandum provides general traffic information for the site and surrounding roadways, compares the number of vehicle trips that would be generated by the site under the current and proposed zoning, and identifies the potential future traffic impacts of developing the site.

This memorandum was conducted in accordance with the Washington County Adequate Public Facilities Ordinance (APFO), revised May 25, 2004, and A Policy for Determining Adequacy of Existing Highways, revised February 22, 2005.

Sources of data for the traffic engineering services include: Miles & Stockbridge, P.C., the Hagerstown Planning Department, the Institute of Transportation Engineers (ITE); and previous studies prepared by Wells & Associates.

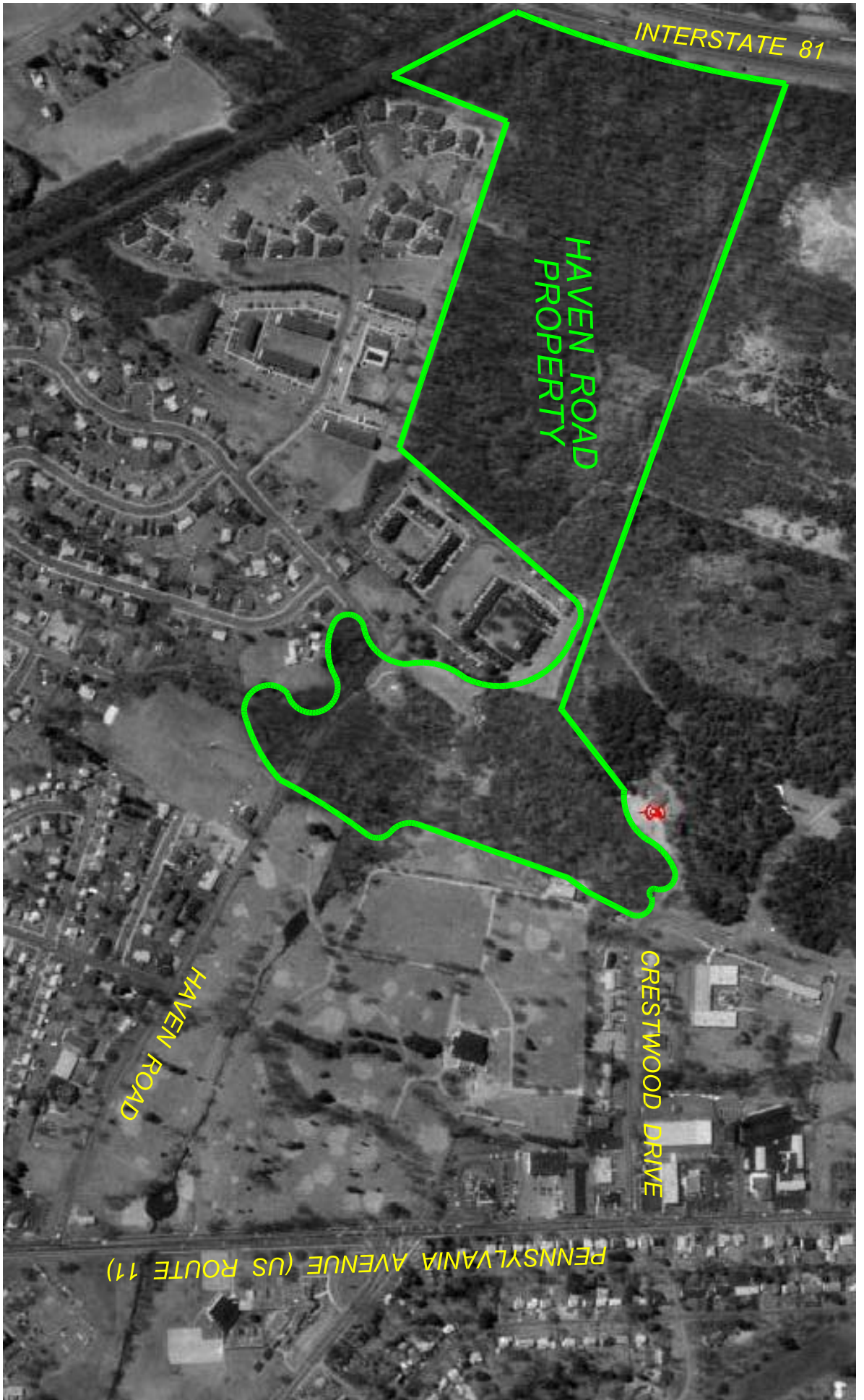


Figure 1
Site Location Map



Existing Road Network

A description of the roadways providing access to the site is as follows:

Pennsylvania Avenue (U.S. Route 11). This roadway consists of a single travel lane in each direction, with a posted speed limit of 45 miles per hour (mph). A continuous turn lane exists from just south of the intersection with Northern Avenue and continues north of the intersection with Crestwood Drive. This roadway is under the jurisdiction of the Maryland State Highway Administration (SHA).

Crestwood Drive. This roadway consists of one travel lane in each direction, with a posted speed limit of 25 mph. The intersection of Crestwood Drive and Pennsylvania Avenue (U.S. Route 11) currently operates under stop sign control. The existing lane use consists of separate eastbound left and right turn lanes, a northbound through lane and separate southbound right and through lanes.

Single-family homes are located on both sides of Crestwood Drive and it terminates at a Youth Scout Club.

Haven Road. This roadway provides a single travel lane in each direction, with a posted speed limit of 25 mph. The intersection of Haven Road and Pennsylvania Avenue (U.S. Route 11) currently operates under stop sign control. The existing lane use consists of separate eastbound left and right turn lanes, separate northbound through and left turn lanes, and separate southbound through and right turn lanes. The southbound right turn lane onto Haven Road is channelized.

Residential units are located along the west side of Haven Road, while the Rest Haven Cemetery lies on the east side. The WJEJ AM 1240 radio station and rental townhomes are located near the end of Haven Road, which terminates within the residential community.

Figure 2 indicates the current lane use and traffic control in the site vicinity.

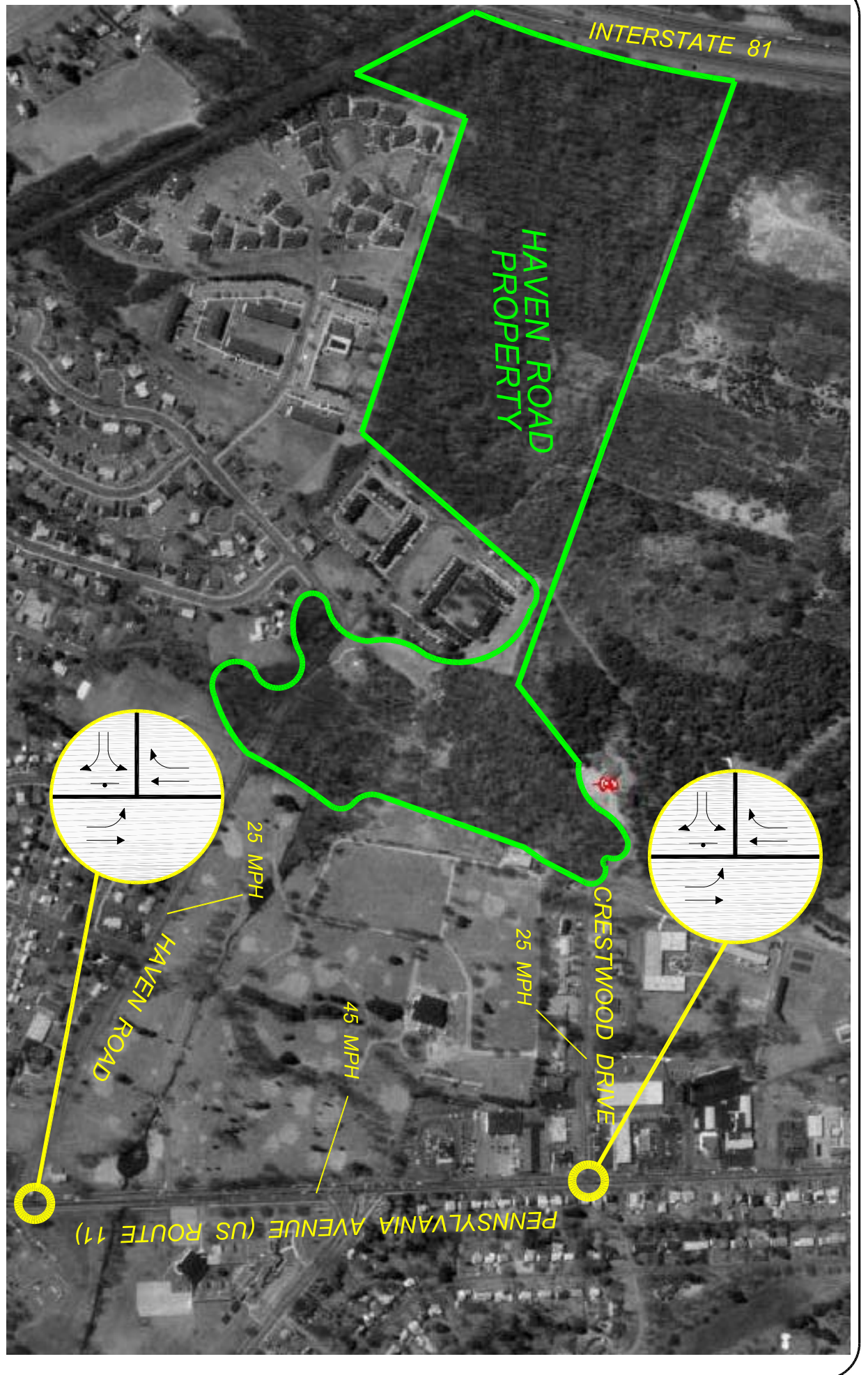




Figure 2
Existing Lane Use

 Represents One Travel Lane
 Stop Sign

 North
 Schematic

Field Observations

Field Observations were made on Monday, March 7, 2005 during the evening peak hour. The following summarizes these observations:

1. There appear to be sufficient gaps in through traffic on Pennsylvania Avenue to allow vehicles to efficiently enter and exit Crestwood Drive and Haven Road during the evening peak hour.
2. No major delays were observed for vehicles entering onto Pennsylvania Avenue from Crestwood Drive or Haven Road. The side-street volumes appear to be minor, but must utilize gaps in through traffic created by upstream and downstream traffic signals in the area. There are times when delays occur primarily for left turning movements.
3. There do not appear to be any physical constraints related to sight distance that would affect traffic flow at both intersections.
4. The nearest signalized intersection on Pennsylvania Avenue at Fairview Road appears to operate efficiently during the evening peak hour. Some queuing occurs in the southbound direction.
5. It is noted that the presence of the vehicle plant to the north and high school create peaks in traffic that occur prior to the evening peak hour, when shift changes occur and when school is dismissed. The traffic volume information indicates, however that the cumulative peak hour in the evening occurs from 5:00 to 6:00 PM.
6. No other major capacity constraints were observed in the field.

Pictures of the surrounding roadways were collected along Pennsylvania Avenue (U.S. Route 11), Crestwood Drive, and Haven Road when the field observations were made, and are located in Appendix A.

Existing Traffic Data

The Highway Information Services Division of the Maryland Department of Transportation, State Highway Administration (SHA) performed 24-hour counts at numerous locations along Pennsylvania Avenue (U.S. Route 11) in 2004. One of these

count locations was 0.2 miles south of the intersection of Northern Avenue and Pennsylvania Avenue (U.S. Route 11) and the counts were performed on July 28 and 29, 2004.

The count information indicates that the weekday AM peak hour occurs between 7:00AM to 8:00AM with approximately 396 northbound vehicles and 482 southbound vehicles, the midday peak hour occurs between 12:00PM and 1:00PM with approximately 641 northbound vehicles and 637 southbound vehicles, and the PM peak hour occurs between 5:00PM to 6:00PM with approximately 723 northbound vehicles and 762 southbound vehicles. In 2004, the average annual daily trips (AADT) were measured to be 16,475 trips.

The peak hour count data indicates that the volume splits in the northbound and southbound directions are 45/55 percent during the AM peak hour, 50/50 percent during the midday peak hour, and 49/51 percent during the PM peak hour, respectively.

The traffic count information is contained in Appendix B.

Ambient Traffic Growth

The traffic study methodology utilized by the City of Hagerstown indicates that an annual growth rate of 2.5 percent should be applied to existing traffic counts in order to account for growth outside the study area will be accounted for by using an annual growth rate of 2.5-percent. The growth rate in the site vicinity was calculated based on Annual Average Daily Traffic (AADT) for preceding years (1999 to 2004). The results indicate that a growth rate of 2.63 percent is currently being realized in the area. The annual growth rate analysis is located in Appendix C.

Site Access

The Haven Road property is proposed to be accessed via Crestwood Drive and Haven Road, as shown on Figure 1. Currently, separate eastbound left and right turn lanes allow traffic to access Pennsylvania Avenue (U.S. Route 11) at both locations, and operate under stop sign control. In addition, northbound access into both Crestwood Drive and Haven Road is provided via a continuous left turn lane. This allows for through traffic to travel uninhibited in this area.

Site Trip Generation and Comparison

A trip generation analysis and comparison for the Haven Road property was prepared based on the density allowed under the current zoning (810 apartments) and the proposed density (450 townhomes), subsequent to annexation into the City.

The results are summarized in Table 1 and indicate that the site would generate a total of 401 AM peak hour trips (80 in and 321 out), 463 PM peak hour trips (301 in and 162 out), and 5,018 daily (24-hour) trips, under the current zoning that would allow for the development of 810 apartments.

The site would generate a total of 172 AM peak hour trips (29 in and 143 out), 206 PM peak hour trips (138 in and 68 out), and 2,305 daily (24-hour) trips, under the proposed zoning assuming the site was developed with 450 townhouses.

A comparison of the current versus the proposed trip generation indicates that the proposed program would generate 229 (or 57 percent) *fewer* AM peak hour trips, 257 (or 56 percent) *fewer* PM peak hour trips, and 2,713 (or 54 percent) *fewer* daily trips than the density that could be built under the current zoning.

Table 1
Haven Road Annexation
Site Trip Generation Analysis ⁽¹⁾

Land Use	Land Use Code	Amount	Units	AM Peak Hour			PM Peak Hour			Average Daily Traffic
				In	Out	Total	In	Out	Total	
Existing Zoning (Washington County-RM)										
Apartments	220	810	D.U.	80	321	401	301	162	463	5,018
Proposed Zoning (City of Hagerstown R-3)										
Townhomes	230	450	D.U.	29	143	172	138	68	206	2,305
Difference				-51	-178	-229	-163	-94	-257	-2,713
Percentage				-64%	-55%	-57%	-54%	-58%	-56%	-54%

Notes: ⁽¹⁾ Trips based on ITE Trip Generation Manual, 7th Edition.

Summary of Findings and Recommendations

The following summarizes the findings and recommendations of this preliminary traffic assessment:

1. Based on the existing traffic counts, Pennsylvania Avenue, south of the Haven Road intersection, currently operates at Level of Service (LOS) "D" during the AM, midday, and PM peak hours. The current County standard is LOS "D", thus, reserve capacity is currently available in the corridor. (Refer to Appendix D). Additional studies would be necessary to determine if this capacity would be exceeded as a result of background traffic, regional growth, or traffic generated by the Haven Road project.
2. Although the side-street turning maneuvers from Crestwood Drive and Haven Road appear to be minor, these would likely operate at LOS "E or F" during peak hours from a technical perspective based on intersection capacity analyses. It is noted, however, that delays on the side-streets were observed to be minimal, utilizing gaps in through traffic created by nearby traffic signals. Future studies may require the preparation of traffic signal warrant analyses at these locations.
3. It does not appear that any additional geometric improvements are necessary at the Haven Road and Crestwood Drive intersections, since separate left and right turn lanes are provided for entering and exiting traffic. Other improvements may be warranted at other critical intersections adjacent to the site.
4. The additional traffic generated by the Haven Road property would add 172 AM peak hour trips, and 206 PM peak hour trips to the road network. Although reserve capacity is available on Pennsylvania Avenue, further traffic analyses would be necessary to determine if the road network could adequately accommodate planned development as well as these new trips.
5. If developed under the current zoning that would allow 810 apartments, the amount of new trips added to the road network would be double that of the proposed program, increasing the traffic impact to the site and surrounding road network.
6. It appears that there are a series of connected residential streets that provide interparcel access between the various subdivisions on the west

side of Pennsylvania Avenue. These connections disperse traffic among several locations that help minimize delays. It is likely that residents of the Haven Road Property would benefit from this connected street system and have other opportunities to access Pennsylvania Avenue.

7. The preparation of a formal traffic impact study would require a traffic scoping meeting with the City of Hagerstown and Washington County in order to establish the appropriate study area, intersections, background development, and specific parameters to be addressed. We assume that this would occur subsequent to the annexation.

Questions regarding this document should be directed to Wells & Associates.

Appendix A

Pictures of Surrounding Roads



Picture 1 – Eastbound Crestwood approaching Pennsylvania Avenue



Picture 2 – Pennsylvania Avenue south of Crestwood Drive



Picture 3 – Southbound Pennsylvania Avenue approaching Crestwood.



Picture 4 – Southbound Pennsylvania Avenue approaching Northern Avenue



Picture 5 – Eastbound Haven Road approaching Pennsylvania Avenue



Picture 6 – Southbound Pennsylvania Avenue approaching Haven Road



Picture 7 – Northbound Pennsylvania Avenue approaching Haven Road



Picture 8 – Northbound Pennsylvania Avenue approaching Haven Road



Picture 9 – Southbound Pennsylvania Avenue approaching Haven Road

Appendix B

Existing Traffic Count Data

*Maryland Department of Transportation
State Highway Administration
Highway Information Services Division*

Volume Count Detail Report

Station ID : B3903
Location : US11-.20 MI S OF NORTHERN AVE
Date : 07/28/2004 **To** 07/29/2004

Compiled By : SHATMS

Week of 07/25/2004 Direction: North

Beginning Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Daily Avg	Weekday Avg	Weekend Avg
0:00	0	0	0	58	76	0	0	67.00	67.00	0.00
1:00	0	0	0	34	32	0	0	33.00	33.00	0.00
2:00	0	0	0	28	22	0	0	25.00	25.00	0.00
3:00	0	0	0	21	20	0	0	20.50	20.50	0.00
4:00	0	0	0	28	28	0	0	28.00	28.00	0.00
5:00	0	0	0	100	103	0	0	101.50	101.50	0.00
6:00	0	0	0	204	197	0	0	200.50	200.50	0.00
7:00	0	0	0	393	398	0	0	395.50	395.50	0.00
8:00	0	0	0	371	413	0	0	392.00	392.00	0.00
9:00	0	0	0	455	469	0	0	462.00	462.00	0.00
10:00	0	0	0	524	511	0	0	517.50	517.50	0.00
11:00	0	0	0	568	592	0	0	580.00	580.00	0.00
12:00	0	0	0	610	671	0	0	640.50	640.50	0.00
13:00	0	0	0	592	597	0	0	594.50	594.50	0.00
14:00	0	0	0	617	661	0	0	639.00	639.00	0.00
15:00	0	0	0	679	644	0	0	661.50	661.50	0.00
16:00	0	0	0	715	692	0	0	703.50	703.50	0.00
17:00	0	0	0	753	692	0	0	722.50	722.50	0.00
18:00	0	0	0	544	573	0	0	558.50	558.50	0.00
19:00	0	0	0	507	493	0	0	500.00	500.00	0.00
20:00	0	0	0	389	390	0	0	389.50	389.50	0.00
21:00	0	0	0	348	314	0	0	331.00	331.00	0.00
22:00	0	0	0	177	177	0	0	177.00	177.00	0.00
23:00	0	0	0	122	109	0	0	115.50	115.50	0.00
Total :	0	0	0	8,837	8,874	0	0	8,855.50	8,855.50	0.00

AM Peak HR. :				11:00	11:00					
AM Peak CT. :	0	0	0	568	592	0	0			
PM Peak HR. :				17:00	17:00					
PM Peak CT. :	0	0	0	753	692	0	0			

*Maryland Department of Transportation
State Highway Administration
Highway Information Services Division*

Volume Count Detail Report

Station ID : B3903
Location : US11-.20 MI S OF NORTHERN AVE
Date : 07/28/2004 **To** 07/29/2004

Compiled By : SHATMS

Week of 07/25/2004 Direction: South

Beginning Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Daily Avg	Weekday Avg	Weekend Avg
0:00	0	0	0	41	65	0	0	53.00	53.00	0.00
1:00	0	0	0	35	31	0	0	33.00	33.00	0.00
2:00	0	0	0	25	24	0	0	24.50	24.50	0.00
3:00	0	0	0	30	23	0	0	26.50	26.50	0.00
4:00	0	0	0	54	56	0	0	55.00	55.00	0.00
5:00	0	0	0	147	155	0	0	151.00	151.00	0.00
6:00	0	0	0	249	263	0	0	256.00	256.00	0.00
7:00	0	0	0	460	504	0	0	482.00	482.00	0.00
8:00	0	0	0	427	460	0	0	443.50	443.50	0.00
9:00	0	0	0	478	510	0	0	494.00	494.00	0.00
10:00	0	0	0	516	580	0	0	548.00	548.00	0.00
11:00	0	0	0	595	556	0	0	575.50	575.50	0.00
12:00	0	0	0	607	666	0	0	636.50	636.50	0.00
13:00	0	0	0	603	596	0	0	599.50	599.50	0.00
14:00	0	0	0	588	603	0	0	595.50	595.50	0.00
15:00	0	0	0	659	652	0	0	655.50	655.50	0.00
16:00	0	0	0	766	739	0	0	752.50	752.50	0.00
17:00	0	0	0	768	755	0	0	761.50	761.50	0.00
18:00	0	0	0	545	531	0	0	538.00	538.00	0.00
19:00	0	0	0	444	468	0	0	456.00	456.00	0.00
20:00	0	0	0	392	425	0	0	408.50	408.50	0.00
21:00	0	0	0	310	309	0	0	309.50	309.50	0.00
22:00	0	0	0	167	168	0	0	167.50	167.50	0.00
23:00	0	0	0	91	79	0	0	85.00	85.00	0.00
Total :	0	0	0	8,997	9,218	0	0	9,107.50	9,107.50	0.00

AM Peak HR. :				11:00	10:00		
AM Peak CT. :	0	0	0	595	580	0	0
PM Peak HR. :				17:00	17:00		
PM Peak CT. :	0	0	0	768	755	0	0

*Maryland Department of Transportation
State Highway Administration
Highway Information Services Division*

Volume Count Detail Report

Station ID : B3903
Location : US11-.20 MI S OF NORTHERN AVE
Date : 07/28/2004 **To** 07/29/2004

Compiled By : SHATMS

Week of 07/25/2004 * Summary of Total Report *****

Beginning Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Daily Avg	Weekday Avg	Weekend Avg
0:00	0	0	0	99	141	0	0	120.00	120.00	0.00
1:00	0	0	0	69	63	0	0	66.00	66.00	0.00
2:00	0	0	0	53	46	0	0	49.50	49.50	0.00
3:00	0	0	0	51	43	0	0	47.00	47.00	0.00
4:00	0	0	0	82	84	0	0	83.00	83.00	0.00
5:00	0	0	0	247	258	0	0	252.50	252.50	0.00
6:00	0	0	0	453	460	0	0	456.50	456.50	0.00
7:00	0	0	0	853	902	0	0	877.50	877.50	0.00
8:00	0	0	0	798	873	0	0	835.50	835.50	0.00
9:00	0	0	0	933	979	0	0	956.00	956.00	0.00
10:00	0	0	0	1040	1091	0	0	1065.50	1065.50	0.00
11:00	0	0	0	1163	1148	0	0	1155.50	1155.50	0.00
12:00	0	0	0	1217	1337	0	0	1277.00	1277.00	0.00
13:00	0	0	0	1195	1193	0	0	1194.00	1194.00	0.00
14:00	0	0	0	1205	1264	0	0	1234.50	1234.50	0.00
15:00	0	0	0	1338	1296	0	0	1317.00	1317.00	0.00
16:00	0	0	0	1481	1431	0	0	1456.00	1456.00	0.00
17:00	0	0	0	1521	1447	0	0	1484.00	1484.00	0.00
18:00	0	0	0	1089	1104	0	0	1096.50	1096.50	0.00
19:00	0	0	0	951	961	0	0	956.00	956.00	0.00
20:00	0	0	0	781	815	0	0	798.00	798.00	0.00
21:00	0	0	0	658	623	0	0	640.50	640.50	0.00
22:00	0	0	0	344	345	0	0	344.50	344.50	0.00
23:00	0	0	0	213	188	0	0	200.50	200.50	0.00
Total:	0	0	0	17,834	18,092	0	0	17,963.00	17,963.00	0.00

AM Peak Hour:				11:00	11:00		
AM Peak CT.:	0	0	0	1163	1148	0	0
PM Peak Hour:				17:00	17:00		
PM Peak CT.:	0	0	0	1521	1447	0	0

*Maryland Department of Transportation
State Highway Administration
Highway Information Services Division*

AADTS Report By Station

County : Washington
Year : 2004

Compiled By : SHATMS

Route NO	Mile	Station ID	Location	Factored AADT
MU 2470				
	0.31	B210035	WALNUT ST-.10 MI S OF US40 (WASHINGTON S	3325
MU 2500				
	0.66	B210036	W WASHINGTON ST-.10 MI W OF US40	5025
US 11				
	0.21	B3900	US11-.10 MI S OF POTOMAC RIVER	6575
	1.57	B3901	US11-.10 MI S OF IS81 RAMPS	16375
	3.08	B4027	US11-.20 MI N OF IS70	12875
	9.00	B3903	US11-.20 MI S OF NORTHERN AVE	16475
	10.17	B3904	US11-.10 MI N OF NORTH POINT DR	14775
	12.63	B3906	US11-.20 MI S OF PENNSYLVANIA ST/L	7175
US 40				
	17.53	B3912	US40-.10 MI E OF IS70	1375
	20.45	B3914	US40-.30 MI E OF MD56	1775
	24.90	B4014	US40-.30 MI E OF MD68	5075
	31.44	B3917	US40-.10 MI W OF MD63	13575
	32.08	B210041	US40-.50 MI E OF HUYETT LA	14275
	32.12	P0002	US 40 East of MD 63	13742
	34.56	B4037	US40-.30 MI E OF IS81	22275
	37.34	B3919	US40-.10 MI W OF COLONIAL DR	29075
	39.45	B3920	US40-.40 MI E OF EMMERT RD	34775
	40.45	B4047	US40-.70 MI S OF IS70	11075
	45.85	B3922	US40-.10 MI W OF FREDERICK CO/L	6175
US 40 AL				
	1.26	B3923	US40AL-.10 MI W OF WILSON BLVD	12575
	8.88	B3924	US40AL-.30 MI W OF MD68	6175
	9.55	B3925	US40AL-.20 MI W OF MD66	8775
	9.95	B3926	US40AL-.20 MI E OF MD66	12475
	11.15	B3927	US40AL-.20 MI E OF MD67	5275
US 340				
	0.44	P0019	US 340 at Potomac River Bridge	24455
	0.52	B210042	US340-.50 MI E OF VIRGINIA ST/L	23275
US 522				
	0.43	B4025	US522-.10 MI S OF MD144WB	13075
	0.73	B4002	US522-.10 MI N OF MD144WB	10875

Appendix C

Growth Rate Calculation

Table 1
 Haven Road Annexation
 Average Daily Traffic Trends ⁽¹⁾

Route	Location	<u>Average Daily Traffic Volumes</u>						Percent Change 1999-2004	Annual Growth Rate 1999-2004		
		1999	2000	2001	2002	2003	2004				
		1999-2000		2000-2001		2001-2002		2002-2003		2003-2004	
U.S. Route 11	0.2 miles S of Northern	17,275	17,850	16,275	16,850	17,025	16,475	-4.63%	-0.94%		
	Yearly Percent Change	3.33%		-8.82%		3.53%		1.04%		-3.23%	
Averages								2.63%		-0.94%	

Sources: ⁽¹⁾ Maryland State Highway Administration Traffic Volume AADT's for Washington County.

Appendix D

Two-Lane Capacity Analyses

HCS2000: Two-Lane Highways Release 4.1d

Two-Way Two-Lane Highway Segment Analysis

Analyst CFP
 Agency/Co. Wells & Associates, LLC
 Date Performed 3/10/2005
 Analysis Time Period AM Peak Period
 Highway Pennsylvania Avenue (Route 11)
 From/To North/South
 Jurisdiction Washington County, MD
 Analysis Year 2004 Existing Conditions
 Description 2765 - Haven Road Annexation

Input Data

Highway class Class 2
 Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
 Lane width 12.0 ft % Trucks and buses 10 %
 Segment length 0.2 mi % Recreational vehicles 2 %
 Terrain type Level % No-passing zones 100 %
 Grade: Length mi Access points/mi 6 /mi
 Up/down %
 Two-way hourly volume, V 878 veh/h
 Directional split 55 / 45 %

Average Travel Speed

Grade adjustment factor, fG 1.00
 PCE for trucks, ET 1.2
 PCE for RVs, ER 1.0
 Heavy-vehicle adjustment factor, 0.980
 Two-way flow rate, (note-1) vp 995 pc/h
 Highest directional split proportion (note-2) 547 pc/h
 Free-Flow Speed from Field Measurement:
 Field measured speed, SFM - mi/h
 Observed volume, Vf - veh/h
 Estimated Free-Flow Speed:
 Base free-flow speed, BFFS 60.0 mi/h
 Adj. for lane and shoulder width, fLS 0.0 mi/h
 Adj. for access points, fA 1.5 mi/h
 Free-flow speed, FFS 58.5 mi/h
 Adjustment for no-passing zones, fnp 2.6 mi/h
 Average travel speed, ATS 48.2 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
 PCE for trucks, ET 1.1
 PCE for RVs, ER 1.0
 Heavy-vehicle adjustment factor, fHV 0.990
 Two-way flow rate, (note-1) vp 985 pc/h
 Highest directional split proportion (note-2) 542
 Base percent time-spent-following, BPTSF 57.9 %
 Adj. for directional distribution and no-passing zones, fd/np 12.8
 Percent time-spent-following, PTSF 70.7 %

Level of Service and Other Performance Measures

Level of service, LOS D
 Volume to capacity ratio, v/c 0.31
 Peak 15-min vehicle-miles of travel, VMT15 49 veh-mi
 Peak-hour vehicle-miles of travel, VMT60 176 veh-mi
 Peak 15-min total travel time, TT15 1.0 veh-h

HCS2000: Two-Lane Highways Release 4.1d

Two-Way Two-Lane Highway Segment Analysis

Analyst CFP
 Agency/Co. Wells & Associates, LLC
 Date Performed 3/10/2005
 Analysis Time Period Mid-Day Peak Period
 Highway Pennsylvania Avenue (Route 11)
 From/To North/South
 Jurisdiction Washington County, MD
 Analysis Year 2004 Existing Conditions
 Description 2765 - Haven Road Annexation

Input Data

Highway class Class 2
 Shoulder width 6.0 ft Peak-hour factor, PHF 0.90
 Lane width 12.0 ft % Trucks and buses 10 %
 Segment length 0.2 mi % Recreational vehicles 2 %
 Terrain type Level % No-passing zones 100 %
 Grade: Length mi Access points/mi 6 /mi
 Up/down %
 Two-way hourly volume, V 1278 veh/h
 Directional split 50 / 50 %

Average Travel Speed

Grade adjustment factor, fG 1.00
 PCE for trucks, ET 1.1
 PCE for RVs, ER 1.0
 Heavy-vehicle adjustment factor, 0.990
 Two-way flow rate, (note-1) vp 1434 pc/h
 Highest directional split proportion (note-2) 717 pc/h
 Free-Flow Speed from Field Measurement:
 Field measured speed, SFM - mi/h
 Observed volume, Vf - veh/h
 Estimated Free-Flow Speed:
 Base free-flow speed, BFFS 60.0 mi/h
 Adj. for lane and shoulder width, fLS 0.0 mi/h
 Adj. for access points, fA 1.5 mi/h
 Free-flow speed, FFS 58.5 mi/h
 Adjustment for no-passing zones, fnp 1.7 mi/h
 Average travel speed, ATS 45.7 mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG 1.00
 PCE for trucks, ET 1.0
 PCE for RVs, ER 1.0
 Heavy-vehicle adjustment factor, fHV 1.000
 Two-way flow rate, (note-1) vp 1420 pc/h
 Highest directional split proportion (note-2) 710
 Base percent time-spent-following, BPTSF 71.3 %
 Adj. for directional distribution and no-passing zones, fd/np 7.8
 Percent time-spent-following, PTSF 79.1 %

Level of Service and Other Performance Measures

Level of service, LOS D
 Volume to capacity ratio, v/c 0.45
 Peak 15-min vehicle-miles of travel, VMT15 71 veh-mi
 Peak-hour vehicle-miles of travel, VMT60 256 veh-mi
 Peak 15-min total travel time, TT15 1.6 veh-h

HCS2000: Two-Lane Highways Release 4.1d

Two-Way Two-Lane Highway Segment Analysis

Analyst CFP
 Agency/Co. Wells & Associates, LLC
 Date Performed 3/10/2005
 Analysis Time Period PM Peak Period
 Highway Pennsylvania Avenue (Route 11)

From/To North/South
 Jurisdiction Washington County, MD
 Analysis Year 2004 Existing Conditions
 Description 2765 - Haven Road Annexation

Input Data

Highway class	Class 2				
Shoulder width	6.0	ft	Peak-hour factor, PHF	0.90	
Lane width	12.0	ft	% Trucks and buses	10	%
Segment length	0.2	mi	% Recreational vehicles	2	%
Terrain type	Level		% No-passing zones	100	%
Grade: Length		mi	Access points/mi	6	/mi
Up/down		%			
Two-way hourly volume, V	1485	veh/h			
Directional split	51 / 49	%			

Average Travel Speed

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.1	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor,	0.990	
Two-way flow rate, (note-1) vp	1667	pc/h
Highest directional split proportion (note-2)	850	pc/h
Free-Flow Speed from Field Measurement:		
Field measured speed, SFM	-	mi/h
Observed volume, Vf	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, BFFS	60.0	mi/h
Adj. for lane and shoulder width, fLS	0.0	mi/h
Adj. for access points, fA	1.5	mi/h
Free-flow speed, FFS	58.5	mi/h
Adjustment for no-passing zones, fnp	1.4	mi/h
Average travel speed, ATS	44.1	mi/h

Percent Time-Spent-Following

Grade adjustment factor, fG	1.00	
PCE for trucks, ET	1.0	
PCE for RVs, ER	1.0	
Heavy-vehicle adjustment factor, fHV	1.000	
Two-way flow rate, (note-1) vp	1650	pc/h
Highest directional split proportion (note-2)	842	
Base percent time-spent-following, BPTSF	76.6	%
Adj. for directional distribution and no-passing zones, fd/np	6.4	
Percent time-spent-following, PTSF	83.0	%

Level of Service and Other Performance Measures

Level of service, LOS	D	
Volume to capacity ratio, v/c	0.52	
Peak 15-min vehicle-miles of travel, VMT15	83	veh-mi
Peak-hour vehicle-miles of travel, VMT60	297	veh-mi
Peak 15-min total travel time, TT15	1.9	veh-h