November 15, 2021

Mr. Timothy G. Fay
Bay Pointe Club, LLC
1275 Wampanoag Trail
East Providence, RI 02915

Re: Proposed Residential Development Expansion
Windward Pines at The Bay Pointe Club
Wareham, Massachusetts

Dear Mr. Fay:

BETA Group, Inc., in accordance with our scope of services has completed a planning level assessment of existing and future traffic safety and operational conditions along the immediate servicing roadway to a proposed mixed-use residential and golf course development project, *The Bay Pointe Club*, in the Town of Wareham, Massachusetts. This study provides an update of a Traffic Impact Assessment dated June 22, 2015, previously completed by our office for a 94-unit mixed residential development as part of the 149.1-acre golf course property. The original proposal had received approvals for these units to be completed in three phases. Since the original approval, Phase 1 has been completed and presently Phase 2 and 3 are under construction.

As part of this project update, additional land has become available to expand the residential use on the property as part of a fourth phase. This includes 52 townhouse units configured in seven higher density buildings situated towards the front of the property in the vicinity of the golf course clubhouse and pavilion. This study was completed for submission to the Town as part of the local planning approval process for the final phase of the project. The analysis completed provides an updated summary of existing roadway conditions and an estimate of future traffic operations if the expanded project is approved and constructed.

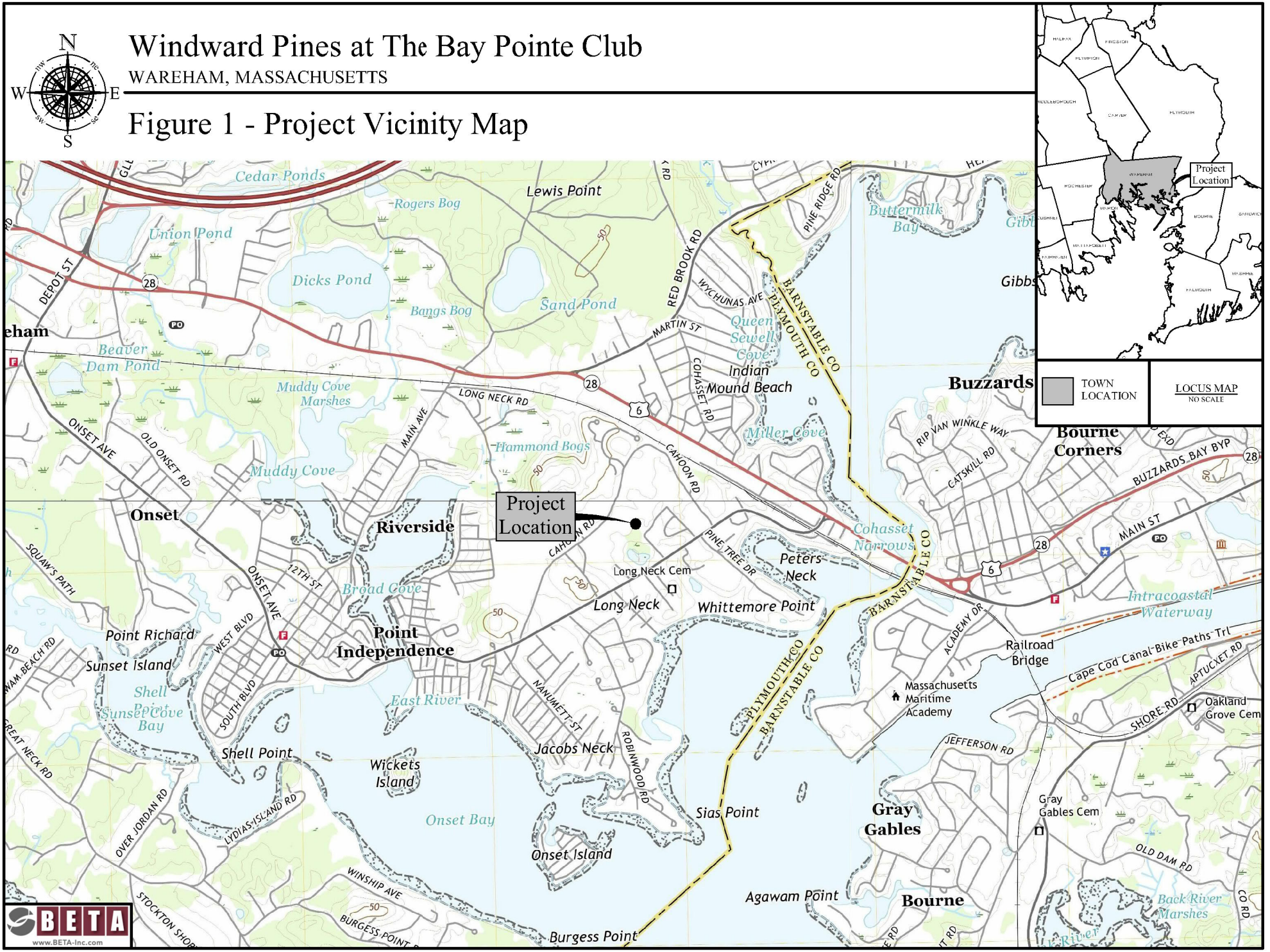
The 149.1-acre parcel is comprised of Assessors Maps 2, 8, 9 and 10, Lots 1004A and 1004B, which is currently developed as a golf course including large, wooded areas and the 28 homes constructed under Phase 1. The property is bounded by Onset Avenue on the south, residential properties on the north and west, and a rail line on the east. Access to the site is provided from the existing access road, Bay Pointe Drive which intersects Onset Avenue to the west of Cleveland Avenue. Figure 1 on the following page depicts the general vicinity of the project in the Town of Wareham.

The following is an update of our original study with record information to identify possible changes to existing conditions, while identifying the potential impacts associated with the additional residential units in Phase 4 and making recommendations to provide safe and efficient access to the development project;

Windward Pines at The Bay Pointe Club

WAREHAM, MASSACHUSETTS

Figure 1 - Project Vicinity Map



PROJECT APPROACH

The objective of this study is to determine if any traffic operational and/or safety concerns that may have arisen since the original study exist along the major servicing roadway to the proposed residential expansion project . A review of the existing roadway features was completed to determine if any potential deficiencies presently warrant mitigation. In addition to the existing conditions analysis, the study also included the assessment of potential impacts resulting from the traffic generated by the new homes. The study focused on these issues and made recommendations for improvements if determined necessary, based upon the findings of the data collection and analysis phases of the study.

In order to complete our analysis, the following scope of work was conducted for the project:

- An inventory of the physical roadway characteristics of Bay Pointe Drive and Onset Avenue in the immediate site vicinity, including roadway alignment, pavement width, signage and traffic control to determine the adequacy of the existing roadway geometric features relating to access, safety, and operations.
- Traffic crash and volume data including Automatic Traffic Recorder (ATR) counts obtained on Onset Avenue from the Massachusetts Department of Transportation (MassDOT) were reviewed.
- The Site Plan for the proposed Phase 4 component of the development was reviewed to define future roadway conditions through the development and at the access road intersection to the site with Onset Avenue.
- Analysis of the data collected, evaluation of the proposed design, and development of recommendations to provide safe and adequate access to the new homes.

PROJECT AREA

As noted in the previous section, the *Bay Pointe Club* development is located off Onset Avenue, a two-lane minor arterial roadway through the southeasterly portion of Wareham, Massachusetts. The 149.1-acre property is situated along the northerly side of Onset Avenue between, Short Neck Road and Cahoon Road. The parcel is presently developed with an eighteen-hole golf course including Clubhouse and Pavilion and the 28 residential homes constructed in Phase 1. The additional 52 units as part of Phase 4, *Windward Pines*, will be constructed in seven buildings situated toward the southerly end of the property adjacent to the golf course clubhouse and pavilion. The existing main entrance road, Bay Pointe Drive, provides the main access to the site. Secondary points of access are available for emergency use on Short Neck Road and Cahoon Road. The Short Neck Road access will be gated when this portion of the development (Phase 2 and 3) are completed.

Other properties in the immediate project area are primarily single-family residential lots along Onset Avenue and off intersecting residential side streets. Immediately abutting the property to the east there are 60 condominiums off of Cahoon Road. A recreational use, Onset Beach is located to the west of the project area. To the east Onset Avenue intersects with Route 6, a major commercial roadway in the community. Along this road there is a diverse mix of land uses including offices, supermarkets, large retail plazas, restaurants, hotels, apartments, and recreational businesses. Refer to Figure 2 on the following page depicting the site and immediate project area.

Windward Pines at The Bay Pointe Club

WAREHAM, MASSACHUSETTS

Figure 2 - Project Area Map

Based upon the small-scale of the proposed Phase 4 of the residential development scope of the new Phase 4 residential component of the project and the adjacent servicing roadway, a study impact area was defined. The limits of our analysis included the section of Onset Avenue between Cahoon Road, west along the property frontage to South Water Street. The extent of the operational analysis within this project area included the main study intersection of Bay Pointe Drive with Onset Avenue.

EXISTING CONDITIONS

ROADWAYS

Onset Avenue

Onset Avenue is classified as a minor arterial roadway through Wareham, providing access from the interstate highway system to more densely populated areas in the southern half of the community along the waterfront.

It should be noted that Onset Avenue was recently reconstructed in 2019 that included new pavement and pavement markings. The roadway paving project also eliminated the permitted passing along a short section of Onset Avenue between Cameron Street and Carol Road by installing solid double yellow centerlines as can be seen in the adjacent photograph looking east along Onset Avenue. Within the defined project area, the roadway is variable in width from 26 to 28 feet. Generally, two 13-foot travel lanes with no defined shoulder are provided in each direction. A posted speed limit of 35 MPH was observed on Onset Avenue in both directions.

A five-foot bituminous sidewalk is located along the northerly side of the road with a granite curb edge treatment. On the southerly side of the road, a bituminous berm is utilized to direct stormwater to a closed drainage system. Cobra head lighting on utility poles is provided sporadically along the corridor including at all side street intersections and at Bay Pointe Drive.

TRAFFIC FLOW DATA

Existing traffic flow characteristics for this area were developed from record data available from the MassDOT and a traffic counting program completed by BETA as part of the original study. Specifically, the Department has a count station (ID 253826), where an Automatic Traffic Recorder (ATR) data collection program was completed in August 2013 and August 2019 on Onset Avenue west of Route 6. BETA also completed a turning movement count at the Bay Pointe Drive intersection with Onset Avenue in June 2015 as part of the original study. Complete count information can be found in the Attachments.

Based upon the MassDOT August 2019 record data, the average daily traffic (AADT) on Onset Avenue in the project area was determined to be approximately 4,900 vehicle per day. When compared to the

MassDOT August 2013 record data of approximately 5,500 vehicles per day, Onset Avenue has seen a decrease of approximately 11% between 2013 and 2019 for an annual decline rate of approximately 2%. On a typical weekday along this section of Onset Avenue during the summer months, traffic volumes begin to gradually increase at 6:00 AM from less than 60 vehicles per hour overnight, to between 150 and 375 vehicles per hour during the morning hours to the noon period. Unlike most arterials, there is no defined morning commuter peak hour as volumes gradually increase over the course of the day to the late afternoon, where the daily peak hour of traffic is realized. The afternoon peak hour was found to occur between 5:00 and 6:00 PM, with approximately 375 vehicles per hour with 215 westbound and 160 eastbound.

SAFETY ANALYSIS

The geometry of Onset Avenue in the project area was investigated to determine if there are any limiting factors affecting safety. These limiting factors would potentially include horizontal or vertical alignment changes or roadside obstructions that limit sight distances for vehicles traveling along the road or entering the road from a side street or driveway location. In this instance, the sight distance standard is necessary to permit turning vehicles to safely enter and exit Onset Avenue from Bay Pointe Drive.

The existing horizontal geometry of Onset Avenue in the immediate project area can generally be described as straight between Short Neck Road and Cahoon Road. The roadway gradient can be defined as gradually rolling with multiple crest and sag curves along its length. At the site access location, Bay Pointe Drive there is a roadway crest with a gradual decline to both the east and west.

The existing horizontal and vertical geometry of Onset Avenue as described at the proposed entrance/exit point to the site, will provide stopping sight distances greater than 750 feet to the east and west of Bay Pointe Drive. These values are in excess of the required 250-foot minimum stopping sight distance for vehicles on wet pavement according to AASTHO criteria for the posted speed limit of 35 mph and the 360-foot requirement for the noted prevailing travel speeds between 35-45 mph. The available sight distances are sufficient for vehicles travelling in excess of 60 mph. The adjacent photo depicts the available sight distance at the study intersection looking west from along Onset Avenue with Bay Pointe Drive to the right side.

Based upon the preliminary evaluation of the existing roadway geometry and physical features, it does not appear that any significant safety deficiencies exist within the study area. It should be noted that there was no observed control on the minor Bay Pointe Drive approach to Onset Avenue. It is recommended that, at a minimum, a Stop line be placed on the southbound approach to the

intersection to alert motorist to the stop condition. Also, as part of this study, a review of crash statistics was completed. Data was reviewed from the Massachusetts Department of Transportation (MassDOT) for the latest recorded full three-year period from January 2017 to December 2019 at the intersection of Onset Avenue with Bay Pointe Drive to determine if the study intersection experienced a high frequency or pattern of crashes. Based upon this review, no crashes were found on record at the Bay Pointe Drive intersection for the latest three-year study period completed for this project.

Analysis of the information did not reveal any accident trends or a high incidence/severity of accidents at the intersection or along any particular section of roadway in the study area. Based upon a review of existing roadway geometry and operating conditions, roadway or traffic related safety improvements are currently not warranted to improve traffic operations or safety within the defined project area.

TRIP GENERATION

To understand the potential traffic impact of a proposed development, estimates of anticipated traffic to be generated by that particular land use must be calculated. As previously discussed, the site development proposal includes expansion of the previously approved 94-unit mixed residential development (60 single family homes and 34 condominium units) to include seven (7) buildings along the easterly side of Bay Pointe Drive, across the Pavilion building, to accommodate 52 townhouse units. Bay Pointe Drive, which intersects with Onset Avenue approximately 300 feet west of the Cleveland Avenue intersection, will be the primary access road to the new townhomes within The Bay Pointe Club property. A site plan, depicting the site layout and access can be found on Figure 4.

For this site, projected traffic volumes for Phase 4 of the proposed residential development were based on use of trip generation factors. These factors are taken from the "Trip Generation" manual, an informational report published by the Institute of Transportation Engineers (ITE), a national professional organization for traffic and transportation engineers. The data provided in the ITE report are based on extensive traffic studies for various types of land uses (residential, commercial, industrial, etc.). This data has been found to be very reliable and provides a sound basis for estimating future trips to new developments. The appropriate worksheets from the manual are included in the Attachments along with the trip estimate calculations. Table 1 below provides a summary of the peak hour volumes estimated for the proposed 52 new residential homes utilizing the ITE factors.

TABLE 1 – Trip Generation Estimate

	Description	Enter	Exit	Total
AM Peak Hour				
ITE Land Use Code 220	Multifamily Housing (Low-Rise)	6	15	21
PM Peak Hour				
ITE Land Use Code 220	Multifamily Housing (Low-Rise)	17	10	27

As can be seen in Table 1, Phase 4 of the residential project will generate a relatively low number of additional vehicles trips during the daily peak periods of traffic on the servicing roadways. It should be noted that a trip is defined as a one-way vehicle movement, therefore driving to and from the site, for example is equivalent to two trips.

Windward Pines at The Bay Pointe Club

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Figure 3 - Site Layout

OPERATIONAL ANALYSIS

The key to any traffic impact analysis is the evaluation of roadway operations during peak traffic periods on the servicing roadway system. This situation would occur when the site-generated traffic, combined with the traffic volumes on the main roadway, result in the highest one-hour volume serviced along a roadway segment, or through an intersection. Review of the traffic data found that weekday morning and afternoon peak hours would represent this worst-case combination of site-generated traffic with the servicing roadway peak traffic period.

The results of this procedure are expressed in terms of Level of Service (LOS). Level of Service is a qualitative measure of traffic flow efficiency based on anticipated vehicle delays. For example, LOS "A" represents the best condition with little or no delay, while LOS "F" indicates that the roadway/intersection is at full capacity resulting in extended vehicle delays and potential queuing. Table 2 below outlines the Level of Service delay criteria presented in the Highway Capacity Manual for unsignalized and signalized intersections.

TABLE 2 – Highway Capacity Manual Criteria

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

In order to properly assess the impacts of a development, future traffic conditions of area roadways should be estimated for the period when the development is constructed and fully occupied. Typically, the expansion of base traffic is calculated when a project is to be constructed over an extended period (3 to 5 years). In all instances, area growth that may affect capacity results should be considered. It is anticipated that Phase 4 of the residential development project would be constructed and occupied within a 3-year period. As previously discussed, traffic volumes along Onset Avenue have seen a decline between 2013 and 2019, though to be conservative, the record count data from 2013 was used for current 2021 base traffic volumes and an annual growth rate of 1.0 percent was utilized for future background traffic growth.

In addition, though Phase 1 of the residential development project has been completed and Phases 2 and 3 are under construction, the estimated trips that will be generated by all three phases has been included as part of the 2021 base traffic volumes at the study intersection of Onset Avenue with Bay Pointe Drive to establish existing traffic condition. The one percent growth rate was applied to the existing volumes to establish a Future 2024 Build traffic condition that includes traffic generated by Phase 4 of the residential development project.

An operational analysis was conducted at the main study intersection of Onset Avenue with the existing Bay Pointe Drive site access road for existing and future build conditions. The access to the site under

existing and future build conditions was found to operate efficiently with minimal delays. Vehicles exiting Bay Pointe Drive currently operate at an acceptable Level of Service B, which is projected to continue under future build conditions during the daily peak hours as noted. As experienced today along Onset Avenue at local side street junctions and driveways, future conditions at the study intersection would result in typically only one vehicle waiting 10 to 15 seconds to turn onto Onset Avenue during daily peak traffic conditions. The one vehicle would be serviced with minor delays, resulting in no congestion at the intersection, and efficient operations. Vehicles turning left into The Bay Pointe Club development from Onset Avenue will also experience minimal delays at Level of Service A, and efficient operations. The turning movement figures and capacity analysis worksheets are included in the Attachments.

CONCLUSIONS AND RECOMMENDATIONS

In summary, the study has shown that the proposed mixed use golf course and residential development project access and circulation plan has been designed to provide an adequate level of traffic safety and efficiency on the servicing roadway system. The safety of the existing site access road (Bay Pointe Drive) intersection with Onset Avenue was reviewed for geometry and sight distances as part of the original study and was determined to provide sufficient sight distances in accordance with AASHTO criteria for visibility and decision making of drivers attempting to enter/exit main street traffic from the site access road, which remain valid. It is recommended, as previously suggested in the original study, that a Stop line be placed on the minor southbound approach to the Onset Avenue intersection, and that this roadway provide a minimum width of twenty-two feet per the development plans.

The results of the operational analysis found that the estimated increase in traffic during the peak periods resulting from the proposed mixed residential development project expansion will have a negligible effect on overall traffic operations along Onset Avenue including the main study intersection reviewed for this project, particularly during the daily morning and afternoon peak hours when the site would potentially have its greatest impact.

Therefore, based upon the data collected on the servicing roadways, the analysis completed as part of this updated study, along with the access and site circulation design proposed, it has been determined that the proposed residential expansion, *Windward Pines at The Bay Pointe Club* project has adequate and safe access to a public street, and the additional traffic generated will not have an adverse impact on public safety and welfare in the study area. We trust that this letter sufficiently addresses the requirements of the Town of Wareham to obtain your local review approvals. If you should have any questions, please do not hesitate to contact our office.

Very truly yours,
BETA Group, Inc.

Herman Peralta, PE
Project Manager

Richard A. Bernardo, P.E.
Senior Vice President

Attachments

ATTACHMENTS

A. Traffic Volume Data

B. Trip Generation

C. Operational Analysis

ATTACHMENT A – Traffic Volume Data

Automatic Traffic Recorder Count

Onset Avenue

Intersection Turning Movement Count

Onset Avenue at Bay Pointe Drive

A

Automatic Traffic Recorder Count

Onset Avenue

Onset Avenue

(Source; Massachusetts Department of Transportation, August 2013)

Massachusetts Highway Department
53826 Weekly Volume Report - Mon 08/19/2013 - Sun 08/25/2013

Location ID:	253826	**Type:**	SPOT
Located On:	ONSET AVENUE	**SOUTH OF:**	ROUTE 6
Direction	2-WAY		
Community:	WAREHAM	**Period:**	Mon 08/19/2013 - Sun 08/25/2013
AADT:	4981		

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg
12:00 AM		16	43					30
1:00 AM		17	14					16
2:00 AM		15	12					14
3:00 AM		13	5					9
4:00 AM		11	20					16
5:00 AM		45	41					43
6:00 AM		120	117					119
7:00 AM		209	225					217
8:00 AM		290	316					303
9:00 AM		315	301					308
10:00 AM	323	303						313
11:00 AM	327	374						351
12:00 PM	377	363						370
1:00 PM	346	371						359
2:00 PM	369	399						384
3:00 PM	414	395						405
4:00 PM	395	432						414
5:00 PM	431	436						434
6:00 PM	359	372						366
7:00 PM	299	332						316
8:00 PM	201	231						216
9:00 PM	134	187						161
10:00 PM	82	113						98
11:00 PM	58	51						55
Total	**4115**	**5410**	**1094**	**0**	**0**	**0**	**0**	
24HrTotal		5166	5453					5310
AM Pk Hr		11:00						
AM Peak		374						374
PM Pk Hr		5:00						
PM Peak		436						436
% Peak Hr		8.06%						8.00%
% Peak Hr		8.34%	8.00%					8.17%

Massachusetts Highway Department
3826_NB Weekly Volume Report - Mon 08/19/2013 - Sun 08/25/2013

Location ID:	253826_NB	**Type:**	SPOT
Located On:	ONSET AVENUE	**SOUTH OF:**	ROUTE 6
Direction	NB		
Community:	WAREHAM	**Period:**	Mon 08/19/2013 - Sun 08/25/2013
AADT:	2715		

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg
12:00 AM		6	22					14
1:00 AM		5	5					5
2:00 AM		7	3					5
3:00 AM		9	5					7
4:00 AM		10	16					13
5:00 AM		39	34					37
6:00 AM		95	97					96
7:00 AM		152	161					157
8:00 AM		190	211					201
9:00 AM		189	181					185
10:00 AM	196	185						191
11:00 AM	178	201						190
12:00 PM	204	210						207
1:00 PM	186	202						194
2:00 PM	208	218						213
3:00 PM	218	213						216
4:00 PM	193	199						196
5:00 PM	195	221						208
6:00 PM	170	186						178
7:00 PM	163	150						157
8:00 PM	89	112						101
9:00 PM	58	78						68
10:00 PM	34	44						39
11:00 PM	20	25						23
Total	**2112**	**2946**	**735**	**0**	**0**	**0**	**0**	
24HrTotal		2814	2979					2897
AM Pk Hr		11:00						
AM Peak		201						201
PM Pk Hr		5:00						
PM Peak		221						221
% Peak Hr		7.50%						8.00%
% Peak Hr		7.75%	7.42%					7.58%

Massachusetts Highway Department
3826_SB Weekly Volume Report - Mon 08/19/2013 - Sun 08/25/2013

Location ID:	253826_SB	**Type:**	SPOT
Located On:	ONSET AVENUE	**SOUTH OF:**	ROUTE 6
Direction	SB		
Community:	WAREHAM	**Period:**	Mon 08/19/2013 - Sun 08/25/2013
AADT:	2267		

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg
12:00 AM		10	21					16
1:00 AM		12	9					11
2:00 AM		8	9					9
3:00 AM		4	0					2
4:00 AM		1	4					3
5:00 AM		6	7					7
6:00 AM		25	20					23
7:00 AM		57	64					61
8:00 AM		100	105					103
9:00 AM		126	120					123
10:00 AM	127	118						123
11:00 AM	149	173						161
12:00 PM	173	153						163
1:00 PM	160	169						165
2:00 PM	161	181						171
3:00 PM	196	182						189
4:00 PM	202	233						218
5:00 PM	236	215						226
6:00 PM	189	186						188
7:00 PM	136	182						159
8:00 PM	112	119						116
9:00 PM	76	109						93
10:00 PM	48	69						59
11:00 PM	38	26						32
Total	**2003**	**2464**	**359**	**0**	**0**	**0**	**0**	
24HrTotal	2352	2474						2413
AM Pk Hr		11:00						
AM Peak		173						173
PM Pk Hr		4:00						
PM Peak		233						233
% Peak Hr		9.46%						9.00%
% Peak Hr	10.03%	9.42%						9.73%

Onset Avenue

(Source; Massachusetts Department of Transportation, August 2019)

Massachusetts Highway Department
53826 Weekly Volume Report - Mon 08/12/2019 - Sun 08/18/2019

Location ID:	253826	**Type:**	SPOT
Located On:	ONSET AVENUE	**SOUTH OF:**	ROUTE 6
Direction	2-WAY		
Community:	Wareham	**Period:**	Mon 08/12/2019 - Sun 08/18/2019
AADT:	4866		

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg
12:00 AM		25	22					24
1:00 AM		12	5					9
2:00 AM		4	14					9
3:00 AM		4	6					5
4:00 AM		17	20					19
5:00 AM		66	57					62
6:00 AM		174	153					164
7:00 AM		291	280					286
8:00 AM		298	304					301
9:00 AM		359	312					336
10:00 AM		333	341					337
11:00 AM		354	370					362
12:00 PM	416	375						396
1:00 PM	446	341						394
2:00 PM	408	334						371
3:00 PM	443	337						390
4:00 PM	432	364						398
5:00 PM	434	375						405
6:00 PM	393	277						335
7:00 PM	302	193						248
8:00 PM	240	149						195
9:00 PM	131	91						111
10:00 PM	79	68						74
11:00 PM	48	44						46
Total	**3772**	**4885**	**1884**	**0**	**0**	**0**	**0**	
24HrTotal		5709	4832					5271
AM Pk Hr		9:00						
AM Peak		359						359
PM Pk Hr		12:00						
PM Peak		375						375
% Peak Hr		7.68%						8.00%
% Peak Hr		7.81%	7.76%					7.79%

Massachusetts Highway Department
53826 Weekly Volume Report - Mon 08/12/2019 - Sun 08/18/2019

Location ID:	253826_NB	**Type:**	SPOT
Located On:	ONSET AVENUE	**SOUTH OF:**	ROUTE 6
Direction	NB		
Community:	Wareham	**Period:**	Mon 08/12/2019 - Sun 08/18/2019
AADT:	2664		

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg
12:00 AM		11	5					8
1:00 AM		6	4					5
2:00 AM		3	7					5
3:00 AM		3	4					4
4:00 AM		16	18					17
5:00 AM		51	45					48
6:00 AM		144	127					136
7:00 AM		217	203					210
8:00 AM		195	199					197
9:00 AM		215	189					202
10:00 AM		201	201					201
11:00 AM		196	206					201
12:00 PM	259	196						228
1:00 PM	235	193						214
2:00 PM	222	187						205
3:00 PM	232	166						199
4:00 PM	213	156						185
5:00 PM	183	160						172
6:00 PM	197	126						162
7:00 PM	148	92						120
8:00 PM	105	59						82
9:00 PM	48	34						41
10:00 PM	38	25						32
11:00 PM	20	14						17
Total	**1900**	**2666**	**1208**	**0**	**0**	**0**	**0**	
24HrTotal		3158	2616					2887
AM Pk Hr		7:00						
AM Peak		217						217
PM Pk Hr		12:00						
PM Peak		196						196
% Peak Hr		8.14%						8.00%
% Peak Hr		8.20%	8.30%					8.25%

Massachusetts Highway Department
53826 Weekly Volume Report - Mon 08/12/2019 - Sun 08/18/2019

Location ID:	253826_SB	**Type:**	SPOT
Located On:	ONSET AVENUE	**SOUTH OF:**	ROUTE 6
Direction	SB		
Community:	Wareham	**Period:**	Mon 08/12/2019 - Sun 08/18/2019
AADT:	2202		

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg
12:00 AM		14	17					16
1:00 AM		6	1					4
2:00 AM		1	7					4
3:00 AM		1	2					2
4:00 AM		1	2					2
5:00 AM		15	12					14
6:00 AM		30	26					28
7:00 AM		74	77					76
8:00 AM		103	105					104
9:00 AM		144	123					134
10:00 AM		132	140					136
11:00 AM		158	164					161
12:00 PM	157	179						168
1:00 PM	211	148						180
2:00 PM	186	147						167
3:00 PM	211	171						191
4:00 PM	219	208						214
5:00 PM	251	215						233
6:00 PM	196	151						174
7:00 PM	154	101						128
8:00 PM	135	90						113
9:00 PM	83	57						70
10:00 PM	41	43						42
11:00 PM	28	30						29
Total	**1872**	**2219**	**676**	**0**	**0**	**0**	**0**	
24HrTotal		2251	2216					2384
AM Pk Hr		11:00						
AM Peak		158						158
PM Pk Hr		5:00						
PM Peak		215						215
% Peak Hr		9.69%						10.00%
% Peak Hr		9.84%	9.70%					9.77%

A

Intersection Turning Movement Count

Onset Avenue at Bay Pointe Drive

Onset Avenue at Bay Pointe Drive

Turning Movement Count

Project Name: The Bay Pointe Club
Town/City: Wareham, MA
Location: Bay Point Dr. @ Onset Ave.
Weather: Sunny/60's

File Name : Onset at Bay Pointe
Site Code : 430001
Start Date : 6/18/2015
Page No : 1

Groups Printed- Cars

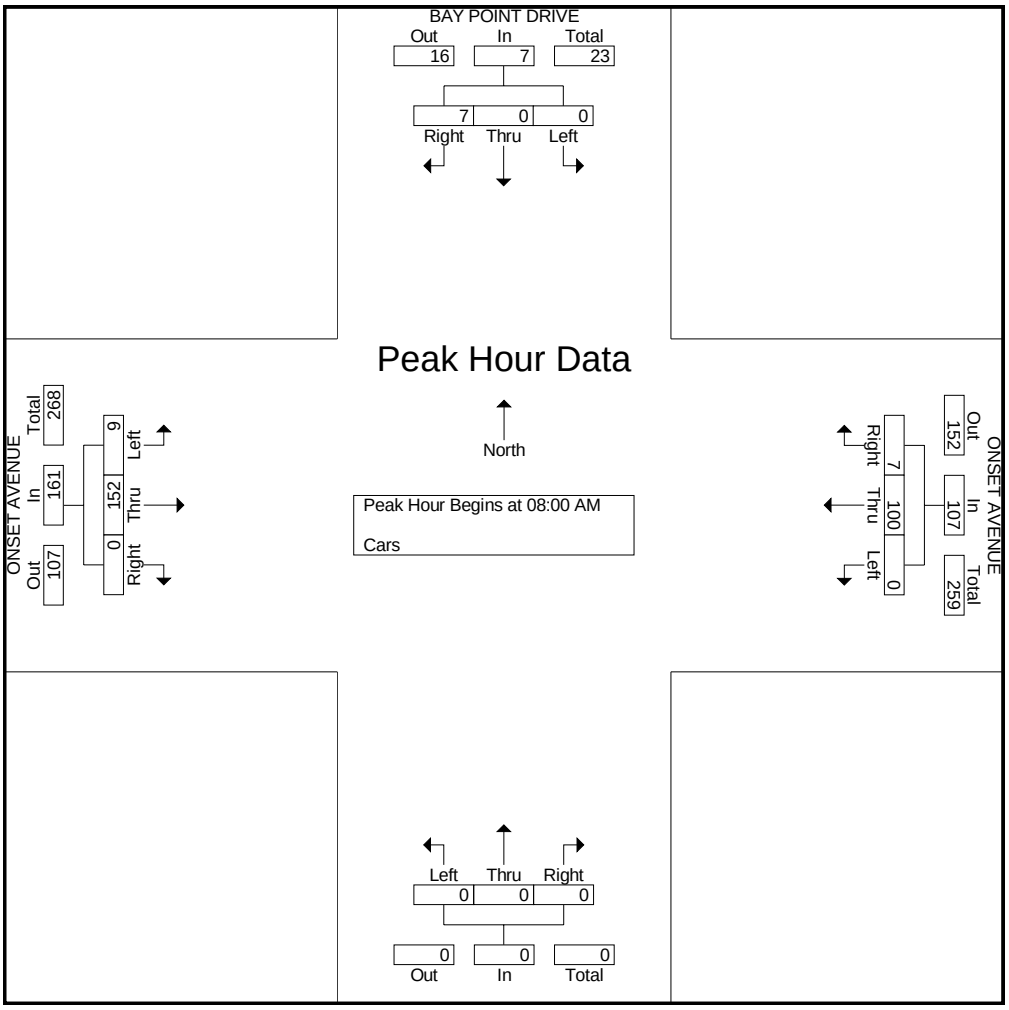
	BAY POINT DRIVE Southbound				ONSET AVENUE Westbound					Northbound			ONSET AVENUE Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
07:00 AM	0	0	1	1	0	9	0	9	0	0	0	0	4	28	0	32	42
07:15 AM	0	0	0	0	0	21	3	24	0	0	0	0	1	34	0	35	59
07:30 AM	1	0	1	2	0	17	3	20	0	0	0	0	8	33	0	41	63
07:45 AM	0	0	3	3	0	14	1	15	0	0	0	0	2	34	0	36	54
Total	1	0	5	6	0	61	7	68	0	0	0	0	15	129	0	144	218
08:00 AM	0	0	4	4	0	24	1	25	0	0	0	0	1	40	0	41	70
08:15 AM	0	0	0	0	0	25	2	27	0	0	0	0	1	50	0	51	78
08:30 AM	0	0	3	3	0	22	0	22	0	0	0	0	3	29	0	32	57
08:45 AM	0	0	0	0	0	29	4	33	0	0	0	0	4	33	0	37	70
Total	0	0	7	7	0	100	7	107	0	0	0	0	9	152	0	161	275
*** BREAK ***																	
04:00 PM	0	0	3	3	0	43	3	46	0	0	0	0	5	57	0	62	111
04:15 PM	2	0	2	4	0	52	1	53	0	0	0	0	0	52	0	52	109
04:30 PM	0	0	3	3	0	47	1	48	0	0	0	0	3	57	0	60	111
04:45 PM	1	0	4	5	0	41	3	44	0	0	0	0	4	39	0	43	92
Total	3	0	12	15	0	183	8	191	0	0	0	0	12	205	0	217	423
05:00 PM	0	0	1	1	0	42	0	42	0	0	0	0	2	37	0	39	82
05:15 PM	1	0	3	4	0	42	1	43	0	0	0	0	2	38	0	40	87
05:30 PM	2	0	6	8	0	37	0	37	0	0	0	0	2	54	0	56	101
05:45 PM	0	0	2	2	0	51	0	51	0	0	0	0	1	44	0	45	98
Total	3	0	12	15	0	172	1	173	0	0	0	0	7	173	0	180	368
Grand Total	7	0	36	43	0	516	23	539	0	0	0	0	43	659	0	702	1284
Apprch %	16.3	0	83.7		0	95.7	4.3		0	0	0		6.1	93.9	0		
Total %	0.5	0	2.8	3.3	0	40.2	1.8	42	0	0	0	0	3.3	51.3	0	54.7	

Turning Movement Count

Project Name: The Bay Pointe Club
Town/City: Wareham, MA
Location: Bay Point Dr. @ Onset Ave.
Weather: Sunny/60's

File Name : Onset at Bay Pointe
Site Code : 430001
Start Date : 6/18/2015
Page No : 2

	BAY POINT DRIVE Southbound				ONSET AVENUE Westbound				Northbound				ONSET AVENUE Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	0	0	**4**	**4**	0	24	1	25	0	0	0	0	1	40	0	41	70
08:15 AM	0	0	0	0	0	25	2	27	0	0	0	0	1	**50**	0	**51**	**78**
08:30 AM	0	0	3	3	0	22	0	22	0	0	0	0	3	29	0	32	57
08:45 AM	0	0	0	0	0	**29**	**4**	**33**	0	0	0	0	**4**	33	0	37	70
Total Volume	0	0	7	7	0	100	7	107	0	0	0	0	9	152	0	161	275
% App. Total	0	0	100		0	93.5	6.5		0	0	0		5.6	94.4	0		
PHF	.000	.000	.438	.438	.000	.862	.438	.811	.000	.000	.000	.000	.563	.760	.000	.789	.881

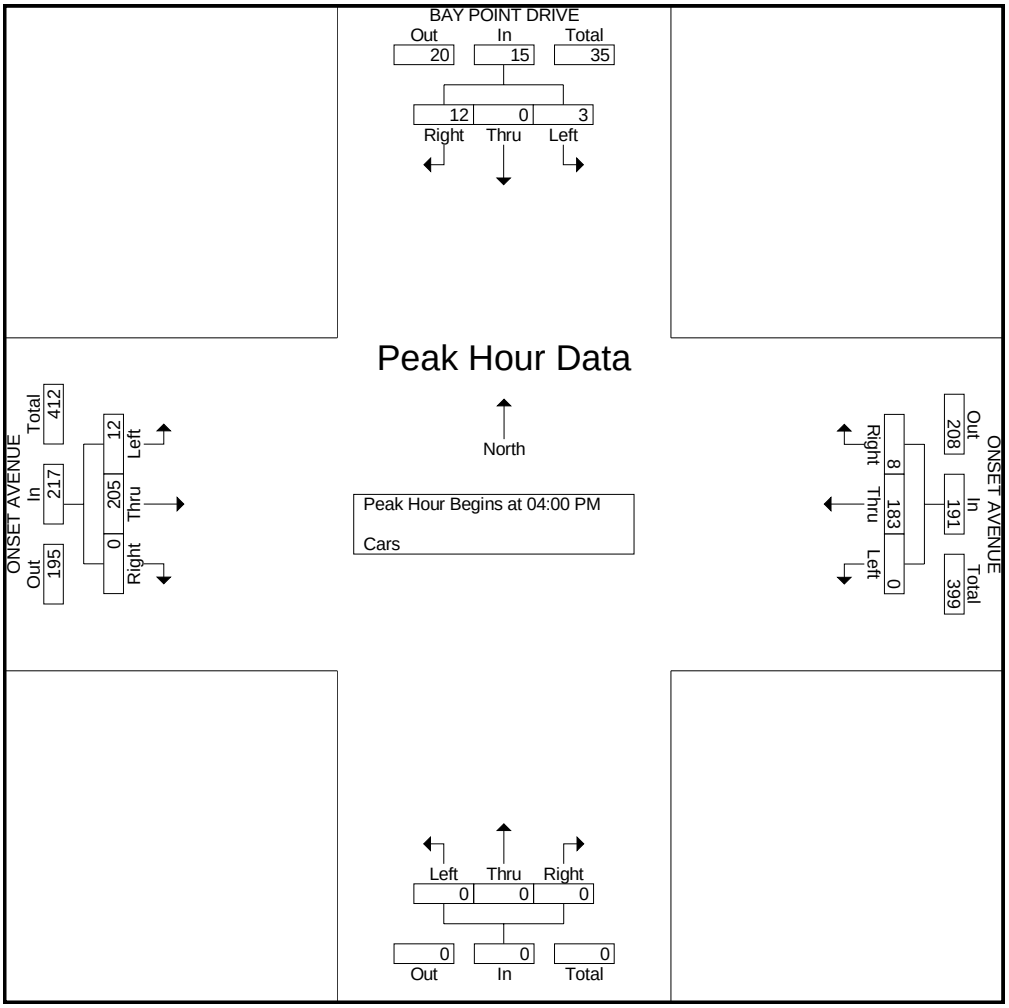


Turning Movement Count

Project Name: The Bay Pointe Club
Town/City: Wareham, MA
Location: Bay Point Dr. @ Onset Ave.
Weather: Sunny/60's

File Name : Onset at Bay Pointe
Site Code : 430001
Start Date : 6/18/2015
Page No : 3

	BAY POINT DRIVE Southbound				ONSET AVENUE Westbound				Northbound				ONSET AVENUE Eastbound				
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	3	3	0	43	**3**	46	0	0	0	0	**5**	**57**	0	**62**	**111**
04:15 PM	**2**	0	2	4	0	**52**	1	**53**	0	0	0	0	0	52	0	52	109
04:30 PM	0	0	3	3	0	47	1	48	0	0	0	0	3	57	0	60	111
04:45 PM	1	0	**4**	**5**	0	41	3	44	0	0	0	0	4	39	0	43	92
Total Volume	3	0	12	15	0	183	8	191	0	0	0	0	12	205	0	217	423
% App. Total	20	0	80		0	95.8	4.2		0	0	0		5.5	94.5	0		
PHF	.375	.000	.750	.750	.000	.880	.667	.901	.000	.000	.000	.000	.600	.899	.000	.875	.953



ATTACHMENT B – Trip Generation

ITE Trip Generation Summary

Site Trip Distribution

ITE Land Use Code

ITE Land Use Code 220 – Multifamily Housing (Low-Rise)

B

ITE Trip Generation Summary

Trip Generation Summary

Summary;

	Description	Enter	Exit	Total
Weekday AM Peak Hour				
ITE Land Use Code 220	Multifamily Housing (Low-Rise)	6	15	21
Weekday PM Peak Hour				
ITE Land Use Code 220	Multifamily Housing (Low-Rise)	17	10	27

Calculations;

ITE Land Use Code 220 **Multifamily Housing (Low-Rise)** **(52 Dwelling Units)**

Independent Variable (X) = Dwelling Units X = 52

AM Peak *Directional Distribution:* *24% Entering* *76% Exiting*

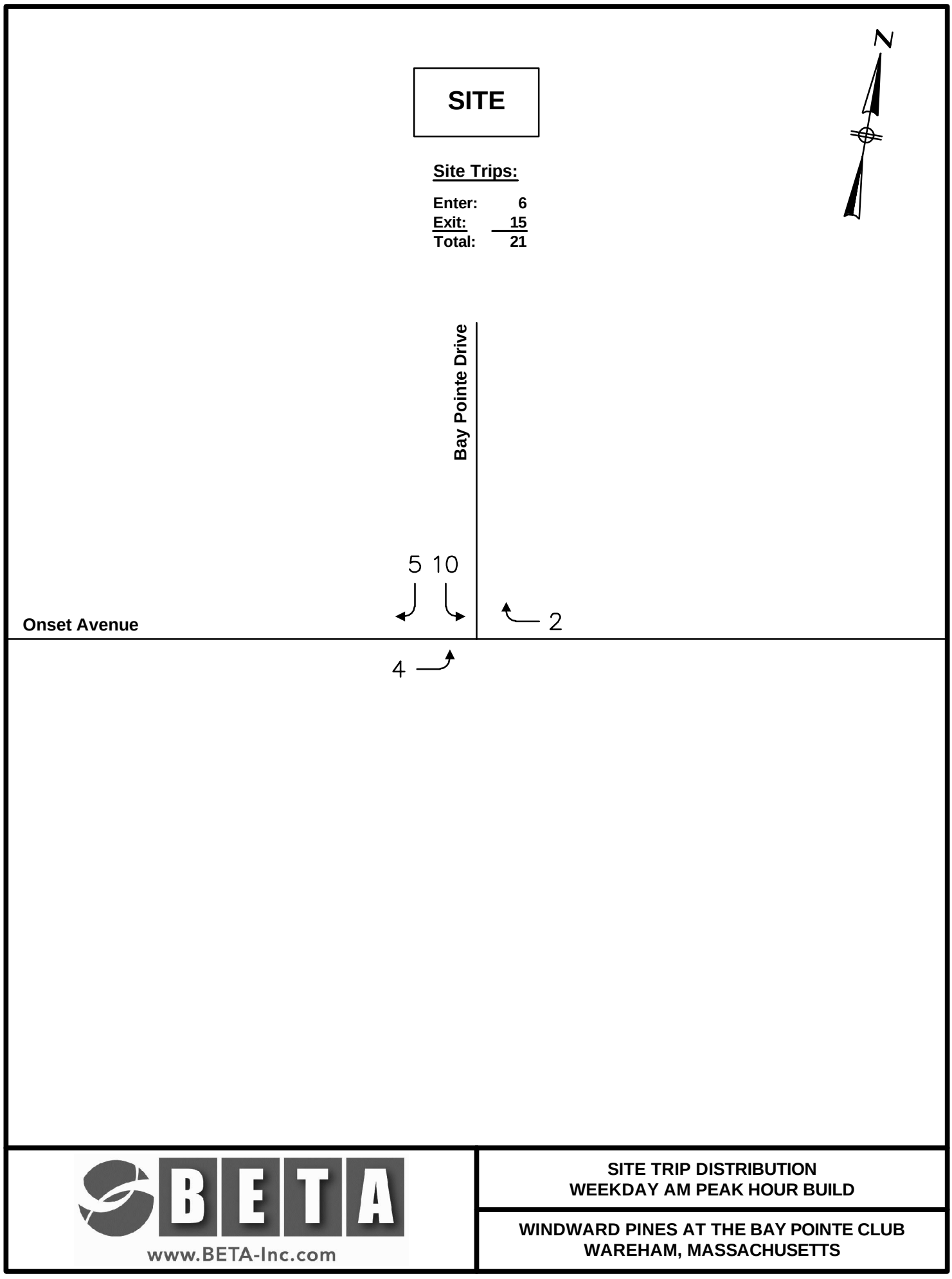
T	=	0.40 (X)	Enter:	6
T	=	0.40 52	Exit:	15
T	=	21	Total:	21

PM Peak *Directional Distribution:* *63% Entering* *37% Exiting*

T	=	0.51 (X)	Enter:	17
T	=	0.51 52	Exit:	10
T	=	27	Total:	27

B

Site Trip Distribution



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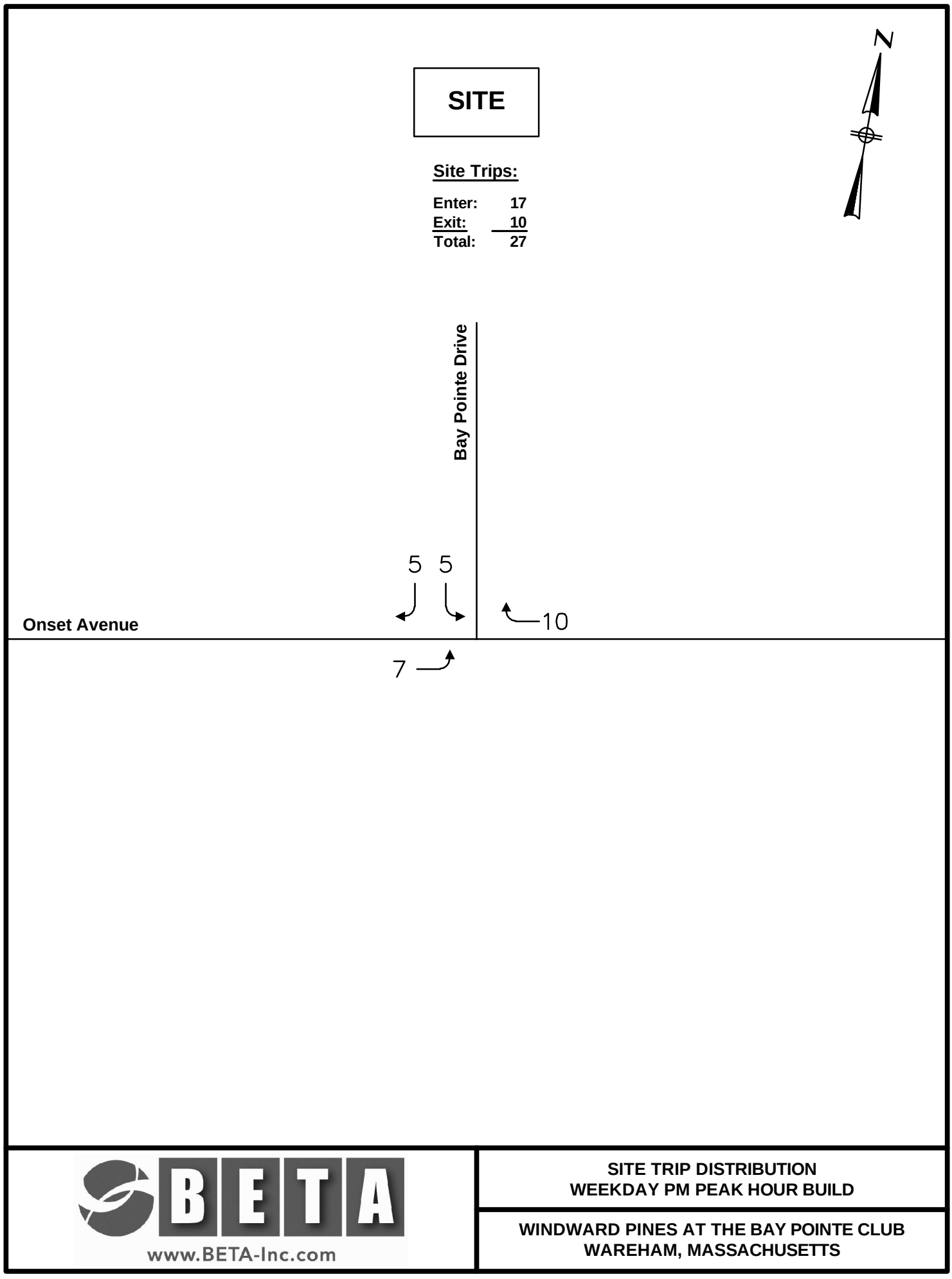
SITE TRIP DISTRIBUTION
WEEKDAY AM PEAK HOUR BUILD

WINDWARD PINES AT THE BAY POINTE CLUB
WAREHAM, MASSACHUSETTS



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SITE TRIP DISTRIBUTION
WEEKDAY PM PEAK HOUR BUILD

WINDWARD PINES AT THE BAY POINTE CLUB
WAREHAM, MASSACHUSETTS

B

ITE Land Use Code

ITE Land Use Code 220 – Multifamily Housing (Low-Rise)

Land Use: 220
Multifamily Housing (Low-Rise)

Description

Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have two or three floors (levels). Various configurations fit this description, including walkup apartment, mansion apartment, and stacked townhouse.

- A walkup apartment typically is two or three floors in height with dwelling units that are accessed by a single or multiple entrances with stairways and hallways.
- A mansion apartment is a single structure that contains several apartments within what appears to be a single-family dwelling unit.
- A fourplex is a single two-story structure with two matching dwelling units on the ground and second floors. Access to the individual units is typically internal to the structure and provided through a central entry and stairway.
- A stacked townhouse is designed to match the external appearance of a townhouse. But, unlike a townhouse dwelling unit that only shares walls with an adjoining unit, the stacked townhouse units share both floors and walls. Access to the individual units is typically internal to the structure and provided through a central entry and stairway.

Multifamily housing (mid-rise) (Land Use 221), multifamily housing (high-rise) (Land Use 222), affordable housing (Land Use 223), and off-campus student apartment (low-rise) (Land Use 225) are related land uses.

Land Use Subcategory

Data are presented for two subcategories for this land use: (1) not close to rail transit and (2) close to rail transit. A site is considered close to rail transit if the walking distance between the residential site entrance and the closest rail transit station entrance is ½ mile or less.

Additional Data

For the three sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.72 residents per occupied dwelling unit.

For the two sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 96.2 percent of the total dwelling units were occupied.

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip

generation resource page on the ITE website (https://www.ite.org/technical-resources/topics/trip-and-parking-generation/).

For the three sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.72 residents per occupied dwelling unit.

It is expected that the number of bedrooms and number of residents are likely correlated to the trips generated by a residential site. To assist in future analysis, trip generation studies of all multifamily housing should attempt to obtain information on occupancy rate and on the mix of residential unit sizes (i.e., number of units by number of bedrooms at the site complex).

The sites were surveyed in the 1980s, the 1990s, the 2000s, the 2010s, and the 2020s in British Columbia (CAN), California, Delaware, Florida, Georgia, Illinois, Indiana, Maine, Maryland, Massachusetts, Minnesota, New Jersey, Ontario (CAN), Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, and Washington.

Source Numbers

188, 204, 237, 300, 305, 306, 320, 321, 357, 390, 412, 525, 530, 579, 583, 638, 864, 866, 896, 901, 903, 904, 936, 939, 944, 946, 947, 948, 963, 964, 966, 967, 1012, 1013, 1014, 1036, 1047, 1056, 1071, 1076

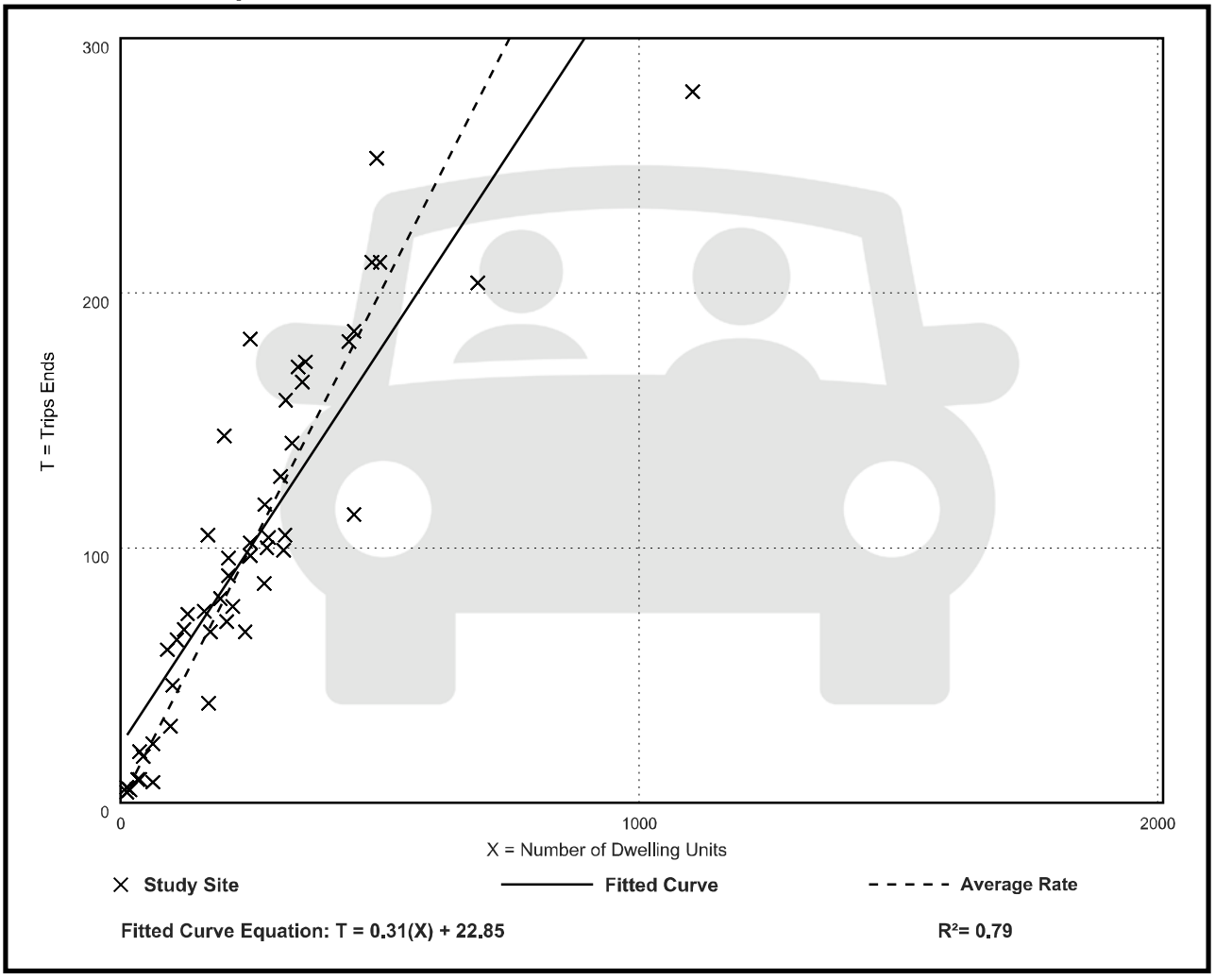
Multifamily Housing (Low-Rise)
Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
Number of Studies: 49
Avg. Num. of Dwelling Units: 249
Directional Distribution: 24% entering, 76% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.40	0.13 - 0.73	0.12

Data Plot and Equation



Fitted Curve Equation: T = 0.31(X) + 22.85

R^2= 0.79

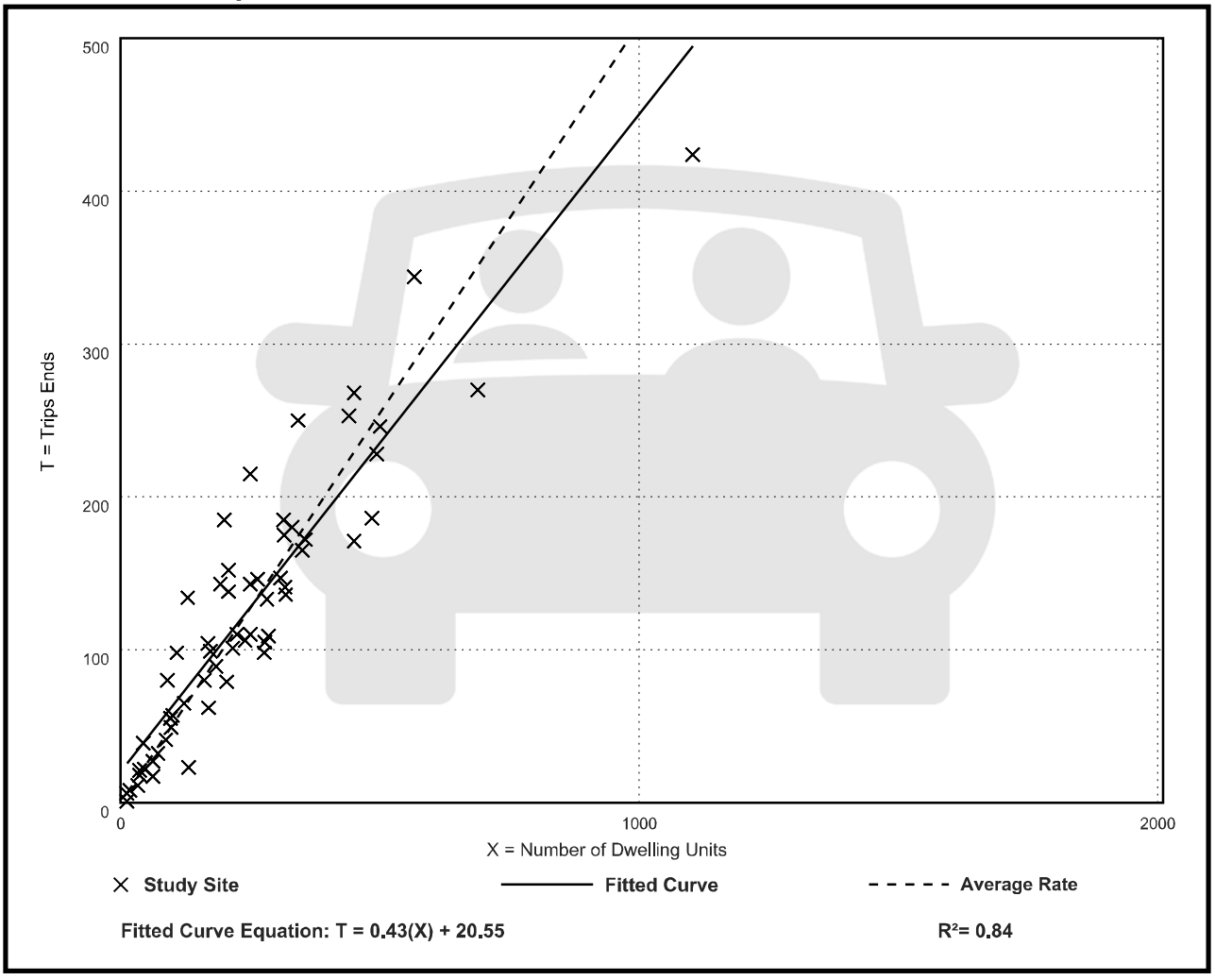
Multifamily Housing (Low-Rise)
Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 59
Avg. Num. of Dwelling Units: 241
Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.51	0.08 - 1.04	0.15

Data Plot and Equation



Fitted Curve Equation: T = 0.43(X) + 20.55

R^2= 0.84

APPENDIX C – Operational Analysis

Existing Conditions

Onset Avenue at Bay Pointe Drive

Future Build Conditions

Onset Avenue at Bay Pointe Drive

C

Existing Weekday AM / PM Peak Hour

Onset Avenue at Bay Pointe Drive

Onset Avenue at Bay Pointe Drive

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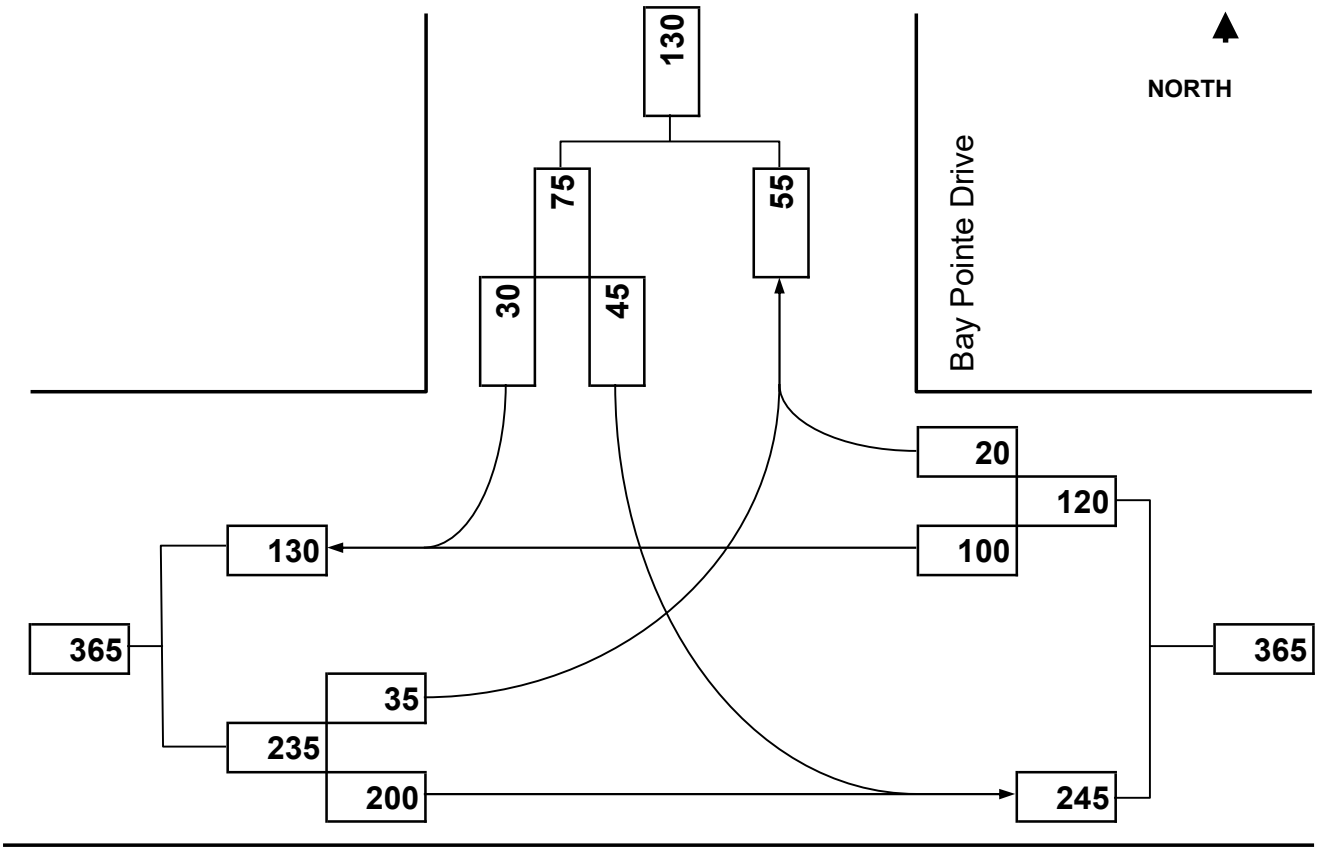
Turning Movement Diagram

Major Street:	Onset Avenue	**Minor Street**:	Bay Pointe Drive
City/Town:	Wareham, MA	**Day of Week**:	Weekday
Reference No.:	10215	**Peak Period**:	8:00 AM - 9:00 AM
Existing:	AM Peak Hour	**Future**:	n/a



HCS7 Two-Way Stop-Control Report

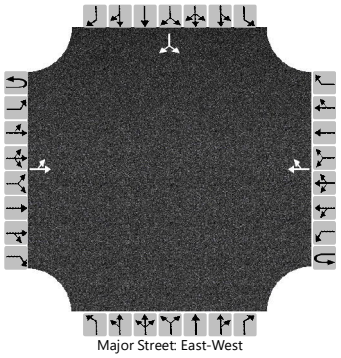
General Information

Analyst	Traffic Department
Agency/Co.	BETA Group, Inc.
Date Performed	11/11/2021
Analysis Year	2021
Time Analyzed	Existing AM Peak Hour
Intersection Orientation	East-West
Project Description	Proposed Residential Expansion

Site Information

Intersection	Onset Ave. at Bay Pointe
Jurisdiction	Wareham, MA
East/West Street	Onset Avenue
North/South Street	Bay Pointe Drive
Peak Hour Factor	0.88
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		35	200				100	20						45		30
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		40													85	
Capacity, c (veh/h)		1460													672	
v/c Ratio		0.03													0.13	
95% Queue Length, Q_{95} (veh)		0.1													0.4	
Control Delay (s/veh)		7.5													11.1	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	1.3												11.1			
Approach LOS													B			

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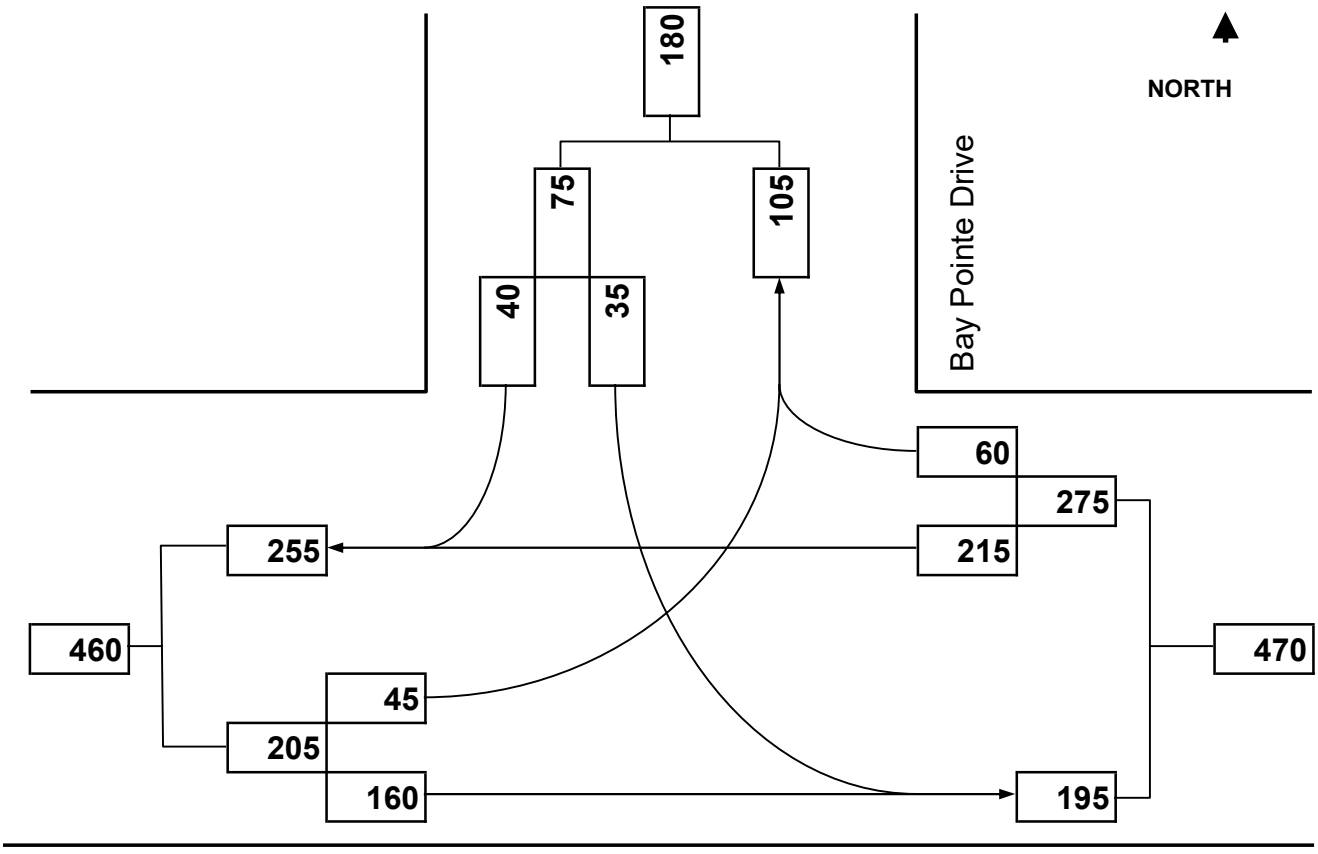
Turning Movement Diagram

Major Street:	Onset Avenue	**Minor Street**:	Bay Pointe Drive
City/Town:	Wareham, MA	**Day of Week**:	Weekday
Reference No.:	10215	**Peak Period**:	5:00 PM - 6:00 PM
Existing:	PM Peak Hour	**Future**:	n/a



HCS7 Two-Way Stop-Control Report

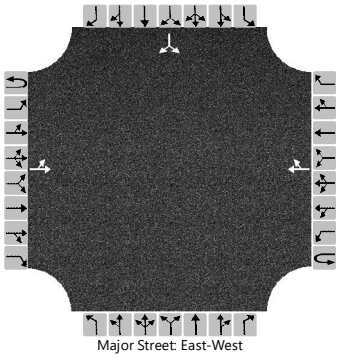
General Information

Analyst	Traffic Department
Agency/Co.	BETA Group, Inc.
Date Performed	11/11/2021
Analysis Year	2021
Time Analyzed	Existing PM Peak Hour
Intersection Orientation	East-West
Project Description	Proposed Residential Expansion

Site Information

Intersection	Onset Ave. at Bay Pointe
Jurisdiction	Wareham, MA
East/West Street	Onset Avenue
North/South Street	Bay Pointe Drive
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		45	160				215	60						35		40
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		47													79	
Capacity, c (veh/h)		1284													619	
v/c Ratio		0.04													0.13	
95% Queue Length, Q_{95} (veh)		0.1													0.4	
Control Delay (s/veh)		7.9													11.7	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)		2.0												11.7		
Approach LOS														B		

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C

Future Build Weekday AM / PM Peak Hour

Onset Avenue at Bay Pointe Drive

Onset Avenue at Bay Pointe Drive

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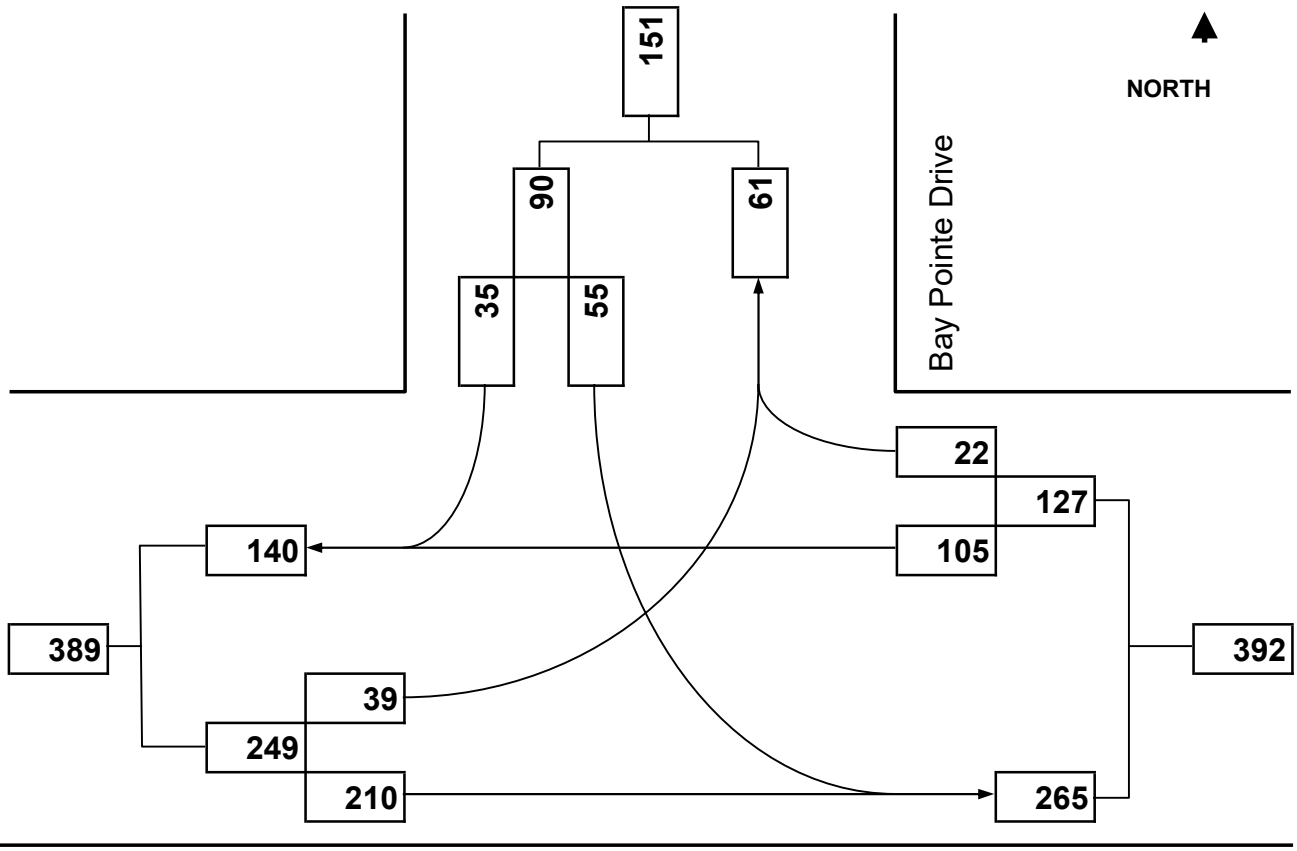
Turning Movement Diagram

Major Street:	Onset Avenue	**Minor Street**:	Bay Pointe Drive
City/Town:	Wareham, MA	**Day of Week**:	Weekday
Reference No.:	10215	**Peak Period**:	AM Peak Hour
Existing:	n/a	**Future**:	2024 Build



HCS7 Two-Way Stop-Control Report

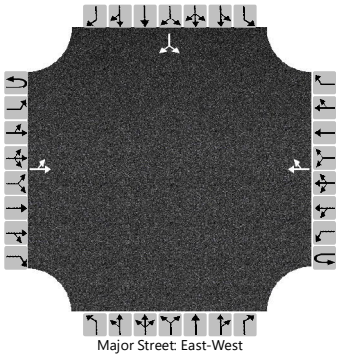
General Information

Analyst	Traffic Department
Agency/Co.	BETA Group, Inc.
Date Performed	11/11/2021
Analysis Year	2024
Time Analyzed	Build AM Peak Hour
Intersection Orientation	East-West
Project Description	Proposed Residential Expansion

Site Information

Intersection	Onset Ave. at Bay Pointe
Jurisdiction	Wareham, MA
East/West Street	Onset Avenue
North/South Street	Bay Pointe Drive
Peak Hour Factor	0.88
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		39	210				105	22						55		35
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		44													102	
Capacity, c (veh/h)		1450													647	
v/c Ratio		0.03													0.16	
95% Queue Length, Q_{95} (veh)		0.1													0.6	
Control Delay (s/veh)		7.6													11.6	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)	1.4												11.6			
Approach LOS													B			

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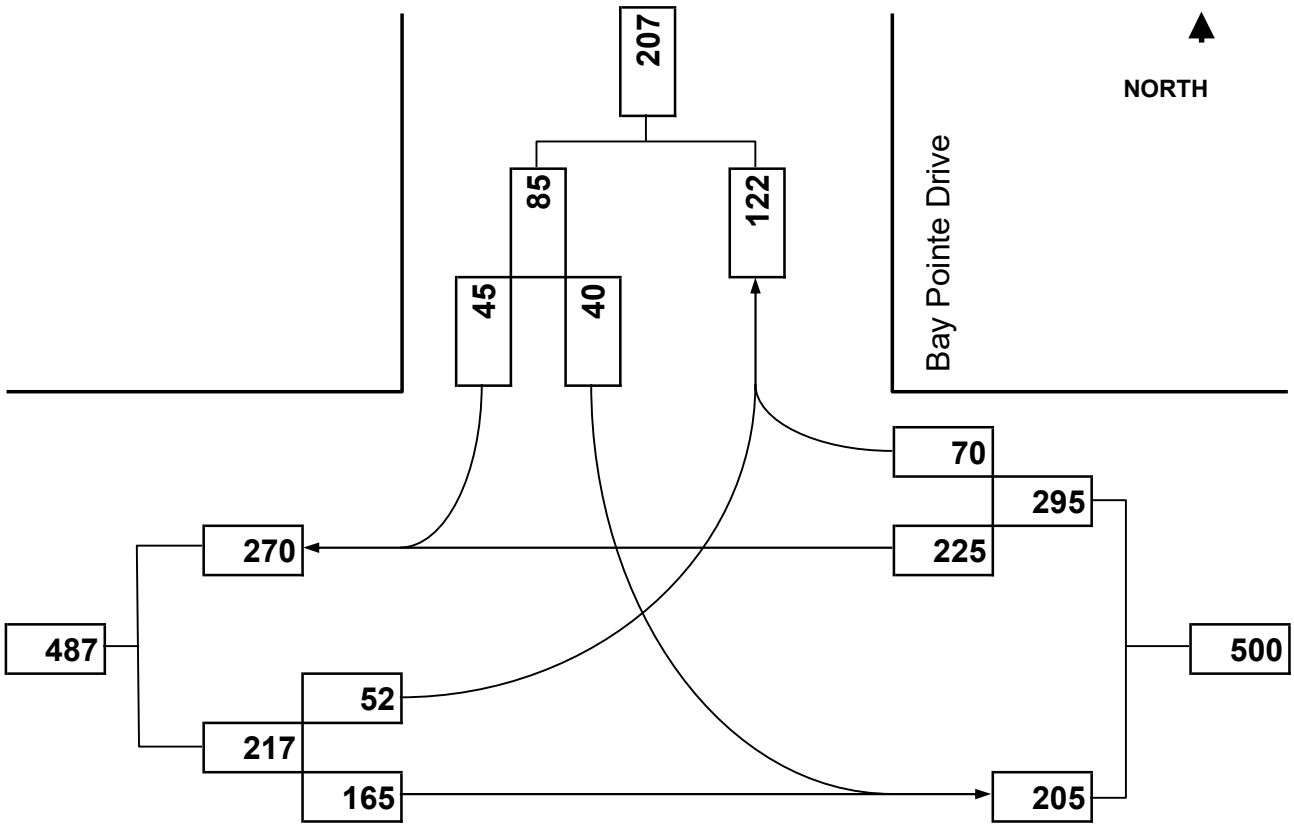
Turning Movement Diagram

Major Street:	Onset Avenue	**Minor Street**:	Bay Pointe Drive
City/Town:	Wareham, MA	**Day of Week**:	Weekday
Reference No.:	10215	**Peak Period**:	PM Peak Hour
Existing:	n/a	**Future**:	2024 Build



HCS7 Two-Way Stop-Control Report

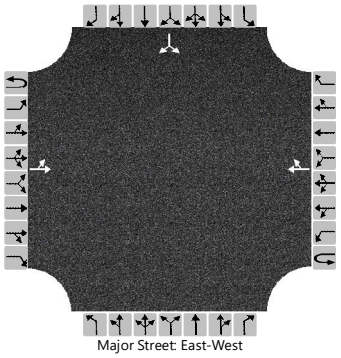
General Information

Analyst	Traffic Department
Agency/Co.	BETA Group, Inc.
Date Performed	11/11/2021
Analysis Year	2024
Time Analyzed	Build PM Peak Hour
Intersection Orientation	East-West
Project Description	Proposed Residential Expansion

Site Information

Intersection	Onset Ave. at Bay Pointe
Jurisdiction	Wareham, MA
East/West Street	Onset Avenue
North/South Street	Bay Pointe Drive
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		52	165				225	70						40		45
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		55													89	
Capacity, c (veh/h)		1261													593	
v/c Ratio		0.04													0.15	
95% Queue Length, Q_{95} (veh)		0.1													0.5	
Control Delay (s/veh)		8.0													12.1	
Level of Service (LOS)		A													B	
Approach Delay (s/veh)		2.2												12.1		
Approach LOS														B		

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