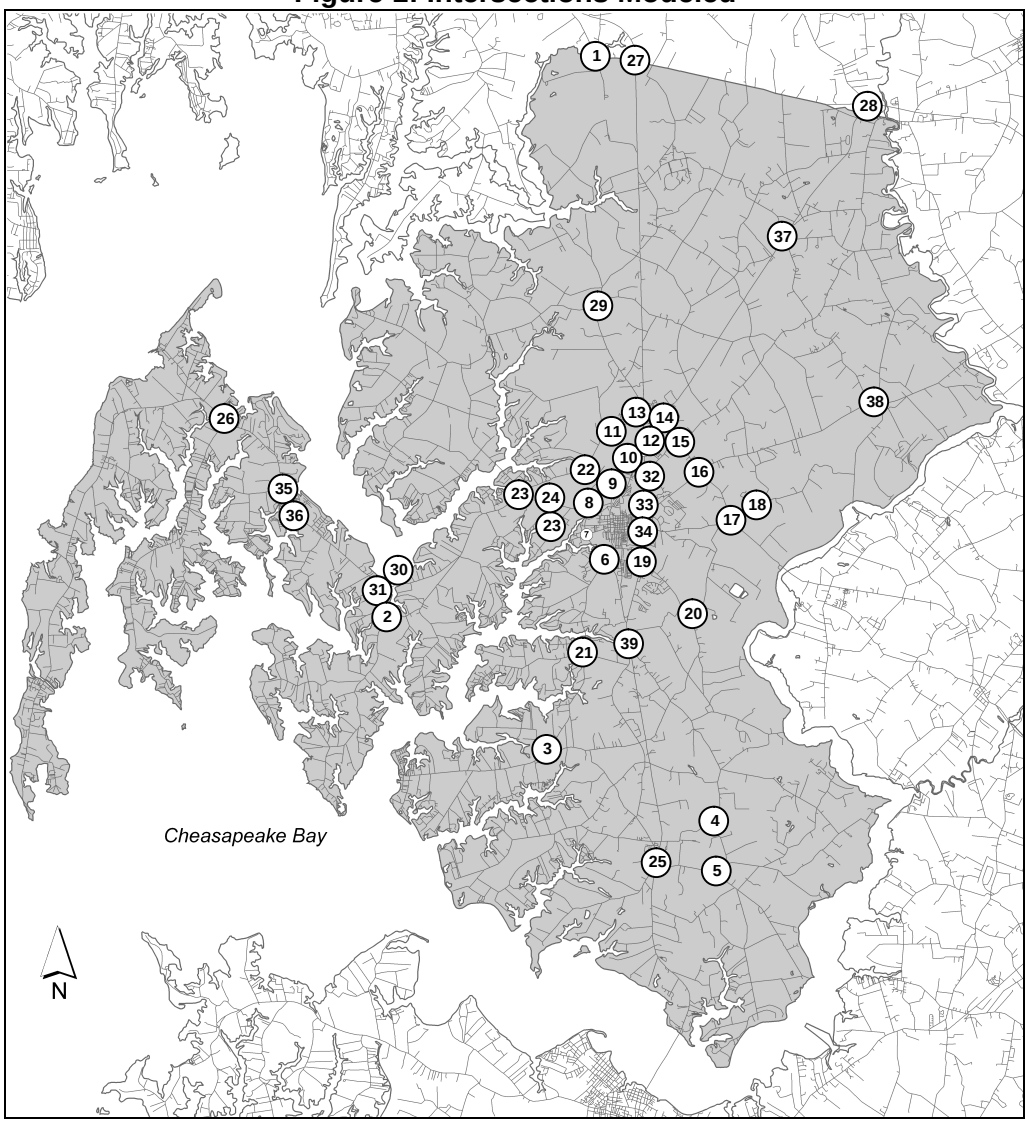
Section C

QUANTIFYING DESIGN YEAR VOLUMES (2015 and 2030)

1. Introduction

The following section documents the methodology used to determine turning movements at 39 intersections in Talbot County for design years 2015 and 2030 (**Figure 1 and Appendix C1-Study Intersections and Corridors**). This analysis was conducted using the nationally recognized Quick Response System QRS II (Version 5) transportation planning software package for forecasting traffic volumes. QRS was first developed in 1978 as a set of technical manuals by the National Cooperative Highway Research Program[1] to address planning issues for small urban areas. In 1981, the Federal Highway Administration released the first computer based version of QRS.

Figure 1: Intersections Modeled

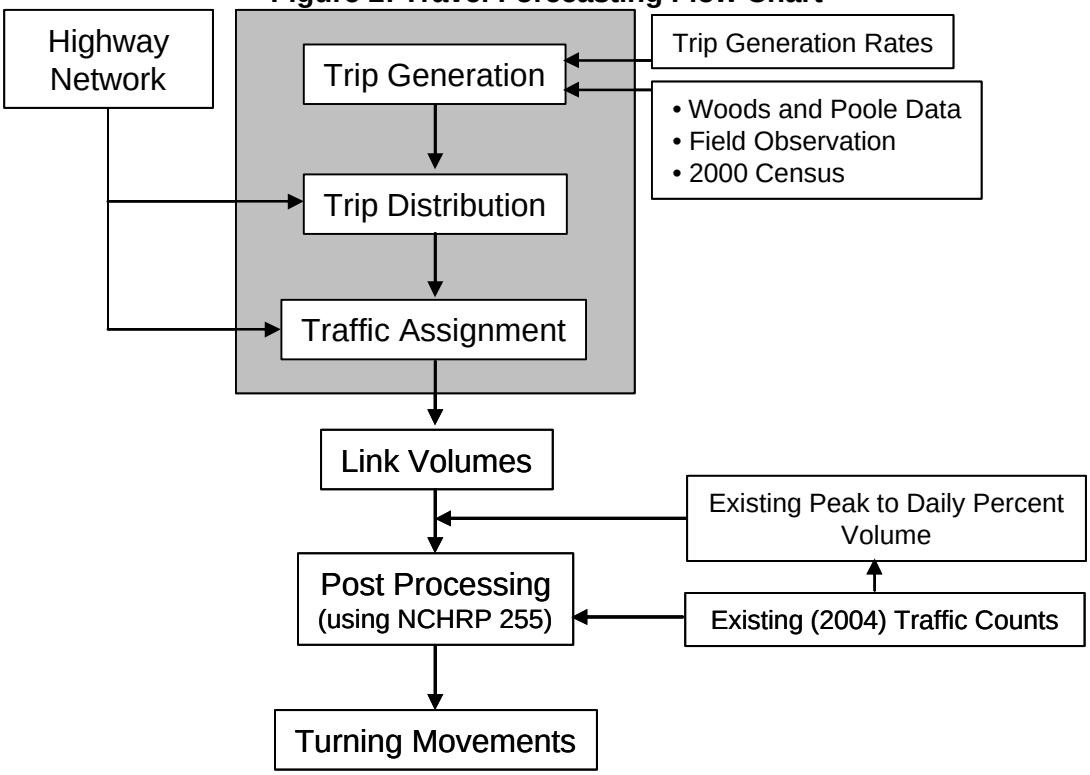


[1] Sosslau, A., Hassam, H., Carter, M., and Wickstrom, G., *National Cooperative Highway Research Program Report 187: Quick Response Urban Travel Estimation Techniques and Transferable Parameters*. Transportation Research Board, Washington, D.C., 1978.

2. Travel Forecasting

The flow chart below shows the steps used in the forecasting process. Traffic forecasting is typically conducted using a four-step process: trip generation, trip distribution, mode choice, and traffic assignment. Trip generation refers to the amount of additional trips that occurs in the study area due to development, and trip distribution refers to the process by which trip origins are linked with trip destinations. Mode choice indicates the mode of transportation (auto, bus, rail, bicycle, walk, etc.) that will be used[2]. Traffic assignment is the process that is used to assign traffic to the transportation network. To conduct traffic assignment, a highway network, which describes the conditions found on the major roadways in the transportation system, was developed. The traffic assignment step produced traffic volumes at designated links in the network. These volumes were validated for their reasonableness and then converted into turning movements, using techniques identified in NCHRP 255[3].

Figure 2: Travel Forecasting Flow Chart



[2] While mode choice is an important step in large urban areas, for the purposes of this study it was assumed that the only available mode of transportation was private vehicle, since alternative modes account for a relatively small percentage of trips.

[3] While mode choice is an important step in large urban areas, for the purposes of this study it was assumed that the only available mode of transportation was private vehicle, since alternative modes account for a relatively small percentage of trips.

a. Network Development

Developing a travel forecasting network includes several components:

i. Transportation Analysis Zones

Transportation Analysis Zones (TAZs) are geographic areas that are used in travel forecasting to represent land use characteristics, including population and employment centers for small areas. Based on the land use characteristics in Talbot County, 106 transportation analysis zones (TAZs) were created and are shown in **Figure 3**.

ii. Roadway Network

The roadway network is a representation of the transportation system that describes the conditions of the road system. For this study it was only necessary to include the most important roads in the network. As shown in **Figure 4**, all arterial and collector roads were incorporated in this forecasting process. To simulate roadway conditions, distances, speeds, number of lanes, facility type and direction of travel were associated with each link in the network.

iii. Centroids

Centroids represent the center of activity in the TAZ. They express the origin and destination of all trips entering or leaving each zone as well as residential and employment activity. In this study, the locations of centroids were determined based on a review of aerial photographs. Centroids are shown in **Figure 4**.

iv. Centroid Connectors

Centroid connectors represent the paths of travel between the centroids and the roadway network and are shown in **Figure 4**.

Figure 3: Transportation Analysis Zones

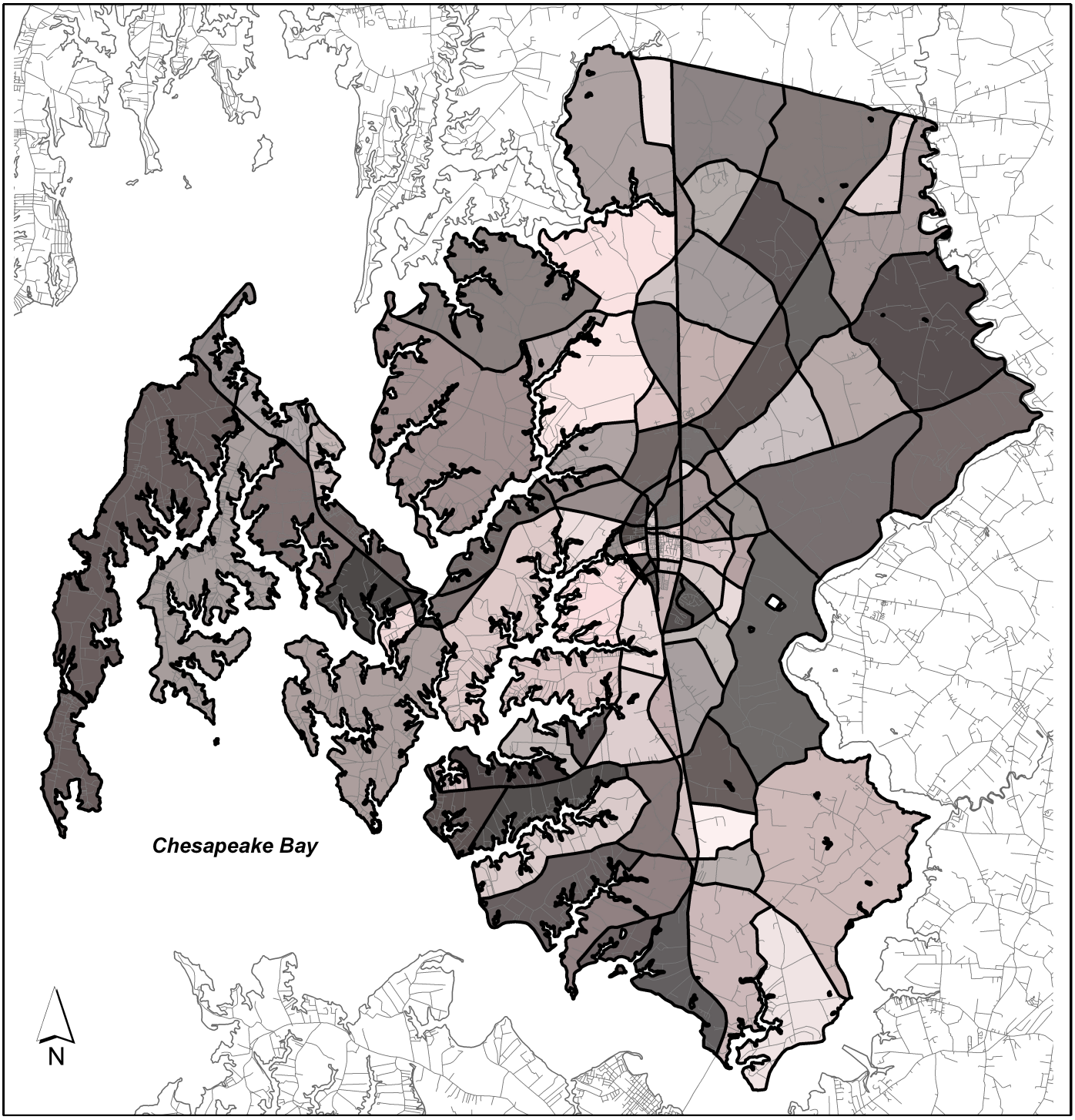
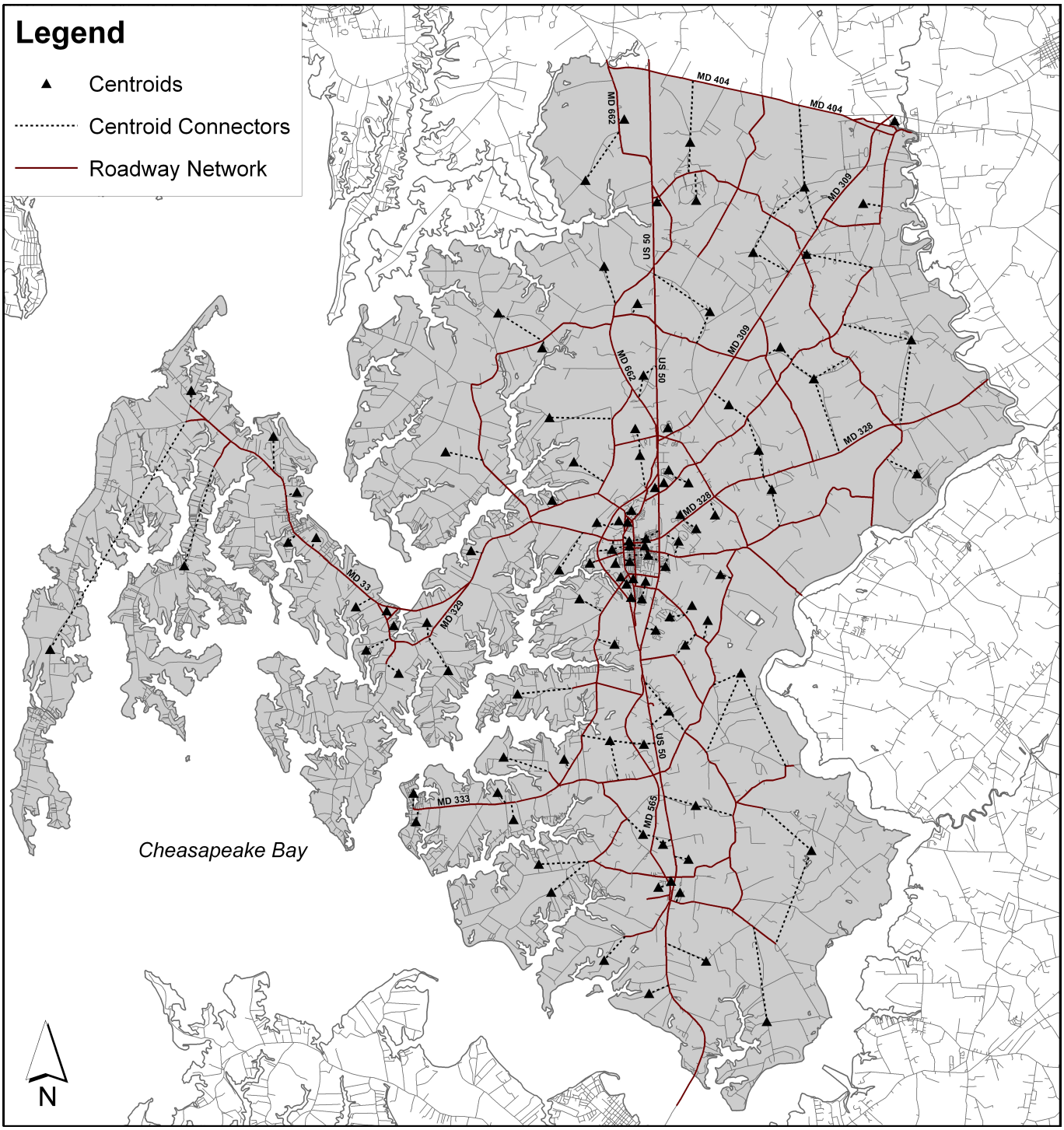


Figure 4: Roadway Network, Centroids and Centroid connectors

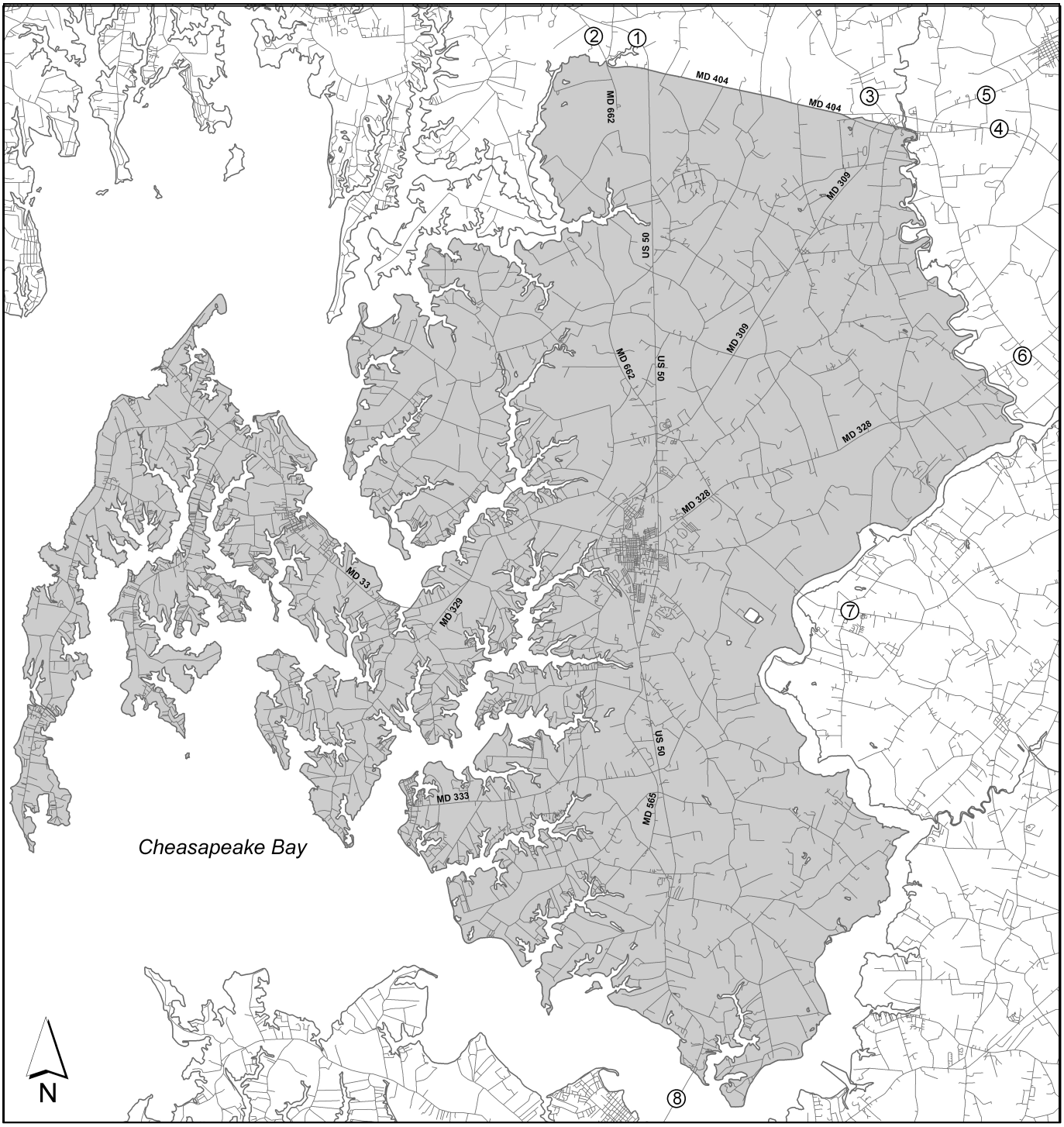


v. External Stations

External stations are locations outside of the study area where traffic entering the study area from external sources is quantified. They contribute both external to external (XX) trips, in which traffic travels between two external stations, passing through the study area, as well as external to internal (XI) and internal to external (IX) trips, in which traffic passes between an external station and an internal location (and vice versa). Eight external stations were identified in the Talbot County study and are shown in **Figure 5**.

1 Route 50 (north of Route 404)
2 Route 662 (north of Wye Mills)
3 Route 309 (north of Queen Anne)
4 Route 404 (east of Queen Anne)
5 Route 480 (east of Queen Anne)
6 Route 328 (Caroline County)
7 Route 331 (Caroline County)
8 Route 50 (Dorchester County)

Figure 5: External stations



b. Trip Generation

Trip generation is the first step in the travel forecasting process and refers to the quantity of travel that is generated. Since travel is a function of the character, intensity and location of land use, this forecasting process sought to capture the effect of land use on travel using residential and employment data in Talbot County and trip generation rates for each trip purpose. The three trip purposes included in this model are:

- Home Based Work (HBW) – commute trips
- Home Based Non Work (HBNW) – trips to the grocery store, gas station, medical visits, etc. made from home
- Non Home Based (NHB) – lunch, errands and other trips where one end is not at home, often taken during work hours

The Talbot County model assumed that each household makes 13.5 trips per day, of which 23.7 percent were HBW trips, 41.7 percent were HBNW trips and 34.6 percent were NHB trips. This means that the average household generated approximately 3.2 HBW, 5.6 HBNW and 4.7 NHB trips per day. The trip generation rates for each trip purpose are based on recommended assumptions by the Quick Response System and the Hagerstown, Maryland Metropolitan Planning Organization (MPO) model. They were adjusted in order to balance productions with attractions.

The Hagerstown MPO Model was created to model HBW, HBNW, and NHB trip characteristics for the Hagerstown area. It was deemed appropriate to utilize the results of the Hagerstown MPO study, because the town/county characteristics closely match Talbot County's characteristics. The significant costs associated with creating a Talbot County-specific MPO model would not have been feasible.

There are several types of travel that occur in the Talbot County study area. Internal trips are those that occur between two locations within Talbot County. Internal to External (and External to Internal) trips are those that occur between one location inside Talbot County and one location outside the County. External to External trips were those that pass through the County without stopping and largely represent trips along US 50. Talbot County demographic and economic data was used to forecast internal trip ends, while Census Transportation Planning Package (CTPP) data was used to estimate external trip ends.

i. Demographic and Economic Data

Demographic data was compiled from several sources, including: the 2000 US census, Woods and Poole Economics[4], and the CTPP. This data was projected to 2004 (the year of traffic counts), and the forecast years of 2015 and 2030.

[4] Woods & Poole Economics provide long term economic and demographic data at the state, regional, metropolitan, and county level.

Residential Data

Residential data was collected from the 2000 US Census at the block level. This data was apportioned to each of the Transportation Analysis Zones (TAZ) based on the land area of the block groups. The following shows the assumed number of households per year:

1. 2000 – 14,323 households
2. 2004 – 14,954 households
3. 2015 – 19,904 households
4. 2030 – 23,104 households

For 2004, the total number of households was projected by applying a 1 percent annual growth rate to the total number of households in 2000. This growth rate was based on assumptions made by Woods and Poole Economics. The total number of households in 2015 was estimated by adding all planned and approved housing units slated for development between 2005 and 2015 to the 2004 total.

Representatives from Talbot County Planning and Zoning, the Town of Easton Department of Planning, the Town of St. Michael's, and the Town of Trappe Planning Office provided known developments in excess of 20 developments within Talbot County. **Table 6** shows the planned and approved developments by jurisdiction and the number of total units between 2004 and 2015. The Town of Trappe indicated that about 20 percent of the units in the Trappe East development were slated for development between 2015 and 2030, however, because this represents only a partial estimate of development that will occur during this time period, it was decided that applying a 1 percent growth rate would be a more accurate representation of future growth (see above). Therefore, a 1 percent annual growth rate (which equals a 16 percent growth rate between 2015 and 2030) was applied to the 2015 total, to estimate 2030 households.

Table 6: Known Developments in Talbot County (2005 to 2015)

Project	Jurisdiction	Total Units
Trappe East	Trappe	2,262
Lion's Farm	Trappe	462
Easton Club East	Easton	408
Miles Point	St. Michael's	279
Easton Village	Easton	250
The Preserve	Talbot County	211
Bretridge	Easton	200
The Woods at Stony Ridge	Easton	200
Mulberry Station	Easton	155
Two Oaks at Matthewstown	Easton	153
Lake Lands	Easton	143
Cooke's Hope	Easton	139
Douglas Landing	Easton	133
Elm St/Hatton's Garden	St. Michael's	130
Easton Mews (Lot 4 Mears)	Easton	108
Unnamed	Easton	100
Tilghman on the Chesapeake	Talbot County	60
Waylands Townhomes	Easton	39
Cannery Square	Easton	30
Lot 31	Easton	18
Ratcliff Farm	Easton	15
Locust Commons	Easton	13
The Hollys	Easton	11
Brookwood	Easton	4
Plum St	Easton	4
Total		**5,527**

Note: The development unit sizes are subject to change.

Retail and Nonretail Employment

Since there are typically substantially more trips associated with retail employees than nonretail employees for the HBNW trip purpose, employment data was distinguished by whether it is retail or nonretail based (**Table 7**). HBW and NHB trip rates are similar for retail and nonretail employees. However, the HBNW trip rate for retail employees is 20 times greater than that of nonretail employees. This is because retail employee trip rates incorporate trips made by shoppers traveling between home and commercial areas, while nonretail employee trip rates tend to largely consist of trips between work-to-home and work to other locations.

Table 7: Trip attraction rates

Employment	HBW	HBNW	NHB
Retail	1.7	10.0	2.0
Nonretail	1.7	0.5	2.5

Annual retail and nonretail employment data for 2004 was taken from Woods and Poole estimates for Talbot County (see **Table 8**).

Table 8: Retail and nonretail employment in Talbot County (thousands)

Year	2000	2004	2015	2030
Retail	4.85	5.14	5.77	6.77
Non Retail	20.89	21.91	24.80	30.20
	25.74	27.05	30.57	36.97

The Woods and Poole employment data was then apportioned to the nine census tracts in Talbot County based on the amount of workers currently employed in each census tract (see **Figure 7**). These proportions are shown in **Table 9** and were developed based on worker flows to census tracts in Talbot County, from the Census Transportation Planning Package (CTPP). The resulting apportionment is provided in **Table 10**.

Figure 6: Census tracts

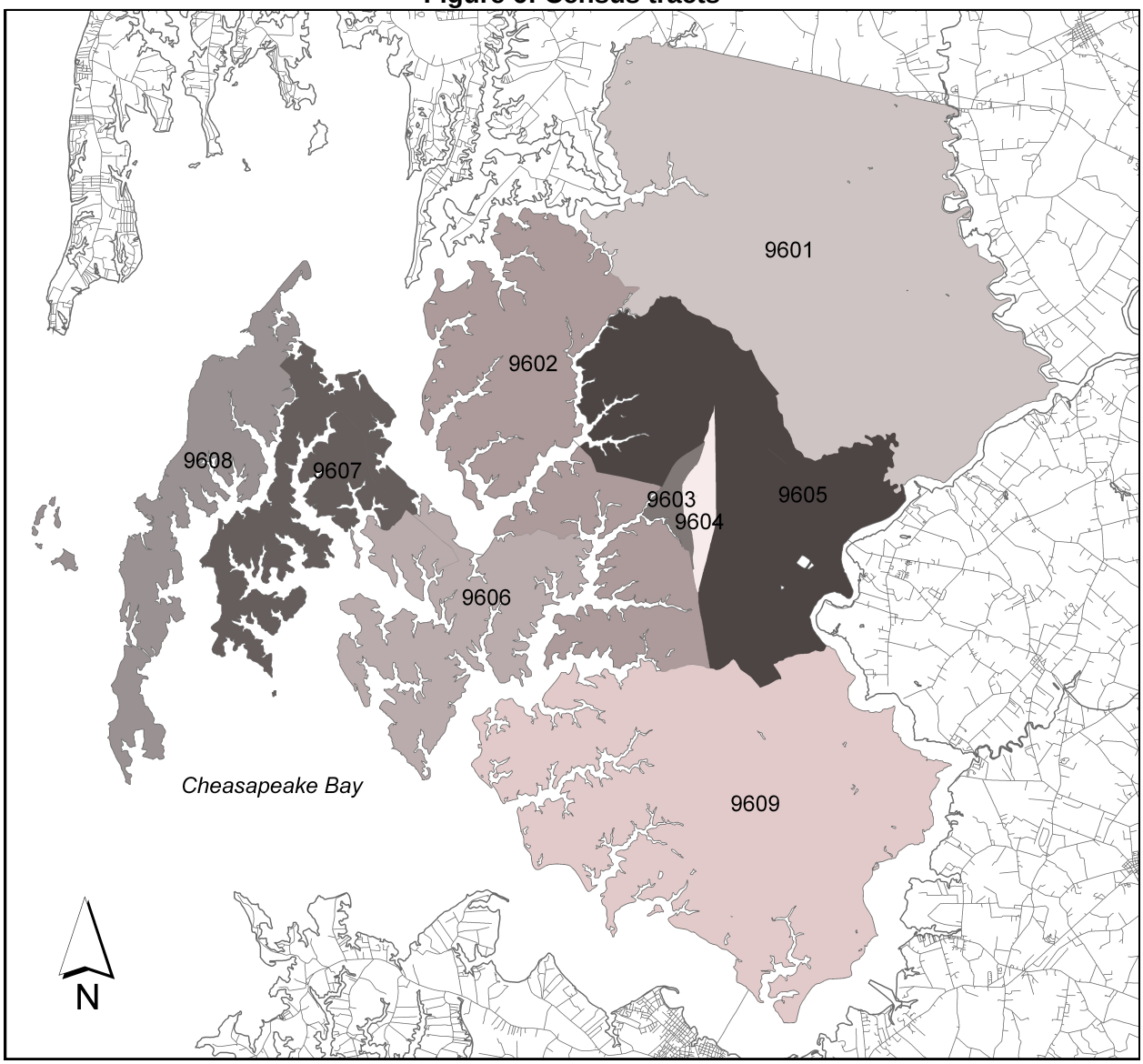


Table 9: Worker flows to census tracts in Talbot Co. (source: CTPP, 2000)

Tract	Flows	Percent
9601	676	3.4%
9602	684	3.5%
9603	3647	18.6%
9604	6692	34.0%
9605	5316	27.0%
9606	250	1.3%
9607	1202	6.1%
9608	225	1.1%
9609	968	4.9%
Total	**19660**	**100.0%**

The employment figures shown in **Table 10** include both full time and part time jobs. Since the travel patterns of full time and part time employees differ, for this analysis, two part time jobs (less than 20 hours per week) were assumed to be equivalent to one full time job. The adjusted retail and nonretail jobs are shown in **Table 11**.

Table 10: Retail and nonretail employment in Talbot Co. by census tract (full time & part time jobs)

	2000		2004		2015		2030	
Tract	Retail	Non Retail	Retail	Non Retail	Retail	Non Retail	Retail	Non Retail
9601	167	718	177	753	198	853	233	1038
9602	169	727	179	763	201	863	236	1051
9603	900	3875	953	4064	1070	4600	1256	5602
9604	1651	7111	1750	7458	1964	8442	2305	10280
9605	1311	5648	1390	5924	1560	6705	1830	8165
9606	62	266	65	279	73	316	86	385
9607	296	1277	314	1339	353	1516	414	1846
9608	56	239	59	251	66	284	78	346
9609	239	1029	253	1079	284	1221	333	1487
Total	4851	20890	5140	21910	5769	24800	6771	30200

Table 11: Retail and nonretail jobs in Talbot County

	2000		2004		2015		2030	
Tract	Retail	Non Retail	Retail	Non Retail	Retail	Non Retail	Retail	Non Retail
9601	161	692	171	726	191	822	225	1000
9602	158	681	168	715	188	809	221	985
9603	856	3686	907	3866	1018	4376	1195	5329
9604	1565	6739	1658	7068	1861	8000	2184	9742
9605	1269	5467	1345	5734	1510	6490	1771	7903
9606	58	249	61	261	68	296	81	360
9607	268	1155	284	1211	319	1371	374	1670
9608	53	225	56	236	62	267	73	326
9609	225	968	238	1015	267	1149	313	1399
Total	4613	19862	4888	20832	5484	23580	6437	28714

ii. Determining Internal and External Trips

Using data from the Census Transportation Planning Package, external to internal (XI) and internal to external (IX) trips were determined. In **Tables 12** and **13**, flows represent the number of people traveling to and from locations in Talbot County from locations outside of the county. Flows were converted to vehicles by using a 1.38 vehicle occupancy rate[5]. **Tables 14** and **15** show how traffic was apportioned to each station from the various external locations. For example, in **Table 14** it was assumed that 95 percent of the traffic traveling from the Bay Bridge to Talbot County was through External Station 1 (on Route 50). These apportionments were based on observation and professional judgment about where the major origins and destinations are located in the area.

Table 12: External to internal (XI) flows

County	Flows	Vehicles
Caroline MD	3220	2333
Dorchester MD	1955	1417
Queen Anne's MD	805	583
Sussex DE	370	268
Bay Bridge	315	228
Wicomico MD	275	199
Kent MD	170	123
Kent DE	120	87
Somerset MD	30	22
Worcester MD	20	14
Total	7280	5274

Table 13: Internal to external (IX) flows

County	Flows	Vehicles
Bay Bridge	1740	1261
Queen Anne's MD	840	609
Dorchester MD	775	562
Caroline MD	600	435
Wicomico MD	75	54
Kent MD	65	47
Kent DE	50	36
Sussex DE	45	33
Philadelphia PA	30	22
Total	4220	3059

[5] Based on recommended assumptions in the Quick Response System

Table 14: External to internal (XI) flows apportioned to station

		Percent									
Station	Vehicles	Caroline	Dorchester	Queen Anne	Sussex	Bay Bridge	Wicomico	Kent MD	Kent DE	Somerset	Worcester
1	742	0.00	0.00	0.70	0.00	0.95	0.00	0.95	0.00	0.00	0.00
2	18	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.00	0.00
3	58	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	1376	0.55	0.00	0.10	0.00	0.00	0.00	0.00	0.40	0.00	0.00
5	434	0.15	0.00	0.10	0.00	0.00	0.00	0.00	0.30	0.00	0.00
6	493	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00
7	926	0.10	0.30	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
8	1227	0.00	0.70	0.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00
Total	5274	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table 15: Internal to external (IX) flows apportioned to stations

		Percent								
Station	Vehicles	Bay Bridge	Queen Anne	Dorchester	Caroline	Wicomico	Kent MD	Kent DE	Sussex	Philly
1	1691	0.95	0.70	0.00	0.00	0.00	0.95	0.00	0.00	1.00
2	65	0.05	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00
3	61	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	315	0.00	0.10	0.00	0.55	0.00	0.00	0.40	0.00	0.00
5	137	0.00	0.10	0.00	0.15	0.00	0.00	0.30	0.00	0.00
6	98	0.00	0.00	0.00	0.20	0.00	0.00	0.30	0.00	0.00
7	245	0.00	0.00	0.30	0.10	0.00	0.00	0.00	1.00	0.00
8	447	0.00	0.00	0.70	0.00	1.00	0.00	0.00	0.00	0.00
Total	3059	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Note: See Figure 6 for Station locations.

Using the apportionment rates in **Tables 14** and **15**, the number of vehicle trips and person trips between external and internal locations per day were estimated in **Table 16**. To project internal to external trips to 2015 and 2030, the residential growth rate was used, since these trips represent flows by persons living within Talbot County to locations outside of the county. Between 2004 and 2015 the annual growth rate was 2.6 percent and between 2015 and 2030 the annual growth rate was 1 percent. To project external to internal trips to 2015 and 2030, the employment growth rate in Talbot County was used, since these are trips by persons to Talbot County from external locations and are most likely for work or shopping purposes. The Woods and Poole estimate of a 1 percent annual increase in employment between 2004 and 2030 was used.

Table 16: External to internal (XI) and internal to external (IX) trips

	Vehicle Trips (2004)		Vehicle Trips (2015)		Vehicle Trips (2030)	
Station	Internal to External (IX)	External to Internal (XI)	Internal to External (IX)	External to Internal (XI)	Internal to External (IX)	External to Internal (XI)
1	3382	1484	4486	1656	5208	1922
2	130	36	172	40	200	46
3	122	116	162	130	188	150
4	630	2752	836	3070	970	3564
5	274	868	364	968	422	1124
6	196	986	260	1100	302	1278
7	490	1852	650	2066	754	2398
8	894	2454	1186	2738	1376	3178
Total	6118	10548	8116	11768	9420	13660

	Person Trips (2004)		Person Trips (2015)		Person Trips (2030)	
Station	Internal to External (IX)	External to Internal (XI)	Internal to External (IX)	External to Internal (XI)	Internal to External (IX)	External to Internal (XI)
1	5412	2374	7177	2648	11262	2329
2	208	58	275	65	432	57
3	195	186	258	207	405	182
4	1008	4403	1337	4913	2098	4321
5	438	1389	581	1549	912	1363
6	313	1577	415	1760	651	1548
7	784	2963	1040	3306	1631	2908
8	1431	3926	1898	4380	2978	3852
Total	9789	16876	12981	18828	20369	16560

Note: See Figure 6 for Station locations.

iii. Determining Pass-Through Trips

Trips between external stations (XX trips) were determined by subtracting XI and IX trips from the average annual daily traffic (AADT) recorded by the Maryland State Highway Administration (MD SHA) at permanent locations near the external stations (see **Table 17**). AADT was factored to average daily traffic (ADT) for August based on historic data from MD SHA. ADT for 2015 and 2030 were estimated using annual growth rates based on historical data available on the MD SHA website. The resultant trips reflect the total number of two-way external to external trips. Therefore, to compute XX trips it was assumed that 50 percent of all trips were “inbound” and 50 percent were “outbound” trips.

Table 17: External to external (XX) vehicle trips in 2004, 2015 and 2030

VEHICLE TRIPS (2004)

			XX		
Station	**ADT**	**XI and IX**	**Total**	**Inbound**	**Outbound**
1	39,792	4,866	34,926	17,463	17,463
2	1,044	166	878	439	439
3	3,333	238	3,095	1,548	1,548
4	18,117	3,382	14,735	7,368	7,368
5	5,620	1,142	4,478	2,239	2,239
6	7,693	1,182	6,511	3,256	3,256
7	11,749	2,342	9,407	4,704	4,704
8	22,969	3,348	19,621	9,811	9,811
			93,651	46,826	46,826

VEHICLE TRIPS (2015)

			XX		
Station	**ADT**	**XI and IX**	**Total**	**Inbound**	**Outbound**
1	52,211	6,142	46,069	23,035	23,035
2	1,165	212	953	477	477
3	5,131	292	4,839	2,420	2,420
4	22,526	3,906	18,620	9,310	9,310
5	6,270	1,332	4,938	2,469	2,469
6	8,583	1,360	7,223	3,612	3,612
7	13,108	2,716	10,392	5,196	5,196
8	30,137	3,924	26,213	13,107	13,107
			119,247	59,624	59,624

VEHICLE TRIPS (2030)

			XX		
Station	**ADT**	**XI and IX**	**Total**	**Inbound**	**Outbound**
1	68,505	7,130	61,375	30,688	30,688
2	1,300	246	1,054	527	527
3	7,899	338	7,561	3,781	3,781
4	28,008	4,534	23,474	11,737	11,737
5	6,995	1,546	5,449	2,725	2,725
6	9,576	1,580	7,996	3,998	3,998
7	14,624	3,152	11,472	5,736	5,736
8	39,542	4,554	34,988	17,494	17,494
			153,369	76,685	76,685

Note: See Figure 6 for Station locations.

Using an iterative process to apportion XX vehicle trips between external stations, **Tables 18** through **Table 20** show XX trips in 2004, 2015 and 2030.

Table 18: XX trips 2004

	Station							
Station	1	2	3	4	6	7	8	Total
1	0	0	0	5,237	2,554	3,690	5,982	17,463
2	0	0	66	112	54	79	128	439
3	0	66	0	692	0	0	790	1,548
4	5,237	112	692	0	0	0	1,328	7,368
6	2,554	54	0	0	0	0	648	3,256
7	3,690	79	0	0	0	0	936	4,704
8	5,982	128	790	1,328	648	936	0	9,811
Total	17,463	439	1,548	7,368	3,256	4,704	9,811	44,589

Table 19: XX trips 2015

	Station							
Station	1	2	3	4	6	7	8	Total
1	0	0	0	6,857	2,983	4,291	8,903	23,035
2	0	0	107	110	48	69	143	477
3	0	107	0	1,006	0	0	1,306	2,420
4	6,858	110	1,006	0	0	0	1,337	9,310
6	2,983	48	0	0	0	0	581	3,612
7	4,291	69	0	0	0	0	836	5,196
8	8,904	143	1,306	1,337	581	836	0	13,107
Total	23,035	477	2,420	9,310	3,612	5,196	13,107	57,157

Table 20: XX trips 2030

	Station							
Station	1	2	3	4	6	7	8	Total
1	0	0	0	9,046	3,523	5,054	13,046	30,688
2	0	0	189	100	39	56	144	527
3	0	189	0	1,470	0	0	2,120	3,781
4	9,052	100	1,471	0	0	0	1,121	11,737
6	3,525	39	0	0	0	0	437	3,998
7	5,057	56	0	0	0	0	626	5,736
8	13,054	144	2,121	1,121	437	626	0	17,494
Total	30,688	527	3,781	11,737	3,998	5,736	17,494	73,961

Note: See Figure 6 for Station locations.

c. Trip Distribution

Trip distribution is the second step in the four-step process and refers to the process of linking trip origins with trip destinations. One important variable is friction factor curves, which are used to express the effect of spatial separation or accessibility (travel time) on travel behavior. They must be calibrated so that travel times match those observed in the study area. Typically, commute trips are the longest Home Base Work (HBW) trips, while Non Home Base (NHB) trips are the shortest. While data on travel times by trip purpose did not exist for Talbot County, an average travel time of approximately twelve minutes for HBW trips, ten minutes for Home Base Non Work (HBNW) trips and eight minutes for NHB trips was assumed. The actual travel time based on the QRS models for 2004, 2015 and 2030 are shown in **Figure 7** by trip purpose.

Figure 7: Average travel time by trip purpose

Trip Purpose	2004	2015	2030
HBW	12.83	12.16	11.89
HBNW	10.26	9.79	9.88
NHB	8.07	7.93	7.59

d. Traffic Assignment and Link Volumes

Traffic assignment is the final step of the four-step process and produces existing and future traffic volumes. In this model, equilibrium assignment was used to derive traffic assignments. Modifications were made to the number of iterations as well as the roadway network, until reasonable results were achieved. The QRS software provided the traffic assignments for the 39 intersections (see **Figure 2** and **Appendix C1-Study Intersections and Corridors**) in 2015 and 2030.

e. Post Processing

Using the traffic counts conducted by Wallace Montgomery in 2004, the link volumes were validated using methods established in NCHRP 255. An average was taken of the absolute and percent difference between the traffic volumes forecasted by QRS and the traffic counts provided by Wallace Montgomery to estimate link volumes for the links approaching 39 intersections (see **Figure 2** and **Appendix C1-Study Intersections and Corridors**). These link volumes are shown in **Table 21**.

Table 21: Travel Forecasting Link Volumes in 2015, 2030

	Traffic Assignment (2015)				Traffic Assignment (2030)			
Intersection	**North**	**South**	**East**	**West**	**North**	**South**	**East**	**West**
1	1,225	4,225	1,450	0	1,475	7,275	2,800	0
2	--	2,275	2,375	1,850	--	2,475	2,650	2,075
3	275	2,650	4,650	4,425	300	3,050	5,025	4,425
4	1,850	2,500	--	500	3,425	5,150	--	900
5	2,525	--	850	2,600	5,200	--	1,050	4,425
6	18,750	9,200	10,350	13,500	20,600	10,300	11,000	15,175
7	19,700	19,400	3,400	3,475	21,350	21,275	3,775	3,525
8	21,275	18,875	9,575	18,550	23,125	20,625	10,750	20,150
9	17,975	16,625	5,825	7,525	19,525	17,825	6,700	8,350
10	15,550	16,375	4,950	7,675	17,575	17,850	5,850	8,250
11	6,250	425	8,300	2,825	7,150	475	8,900	2,850
12	52,300	41,050	--	17,875	61,175	46,875	--	20,125
13	40,725	44,675	7,100	4,400	49,475	52,225	8,025	5,725
14	6,275	3,575	3,150	5,150	7,125	4,225	3,600	5,725
15	2,125	2,475	3,575	2,725	2,650	3,075	4,625	3,025
16	3,625	2,800	7,400	8,225	4,350	3,100	8,250	8,600
17	2,900	4,275	1,675	--	3,200	5,950	3,825	--
18	4,025	--	12,900	13,275	5,650	--	14,125	13,625
19	41,225	34,400	8,775	5,875	46,500	38,950	9,350	6,550
20	2,650	1,600	--	2,400	2,900	1,725	--	2,425
21	8,275	6,000	725	1,200	9,475	6,450	1,175	1,250
22	3,450	--	2,925	2,050	3,800	--	3,675	2,400
23	4,375	150	18,800	17,225	5,475	150	21,175	17,950
24	3,525	4,575	2,125	--	5,100	5,675	2,450	--
25	35,425	36,850	4,650	2,225	42,925	47,800	6,850	3,475
26	225	2,250	6,600	4,950	250	2,450	6,975	5,400
27	58,475	39,150	19,025	1,700	79,175	52,025	25,375	3,200
28	4,250	2,375	2,100	4,175	5,350	2,850	2,650	4,500
29	1,925	1,750	--	975	3,300	2,400	--	1,800
30	--	1,025	12,375	12,075	--	1,075	12,750	12,300
31	1,675	2,025	575	--	1,825	2,225	625	--
32	40,875	41,300	4,200	4,275	46,550	46,575	4,525	5,125
33	43,050	42,400	17,600	12,725	48,700	47,150	17,625	13,925
34	50,625	55,750	24,900	17,275	55,875	61,800	24,925	18,850
35	575	2,600	14,150	12,575	625	2,900	14,725	13,175
36	--	650	16,100	15,975	--	725	16,725	16,625
37	5,400	5,425	1,750	1,600	7,300	6,450	2,625	2,525
38	700	600	6,600	6,875	1,225	1,500	7,375	8,375
39	37,875	34,625	3,225	2,425	42,150	38,650	3,575	2,725

Note: See Figure 2 or Appendix C1for Station locations.

f. Turning Movements

Peak morning and afternoon turning movements were developed using a hybrid method derived from the non-directional turning movement methodology outlined in NCHRP-255. The procedure utilized an iterative proportioning function (IPF) to generate turning movements. The non-directional (Average Weekday Daily Traffic) AWDT link volumes served as the input and the initial iterations were seeded with the existing turning movements for the intersections. This was used in conjunction with the refined approach link volumes to develop AWDT turning movements. Peak hour traffic projections were derived from the refined AWDT volumes based on 2004 peaking characteristics from the Wallace Montgomery traffic counts. The peak hour projections represent average weekday traffic forecasts for both the morning and evening peak hours. **Appendix A4 – Traffic Forecasting Volume Summary** contains a summary of the existing, the short-term 2015, and the long-term 2030 forecasted volumes.