

November 30, 2005

Zoning Board of Appeals
Town of Holliston
703 Washington Street
Holliston, MA 01746

RE: Responses to Traffic Peer Review
Cedar Ridge Estates
Holliston, MA

Dear Board Members:

The following are our responses to the comments received in a Technical Memorandum, Dated November 7, 2005, prepared by Professional Services Corporation, PC for the Holliston Zoning Board of Appeals. Specific comments from the Technical Memorandum are listed below in normal font with our responses included in *italics font*.

1. The proposed project is forecast to generate over 1100 vehicle trips per day on both weekday and Saturday. Accordingly, we have a concern that the Traffic Study Area should be expanded to include additional intersection locations to more fully evaluate project impacts.

We believe the study area chosen for the project is appropriate for the size and type of development proposed. A typical threshold used for determining if an intersection will be impacted is the addition of 50 or more new vehicle trips in a peak hour period. Once project related traffic is distributed on Marshall Street and on Prentice Street the only intersections receiving 50 or more trips are the site driveways and the Marshall Street at Prentice Street intersection.

It is our understanding that the Town's peer review engineer, Professional Services Corporation, PC, utilizes a 10% threshold for determining if an intersection will be impacted due to the projected site traffic. To this end, Coler & Colantonio, Inc. has reviewed the Abend Associates Technical Memo, dated January 16, 2004, and titled: Traffic Impact Assessment for Highland Meadows on Highland Street.

The intersection of Prentice Street at Highland Street is a three-way stop controlled intersection with Prentice Street under stop sign control. Prentice Street is a single lane approach that flares out at the intersection to allow for two lanes of traffic to stack for two car lengths.

Based on the trip distribution documented in the Coler & Colantonio, Inc. Traffic Impact Report, 40% of Cedar Ridge Estates related traffic is expected to head to or come from the west on Prentice Street. Although some of the 40% may actually turn off of Prentice Street before reaching Highland Street it was assumed for this analysis that all 40% of the traffic passed through the Prentice Street at Highland Street intersection.

The Abend Associates Highland Meadows report included a weekday AM and weekday PM peak hour analysis. Cedar Ridge Estates is projected to add 38 vehicles to the intersection in the AM peak hour for an increase of 2.7%. A total of 44 vehicles would be added in the PM peak hour representing an increase of 2.8% at the intersection.

As documented in the Highland Meadows report the level of service for the stop controlled Prentice Street approach at the intersection of Prentice Street at Highland Avenue is expected to be LOS "F" during both the weekday AM and weekday PM peak hour period in 2008 with the traffic from the Highland Meadows project. The level of service on the Highland Avenue approaches will be LOS "A". With the addition of the Cedar Ridge Estates project traffic the level of service for the Prentice Street approach as well as the Highland Avenue approaches would remain the same. Copies of the level of service analyses are attached with this letter.

Based on the fact that traffic volume at the intersection of Prentice Street at Highland Avenue will increase by less than 3% and no change in level of service is expected from the development of Cedar Ridge Estates, we believe that there is limited impact at this location due to this project.

2. Given the anticipated distribution of traffic to/from the east on Prentice Street, it is recommended that the Prentice Street intersections with Mill Street and the Pine Crest Golf Club driveway intersection be included in the Traffic Study Area. Safety and capacity issues at these locations should be evaluated and addressed at these additional locations.

Based on the analysis described in Response #1, it is our opinion that the fewer than 3% increase in the volume would result in limited impacts at this location due to this project. Please refer to Response #1 above.

3. Given the anticipated distribution of traffic to/from the west on Prentice Street, the Prentice Street and Route 85 (Hayden Rowe) intersection in Hopkinton should also be included in the Traffic Study Area.

Based on the analysis described in Response #1, it is our opinion that the fewer than 3% increase in the volume would result in limited impacts at this location due to this project. Please refer to Response #1 above.

4. Manual turning movement counts (TMCs) were conducted at the study area intersection of Prentice Street and Marshall Street and automatic traffic recorder (ATR) counts were conducted along Prentice Street and Marshall Street in the vicinity of the proposed site in October 2003. Supplemental ATRs were conducted along Prentice Street and Marshall Street in September and October 2005 to determine if any adjustment was needed to represent a current 2005 existing addition. Accordingly, the 2003 base traffic volumes were adjusted with an annual growth rate based on the average rate of increase from the ATR counts, on average 8.5%. Although the TMCs exceed the general state guidelines of a 2-year threshold, the Board could allow use of this data.

No response required.

5. A summary of the MassHighway crash data for the study area intersection, including intersection crash rates, for the most recent three-year period available (2001-2003) is

provided in the Traffic Study. The MassHighway data was supplemented with accident data from the Holliston Police Department. Based on a review of crash data presented in the Traffic Study, it does not appear that significant safety problems exist at this location.

No response required.

6. As stated in Section III *Future Traffic Growth*, the Town of Holliston was contacted to determine if any planned or approved specific developments that would generate a significant volume of traffic on the study area roadways within the project's design horizon should be considered in the Traffic Study. One development was identified, which consists of the construction of two full-size soccer fields and four practice fields to be located on the east side of Marshall Street, south of the proposed development. As the use of the proposed development is a seasonal use, a separate peak soccer condition analysis was included as part of the traffic study. We concur with this methodology; however, given the projects proximity on Prentice Street to Hopkinton, MA, officials from the Town of Hopkinton should have also been contacted regarding potential background developments. Should significant pipeline projects be identified in Hopkinton, the traffic volumes should be revised and operations reevaluated.

The Town of Hopkinton Planning Department was contacted on November 8, 2005 in order to determine if there were any known development projects planned in the Town of Hopkinton that would add traffic to the Prentice Street area. The Town indicated that there were no definitive plans for development in the area. They indicated that there were two residential developments in the preliminary stages that they were aware of (one on Chestnut Street and one on Hayden Rowe) but neither had filed any information on projected traffic.

7. Also stated in Section III of the Traffic Study, the Town of Holliston US Census data and the 2003 and 2005 ATR data was used to determine an annual traffic growth rate. This information revealed a 0.7% annual increase in population occurred between 1990 to 2000 and a 0.7% and 8.8% annual growth rate occurred between 2003 and 2005 on Prentice Street and Marshall Street, respectively. Therefore, the Traffic Study used a 3.5% annual growth rate, which appears to be an average of the aforementioned three values. Historical traffic volume data from automatic traffic recorders conducted by MassHighway should also have been reviewed, given that data is available on Prentice Street at the Hopkinton Town Line. In addition, this data conflicts with earlier annual adjustments of approximately 8.5% per year from 2003 to 2005. While a 3.5% annual growth rate could be reasonable, justification for the aforementioned inconsistency should be provided.

The 3.5% annual growth rate was calculated as an average of the growth rates available from population statistics as well as the historic traffic count data. This differs from the 8.5% rate used to adjust the 2003 turning movement counts on Marshall Street because the 8.5% is an uncharacteristically high growth rate most likely associated with added traffic from the newly constructed soccer fields. The traffic on Marshall Street is not expected to continue to grow at such a high rate. A typical growth rate for roadways in residential areas is 1% to 2% per year and therefore we believe the 3.5% per year growth rate used to project future conditions represents a conservative analysis.

8. As stated in Section IV *Future Build Conditions: Trip Distribution and Assignment*, "the assignment of resulting percentages to/from local communities was based on existing

travel patterns and logical travel routes and the assumption that the majority of drivers will seek the most efficient travel route to and from the site." These assignments are presented on Figure 4 and indicate that 40 percent of the site traffic is expected to and from the east on Prentice Street, 30 percent to and from the west on Prentice Street and 30 percent to and from the south on Marshall Street. Based on the existing roadway network, this distribution does not appear reasonable; specifically the large volume assigned to Marshall Street. Justification for this trip distribution should be provided, which includes the review of available 2000 US Census Journey to Work information for the Town of Holliston.

The trip distribution percentages used in the traffic analyses were based on the existing travel patterns on Marshall Street. Automatic traffic recorder counts on Marshall Street from both 2003 and 2005 indicate that approximately 30% of the traffic is headed south on Marshall Street in the weekday AM peak period. Based on the data available, we believe the 70% northbound and 30% southbound predicted split in site traffic is reasonable for Marshall Street. Potential destinations for residents southbound on Marshall Street include points on Route 16 in Holliston as well as a travel route of Marshall Street, to Adams Street, to Route 16, to Milford to access Route 495.

9. As stated in the *Sight Distance* section of the Traffic Study, at the intersection of Marshall Street and Prentice Street, intersection sight distance looking to the west is hindered by both vegetation on Prentice Street and the vertical alignment of Prentice Street. The study further states, "it is our observation that the sight distance at the intersection is an existing problem, and the proposed development will not worsen the sight distance condition." While we do concur that it is an existing site distance issue at this location, the development will add a substantial amount of its traffic (70% per the study) through this intersection, which could create a safety issue. However, the study indicates that the applicant is willing to perform clearing and grading in order to improve the existing sight distance deficiency at the intersection. A permanent sight-line easement should be granted to the Town to allow for perpetually maintenance of available sight lines.

Our recommendation is to keep sight lines at the intersection of Marshall Street at Prentice Street free of obstructions. The applicant will consider if a permanent sight line easement at the intersection of Marshall Street at Prentice Street is feasible as part of the project.

10. Also stated in the *Sight Distance* section of the Traffic Study, the recommended Intersection Sight Distance (ISD) is not meet looking to the north at the proposed site driveway #1 and looking to the south at the proposed site driveway #2 due to the vertical alignment of Marshall Street. The study states, "although these directions do not meet the recommended intersection distances they do meet the minimum distances for vehicles to stop and do not represent a safety concern." We do not concur with creating major new intersections in location where intersection sight distance is not provided. The Traffic Study should explore options for upgrading the vertical geometry of Marshall Street in order to improve available intersection sight distance.

As stated in the report, the sight distance available at the site driveways exceeds AASHTO minimums. The proposed site driveways do not represent "major intersections" as they are driveways located on a relatively low volume road. The AASHTO recommended sight distances are based on not inconveniencing the traffic on the through

roadway. The AASHTO minimum distances, which are met, are based on providing enough sight distance to safely stop if necessary. Alterations to the vertical geometry on Marshall Street are not necessary to provide safe access and egress at the proposed site driveways.

Options for upgrading the vertical geometry of Marshall Street have been analyzed in order to improve the intersection sight distance at the site driveway. A conceptual level opinion of probable construction cost has been prepared, see attached, that includes lowering the Marshall Street profile by +/- 1.5 feet from Sta. 18+50 to Sta. 21+00, the location of the vertical curve deficiency. The order of magnitude costs for this type of improvement is approximately \$55,000.00.

11. The proposed Cedar Ridge Estates development consists of the construction of 200 residential townhouse style condominiums on the existing parcel located at the southwest corner of Prentice Street and Marshall Street, which is currently vacant. As stated in Section IV *Future Build Conditions: Project Trip Generation*, and presented in Table 8 (*Trip Generation Summary*), the proposed trips were generated using trip rates published in the Institute of Transportation Engineers (ITE) *Trip Generation* manual, Land Use Code (LUC) 230 – Residential Condominium/Townhouse, and the regression equations were utilized to provide a conservative analysis condition. Trip generation estimates used in the Traffic Study are in accord with standard engineering practice.

No response required.

12. Based on a review of the capacity analysis worksheets provided in the Traffic Study Appendix, default peak hour factors (PHFs) of 0.85 were used on all intersection approaches, while the calculated values ranged from 0.813 to 1.0 and default heavy truck percentages (%HV) of 2 percent were used on all critical movements, while the calculated values ranged from 0 to 8 percent. Actual PHFs and %HVs from the Turning Movement Counts (TMCs) should be utilized to provide a realistic analysis including new locations to be included in an expanded Traffic Study Area.

The peak hour capacity analyses at the study area intersections have been revised to reflect the actual peak hour factor and truck percentages in place of default values. The revised analyses are attached with this letter. No significant changes in results were noticed in the revised capacity analyses.

13. Based on the analysis provided, all study area intersections operate at acceptable levels of service (LOS) C or better and there are no significant changes in LOS as a result of the proposed development without the background soccer field development. However, it is recommended that additional safety analysis such as left-turn warrants should be conducted, specifically at the intersection of Prentice Street and Marshall Street, given the projected site left-turn volume at this intersection, as well as the operation with the use of the proposed soccer fields.

The levels of service and queues realized on Marshall Street at the intersection with Prentice Street under average season traffic conditions do not warrant the addition of a left turn lane. Addition of a left turn lane would result in minimal improvements to delay.

Under peak soccer conditions an improvement in level of service on the northbound approach would be realized with the addition of a left turn lane on Marshall Street.

Options for geometric upgrades to the Prentice Street and Marshall Street intersection with a left-turn lane have been analyzed. Additionally, a geometric analysis of adding a right-turn lane on Prentice Street has been analyzed. A conceptual level opinion of probable construction cost has been prepared, see attached, that includes these improvements. The order of magnitude costs for this type of improvement is approximately \$67,000.00.

14. Based on the analysis provided the Marshall Street approach operates at a LOS F during the weekday evening and Saturday midday peak hours under peak soccer field use. An analysis of 2010 Build with peak soccer conditions was not provided for the site driveway intersections. These analyses should be provided to ensure acceptable operation at the site driveway locations with the development in place. This further necessitates the need for additional safety analysis (i.e., turn lane warrant analysis and lane separation) at the study intersections.

Peak hour capacity analyses have been performed for the site driveway intersections with Marshall Street under peak soccer conditions. The results are included in the attached Level of Service Summary Table. The results of the analyses indicate that the site driveways operate at LOS "C" or better and do not warrant left turn lanes.

Concerns were expressed at the public hearings that Saturday counts had not been performed during a period when the new soccer fields on Marshall Street were in use. The original traffic counts performed in 2003 were done before the fields were constructed and the October 2005 counts were performed in poor weather conditions. Although the Traffic Impact Report included an analysis for an average Saturday without soccer field use as well as a worst case Peak Soccer Field use conditions, based on all available parking spaces at the field being utilized by successive soccer games, the question of actual Saturday traffic with the soccer fields was asked.

Traffic counts were performed on Marshall Street at the location of the site on Saturday November 12 and Sunday November 13, 2005. Counts were performed while the soccer fields on Marshall Street were still in use. A copy of the daily traffic count data is attached with this report. The results of the counts indicate that the peak hour traffic volume on Saturday with the soccer fields in use is approximately 50% higher than the original Saturday traffic counts performed in 2003. However, the traffic volumes on Marshall Street were found to be approximately half of what was assumed in the Peak Soccer Season analyses included in the Traffic Impact Report.

A traffic capacity analysis for the weekend peak hour was performed for the intersection of Prentice Street at Marshall Street based on the traffic volumes with the soccer field in use. A copy of the level of service analysis worksheets is attached with this letter. The peak hour during the weekend was determined to be from 2:00pm to 3:00 pm on Saturday November 12, 2005. Traffic volumes at the intersection were projected to 2010 Build conditions based on the new Saturday counts, the growth rate of 3.5% per year and the added traffic from the proposed development.

The results of the analysis indicate that the stop controlled Marshall Street approach to the intersection will operate at LOS "C" in the Saturday peak hour under future 2010 Build conditions with the soccer fields in use. This indicates that the intersection is expected to operate at an acceptable level of service in the peak weekend condition and

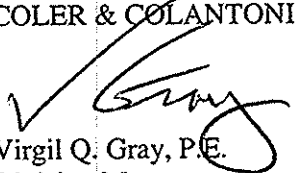
better than the worst-case peak soccer field use condition presented in the Traffic Impact Report.

15. As a mitigating measure, we recommend that the substandard geometric characteristics of Marshall Street be addressed. The roadway width on Marshall Street is only 18 to 22 feet wide and intersection sight distance is not provided for either project driveway. The one lane north bound approach and the one lane westbound approach to the Marshall and Prentice Streets intersections are insufficient given future build traffic volumes.
- a. The applicant may wish to submit information concerning the feasibility and cost of upgrading Marshall Street and the Marshall and Prentice Streets intersection during the application process.
 - b. As a Condition of Approval of any Comprehensive Permit, the proponent should be required to prepare final Roadway Improvement Plans for the reconstruction of Marshall Street including the Marshall Street and Prentice Street intersection. The applicant should submit both "25% plans" and final plans to the Town for approval.
 - c. The Roadway Improvement Plans should provide for a widened pavement of 24 feet or such width as may be recommended by Coler & Colantonio.
 - d. The Roadway Improvement Plans should provide for reconstruction of segments of the street as required to provide intersection sight distance adequate to accommodate the 85th percentile speed.
 - e. The plans should provide for two approach lanes on Marshall Street accommodating the 95th percentile queue.
 - f. If practicable pavement widening on Prentice accommodating a designated or defacto left turn lane should be provided.
 - g. As a Condition of Approval, the applicant should construct the proposed roadway and intersection improvements.

The majority of the comments outlined in item 15 have been addressed in the previous comments and responses with the traffic related impacts clarified. The engineering of 25% plans should not be considered part of the traffic subject matter and should be taken up under other headings.

If you have any questions regarding our responses to the peer review comments please do not hesitate to contact us.

Regards,
COLER & COLANTONIO, INC.


Virgil Q. Gray, P.E.
Division Manager
Transportation Engineering Division

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Page 3
03464Bspeed
Site Code: 03464

Marshall Street
south of Prentice Street
City, State: Holliston, MA
Client: C&C/J. Morgan

NB

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total
11/12/0															
5	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2
01:00	0	0	0	1	0	1	3	0	0	0	0	0	0	0	5
02:00	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	1	0	0	0	0	1	0	0	0	0	0	0	2
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06:00	0	1	0	0	4	3	1	0	0	0	0	0	0	0	9
07:00	0	0	0	1	3	6	7	2	0	0	0	0	0	0	19
08:00	0	0	1	3	20	22	10	1	0	0	0	0	0	0	57
09:00	2	1	1	7	21	31	15	2	0	0	0	0	0	0	80
10:00	2	1	2	14	56	49	14	5	0	0	0	0	0	0	143
11:00	1	4	3	11	30	45	15	2	1	0	0	0	0	0	112
12 PM	0	0	3	14	53	49	12	6	3	0	0	0	0	0	140
13:00	1	1	1	14	36	44	14	1	0	0	0	0	0	0	112
14:00	0	0	1	14	74	55	22	0	1	0	0	1	0	0	168
15:00	0	2	0	5	22	26	14	2	1	0	0	0	0	0	72
16:00	0	2	4	21	36	21	4	0	0	0	0	0	0	0	88
17:00	0	0	0	3	11	25	7	1	0	0	0	0	0	0	47
18:00	0	0	1	1	8	8	2	0	1	0	0	0	0	0	21
19:00	0	0	0	1	4	8	5	1	0	0	0	0	0	0	19
20:00	0	0	0	1	1	8	3	1	0	0	0	0	0	0	14
21:00	0	0	0	0	1	5	4	0	0	0	0	0	0	0	10
22:00	0	0	0	0	2	4	1	0	0	0	0	0	0	0	7
23:00	0	0	0	0	2	2	1	0	0	0	0	0	0	0	5
Total	6	12	18	112	385	413	157	25	7	0	0	1	0	0	1136

Daily

15th Percentile : 31 MPH
50th Percentile : 36 MPH
85th Percentile : 41 MPH
95th Percentile : 45 MPH

Mean Speed(Average) : 36 MPH
10 MPH Pace Speed : 31-40 MPH
Number in Pace : 798
Percent in Pace : 70.2%
Number of Vehicles > 35 MPH : 603
Percent of Vehicles > 35 MPH : 53.1%

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03464Bspeed
Site Code: 03464

Marshall Street
south of Prentice Street
City, State: Holliston, MA
Client: C&C/J. Morgan

SB

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total
11/12/0															
5	0	0	0	2	2	1	0	0	0	0	0	0	0	0	5
01:00	0	0	0	2	0	1	1	0	0	0	0	0	0	0	4
02:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
05:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
06:00	0	0	0	0	2	3	0	0	0	0	0	0	0	0	5
07:00	0	0	1	2	2	7	3	0	0	0	0	0	0	0	15
08:00	0	0	0	4	29	36	5	0	0	0	0	0	0	0	74
09:00	2	2	3	10	41	37	11	0	0	0	0	0	0	0	106
10:00	0	1	0	10	58	55	17	2	0	0	0	0	0	0	143
11:00	0	2	3	11	42	32	7	0	0	0	0	0	0	0	97
12 PM	0	3	5	15	54	46	7	0	0	0	0	0	0	0	130
13:00	3	1	3	30	69	43	7	4	0	0	0	0	0	0	160
14:00	0	1	2	24	60	51	21	0	0	0	0	0	0	0	159
15:00	0	0	0	8	25	24	12	2	0	0	0	0	0	0	71
16:00	0	1	0	4	15	20	1	0	0	0	0	0	0	0	41
17:00	0	0	0	2	14	12	5	2	0	0	0	0	0	0	35
18:00	0	0	0	2	5	13	2	0	0	0	0	0	0	0	22
19:00	0	0	2	1	7	5	5	1	0	0	0	0	0	0	21
20:00	0	0	0	1	5	8	2	0	0	0	0	0	0	0	16
21:00	0	0	1	0	4	4	2	0	0	0	0	0	0	0	11
22:00	0	0	0	2	3	4	3	0	0	0	0	0	0	0	12
23:00	0	0	0	1	2	2	2	2	0	0	0	0	0	0	9
Total	5	11	20	131	440	405	114	13	0	0	0	0	0	0	1139

Daily

15th Percentile : 31 MPH
50th Percentile : 35 MPH
85th Percentile : 40 MPH
95th Percentile : 44 MPH

Mean Speed(Average) : 35 MPH
10 MPH Pace Speed : 31-40 MPH
Number in Pace : 845
Percent in Pace : 74.2%
Number of Vehicles > 35 MPH : 532
Percent of Vehicles > 35 MPH : 46.7%

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Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total
11/13/05	0	0	0	1	3	4	1	0	0	0	0	0	0	0	9
01:00	0	0	0	1	1	2	1	1	0	0	0	0	0	0	6
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
06:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
07:00	0	0	0	0	0	2	1	0	0	0	0	0	0	0	3
08:00	0	0	0	4	3	5	5	0	0	0	0	0	0	0	17
09:00	0	0	0	3	8	10	2	0	0	0	0	0	0	0	23
10:00	0	0	1	2	4	7	2	1	0	0	0	0	0	0	17
11:00	0	0	0	5	20	19	16	2	0	0	0	0	0	0	62
12 PM	0	1	0	5	19	32	11	0	0	0	0	0	0	0	68
13:00	0	1	1	5	28	14	4	0	0	0	0	0	0	0	53
14:00	0	1	0	0	11	17	5	2	0	0	0	0	0	0	36
15:00	0	1	0	2	17	14	3	2	0	0	0	0	0	0	39
16:00	0	0	1	3	7	10	3	0	0	0	0	0	0	0	24
17:00	0	0	0	1	7	14	4	1	0	0	0	0	0	0	27
18:00	0	0	0	2	10	10	6	0	0	0	0	0	0	0	28
19:00	0	0	0	2	7	11	0	0	0	0	0	0	0	0	20
20:00	0	0	0	2	6	8	1	0	0	0	0	0	0	0	17
21:00	0	0	0	1	4	8	1	0	0	0	0	0	0	0	14
22:00	0	0	0	0	2	5	0	0	0	0	0	0	0	0	7
23:00	0	0	0	0	2	1	0	0	0	0	0	0	0	0	3
Total	0	4	4	40	159	193	66	9	0	0	0	0	0	0	475

Daily

15th Percentile : 31 MPH
50th Percentile : 36 MPH
85th Percentile : 41 MPH
95th Percentile : 44 MPH

Mean Speed(Average) : 36 MPH
10 MPH Pace Speed : 31-40 MPH
Number in Pace : 352
Percent in Pace : 74.1%
Number of Vehicles > 35 MPH : 268
Percent of Vehicles > 35 MPH : 56.4%

Grand Total	5	15	24	171	599	598	180	22	0	0	0	0	0	0	1614
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Overall

15th Percentile : 31 MPH
50th Percentile : 35 MPH
85th Percentile : 40 MPH
95th Percentile : 44 MPH

Mean Speed(Average) : 35 MPH
10 MPH Pace Speed : 31-40 MPH
Number in Pace : 1197
Percent in Pace : 74.2%
Number of Vehicles > 35 MPH : 800
Percent of Vehicles > 35 MPH : 49.6%

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Page 4
03464Bspeed
Site Code: 03464

Marshall Street
south of Prentice Street
City, State: Holliston, MA
Client: C&C/J. Morgan

NB

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total
11/13/0															
5	0	0	0	0	1	1	0	0	0	1	0	0	0	0	3
01:00	0	0	0	1	2	2	0	0	0	0	0	0	0	0	5
02:00	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2
03:00	0	0	0	0	0	1	2	0	0	0	0	0	0	0	3
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	1	0	0	1	0	1	1	0	0	0	0	0	0	4
06:00	0	0	0	1	2	1	1	0	0	0	0	0	0	0	5
07:00	0	1	0	1	1	7	1	1	0	0	0	0	0	0	12
08:00	0	0	0	0	7	8	3	2	0	0	0	0	0	0	20
09:00	0	1	1	3	4	9	6	0	0	0	0	0	0	0	24
10:00	0	0	0	3	4	8	6	1	0	0	0	0	0	0	22
11:00	0	0	1	3	2	8	10	5	2	0	0	0	0	0	31
12 PM	0	0	0	3	13	20	20	4	0	0	0	0	0	0	60
13:00	0	1	1	8	18	26	9	2	0	0	0	0	0	0	65
14:00	0	0	0	1	8	14	6	3	1	0	0	0	0	0	33
15:00	0	0	0	11	24	19	6	1	0	0	0	0	0	0	61
16:00	0	1	0	11	17	18	7	3	0	0	0	0	0	0	57
17:00	0	0	0	4	8	11	6	1	0	0	0	0	0	0	30
18:00	0	0	0	0	6	5	8	5	0	0	0	0	0	0	24
19:00	0	0	0	2	7	8	2	1	0	0	0	0	0	0	20
20:00	0	0	0	1	6	4	4	1	0	0	0	0	0	0	16
21:00	0	0	0	2	3	6	1	0	0	0	0	0	0	0	12
22:00	0	0	0	1	1	0	2	1	1	0	0	0	0	0	6
23:00	0	0	0	0	2	1	1	0	0	0	0	0	0	0	4
Total	0	5	3	56	138	178	102	32	4	1	0	0	0	0	519

Daily

15th Percentile : 31 MPH
50th Percentile : 37 MPH
85th Percentile : 43 MPH
95th Percentile : 47 MPH

Mean Speed(Average) : 37 MPH
10 MPH Pace Speed : 31-40 MPH
Number in Pace : 316
Percent in Pace : 60.9%
Number of Vehicles > 35 MPH : 317
Percent of Vehicles > 35 MPH : 61.1%

Grand Total	6	17	21	168	523	591	259	57	11	1	0	1	0	0	1655
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Overall

15th Percentile : 31 MPH
50th Percentile : 36 MPH
85th Percentile : 42 MPH
95th Percentile : 45 MPH

Mean Speed(Average) : 36 MPH
10 MPH Pace Speed : 31-40 MPH
Number in Pace : 1114
Percent in Pace : 67.3%
Number of Vehicles > 35 MPH : 920
Percent of Vehicles > 35 MPH : 55.6%

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JBB				Intersection	Marshall St. @ Prentice St.			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/8/05				Analysis Year	2005 AM Existing			
Analysis Time Period	AM Peak (7:00-8:00am)								
Project Description AM Peak Hour Existing Conditions									
East/West Street: Prentice Street					North/South Street: Marshall Street				
Intersection Orientation: East-West					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Eastbound			Westbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume		211	7	15	218				
Peak-Hour Factor, PHF	1.00	0.81	0.81	0.87	0.87	1.00			
Hourly Flow Rate, HFR	0	260	8	17	250	0			
Percent Heavy Vehicles	2	--	--	8	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration			TR	LT					
Upstream Signal		0			0				
Minor Street	Northbound			Southbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	25		67						
Peak-Hour Factor, PHF	0.81	1.00	0.81	1.00	1.00	1.00			
Hourly Flow Rate, HFR	30	0	82	0	0	0			
Percent Heavy Vehicles	0	0	2	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Eastbound	Westbound	Northbound			Southbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration		LT		LR					
v (vph)		17		112					
C (m) (vph)		1262		673					
v/c		0.01		0.17					
95% queue length		0.04		0.59					
Control Delay		7.9		11.4					
LOS		A		B					
Approach Delay	--	--	11.4						
Approach LOS	--	--	B						

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JBB				Intersection	Marshall St. @ Prentice St.			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/8/05				Analysis Year	2005 PM Existing			
Analysis Time Period	PM Peak (4:45-5:45pm)								
Project Description PM Peak Hour Existing Conditions									
East/West Street: Prentice Street					North/South Street: Marshall Street				
Intersection Orientation: East-West					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Eastbound			Westbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume		214	18	64	251				
Peak-Hour Factor, PHF	0.85	0.82	0.82	0.87	0.87	0.85			
Hourly Flow Rate, HFR	0	260	21	73	288	0			
Percent Heavy Vehicles	2	--	--	2	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration			TR	LT					
Upstream Signal		0			0				
Minor Street	Northbound			Southbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	20		41						
Peak-Hour Factor, PHF	1.00	0.85	1.00	0.85	0.85	0.85			
Hourly Flow Rate, HFR	20	0	41	0	0	0			
Percent Heavy Vehicles	6	0	3	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Eastbound	Westbound	Northbound			Southbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration		LT		LR					
v (vph)		73		61					
C (m) (vph)		1282		570					
v/c		0.06		0.11					
95% queue length		0.18		0.36					
Control Delay		8.0		12.1					
LOS		A		B					
Approach Delay	--	--	12.1						
Approach LOS	--	--	B						

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JBB				Intersection	Marshall St. @ Prentice St.			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/8/05				Analysis Year	2005 SAT Existing			
Analysis Time Period	SAT Peak (11:00am-12:00pm)								
Project Description SAT Peak Hour Existing Conditions									
East/West Street: Prentice Street					North/South Street: Marshall Street				
Intersection Orientation: East-West					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Eastbound			Westbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume		157	25	99	146				
Peak-Hour Factor, PHF	0.85	0.86	0.86	0.83	0.83	0.85			
Hourly Flow Rate, HFR	0	182	29	119	175	0			
Percent Heavy Vehicles	2	--	--	1	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration			TR	LT					
Upstream Signal		0			0				
Minor Street	Northbound			Southbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	24		106						
Peak-Hour Factor, PHF	0.89	0.85	0.89	0.85	0.85	0.85			
Hourly Flow Rate, HFR	26	0	119	0	0	0			
Percent Heavy Vehicles	0	0	4	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Eastbound	Westbound	Northbound			Southbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration		LT		LR					
v (vph)		119		145					
C (m) (vph)		1366		713					
v/c		0.09		0.20					
95% queue length		0.29		0.76					
Control Delay		7.9		11.3					
LOS		A		B					
Approach Delay	--	--	11.3						
Approach LOS	--	--	B						

TWO-WAY STOP CONTROL SUMMARY							
General Information				Site Information			
Analyst	JBB			Intersection	Marshall St. @ Prentice St.		
Agency/Co.	Coler & Colantonio			Jurisdiction	Holliston		
Date Performed	11/8/05			Analysis Year	2010 AM No-Build		
Analysis Time Period	AM Peak (7:00-8:00am)						
Project Description AM Peak Hour No-Build Conditions							
East/West Street: Prentice Street				North/South Street: Marshall Street			
Intersection Orientation: East-West				Study Period (hrs): 0.25			
Vehicle Volumes and Adjustments							
Major Street	Eastbound			Westbound			
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume		251	8	18	259		
Peak-Hour Factor, PHF	1.00	0.81	0.81	0.87	0.87	1.00	
Hourly Flow Rate, HFR	0	309	9	20	297	0	
Percent Heavy Vehicles	2	--	--	8	--	--	
Median Type	Undivided						
RT Channelized			0			0	
Lanes	0	1	0	0	1	0	
Configuration			TR	LT			
Upstream Signal		0			0		
Minor Street	Northbound			Southbound			
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume	30		80				
Peak-Hour Factor, PHF	0.81	1.00	0.81	1.00	1.00	1.00	
Hourly Flow Rate, HFR	37	0	98	0	0	0	
Percent Heavy Vehicles	0	0	2	0	0	0	
Percent Grade (%)	0			0			
Flared Approach		N			N		
Storage		0			0		
RT Channelized			0			0	
Lanes	0	0	0	0	0	0	
Configuration		LR					
Delay, Queue Length, and Level of Service							
Approach	Eastbound	Westbound	Northbound			Southbound	
Movement	1	4	7	8	9	10	11
Lane Configuration		LT		LR			
v (vph)		20		135			
C (m) (vph)		1209		610			
v/c		0.02		0.22			
95% queue length		0.05		0.84			
Control Delay		8.0		12.6			
LOS		A		B			
Approach Delay	--	--	12.6				
Approach LOS	--	--	B				

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JBB				Intersection	Marshall St. @ Prentice St.			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/8/05				Analysis Year	2010 PM No-Build			
Analysis Time Period	PM Peak (4:45-5:45pm)								
Project Description PM Peak Hour No-Build Conditions									
East/West Street: Prentice Street					North/South Street: Marshall Street				
Intersection Orientation: East-West					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Eastbound			Westbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume		254	21	76	298				
Peak-Hour Factor, PHF	1.00	0.82	0.82	0.87	0.87	1.00			
Hourly Flow Rate, HFR	0	309	25	87	342	0			
Percent Heavy Vehicles	2	--	--	2	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration			TR	LT					
Upstream Signal		0			0				
Minor Street	Northbound			Southbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	24		49						
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00			
Hourly Flow Rate, HFR	24	0	49	0	0	0			
Percent Heavy Vehicles	6	0	3	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Eastbound	Westbound	Northbound			Southbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration		LT	LR						
v (vph)		87	73						
C (m) (vph)		1225	498						
v/c		0.07	0.15						
95% queue length		0.23	0.51						
Control Delay		8.2	13.5						
LOS		A	B						
Approach Delay	--	--	13.5						
Approach LOS	--	--	B						

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	JBB			Intersection	Marshall St. @ Prentice St.			
Agency/Co.	Coler & Colantonio			Jurisdiction	Holliston			
Date Performed	11/8/05			Analysis Year	2010 SAT No-Build			
Analysis Time Period	SAT Peak (11:00am-12:00pm)							
Project Description SAT Peak Hour No-Build Conditions								
East/West Street: Prentice Street				North/South Street: Marshall Street				
Intersection Orientation: East-West				Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume		186	30	118	173			
Peak-Hour Factor, PHF	1.00	0.86	0.86	0.83	0.83	1.00		
Hourly Flow Rate, HFR	0	216	34	142	208	0		
Percent Heavy Vehicles	2	--	--	1	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration			TR	LT				
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume	29		126					
Peak-Hour Factor, PHF	0.89	1.00	0.89	1.00	1.00	1.00		
Hourly Flow Rate, HFR	32	0	141	0	0	0		
Percent Heavy Vehicles	0	0	4	0	0	0		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration		LR						
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT		LR				
v (vph)		142		173				
C (m) (vph)		1321		649				
v/c		0.11		0.27				
95% queue length		0.36		1.07				
Control Delay		8.1		12.6				
LOS		A		B				
Approach Delay	--	--	12.6					
Approach LOS	--	--	B					

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JBB				Intersection	Marshall St. @ Prentice St.			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/8/05				Analysis Year	2010 AM Build			
Analysis Time Period	AM Peak (7:00-8:00am)								
Project Description AM Peak Hour Build Conditions									
East/West Street: Prentice Street					North/South Street: Marshall Street				
Intersection Orientation: East-West					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Eastbound			Westbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume		251	12	25	259				
Peak-Hour Factor, PHF	1.00	0.81	0.81	0.87	0.87	1.00			
Hourly Flow Rate, HFR	0	309	14	28	297	0			
Percent Heavy Vehicles	2	--	--	8	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration			TR	LT					
Upstream Signal		0			0				
Minor Street	Northbound			Southbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	52		111						
Peak-Hour Factor, PHF	0.81	1.00	0.81	1.00	1.00	1.00			
Hourly Flow Rate, HFR	64	0	137	0	0	0			
Percent Heavy Vehicles	0	0	2	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Eastbound	Westbound	Northbound			Southbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration		LT		LR					
v (vph)		28		201					
C (m) (vph)		1204		586					
v/c		0.02		0.34					
95% queue length		0.07		1.52					
Control Delay		8.1		14.3					
LOS		A		B					
Approach Delay	--	--	14.3						
Approach LOS	--	--	B						

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JBB				Intersection	Marshall St. @ Prentice St.			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/8/05				Analysis Year	2010 PM Build			
Analysis Time Period	PM Peak (4:45-5:45pm)								
Project Description PM Peak Hour Build Conditions									
East/West Street: Prentice Street					North/South Street: Marshall Street				
Intersection Orientation: East-West					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Eastbound			Westbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume		254	42	105	298				
Peak-Hour Factor, PHF	0.85	0.82	0.82	0.87	0.87	0.85			
Hourly Flow Rate, HFR	0	309	51	120	342	0			
Percent Heavy Vehicles	2	--	--	2	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration			TR	LT					
Upstream Signal		0			0				
Minor Street	Northbound			Southbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	34		56						
Peak-Hour Factor, PHF	1.00	0.85	1.00	0.85	0.85	0.85			
Hourly Flow Rate, HFR	34	0	56	0	0	0			
Percent Heavy Vehicles	6	0	3	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Eastbound	Westbound	Northbound			Southbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration		LT		LR					
v (vph)		120		90					
C (m) (vph)		1199		435					
v/c		0.10		0.21					
95% queue length		0.33		0.77					
Control Delay		8.3		15.4					
LOS		A		C					
Approach Delay	--	--	15.4						
Approach LOS	--	--	C						

TWO-WAY STOP CONTROL SUMMARY							
General Information				Site Information			
Analyst	JBB			Intersection	Marshall St. @ Prentice St.		
Agency/Co.	Coler & Colantonio			Jurisdiction	Holliston		
Date Performed	11/8/05			Analysis Year	2010 SAT Build		
Analysis Time Period	SAT Peak (11:00am-12:00pm)						
Project Description SAT Peak Hour Build Conditions							
East/West Street: Prentice Street				North/South Street: Marshall Street			
Intersection Orientation: East-West				Study Period (hrs): 0.25			
Vehicle Volumes and Adjustments							
Major Street	Eastbound			Westbound			
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume		186	46	141	173		
Peak-Hour Factor, PHF	0.85	0.86	0.86	0.83	0.83	0.85	
Hourly Flow Rate, HFR	0	216	53	169	208	0	
Percent Heavy Vehicles	2	--	--	1	--	--	
Median Type	Undivided						
RT Channelized			0			0	
Lanes	0	1	0	0	1	0	
Configuration			TR	LT			
Upstream Signal		0			0		
Minor Street	Northbound			Southbound			
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume	43		144				
Peak-Hour Factor, PHF	0.89	0.85	0.89	0.85	0.85	0.85	
Hourly Flow Rate, HFR	48	0	161	0	0	0	
Percent Heavy Vehicles	0	0	4	0	0	0	
Percent Grade (%)	0			0			
Flared Approach		N			N		
Storage		0			0		
RT Channelized			0			0	
Lanes	0	0	0	0	0	0	
Configuration		LR					
Delay, Queue Length, and Level of Service							
Approach	Eastbound	Westbound	Northbound			Southbound	
Movement	1	4	7	8	9	10	11
Lane Configuration		LT		LR			
v (vph)		169		209			
C (m) (vph)		1300		588			
v/c		0.13		0.36			
95% queue length		0.45		1.60			
Control Delay		8.2		14.5			
LOS		A		B			
Approach Delay	--	--	14.5				
Approach LOS	--	--	B				

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JBB				Intersection	Marshall St. @ Prentice St.			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/8/05				Analysis Year	2010 PM Build w/ Soccer			
Analysis Time Period	PM Peak (4:45-5:45pm)								
Project Description PM Peak Hour Build Conditions									
East/West Street: Prentice Street					North/South Street: Marshall Street				
Intersection Orientation: East-West					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Eastbound			Westbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume		254	65	243	298				
Peak-Hour Factor, PHF	1.00	0.82	0.82	0.87	0.87	1.00			
Hourly Flow Rate, HFR	0	309	79	279	342	0			
Percent Heavy Vehicles	2	--	--	2	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration			TR	LT					
Upstream Signal		0			0				
Minor Street	Northbound			Southbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	103		148						
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00			
Hourly Flow Rate, HFR	103	0	148	0	0	0			
Percent Heavy Vehicles	2	0	0	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Eastbound	Westbound	Northbound			Southbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration		LT		LR					
v (vph)		279		251					
C (m) (vph)		1170		272					
v/c		0.24		0.92					
95% queue length		0.93		8.48					
Control Delay		9.0		77.0					
LOS		A		F					
Approach Delay	--	--	77.0						
Approach LOS	--	--	F						

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JBB				Intersection	Site Driveway #1 @ Marshall St			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/8/05				Analysis Year	2010 Build w/ Soccer			
Analysis Time Period	PM Peak (4:45-5:45pm)								
Project Description PM Peak Hour Build Conditions									
East/West Street: Site Driveway #1					North/South Street: Marshall Street				
Intersection Orientation: North-South					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Northbound			Southbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume	7	241			287	21			
Peak-Hour Factor, PHF	0.84	0.84	1.00	1.00	0.80	0.80			
Hourly Flow Rate, HFR	8	286	0	0	358	26			
Percent Heavy Vehicles	7	--	--	0	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration	LT					TR			
Upstream Signal		0			0				
Minor Street	Eastbound			Westbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	10		3						
Peak-Hour Factor, PHF	0.85	1.00	0.85	1.00	1.00	1.00			
Hourly Flow Rate, HFR	11	0	3	0	0	0			
Percent Heavy Vehicles	0	0	0	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Northbound	Southbound	Westbound			Eastbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration	LT						LR		
v (vph)	8						14		
C (m) (vph)	1148						458		
v/c	0.01						0.03		
95% queue length	0.02						0.09		
Control Delay	8.2						13.1		
LOS	A						B		
Approach Delay	--	--				13.1			
Approach LOS	--	--				B			

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JBB				Intersection	Site Driveway #2 @ Marshall St			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/8/05				Analysis Year	2010 Build w/ Soccer			
Analysis Time Period	PM Peak (4:45-5:45pm)								
Project Description PM Peak Hour Build Conditions									
East/West Street: Site Driveway #2					North/South Street: Marshall Street				
Intersection Orientation: North-South					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Northbound			Southbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume	14	233			261	29			
Peak-Hour Factor, PHF	0.84	0.84	1.00	1.00	0.80	0.80			
Hourly Flow Rate, HFR	16	277	0	0	326	36			
Percent Heavy Vehicles	7	--	--	0	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration	LT					TR			
Upstream Signal		0			0				
Minor Street	Eastbound			Westbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	15		7						
Peak-Hour Factor, PHF	0.85	1.00	0.85	1.00	1.00	1.00			
Hourly Flow Rate, HFR	17	0	8	0	0	0			
Percent Heavy Vehicles	0	0	0	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Northbound	Southbound	Westbound			Eastbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration	LT						LR		
v (vph)	16						25		
C (m) (vph)	1169						490		
v/c	0.01						0.05		
95% queue length	0.04						0.16		
Control Delay	8.1						12.7		
LOS	A						B		
Approach Delay	--	--				12.7			
Approach LOS	--	--				B			

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JBB				Intersection	Marshall St. @ Prentice St.			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/8/05				Analysis Year	2010 Build w/ Soccer			
Analysis Time Period	Weekend mid-day Peak								
Project Description Weekend mid-day Peak Hour Build Conditions									
East/West Street: Prentice Street					North/South Street: Marshall Street				
Intersection Orientation: East-West					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Eastbound			Westbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume		186	69	279	173				
Peak-Hour Factor, PHF	1.00	0.86	0.86	0.83	0.83	1.00			
Hourly Flow Rate, HFR	0	216	80	336	208	0			
Percent Heavy Vehicles	2	--	--	2	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration			TR	LT					
Upstream Signal		0			0				
Minor Street	Northbound			Southbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	112		236						
Peak-Hour Factor, PHF	0.89	1.00	0.89	1.00	1.00	1.00			
Hourly Flow Rate, HFR	125	0	265	0	0	0			
Percent Heavy Vehicles	2	0	0	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Eastbound	Westbound	Northbound			Southbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration		LT	LR						
v (vph)		336	390						
C (m) (vph)		1265	355						
v/c		0.27	1.10						
95% queue length		1.08	14.48						
Control Delay		8.9	111.5						
LOS		A	F						
Approach Delay	--	--	111.5						
Approach LOS	--	--	F						

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JBB				Intersection	Site Driveway #1 @ Marshall St			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/8/05				Analysis Year	2010 Build w/ Soccer			
Analysis Time Period	Weekend midday Peak Hour								
Project Description Weekend midday Peak Hour Build Conditions									
East/West Street: Site Driveway #1					North/South Street: Marshall Street				
Intersection Orientation: North-South					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Northbound			Southbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume	5	334			332	16			
Peak-Hour Factor, PHF	0.84	0.84	1.00	1.00	0.55	0.55			
Hourly Flow Rate, HFR	5	397	0	0	603	29			
Percent Heavy Vehicles	4	--	--	0	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration	LT					TR			
Upstream Signal		0			0				
Minor Street	Eastbound			Westbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	14		5						
Peak-Hour Factor, PHF	0.85	1.00	0.85	1.00	1.00	1.00			
Hourly Flow Rate, HFR	16	0	5	0	0	0			
Percent Heavy Vehicles	0	0	0	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Northbound	Southbound	Westbound			Eastbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration	LT						LR		
v (vph)	5						21		
C (m) (vph)	941						295		
v/c	0.01						0.07		
95% queue length	0.02						0.23		
Control Delay	8.8						18.1		
LOS	A						C		
Approach Delay	--	--				18.1			
Approach LOS	--	--				C			

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JBB				Intersection	Site Driveway #2 @ Marshall St			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/8/05				Analysis Year	2010 Build w/ Soccer			
Analysis Time Period	Weekend midday Peak Hour								
Project Description Weekend midday Peak Hour Build Conditions									
East/West Street: Site Driveway #2					North/South Street: Marshall Street				
Intersection Orientation: North-South					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Northbound			Southbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume	11	321			309	23			
Peak-Hour Factor, PHF	0.84	0.84	1.00	1.00	0.55	0.55			
Hourly Flow Rate, HFR	13	382	0	0	561	41			
Percent Heavy Vehicles	4	--	--	0	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration	LT					TR			
Upstream Signal		0			0				
Minor Street	Eastbound			Westbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	18		9						
Peak-Hour Factor, PHF	0.85	1.00	0.85	1.00	1.00	1.00			
Hourly Flow Rate, HFR	21	0	10	0	0	0			
Percent Heavy Vehicles	0	0	0	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Northbound	Southbound	Westbound			Eastbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration	LT						LR		
v (vph)	13						31		
C (m) (vph)	966						321		
v/c	0.01						0.10		
95% queue length	0.04						0.32		
Control Delay	8.8						17.4		
LOS	A						C		
Approach Delay	--	--				17.4			
Approach LOS	--	--				C			

TWO-WAY STOP CONTROL SUMMARY									
General Information					Site Information				
Analyst	JGM				Intersection	Marshall St. @ Prentice St.			
Agency/Co.	Coler & Colantonio				Jurisdiction	Holliston			
Date Performed	11/28/05				Analysis Year	2010 SAT Build			
Analysis Time Period	SAT Peak (2:00pm-3:00pm)								
Project Description SAT Peak Hour Build Conditions (w/ Updated Volumes)									
East/West Street: Prentice Street					North/South Street: Marshall Street				
Intersection Orientation: East-West					Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments									
Major Street	Eastbound			Westbound					
Movement	1	2	3	4	5	6			
	L	T	R	L	T	R			
Volume		186	54	175	173				
Peak-Hour Factor, PHF	0.85	0.86	0.86	0.83	0.83	0.85			
Hourly Flow Rate, HFR	0	216	62	210	208	0			
Percent Heavy Vehicles	2	--	--	1	--	--			
Median Type	Undivided								
RT Channelized			0			0			
Lanes	0	1	0	0	1	0			
Configuration			TR	LT					
Upstream Signal		0			0				
Minor Street	Northbound			Southbound					
Movement	7	8	9	10	11	12			
	L	T	R	L	T	R			
Volume	50		181						
Peak-Hour Factor, PHF	0.89	0.85	0.89	0.85	0.85	0.85			
Hourly Flow Rate, HFR	56	0	203	0	0	0			
Percent Heavy Vehicles	0	0	4	0	0	0			
Percent Grade (%)	0			0					
Flared Approach		N			N				
Storage		0			0				
RT Channelized			0			0			
Lanes	0	0	0	0	0	0			
Configuration		LR							
Delay, Queue Length, and Level of Service									
Approach	Eastbound	Westbound	Northbound			Southbound			
Movement	1	4	7	8	9	10	11	12	
Lane Configuration		LT		LR					
v (vph)		210		259					
C (m) (vph)		1291		557					
v/c		0.16		0.46					
95% queue length		0.58		2.45					
Control Delay		8.3		17.0					
LOS		A		C					
Approach Delay	--	--	17.0						
Approach LOS	--	--	C						



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱		↱	↱	
Sign Control	Stop			Free	Free	
Grade	0%			0%	-1%	
Volume (veh/h)	429	55	83	568	147	145
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	466	60	90	617	160	158
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1036	239	317			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1036	239	317			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	93	93			
cM capacity (veh/h)	238	800	1243			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	526	708	317			
Volume Left	466	90	0			
Volume Right	60	0	158			
cSH	259	1243	1700			
Volume to Capacity	2.03	0.07	0.19			
Queue Length (ft)	964	6	0			
Control Delay (s)	510.0	1.8	0.0			
Lane LOS	F	A				
Approach Delay (s)	510.0	1.8	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay			173.8			
Intersection Capacity Utilization			84.9%	ICU Level of Service	E	
Analysis Period (min)			15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱		↕	↕	↱
Sign Control	Stop			Free	Free	
Grade	0%			0%	-1%	
Volume (veh/h)	250	104	72	191	445	484
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	272	113	78	208	484	526
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1111	747	1010			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1111	747	1010			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	73	89			
cM capacity (veh/h)	205	413	686			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	385	286	1010			
Volume Left	272	78	0			
Volume Right	113	0	526			
cSH	246	686	1700			
Volume to Capacity	1.56	0.11	0.59			
Queue Length (ft)	587	10	0			
Control Delay (s)	308.8	4.0	0.0			
Lane LOS	F	A				
Approach Delay (s)	308.8	4.0	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay			71.4			
Intersection Capacity Utilization			90.9%	ICU Level of Service	E	
Analysis Period (min)			15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱		↱	↱	
Sign Control	Stop			Free	Free	
Grade	0%			0%	-1%	
Volume (veh/h)	456	59	86	568	147	149
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	496	64	93	617	160	162
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type	None					
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1045	241	322			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1045	241	322			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	92	92			
cM capacity (veh/h)	234	798	1238			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	560	711	322			
Volume Left	496	93	0			
Volume Right	64	0	162			
cSH	255	1238	1700			
Volume to Capacity	2.19	0.08	0.19			
Queue Length (ft)	1074	6	0			
Control Delay (s)	581.5	1.9	0.0			
Lane LOS	F	A				
Approach Delay (s)	581.5	1.9	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay		205.3				
Intersection Capacity Utilization		86.8%		ICU Level of Service	E	
Analysis Period (min)		15				



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱		↰	↱	
Sign Control	Stop			Free	Free	
Grade	0%			0%	-1%	
Volume (veh/h)	261	108	76	191	445	509
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	284	117	83	208	484	553
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type	None					
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1133	760	1037			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1133	760	1037			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	71	88			
cM capacity (veh/h)	197	406	670			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	401	290	1037			
Volume Left	284	83	0			
Volume Right	117	0	553			
cSH	236	670	1700			
Volume to Capacity	1.70	0.12	0.61			
Queue Length (ft)	659	10	0			
Control Delay (s)	369.1	4.3	0.0			
Lane LOS	F	A				
Approach Delay (s)	369.1	4.3	0.0			
Approach LOS	F					
Intersection Summary						
Average Delay		86.4				
Intersection Capacity Utilization		93.3%		ICU Level of Service	F	
Analysis Period (min)		15				

CONCEPTUAL OPINION OF PROBABLE COST

CITY/TOWN
PROJECT
E.W.O. #
FILE:

Holliston
Cedar Ridge Estates - Marshall St Profile

ESTIMATED BY: ADM
CHECKED BY: VQG
DATE: 11/29/2005

ITEM #	QUANT	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
120.1	450	CY	Unclassified Excavation	\$ 15.00	\$ 6,750.00
151.01	195	CY	Gravel Borrow	\$ 30.00	\$ 5,850.00
170	585	SY	Fine Grading & Compacting - Subgrade Areas	\$ 3.00	\$ 1,755.00
460	210	TON	Hot Mix Asphalt	\$ 115.00	\$ 24,150.00
464	10	GAL	Bitumen for Tack Coat	\$ 3.00	\$ 30.00
751	15	CY	Loam Borrow	\$ 30.00	\$ 450.00
765	115	SY	Seeding	\$ 1.00	\$ 115.00

SUB TOTAL \$ 39,100.00

CONTIGENCY 15% \$ 5,865.00

ENGINEERING 15% \$ 5,865.00

POLICE 10% \$ 3,910.00

PROJECT TOTAL \$ 54,740.00

SAY \$ 55,000.00

CONCEPTUAL OPINION OF PROBABLE COST

CITY/TOWN
PROJECT
E.W.O. #
FILE:

Holliston
Cedar Ridge Estates INT Concept

ESTIMATED BY: ADM
CHECKED BY: VQG
DATE: 11/29/2005

ITEM #	QUANT	UNIT	DESCRIPTION	UNIT PRICE	AMOUNT
120.1	185	CY	Unclassified Excavation	\$ 15.00	\$ 2,775.00
151.01	70	CY	Gravel Borrow	\$ 30.00	\$ 2,100.00
170	550	SY	Fine Grading & Compacting - Subgrade Areas	\$ 3.00	\$ 1,650.00
402	50	CY	Dense Graded Crushed Stone for Sub-Base	\$ 30.00	\$ 1,500.00
420	140	TON	Hot Mix Asphalt Base Course	\$ 115.00	\$ 16,100.00
460	160	TON	Hot Mix Asphalt	\$ 115.00	\$ 18,400.00
464	15	GAL	Bitumen for Tack Coat	\$ 3.00	\$ 45.00
751	15	CY	Loam Borrow	\$ 30.00	\$ 450.00
765	135	SY	Seeding	\$ 1.00	\$ 135.00
865.1	60	SF	Crosswalks and Stop Lines Refl. White (Thermo.)	\$ 2.00	\$ 120.00
866.04.	350	LF	4-INCH ReflectORIZED White Line (Thermoplastic)	\$ 1.00	\$ 350.00
867.04	700	LF	4-INCH ReflectORIZED Yellow Line (Thermoplastic)	\$ 1.00	\$ 700.00
	2	LS	Relocate Utility Pole	\$ 1,500.00	\$ 3,000.00

SUB TOTAL \$ 47,325.00

CONTINGENCY 15% \$ 7,098.75

ENGINEERING 15% \$ 7,098.75

POLICE 10% \$ 4,732.50

PROJECT TOTAL \$ 66,255.00

SAY \$ 67,000.00