

Access Safety & Operational Analysis of Route 2 Interchanges & At-Grade Intersections in the MRPC Region



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TABLE OF CONTENTS

MONTACHUSETT METROPOLITAN PLANNING ORGANIZATION SIGNATORIES.....	2
MONTACHUSETT JOINT TRANSPORTATION COMMITTEE.....	3
INTRODUCTION.....	4
Figure 1: The Communities Served by the MRPC	4
Table 1: Locations and Assessment Status	5
I: METHODS USED TO ANALYZE ROUTE 2 INTERCHANGES & AT-GRADE INTERSECTIONS	6
Table 2: Crash Zone 1 Overlaps	6
Table 3: Interchanges with Different Crash Zone 2 Radii	7
II: ACCESS SAFETY CONDITIONS ON ROUTE 2 INTERCHANGES & AT-GRADE INTERSECTIONS.....	10
Exit 38 Interchange	11
Exit 37 Interchange	13
Exit 36 Interchange	15
Exit 35 Interchange	17
Exit 34 Interchange	19
Rte 2 & Rte I-190 Intersection and Exits 33 & 8 (Rte I-190) Interchanges	21
Exit 32 Interchange	23
Exit 31 Interchange	25
Abbott Ave Intersection	28
Exit 30 Interchange	30
Mt Elam Rd Intersection	33
Oak Hill & Palmer Rds Intersection	35
Exit 28 Interchange	37
Exit 27 Interchange	39
Exit 26 Interchange	41
Exit 25 Interchange	43
Exit 24 Interchange	46
Exit 23 Interchange	49
Exit 22 Interchange	51
Exit 21 Interchange	53
Exit 20 Interchange	55
Exit 19 Interchange	57
Exit 18 Interchange	59
Exit 17 Interchange	61
III: OTHER ISSUES/STUDIES:	63
APPENDIX.....	64

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Chairperson, Townsend Board of Selectmen <i>Subregion 2</i>	David Chenelle
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Arthur Frost, Project Development Engineer for Commissioner Paiewonsky
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Mohammed H. Khan, Administrator, MART, for Chairman Mayor Mazzearella

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MONTACHUSETT JOINT TRANSPORTATION COMMITTEE

<u>COMMUNITY</u>	<u>APPOINTED BY SELECTMEN OR MAYOR</u>	<u>APPOINTED BY PLANNING BOARD</u>
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Athol	Doug Walsh	
Ayer	Pauline Hamel	Jim Lucchesi
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Lunenburg		Robert Saia
Petersham	Roy Nilson	
Phillipston	Ronald Recos	Kevin Flynn
Royalston	Andrew West	
Shirley	Joseph Lynch	John Oelfke/Charles
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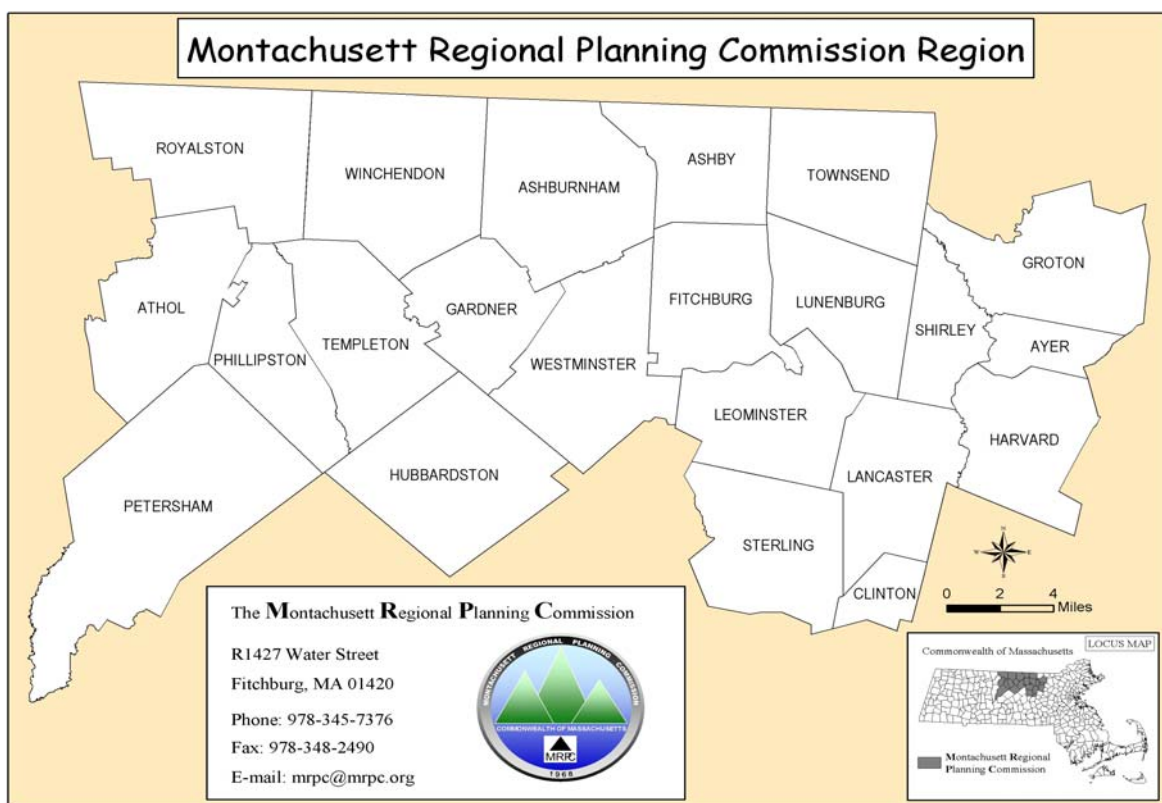
ORGANIZATION MEMBERS

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Donna Brooks	Northern Worcester County Board of Realtors
Tony Salerno	Amalgamated Transit Union #690 (ATU 690)
Kit Walker	Fitchburg Airport Commission
Elizabeth Zoldak	North Central MA Chamber of Commerce
	Fitchburg Council on Aging
Frank Garcia	South Fitchburg Neighborhood Association
Richard Montuori	Mass Development
Peter Lowitt	Devens Enterprise Commission (DEC)

INTRODUCTION

The Montachusett Regional Planning Commission (MRPC) is the regional planning agency and staff for the Montachusett region (Region) serving 22 communities in North Central Massachusetts (see **Figure 1**). These communities fall within Worcester and Middlesex Counties. The MRPC carries out comprehensive regional planning in the Region. Staff of the MRPC Transportation Department develops the Transportation Improvement Plan (TIP) and the Regional Transportation Plan (RTP) and regularly conducts Region wide and community level transportation studies.

Figure 1: The Communities Served by the MRPC



The primary reason for completing this analysis is due to the ranking of most of the Route 2 interchanges and at-grade intersections in **Table 1: The Most Dangerous Intersections and Interchanges in the Region (2002-2005)** found in the *Phase I Report: Roadway Safety Conditions in the Montachusett Region*. This analysis identifies safety problem locations of Route 2 interchanges and at-grade intersections and provides operational conditions by utilizing Geographic Information System (GIS) techniques, crash statistics developed from MassHighway crash data, and ramp traffic counts conducted by MassHighway and the MRPC.

There are 22 interchanges, 7 at-grade intersections, 3 rest area at-grade intersections, and 2 weigh station area at-grade intersections in the Region. Not all 33 locations are assessed in the analysis. See **Table 1** below for the locations in the Region and the assessment status of each location.

Table 1: Locations and Assessment Status

	Locations (east to west)	Community	Assessment Status	Comment
1	Exit 38 Interchange	Harvard	Yes	
2	Exit 37 Interchange	Harvard/Lancaster	Yes	
3	Exit 36 Interchange	Lancaster	Yes	
4	Exit 35 Interchange	Lancaster	Yes	No traffic Counts ¹
5	Rest Area (WB ²) at-grade intersection	Lancaster	No	Insufficient Crash Data
6	Weight Station (EB ³) at-grade intersection	Lancaster	No	Insufficient Crash Data
7	Exit 34 Interchange	Lancaster/Leominster	Yes	
8	Rte 2 & I 190 Intersection / Exits 33 & 8 (Rte I 190) Interchanges	Leominster	Yes	No traffic Counts
9	Exit 32 Interchange	Leominster	Yes	
10	Exit 31 Interchange	Leominster	Yes	
11	Abbott Ave (WB) at-grade intersection	Leominster	Yes	No traffic Counts
12	Abbott Ave (EB) at-grade intersection	Leominster	Yes	No traffic Counts
13	Exit 30 Interchange	Leominster/Fitchburg	Yes	
14	Mt Elam Rd (WB) at-grade intersection	Fitchburg	Yes	
15	Mt Elam Rd (EB) at-grade intersection	Leominster/Fitchburg	Yes	
16	Oak Hill Rd (WB) at-grade intersection	Fitchburg	Yes	
17	Palmer Rd (EB) at-grade intersection	Leominster/Fitchburg	Yes	No traffic Counts
18	Exit 28 Interchange	Fitchburg	Yes	
19	Exit 27 Interchange	Fitchburg/Westminster	Yes	
20	Exit 26 Interchange	Westminster	Yes	
21	Exit 25 Interchange	Westminster	Yes	
22	Exit 24 Interchange	Westminster	Yes	
23	Exit 23 Interchange	Gardner	Yes	
24	Exit 22 Interchange	Gardner	Yes	
25	Rest Area (WB) at-grade intersection	Templeton	No	Insufficient Crash Data
26	Rest Area (EB) at-grade intersection	Templeton	No	Insufficient Crash Data
27	Exit 21 Interchange	Templeton	Yes	
28	Exit 20 Interchange	Templeton	Yes	
29	Exit 19 Interchange	Templeton/Phillipston	Yes	
30	Exit 18 Interchange	Phillipston/Athol	Yes	
31	Exit 17 Interchange	Athol	Yes	
32	Weight Station (WB) at-grade intersection	Athol	No	Insufficient Crash Data

This analysis will serve as one of several planning tools⁴ that can be used to develop safety improvement projects that work towards meeting the goals of the Massachusetts Strategic Highway Safety Plan in our Region. Although individual interchange and at-grade intersection information is provided in this analysis it is not intended to replace the need to conduct a traffic safety study of the location. Instead the information should be used as a screening tool to draw attention to the real or potential safety problem at the location.

¹ Recent pavement project – counts not able to be conducted

² WB = WestBound

³ EB = EastBound

⁴ See *Phase I Report*

I: METHODS USED TO ANALYZE ROUTE 2 INTERCHANGES & AT-GRADE INTERSECTIONS

Defining Interchange Limits and At-grade Intersection Limits for Safety Analysis Utilizing GIS

Interchange limits and at-grade intersection limits for safety analysis are defined by the following areas or **Crash Zones**. The Crash Zones described below belong to a GIS datalayer that interprets the method used to determine intersection and interchange crashes found in section *III: Regional & Community Crash Statistics of the Phase I Report: Roadway Safety Conditions in the Montachusett Region*. Crash Zones are depicted on the figures and tables in section *II: Access Safety Conditions at Route 2 Interchanges & At-grade Intersections* of this report.

1) Interchange Limits for a Route 2 major road:

Crash Zone 1: It is the area (zone) of the major road within a 1,000 foot radius of the intersection that exists where the major road and the acceleration and/or deceleration lanes respectively merge and/or diverge. This accounts for crashes that occur as a result of high speed differentials between ramp traffic and highway thru traffic and also the merging and weaving of traffic in the travel lanes.

2) At-grade Intersection Limits for a Route 2 major road:

This is the 1st of only 2 Crash Zones at Route 2 at-grade intersections.

Crash Zone 1: The same radius used to determine *Interchange Limits for a Route 2 major road* is applied to the major road. The limits on the major road is the area (zone) of the road within a 1,000 foot radius of the at-grade intersection. This accounts for crashes that occur as a result of high speed differentials between minor street traffic trying to merge into highway thru traffic and the weaving of traffic in the travel lanes. These intersections have very short or non existent acceleration and deceleration lanes. Four are stop controlled on the minor approach and two are signalized (WB flashing). The 1,000 foot radius is also applied to rest area and weigh station area at-grade intersections.

Crash Zone 1 Overlaps:

Crash Zone 1 overlaps occur between several interchanges and at-grade intersections due to their proximity to each other. The overlap areas are a safety issue because they add merging, diverging, and weaving traffic to the safety analysis limits of interchanges and at-grade intersections. The crashes that fall within the overlaps are attributed to only one interchange or at-grade intersection. **Table 2** below provides the locations and the **Figures** in section *II* show where the overlaps occur.

Table 2: Crash Zone 1 Overlaps

Locations (east to west) (E = Exit)
E 35 Interchange (Fig 5) / Rest Area (WB) at-grade intersection / Weight Station (EB) at-grade intersection / E 34 Interchange (Fig 6) / Rte 2 & Rte I 190 Intersection-E 33-E 8 (Rte I190) Interchanges (Fig 7)
Abbott Ave (EB) at-grade intersection (Fig X) / Exit 30 Interchange (EB) (Fig X)
Exit 28 Interchange (WB) (Fig X) / Exit 27 Interchange (WB) (Fig X)
Exit 26 Interchange (EB) (Fig X) / Exit 25 Interchange (EB) (Fig X)
Exit 24 Interchange (Fig X) / Exit 23 Interchange (Fig X)

3) Interchange Limits for a Route 2 interchange access road and ramp intersections:

Crash Zone 2: The radius used to determine intersection crashes is applied.

Interchange Limits for the minor access road and ramp intersections is the area (zone) of the road within a 200 foot radius of the intersections. However, a smaller radius is applied to ramp approaches of several interchanges due to ramps having either a tight radius or inadequate length. In either case, vehicles must reduce speed very rapidly entering the ramp then increase speed very rapidly before merging either with Route 2 or minor road traffic. The radius varies for ramp to ramp. **Table 3** provides the interchanges and the interchange figure numbers which can be seen in section *II*.

Table 3: Interchanges with Different Crash Zone 2 Radii

Interchanges (E) & (Fig #)	Direction	ON Ramp Radius*	Origin of ON Ramp Radius	OFF Ramp Radius*	Origin of OFF Ramp Radius
E 36 (Fig 4)	WB	50	ON Ramp Y Intersection	50	OFF Ramp Y Intersection
E 35 (Fig 5)	EB	85	ON Ramp Y Intersection	85	OFF Ramp Y Intersection
E 35 (Fig 5)	WB	85	ON Ramp Y Intersection	85	OFF Ramp Y Intersection
E 34 (Fig 6)	WB	100	Ramp & Minor Street Intersection		
E 34 (Fig 6)	EB	100	ON Ramp Y Intersection	100	OFF Ramp Y Intersection
E 31 (Fig 9)	WB	150	Ramp & Minor Street Intersection	150	Ramp & Minor Street Intersection
E 31 (Fig 9)	EB	150	Ramp & Minor Street Intersection	150	Ramp & Minor Street Intersection
*in feet					

Crash Zone 2 takes several geometric forms depending on the number of roads involved. The four examples described below are provided to show the diversity of forms this crash zone takes:

- Zones where each on and off ramp is used to direct traffic in one direction only. This forms only one intersection between the ramp and the minor access road where crashes could occur. See Exit 38 which has two intersections for each pair of adjacent on and off ramps.
- Zones where a combined on and off ramp has two-lanes for two-way traffic with no median that directs traffic in two directions for off traffic and one direction for on traffic (see Exit 18). This forms six intersections between the ramp and the minor access road and one intersection where the on and off lanes diverge for a total of seven intersections where crashes could occur.
- Zones where a single lane ramp is used solely as either an on or off ramp that either directs traffic in two directions for off traffic or one direction for on traffic (see Exit 18). This forms three intersections between the ramp and the minor access road where crashes could occur.
- Zones which are similar to those described in the above Zones description but the on and off ramps are side by side each having its own lane separated by a median (see Exit 24). The zone either directs traffic in two directions for off traffic or one direction for on traffic. This forms five intersections between the ramp and the minor access road where crashes could occur.

- 4) At-grade Intersection Limits for a Route 2 minor road:
This is the 2nd of only 2 Crash Zones at Route 2 at-grade intersections.
Crash Zone 2: The radius used to determine intersection crashes is applied to the minor road. Intersection Limits on the minor road is the area (zone) of the road within a 200 foot radius of the intersection.
- 5) **Crash Zone 3:** If applicable, it is the remaining area (zone) of the road on the ramps between the major road (Route 2) and the Crash Zone 2 radii.
- 6) **Crash Zone 4:** If applicable, it is the remaining area (zone) of the road on the travel lanes of the major and minor roads between either the Crash Zone 1 radii or the Crash Zone 2 radii respectively.
- 7) **Undetermined Crash Zone:** This is not a Crash Zone. Crashes are placed in this category if their Crash Zone could not be determined. This situation occurs at interchange grade separations.

Interchange and At-grade Intersection Crash Statistics

This analysis utilizes three MassHighway crash related GIS datalayers to develop the crash statistics. The first and second are the 2003 GIS located crashes and the 2004-2006 GIS located crashes datalayers which are joined to create one datalayer. This joined datalayer provides GIS X and Y coordinate location information for crashes that could be successfully located based on available location information. To develop the crash statistics from the attributes of the datalayer, MRPC staff analyzed the attribute fields that address *Crash Severity*, and *Most Harmful Event* (MHE). *Crash severity* states the types of harm or the most serious outcome of a crash. There are essentially three possible outcomes:

1. **Fatal Injury** crash: Is the worst type of harm that involves at least one fatality or death of a person.
2. **Non-fatal Injury** crash: Is the second worst type of harm that involves at least one injury to a person.
3. **Property Damage Only (PDO)** crash: Is the third worst type of harm that involves damage to property of any type.

The *Equivalent Property Damage Only* (EPDO) crash severity rating system was used to determine an EPDO Total for each interchange or at-grade intersection. EPDO rates a crash based on crash severity that gives one (1) point to a *PDO* crash; five (5) points for a crash involving at least one *Non-fatal Injury*; and ten (10) points to a crash that involves at least one *Fatal Injury*. In other words, one *Fatal Injury* crash equals two *Non-fatal Injury* crashes and ten *PDO* crashes. After determining each crash EPDO rate, the ratings of the crashes for each interchange or at-grade intersection are totaled. A high EPDO total indicates a dangerous interchange or at-grade intersection where crashes have the most severe consequences.

MHE states the worst type of harm that occurs during a crash for each vehicle involved. Some examples include: a crash with - Motor Vehicle in Traffic (MVT); Pedestrian; Wildlife; Work Zone Maintenance Equipment; Tree; Utility/Light/Other Pole; Guardrail; Median Barrier; Embankment. Some other events include: Fire/Explosion; Jackknife.

The third GIS datalayer is the 2005 **Crash Clusters** (which are polygons; a GIS area feature) datalayer that aggregates 2003-2005 crash data that occurs at a location which allows analysts to better evaluate the total crash experience at a location. According to the MassHighway description, the method used to create Crash Clusters is based on the following:

“At the heart of the method ... is a 25 meter (82 feet) fixed search distance (radius) around each crash. In basic terms, this radius controls how far the application will search for adjacent crashes. Using a 25 meter radius, the analysis method found nearby crashes and merged their areas together, thus creating (crash) clusters (which are polygons; a GIS area feature).”

This produces Crash Clusters of various sizes and shapes. However, not all crashes are captured in a Crash Cluster. There are remaining single crashes that occur at a location outside a Crash Cluster. These are called **Non-Cluster crashes**. In this safety analysis Crash Clusters are the primary tool used to identify problem locations within a Crash Zone. Non-Cluster crashes are the secondary tool used to assist in identifying problem locations within a Crash Zone.

Two important decisions were made based on the fact that Crash Clusters are based on 2003-2005 crash data and the safety analysis includes 2006 crash data. First, if a 2006 crash falls within the boundary of a Crash Cluster the crash is included in the analysis of the cluster but a new Crash Cluster is not created. Second, new Crash Clusters were created if at least one 2006 non-cluster crash is located within a 25 meter radius of a 2003-2005 Non-Cluster crash for the purpose of identifying other potential problem locations.

Finally, all crashes that occurred at interchange grade separations are grade-separated and placed in a respective Crash Zone but retain the same Crash Cluster ID designation. Not all crashes could be grade-separated due to a lack of data and the Crash Zone is Undetermined as described above. Crash Clusters and their respective crashes, and Non-Cluster crashes are identified in the figures and tables in section *II*.

II: ACCESS SAFETY CONDITIONS ON ROUTE 2 INTERCHANGES & AT-GRADE INTERSECTIONS

The analyses presented below provide results for each interchange and at-grade intersection that was analyzed. See the *Appendix* for the MHE analysis tables. Contact the MRPC for the traffic count reports that were used to develop the traffic volume information depicted for each location in this study.

Description of Interchange or Intersection Analysis Results Page

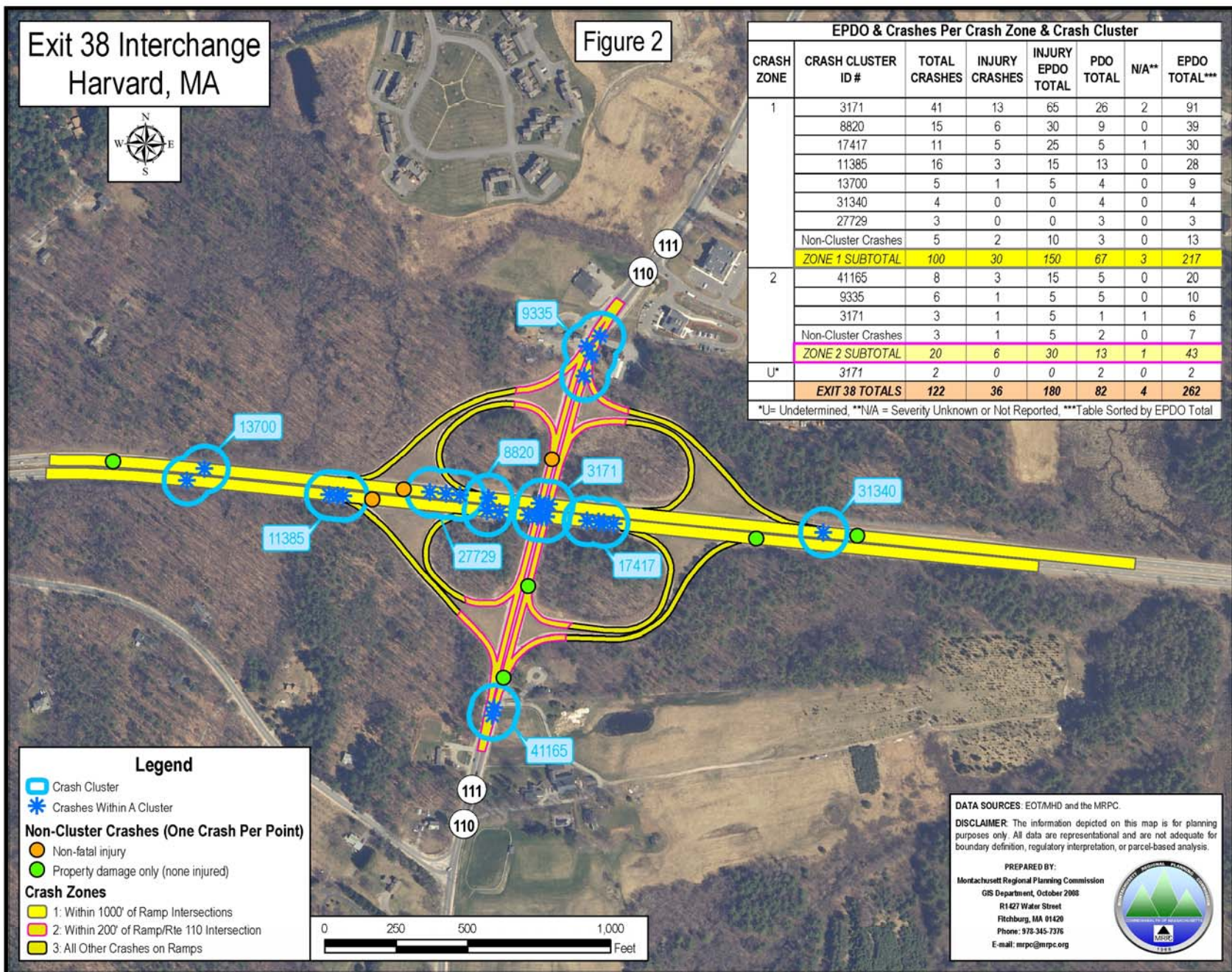
The analysis pages provide the following information for each interchange and intersection:

- Types of traffic control devices.
- Informs reader if a recently completed project changed the geometry which will most likely affect crash occurrence.
- The Phase I Report dangerous location rank.
- Total EPDO results differences between results determined in this study and the Phase 1 Report.
- Percentage non-fatal/fatal injury crashes. Safety is a problem to be addressed if the non-fatal/fatal injury crash percentage is equal to or greater than 30% of the total number of crashes.
- The most dangerous Crash Zone. Safety is a problem to be addressed within a Crash Zone if the Crash Zone EPDO total is equal to or greater than 30% of the Total EPDO.
- The most dangerous Crash Cluster(s) and/or Non-Cluster crashes within the Crash Zone. Safety is a problem to be addressed within a Crash Zone if the Crash Cluster and/or Non-Cluster crashes EPDO total is equal to or greater than 30% of the Total EPDO.
- The Top 3 MHE and significant MHE results.
- Location patterns of Crash Clusters and Non-Cluster crashes within a Crash Zone(s).
- Analysis conclusions, recommendations, and problematic geometric issues.
- Informs reader if a proposed project is in the planning stages.
- Ramp traffic count summaries with peak hours are provided if counts were taken. The ramps are ranked using the following method:

Ramp Peak Traffic Count Rank
1 (peak)
2
3
4

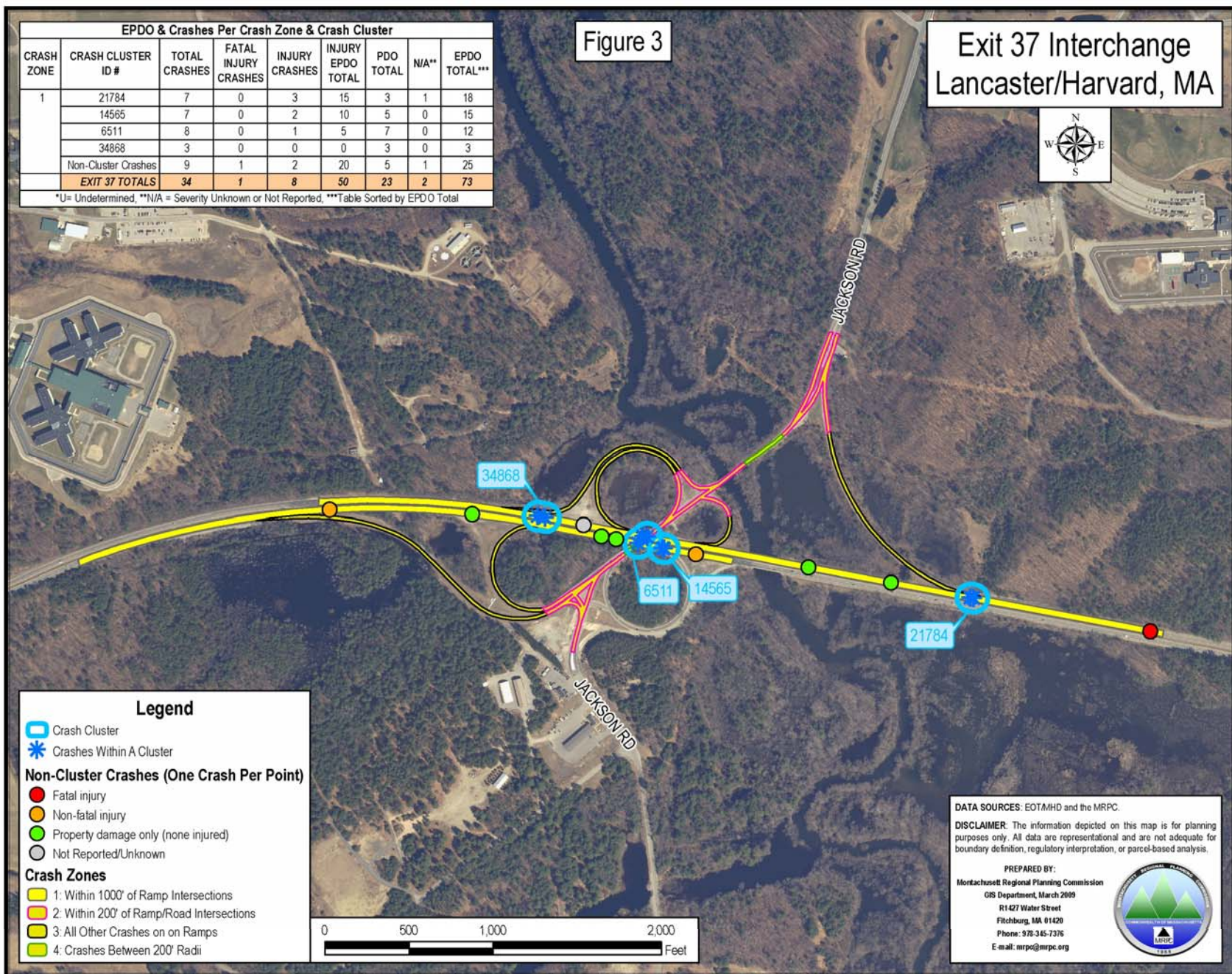
Exit 38 Interchange Access Safety Analysis Results (see Figure 2 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	262
	Phase I Report EPDO Total:	231
	Phase I Report Region Rank:	4th
	EPDO Total difference:	31 points or 13%
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	122
	Number of Injury Crashes:	36 (no fatal injury)
	Percent of Total Crashes:	30%
	Total Fatal & Injury Percentage of Total Crashes:	30%
	Percentage Significant?*	Yes
D	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	217
	Percentage of Interchange EPDO Total:	83%
	Percentage Significant?*	Yes
E	EPDO Total of Clusters 3171, 8820, 17417, 11385, 31340, & 27729:	195
	EPDO Total of 4 Nearby Non-Cluster Crashes:	12
	Combined EPDO Total:	207
	Percentage of Interchange EPDO Total:	79%
	Percentage Significant?*	Yes
F	EPDO Total of Crash Zone 2 Clusters 41165, 9335, & 3171:	36
	EPDO Total of 3 Nearby Non-Cluster Crashes:	7
	Combined EPDO Total:	43
	Percentage of Interchange EPDO Total:	16%
	Percentage Significant?*	No
G	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	41% 42%
	2. Guardrail:	25% 31%
	3. Rollover:	3% 8%
	Total:	69% 81%
	All others Total:	31% 19%
	Most Significant Results: Crash Zone 1 accounts for 80% of the Top 3 MHE.	
H	Location Patterns of Crash Clusters:	
Zone 1:	Clusters 3171, 8820, 17417 are located between inner loops.	
	Clusters 11385, 31340, 27729 are located at deceleration lanes.	
	Cluster 13700 is located approximately 500 feet west of acceleration/deceleration lanes.	
Zone 2:	Clusters 41165, 9335, & 3171 are located at ramp and Route 110/111 intersections.	
I	Location Patterns of Non-cluster Crashes:	
Zone 1:	4 crashes are located at acceleration or deceleration lanes.	
	1 crash is located approximately 750 feet away from an acceleration lane.	
Zone 2:	3 crashes are located at ramp and Route 110/111 intersections.	
J	Analysis Conclusions & Recommendation:	
	The results of the analysis indicate that 79% of the EPDO Total occurred in between and at the outer accel/decel lanes. These are locations where vehicles are at the highest speed differentials and where merging and weaving take place.	
	Recommend Further Study of the following to improve safety	
	The highest priority locations are at & in between the outer accel/decel lanes of the WB & EB lanes in Crash Zone 1.	
	The second highest priority locations are the Ramp & Rte 110/111 intersections that includes Clusters 41165 & 9335.	
K	Ramp Traffic Counts Summary:	
	All Ramps Total: 13,269. Directional Split: WestBound (WB) 50%, EastBound (EB) 50%	
	Peak Hours & Rank (in red) & (Vehicle Count)	Total Veh** & Rank
WB:	AM: 2 On Ramps: 7:15 (65), 9:00 (144) / 2 Off Ramps: 3) 7:30 (219) , 9:15 (35)	4) 463
	PM: 2 On Ramps: 4:45 (270), 5:15 (99) / 2 Off Ramps: 1) 4:30 (313) , 5:00 (83)	1) 765
EB:	AM: 2 On Ramps: 7:15 (73), 2) 8:30 (299) / 2 Off Ramps: 6:30 (249), 7:30 (125)	2) 746
	PM: 2 On Ramps: 4:00 (42), 4) 4:00 (196) / 2 Off Ramps: 2:00 (177), 2:45 (63)	3) 478
	*30% & higher considered significant in this analysis.	**Vehicles



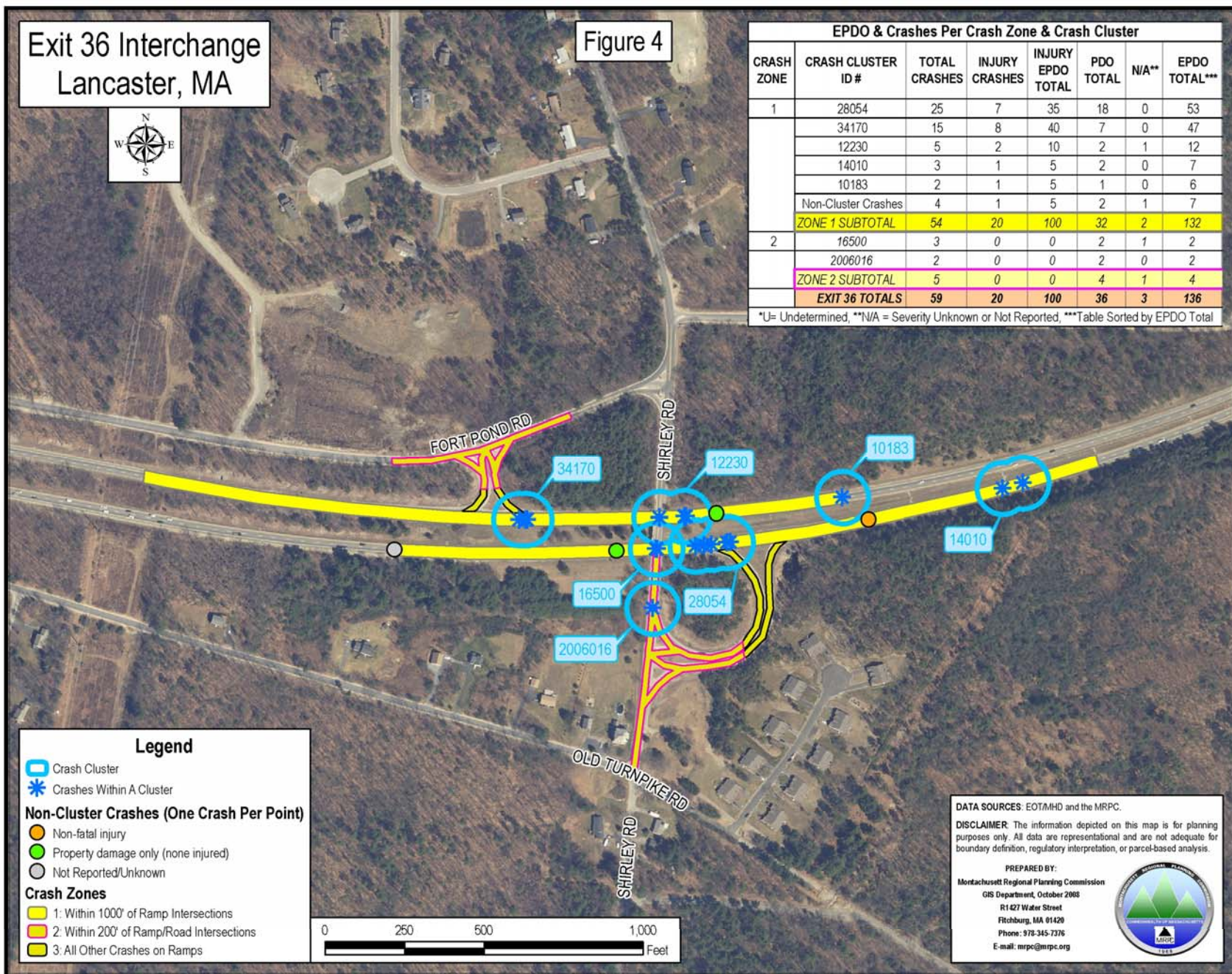
Exit 37 Interchange Access Safety Analysis Results (see Figure 3 & Appendix)

A	Type of Control: On Ramps: YIELD	
B	Project Update (Project # 601839) for this Interchange Concurrent to the years of this analysis, MassHighway undertook and completed major geometric improvements to this interchange. Due to this situation the locations of, and the characteristics of, crashes at this interchange may change significantly. Monitoring the crash conditions should be the focus over at least the next 3 years to see how crashes are affected. The Crash Zones in Figure 3 show the new design. The partial analysis below describes the crash conditions during the construction period. No <i>Most Harmful Events</i> analysis was undertaken.	
C	Interchange EPDO Total: 73 Phase I Report EPDO Total: 87 Phase I Report Region Rank: 32nd EPDO Total difference (if less ()): (14) points or (16%) EPDO Total & Rank Significant? Yes	
D	Interchange Total Crashes: 34 Number of Fatal Crashes: 1 Percent of Total Crashes: 2.9% Number of Injury Crashes: 8 Percent of Total Crashes: 23.5% Total Fatal & Injury Percentage of Total Crashes: 26.5% Percentage Significant?* No	
E	Most Dangerous Crash Zone: Zone 1 EPDO Total: 73 Percentage of Interchange EPDO Total: 100.0% Percentage Significant?* Yes	
F	EPDO Total of WB Clusters 21784, 6511WB, & 34868: 31 EPDO Total of 4 WB Non-Cluster Crashes: 12 Combined EPDO Total: 43 Percentage of Interchange EPDO Total: 58.9% Percentage Significant?* Yes	
G	EPDO Total of EB Clusters 14565 & 6511EB: 17 EPDO Total of 4 EB Non-Cluster Crashes: 8 Combined EPDO Total: 25 Percentage of Interchange EPDO Total: 34.2% Percentage Significant?* Yes	
H	Location Patterns of Crash Clusters: Zone 1: Clusters 21784, 6511WB, 34868 are located approximately within 2,650 feet of each other focused on accel/decel lanes. Clusters 14565 & 6511EB are located approximately within a 750 foot radius of the eliminated EB accel lane & overlap.	
I	Location Patterns of Non-cluster Crashes: Zone 1: 4 WB crashes are located within approximately within a 925 foot radius of accel/decel lanes. 4 EB crashes located approximately within a 930 foot radius of the EB accel lane.	
J	Analysis Recommendation Recommend monitoring the crash situation at this interchange as discussed in section B above.	
K	Traffic Counts Summary for New Ramp Geometry: All Ramps Total**: 12,897. Directional Split: WB 50%, EB 50% <div>***One WB ON Ramp not available (n/a)</div>	
	Peak Hours & Rank (in red) & (Vehicle Count)	Total Veh** & Rank
WB:	AM: 2 On Ramps: 9:30 (199), n/a (n/a) / 2 Off Ramps: 6:45 (35), 3) 8:30 (416)	3) 650
	PM: 2 On Ramps: 2) 4:15 (747) , n/a (n/a) / 2 Off Ramps: 2:30 (11), 4:30 (132)	2) 890
EB:	AM: 1 On Ramp: 8:30 (155) / 1 Off Ramp: 1) 7:15 (796)	1) 951
	PM: 1 On Ramp: 4:30 (270) / 1 Off Ramp: 4) 2:00 (274)	4) 544
	*30% & higher considered significant in this analysis. **Vehicles	



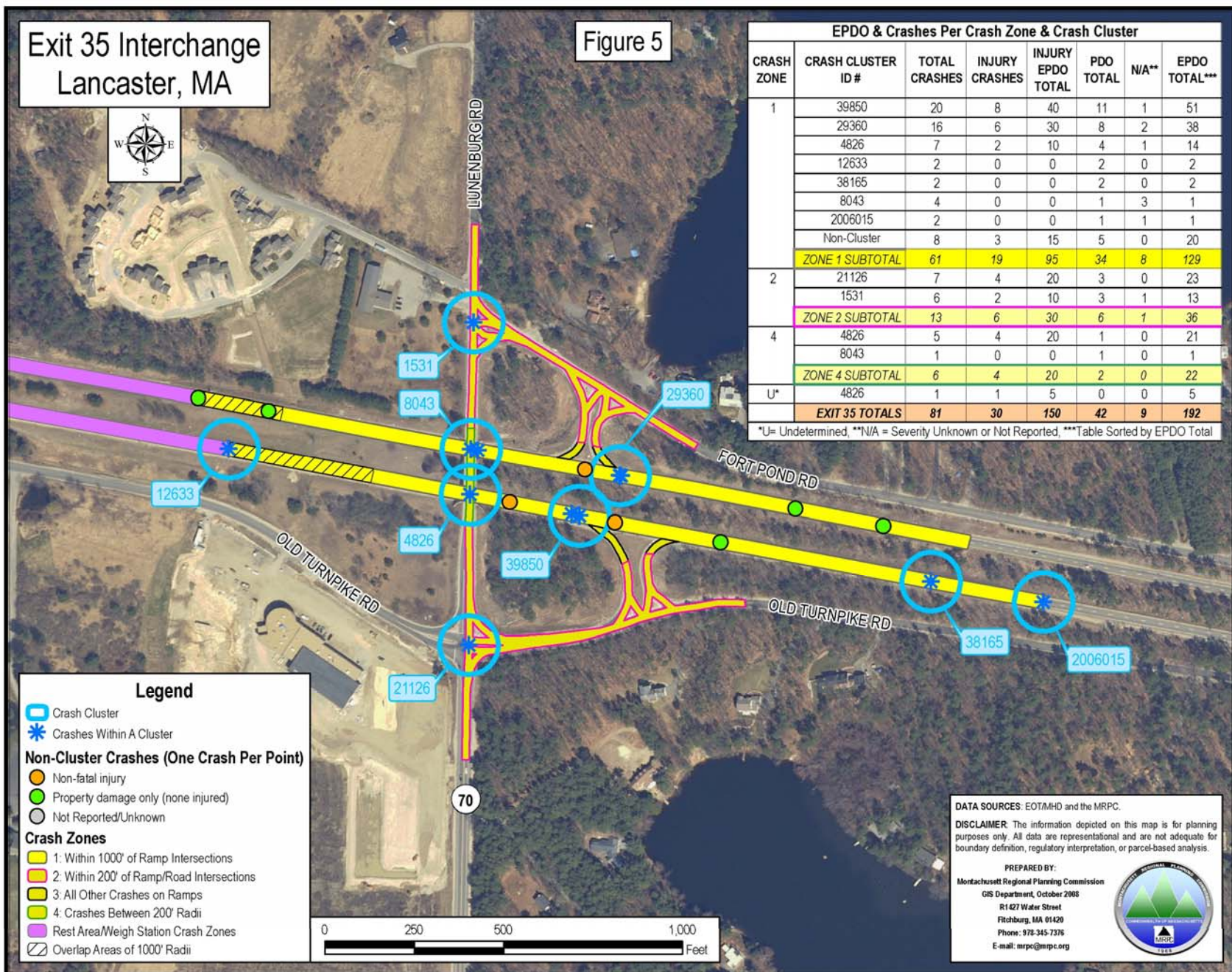
Exit 36 Interchange Access Safety Analysis Results (see Figure 4 & Appendix)

A	Type of Control: On Ramps: YIELD, STOP		
B	Interchange EPDO Total:	136	
	Phase I Report EPDO Total:	133	
	Phase I Report Region Rank:	16th	
	EPDO Total difference (if less ()):	3 points or 2.3%	
	EPDO Total & Rank Significant?		Yes
C	Interchange Total Crashes:	59	
	Number of Injury Crashes:	20	(no fatal injury)
	Percent of Total Crashes:	34%	
	Total Fatal & Injury Percentage of Total Crashes:	34%	
	Percentage Significant?*		Yes
D	Most Dangerous Crash Zone:	Zone 1	
	EPDO Total:	132	
	Percentage of Interchange EPDO Total:	97.1%	
	Percentage Significant?*		Yes
E	EPDO Total of Clusters 28054 & 14010:	60	
	EPDO Total of 2 Nearby Non-Cluster Crashes:	6	
	Combined EPDO Total:	66	
	Percentage of Interchange EPDO Total:	48.5%	
	Percentage Significant?*		Yes
F	EPDO Total of Clusters 34170, 12230, & 10183:	65	
	EPDO Total of 1 Nearby Non-Cluster Crash:	1	
	Combined EPDO Total:	66	
	Percentage of Interchange EPDO Total:	48.5%	
	Percentage Significant?*		Yes
G	Top 3 Most Harmful Events (MHE):		
		% of Total Crashes:	% of Injury Crashes:
	1. Motor Vehicle in Traffic:	46%	35%
	2. Guardrail:	10%	10%
	3. Median Barrier:	7%	5%
	Total:	63%	50%
	All others Total:	37%	50%
	Most Significant Results: Crash Zone 1 accounts for 94% of the Top 3 MHE.		
H	Location Patterns of Crash Clusters:		
Zone 1:	Clusters 28054 & 14010 are located at the EB accel/decel lanes.		
	Clusters 34170, 12230, & 10183 are located at the WB decel lane.		
	Cluster 14010 is located approximately 890 feet east of an acceleration lane.		
I	Location Patterns of Non-cluster Crashes:		
Zone 1:	2 crashes are near EB Crash Clusters. 1 crash is near a WB Crash Cluster.		
J	Analysis Conclusions & Recommendation:		
	The analysis results indicate that 48.5% of the EPDO Total occurred approximately within 990 Feet of the WB decel lane.		
	Also, 48.5% of the EPDO Total occurred approximately within a 760 Foot radius of the EB accel & decel lanes.		
	These are locations where vehicles are at the highest speed differentials and where merging and weaving take place.		
	Geometric Issues:		
	Fort Pond Road ramps are short and appear to be insufficient for the speed vehicles are traveling.		
	The length & width of all acceleration & deceleration lanes appear to be insufficient to allow proper merging and weaving.		
	Recommend Further Study of the following to improve safety		
	The highest priority locations are the WB decel and EB accel/decel lanes.		
K	Ramp Traffic Counts Summary:		
	All Ramps Total: 6,142. Directional Split: WB 49%, EB 51%		
	Peak Hours & Rank (in red) & (Vehicle Count)		Total Veh** & Rank
WB:	AM: 1 On Ramp: 3) 7:30 (188) / 1 Off Ramp: 6:45 (89)		4) 277
	PM: 1 On Ramp: 1) 3:15 (282) / 1 Off Ramp: 5:15 (139)		1) 421
EB:	AM: 1 On Ramp: 7:30 (165) / 1 Off Ramp: 2) 7:00 (209)		2) 374
	PM: 1 On Ramp: 3:30 (102) / 1 Off Ramp: 3) 2:30 (188)		3) 290
	*30% & higher considered significant in this analysis.		**Vehicles



Exit 35 Interchange Access Safety Analysis Results (see Figure 5 & Appendix)

A	Type of Control:	On Ramps: STOP
B	Interchange EPDO Total:	192
	Phase I Report EPDO Total:	234
	Phase I Report Region Rank:	13th
	EPDO Total difference (if less: ()):	(42) points or (18%)
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	81
	Number of Injury Crashes:	30 (no fatal injury)
	Percent of Total Crashes:	37%
	Total Fatal & Injury Percentage of Total Crashes:	37%
	Percentage Significant?*	Yes
D	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	129
	Percentage of Interchange EPDO Total:	67.2%
	Percentage Significant?*	Yes
E	EPDO Total of Clusters 39850, 4826, 12633, 38165, & 200615:	70
	EPDO Total of 3 Non-Cluster Crashes:	11
	Combined EPDO Total:	81
	Percentage of Interchange EPDO Total:	42.2%
	Percentage Significant?*	Yes
F	EPDO Total of Clusters 29360 & 8043:	39
	EPDO Total of 5 Nearby Non-Cluster Crashes:	9
	Combined EPDO Total:	48
	Percentage of Interchange EPDO Total:	25.0%
	Percentage Significant?*	No
G	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	52% 60%
	2. Not Reported:	27% 20%
	3. Guardrail:	16% 10%
	Total for # 1 & #3:	68% 70%
	All others Total:	32% 30%
	Most Significant Results: Crash Zone 1 accounts for 82% of the #1 & #3 Top 3 MHE.	
H	Location Patterns of Crash Clusters:	
	Zone 1: All EB Clusters are located approximately within a 990 foot radius of accel/decel lanes.	
I	Location Patterns of Non-cluster Crashes:	
	Zone 1: 3 crashes are located in the EB lane.	
J	Analysis Conclusions & Recommendation:	
	The results indicate that 42% of the EPDO Total occurred within a 1,000 foot radius of the EB accel/decel lanes. These are locations where vehicles are at the highest speed differentials and where merging and weaving take place.	
	Geometric & Signage Issues:	
	All ramps are short and appear to be insufficient for the speed vehicles are traveling.	
	ON ramps are STOP controlled which adds to the difficulty of vehicles attempting to enter the traffic stream.	
	The length & width of all acceleration & deceleration lanes appear to be insufficient to allow proper merging and weaving.	
	Recommend Further Study of the following to improve safety	
	The highest priority locations are the EB accel/decel lanes.	
	The second highest priority locations are the WB accel/decel lanes.	
	Exit 35 Interchange Project Info:	
	A project for the intersection of Route 70 & Old Union Turnpike (at Cluster 21126) is at 25% design as of 12/2/08.	
K	Ramp Traffic Counts Summary: No traffic counts taken.	
	*30% & higher considered significant in this analysis.	



Exit 34 Interchange Access Safety Analysis Results (see Figure 6 & Appendix)

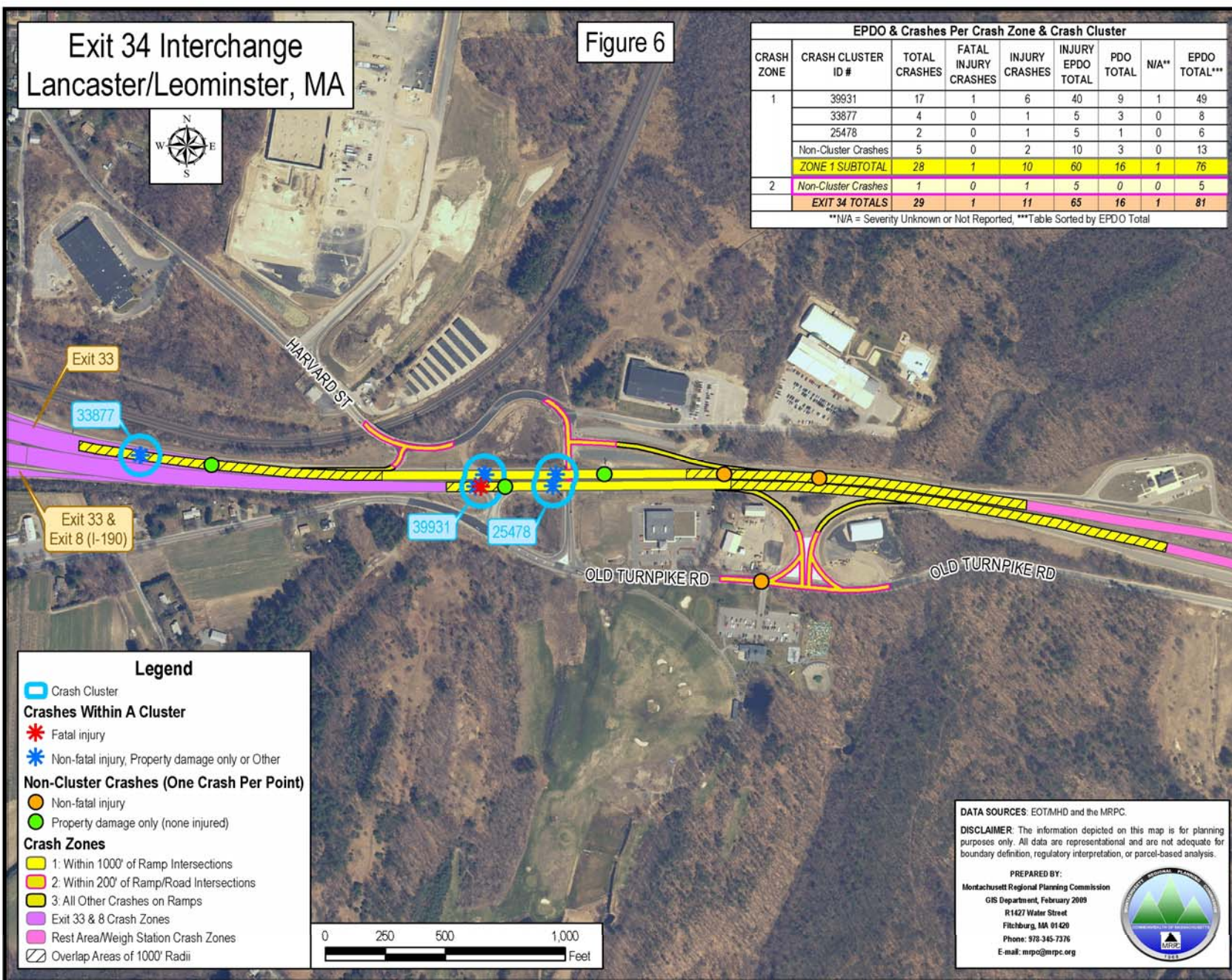
A	Type of Control:	On Ramps: YIELD
B	Project Update (Project # 180514) for this Interchange	
	Concurrent to the years of this analysis, MassHighway undertook and completed major geometric improvements to this interchange. Due to this situation the locations of, and the characteristics of, crashes at this interchange may change significantly. Monitoring the crash situation should be the focus over at least the next 3 years to see how crashes are affected. The Crash Zones in Figure 6 show the new design. The partial analysis below describes the crash conditions during the construction period. No <i>Most Harmful Events</i> analysis was undertaken.	
C	Interchange EPDO Total:	81
	Phase I Report EPDO Total:	56
	Phase I Report Region Rank:	63rd
	EPDO Total difference (if less ()): 25 points or 45%	
	EPDO Total & Rank Significant?	Yes
D	Interchange Total Crashes:	29
	Number of Fatal Crashes:	1
	Percent of Total Crashes:	3.4%
	Number of Injury Crashes:	11
	Percent of Total Crashes:	37.9%
	Total Fatal & Injury Percentage of Total Crashes:	41.4%
	Percentage Significant?*	Yes
E	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	76
	Percentage of Interchange EPDO Total:	93.8%
	Percentage Significant?*	Yes
F	Most Dangerous Crash Cluster:	39931
	EPDO Total:	49
	Percentage of Interchange EPDO Total:	60.5%
	Percentage Significant?*	Yes
G	Location Patterns of Crash Clusters:	
Zone 1:	Cluster 39931 is located at/near ramp locations that have been removed.	
H	Analysis Conclusions & Recommendation:	
	Cluster 39931 is by far the most dangerous cluster with over 60% of the EPDO Total. However, due to its location as described in section G, and the geometric changes as described in section B, the following is recommended:	
	Recommendation: monitor the crash situation at this interchange as discussed in section B.	
I	Traffic Counts Summary for New Ramp Geometry:	
	All Ramps Total: 10,719. Directional Split: WB 69%, EB 31%	
	Peak Hours & Rank (in red) & (Vehicle Count)	
WB:	AM: 1 On Ramp: 2) 10:45 (317) / 1 Off Ramp: 10:30 (98)	Total Veh** & Rank 2) 415
	PM: 1 On Ramp: 1) 4:45 (478) / 1 Off Ramp: 5:30 (299)	1) 777
EB:	AM: 1 On Ramp: 8:00 (148) / 1 Off Ramp: 3) 10:30 (197)	3) 345
	PM: 1 On Ramp: 1:30 (79) / 1 Off Ramp: 4) 6:00 & 6:15 & 6:45 (each have 154)	4) 233
	*30% & higher considered significant in this analysis.	
	**Vehicles	

Exit 34 Interchange Lancaster/Leominster, MA

Figure 6

EPDO & Crashes Per Crash Zone & Crash Cluster								
CRASH ZONE	CRASH CLUSTER ID #	TOTAL CRASHES	FATAL INJURY CRASHES	INJURY CRASHES	INJURY EPDO TOTAL	PDO TOTAL	N/A**	EPDO TOTAL***
1	39931	17	1	6	40	9	1	49
	33877	4	0	1	5	3	0	8
	25478	2	0	1	5	1	0	6
	Non-Cluster Crashes	5	0	2	10	3	0	13
	ZONE 1 SUBTOTAL	28	1	10	60	16	1	76
2	Non-Cluster Crashes	1	0	1	5	0	0	5
	EXIT 34 TOTALS	29	1	11	65	16	1	81

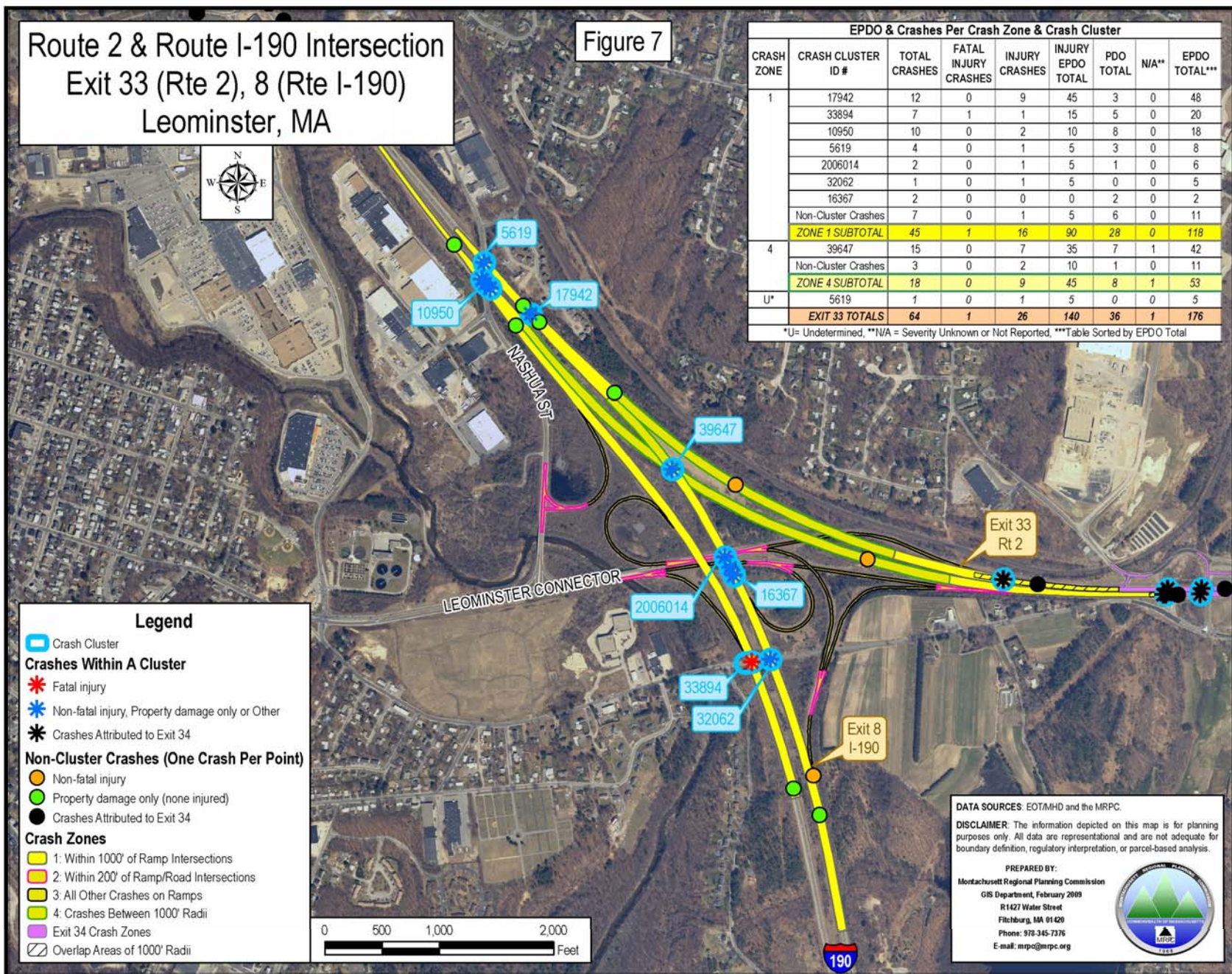
N/A = Severity Unknown or Not Reported, *Table Sorted by EPDO Total



Rte 2 & Rte I-190 Intersection and Exits 33 & 8 (Rte I-190) Interchanges

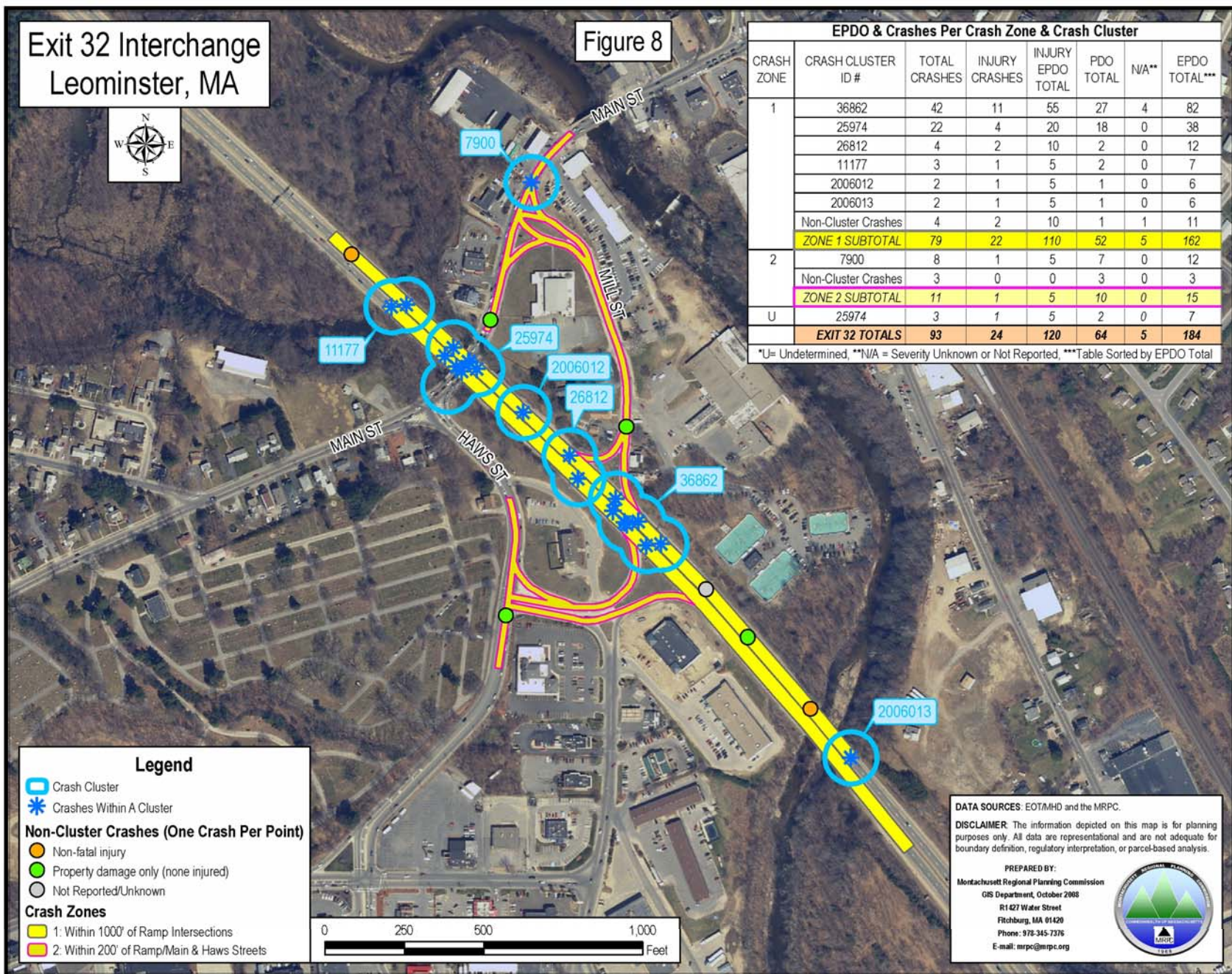
Access Safety Analysis Results (see Figure 7 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	178
	Phase I Report EPDO Total:	206
	Phase I Report Region Rank:	6th
	EPDO Total difference (if less ()): (28) points or (13.6%)	
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	64
	Number of Fatal Crashes:	1
	Percent of Total Crashes:	1.6%
	Number of Injury Crashes:	26
	Percent of Total Crashes:	41%
	Total Fatal & Injury Percentage of Total Crashes:	41%
	Percentage Significant?*	Yes
D	Most Dangerous Crash Zone (CZ):	Zone 1
	EPDO Total:	118
	Percentage of Interchange EPDO Total:	66.3%
	Percentage Significant?*	Yes
E	EPDO Total of Crash Clusters 17942, 5619 (CZ 1):	56
	EPDO Total of 2 Nearby Non-cluster crashes:	2
	Combined EPDO Total:	58
	Percentage of Interchange EPDO Total:	32.6%
	Percentage Significant?*	Yes
F	EPDO Total of Crash Cluster 39647 (CZ 4):	42
	Percentage of Interchange EPDO Total:	23.6%
	Percentage Significant?*	No
G	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	41% 37%
	2. Guardrail:	22% 23%
	3. Not Reported:	16% 12%
	Total for #1 & #2:	63% 60%
	All others Total:	37% 40%
	Most Significant Results: CZ 1 accounts for 72.5% of #1 & #2 Top 3 MHE.	
H	Location Patterns of Crash Clusters:	
	Clusters in section E above are approximately within 650 feet of each other and are located on a road segment where Rte 2 & Rte I-190 merge and 4 lanes merge down to 2 lanes.	
	Cluster in section F above is located on the EB road segment under the WB bridge.	
I	Location Patterns of Non-cluster Crashes:	
Zone 1:	2 Non-Cluster crashes are just outside Cluster 17942.	
J	Analysis Conclusions & Recommendation:	
	The results of the analysis indicate that 33% of the EPDO Total occurred in CZ 1 at the Rte 2 & Rte I-190 intersection where	
	where traffic must merge from 4 lanes down to 2 lanes, vehicles weave to change lanes, and vehicle speeds vary.	
	Also, 24% of the EPDO Total occurred in the Rte 2 EB lane near the Rte I-190 bridge that includes Crash Cluster 39647.	
	Combined these two locations account for 56% of the EPDO Total of this intersection/interchange transportation facility.	
	Recommend Further Study of the following to improve safety	
	The highest priority location is the WB Rte 2 & Rte I-190 intersection merge in CZ 1 that includes Clusters 17942 & 5619.	
	The second location is in the Rte 2 EB lane in the area of the Rte I-190 bridge in CZ 4 that includes Cluster 39647.	
K	Ramp Traffic Counts Summary: No traffic counts taken.	
	*30% & higher considered significant in this analysis.	



Exit 32 Interchange Access Safety Analysis Results (see Figure 8 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	184
	Phase I Report EPDO Total:	240
	Phase I Report Region Rank:	2nd
	EPDO Total difference (if less: ()):	(56) points or (23%)
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	93
	Number of Injury Crashes:	24 (no fatal injury)
	Percent of Total Crashes:	26%
	Total Fatal & Injury Percentage of Total Crashes:	26%
	Percentage Significant?*	No
D	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	162
	Percentage of Interchange EPDO Total:	88.0%
	Percentage Significant?*	Yes
E	Most Dangerous Crash Cluster:	36862
	EPDO Total:	82
	Percentage of Interchange EPDO Total:	44.6%
	Percentage Significant?*	Yes
F	Nearby or Overlapping Crash Clusters:	25974, 26812, 11177, 2006012, 200613
	EPDO Total:	69
	EPDO Total of 3 Non-Cluster Crashes:	11
	Combined EPDO Total:	80
	Percentage of Interchange EPDO Total:	37.5%
	Percentage Significant?*	Yes
H	Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	52% 54%
	All others Total:	48.0% 46.0%
	Most Significant Results:	Crash Zone 1 accounts for 77% of the #1 top MHE.
I	Location Patterns of Crash Clusters:	
Zone 1:	Cluster 36862 is located at EB & WB deceleration lanes.	
	Clusters 25974, 26812, 11177, 2006012 are located to the west of Cluster 36862 approximately within 950 feet.	
	Cluster 2006013 is located in the WB lane approximately 900 feet east of Cluster 36862.	
Zone 2:	Cluster 7900 is located at the ramp and Main St intersection north of Rte 2.	
J	Location Patterns of Non-cluster Crashes:	
Zone 1:	All 4 crashes are in the WB lane.	
K	Analysis Conclusions & Recommendation:	
	The results of the analysis indicate that approximately 65% of the Crash Zone 1 EPDO Total occurred within the WB lane.	
	Also, 93% of the Crash Zone 1 EPDO Total occurred at, and west of, the EB decel lane & WB accel/decel lanes.	
	These are locations where vehicles are at the highest speed differentials and where merging and weaving take place.	
	Recommend Further Study of the following to improve safety	
	The highest priority location is the full length of the WB lane, approximately 2,350 feet long.	
	The second highest priority location is the EB lane west of, and including, the EB decel lane, approximately 1,200 feet long.	
L	Ramp Traffic Counts Summary:	
	All Ramps Total: 24,970. Directional Split: WB 37%, EB 63%	
	Peak Hours & (Vehicle Count) & Rank	Total Veh** & Rank
WB:	AM: 1 On Ramp: 4) 11:00 (322) / 1 Off Ramp: 7:15 (227)	4) 549
	PM: 1 On Ramp: 3) 6:00 (534) / 1 Off Ramp: 2:45 (342)	3) 876
EB:	AM: 1 On Ramp: 1) 11:00 (842) / 1 Off Ramp: 10:15 (323)	1) 1,165
	PM: 1 On Ramp: 2) 12:30 (783) / 1 Off Ramp: 1:30 (341)	2) 1,124
	*30% & higher considered significant in this analysis.	
	**Vehicles	



Exit 31 Interchange Access Safety Analysis Results. (see Figure 9 & Appendix)

A	Type of Control:	On Ramps: STOP, YIELD
B	Interchange EPDO Total:	327
	Phase I Report EPDO Total:	384
	Phase I Report Region Rank:	1st
	EPDO Total difference (if less: ()):	(57) points or (15%)
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	161
	Number of Injury Crashes:	45 (no fatal injury)
	Percent of Total Crashes:	28%
	Total Fatal & Injury Percentage of Total Crashes:	28%
	Percentage Significant?*	No
D	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	281
	Percentage of Interchange EPDO Total:	85.9%
	Percentage Significant?	Yes
E	Most Dangerous Crash Cluster:	3399
	EPDO Total:	204
	Percentage of Interchange EPDO Total:	62.4%
	Percentage Significant?*	Yes
F	Nearby Crash Clusters:	4722, 10691, 13954
	EPDO Total:	73
	Percentage of Interchange EPDO Total:	22.3%
	Percentage Significant?*	No
G	EPDO Total of sections E & F above:	277
	Percentage of Interchange EPDO Total:	85%
	Percentage Significant?*	Yes
H	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	57% 56%
	2. Not Reported:	29% 29%
	3. Median Barrier:	7% 9%
	Total for #1 & #3:	64% 65%
	All others Total:	36% 35%
	Most Significant Results:	Crash Zone 1 accounts for 81.4% of #1 & #3 Top 3 MHE.
I	Location Patterns of Crash Clusters:	
Zone 1:	86% of the EPDO of Cluster 3399 is located in between the inner loops on Rte 2. Clusters 4722 & 13954 are located at accel/decel lanes. Cluster 10691 is located approximately 350 feet west of a decel lane that includes Cluster 4722. The length of Rte 2 roadway that Clusters 4722, 3399, & 13954 cover is approximately 1,300 feet.	
Zone 2:	3% of the EPDO of Cluster 3399 is located on the SB lane of the Rte 12 bridge.	
Zone 4:	7.6% of the EPDO of Cluster 3399 is located on the NB lane of the Rte 12 bridge.	

(continued next page)

Exit 31 Interchange Access Safety Analysis Results (continued)

J

Analysis Conclusions & Recommendation:

The results of the analysis indicate that 80% of the EPDO Total occurred in between and at the outer accel/decel lanes. These are Crash Zone 1 locations where vehicles are at the highest speed differentials and where merging and weaving take place.

Geometric Issues:

The following 2 major geometric issues combine to create a severe roadway safety hazard at this interchange:

The inner loops are within approximately 300 feet of each other.

A combined steep vertical curve & significant horizontal curve begin at Route 12 heading west.

Recommend Further Study of the following to improve safety

The highest priority location is between & at the outer accel/decel lanes that includes Crash Clusters 3399, 4722, & 13954.

The second highest priority is the Rte 12 bridge over Rte 2 that includes Crash Cluster 3399.

The third highest priority location is the EB deceleration lane that includes Crash Cluster 10691.

Exit 31 Interchange Project Info:

Major improvement projects that include a bridge replacement are being planned for this interchange.

K

Ramp Traffic Counts Summary:

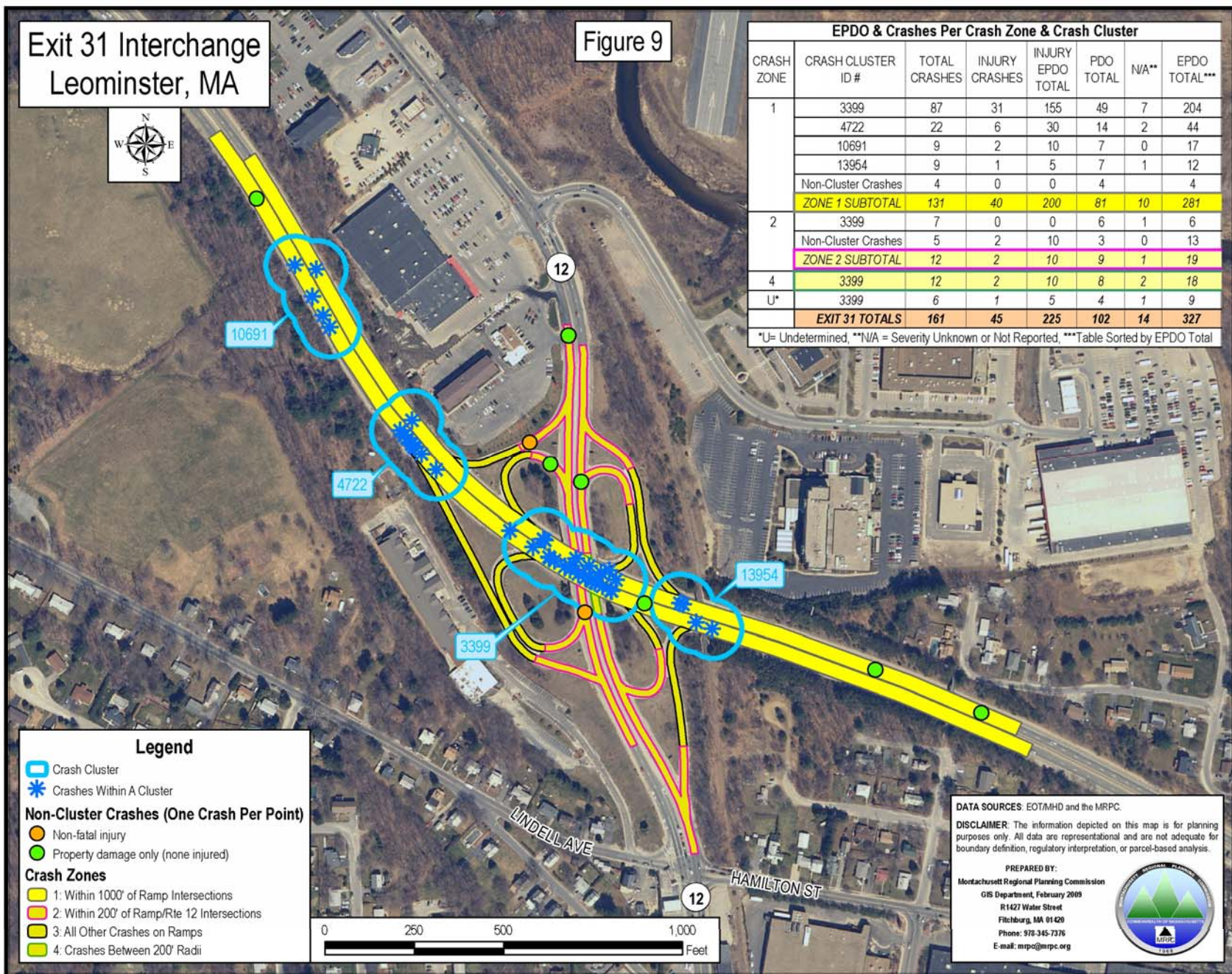
All Ramps Total: 28,613. Directional Split: WB 48.4%, EB 51.6%

Peak Hours & (Vehicle Count) & Rank

		Total Veh** & Rank
WB:	AM: 2 On Ramps: 11:00 (134), 11:00 (117) / 2 Off Ramps: 4) 9:00 (444), 7:00 (162)	4) 857
	PM: 2 On Ramps: 4:00 (289), 5:00 (237) / 2 Off Ramps: 1) 4:00 (620), 5:00 (329)	1) 1,475
EB:	AM: 2 On Ramps: 2) 7:00 (552), 7:00 (215) / 2 Off Ramps: 8:00 (253), 8:00 (180)	2) 1,200
	PM: 2 On Ramps: 3) 3:00 (486), 3:00 (265) / 2 Off Ramps: 2:00 (200), 3:00 (177)	3) 1,128

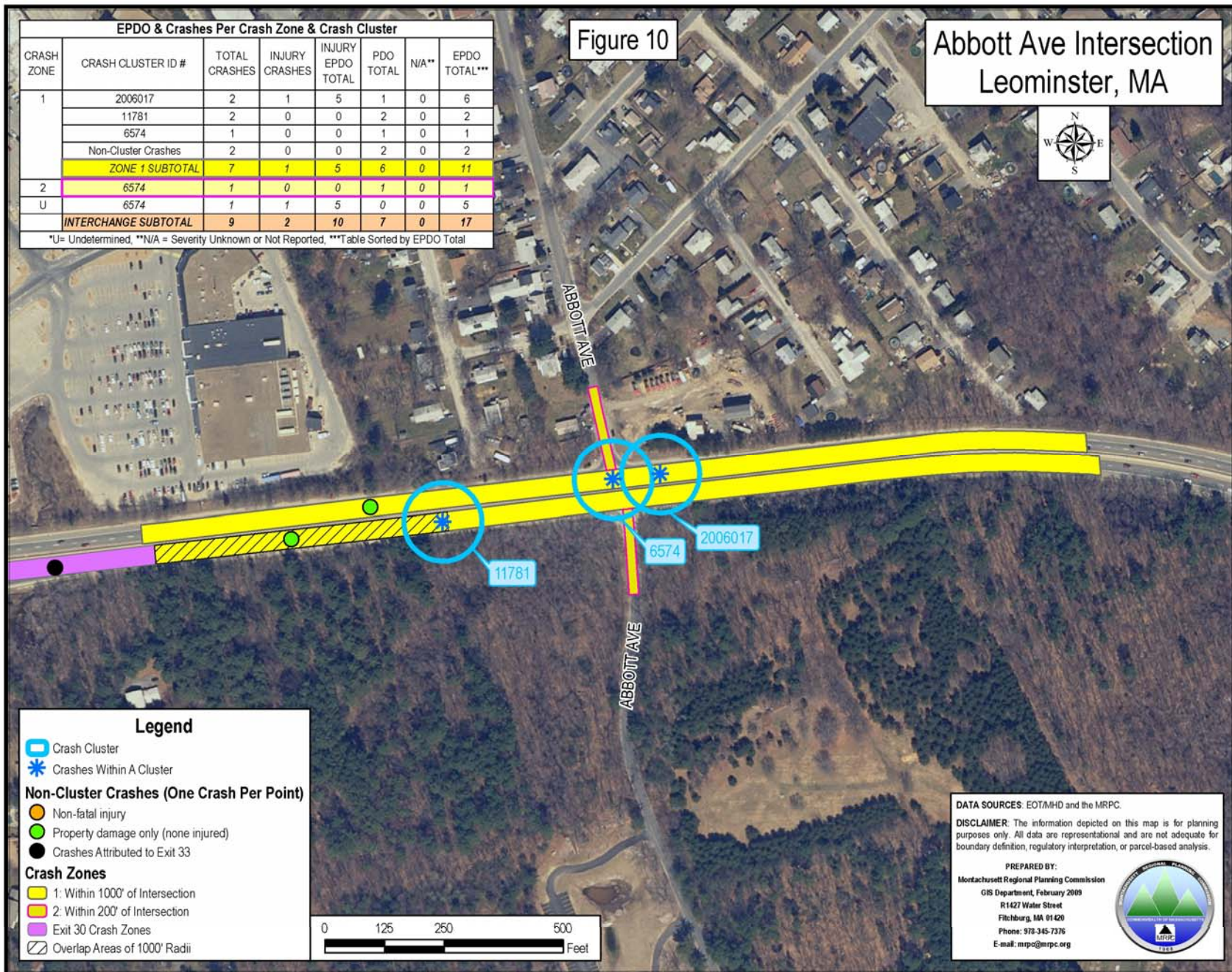
*30% & higher considered significant in this analysis.

**Vehicles



Abbott Ave Intersection Access Safety Analysis Results (see Figure 10 & Appendix)

A	Type of Control:	On Ramps:	Off Ramps:
B	Intersection EPDO Total:	17	
	Phase I Report EPDO Total:	12	
	Phase I Report Region Rank:	not ranked	
	EPDO Total & Rank Significant? No		
	No Most Harmful Events analysis was undertaken.		
C	Analysis Conclusions & Recommendation:		
	No significant existing safety problems.		
	Recommendation: Monitor the crash situation at this intersection		
D	Minor Street Traffic Counts Summary: No traffic counts taken.		



Exit 30 Interchange Access Safety Analysis Results. (see Figure 11 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	185
	Phase I Report EPDO Total***:	80 (Fitchburg), 80 (Leominster)
	Combined EPDO Total:	160
	Phase I Report Region Rank:	36th (Leominster), 37th (Fitchburg)
	Proposed Revision of Phase I Report Region Rank:	15th (if ranked based on combined total)
	EPDO Total Difference:	25 points or 15.6%
	EPDO Total & Rank Significant? Yes	
C	Interchange Total Crashes:	110
	Number of Injury Crashes:	21 (no fatal injury)
	Percent of Total Crashes:	19%
	Percentage Significant?* No	
D	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	91
	Percentage of Interchange EPDO Total:	49.2%
	Most Dangerous Crash Cluster in Crash Zone 1:	18804 (see EB decel lane)
	EPDO Total of Cluster:	33
	EPDO Total of Crash Cluster 32391EB & EB Non-Cluster crashes:	28
	Combined EPDO Total:	61
	Percentage of Interchange EPDO Total:	33.0% (EB decel lane)
	Crash Cluster:	7984 (see WB decel lane)
	EPDO Total of Cluster:	19
	EPDO Total of Nearby Cluster 32391WB & WB Non-Cluster Crashes:	11
	Combined EPDO Total:	30
	Percentage of Interchange EPDO Total:	16.2%
	Percentage Significant for Either Location?* Yes (EB decel lane)	
E1 & 2	Analysis of Contiguous Crash Zones (CZ(s)) 2 & 4	
	Most Dangerous Crash Cluster:	24566 (in Crash Zone 2)
	EPDO Total of Cluster:	52
E2	Contiguous/Overlapping/Nearby Clusters & Non-Cluster Crashes:	EPDO Subtotal:
	CZ 2: 24566, 2006010, 15303 (partial). CZ 4: 32391, 15303 (partial):	83
	Nearby Clusters in CZ 2: 2006011 & 8042. And 2 Non-Cluster Crashes:	8
	Combined EPDO Total:	91
	Percentage of Interchange EPDO Total:	49.2%
	Percentage Significant?* Yes	
F	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	62% 62%
	2. Not Reported:	16% 19%
	3. Median Barrier:	9% 5%
	Total for #1 & #3:	71% 67%
	All others Total:	29% 33%
	Most Significant Results: Crash Zones 2 & 4 accounts for 70.5% of #1 & #3 Top 3 MHE.	
G	Location Patterns of Crash Clusters:	
Zones: 2 & 4	The location of the group of Clusters described in section E2 above begin at the ramp & Whalon St intersection and ends at the ramp & Merriam Ave intersection. 53% of the EPDO Total for Cluster 32391 belongs to Merriam Ave bridge area.	
	The length of this location is approximately 1,400 feet.	
Zone 1:	Cluster 32391 is approximately 350 feet west & east of Clusters 18804 & 7984 that are located at decel lanes.	
H	Location Patterns of Non-cluster Crashes:	
Zone 1:	10 are approximately within a 1,000 foot radius of EB & WB accel/decel lanes.	
Zone 2:	2 are among Crash Clusters.	

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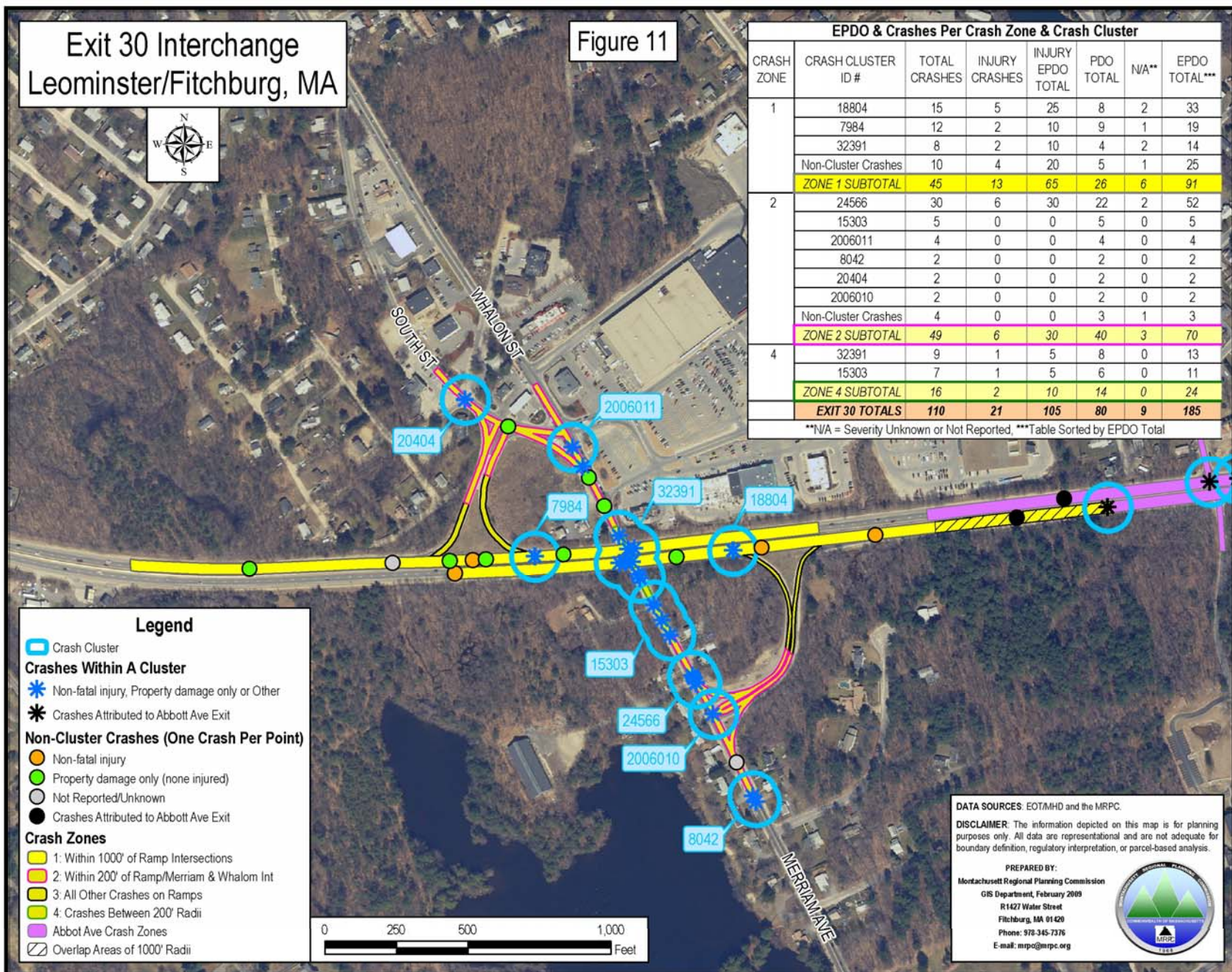
Exit 30 Interchange Access Safety Analysis Results (continued)

I	Analysis Conclusions & Recommendation: <p>The results of the analysis indicate that 49% of the EPDO Total occurred in Crash Zones 2 & 4.</p> <p>Recommend Further Study of the following to improve safety</p> <p>The 1,400 foot section of roadway that falls within CZs 2 & 4 is the highest priority location.</p> <p>The second highest priority location is the CZ 1 EB decel/accel lanes that includes Crash Clusters 18804 & 32391EB.</p> <p>The third highest priority location is the CZ 1 WB decel/accel lanes that includes Crash Clusters 7984 & 32391WB.</p>														
J	Ramp Traffic Counts Summary: <p>All Ramps Total: 19,178. Directional Split: WB 44%, EB 56%</p> <table> <tr> <th></th><th>Peak Hours (red) & (Vehicle Count) & Rank</th><th>Total Veh** & Rank</th></tr> <tr> <td rowspan="2">WB:</td><td>AM: 1 On Ramp: 4) 8:30 (229) / 1 Off Ramp: 8:30 (224)</td><td>4) 453</td></tr> <tr> <td>PM: 1 On Ramp: 2) 5:15 (467) / 1 Off Ramp: 5:45 (405)</td><td>2) 872</td></tr> <tr> <td rowspan="2">EB:</td><td>AM: 1 On Ramp: 1) 8:15 (805) / 1 Off Ramp: 8:45 (295)</td><td>1) 1,100</td></tr> <tr> <td>PM: 1 On Ramp: 3) 2:45 (455) / 1 Off Ramp: 12:45 (246)</td><td>3) 701</td></tr> </table> <p>*30% & higher considered significant in this analysis.</p> <p>***In Phase I Report, Interchange is separated in 2 analysis sections divided by City boundary.</p>			Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank	WB:	AM: 1 On Ramp: 4) 8:30 (229) / 1 Off Ramp: 8:30 (224)	4) 453	PM: 1 On Ramp: 2) 5:15 (467) / 1 Off Ramp: 5:45 (405)	2) 872	EB:	AM: 1 On Ramp: 1) 8:15 (805) / 1 Off Ramp: 8:45 (295)	1) 1,100	PM: 1 On Ramp: 3) 2:45 (455) / 1 Off Ramp: 12:45 (246)	3) 701
	Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank													
WB:	AM: 1 On Ramp: 4) 8:30 (229) / 1 Off Ramp: 8:30 (224)	4) 453													
	PM: 1 On Ramp: 2) 5:15 (467) / 1 Off Ramp: 5:45 (405)	2) 872													
EB:	AM: 1 On Ramp: 1) 8:15 (805) / 1 Off Ramp: 8:45 (295)	1) 1,100													
	PM: 1 On Ramp: 3) 2:45 (455) / 1 Off Ramp: 12:45 (246)	3) 701													

**Vehicles

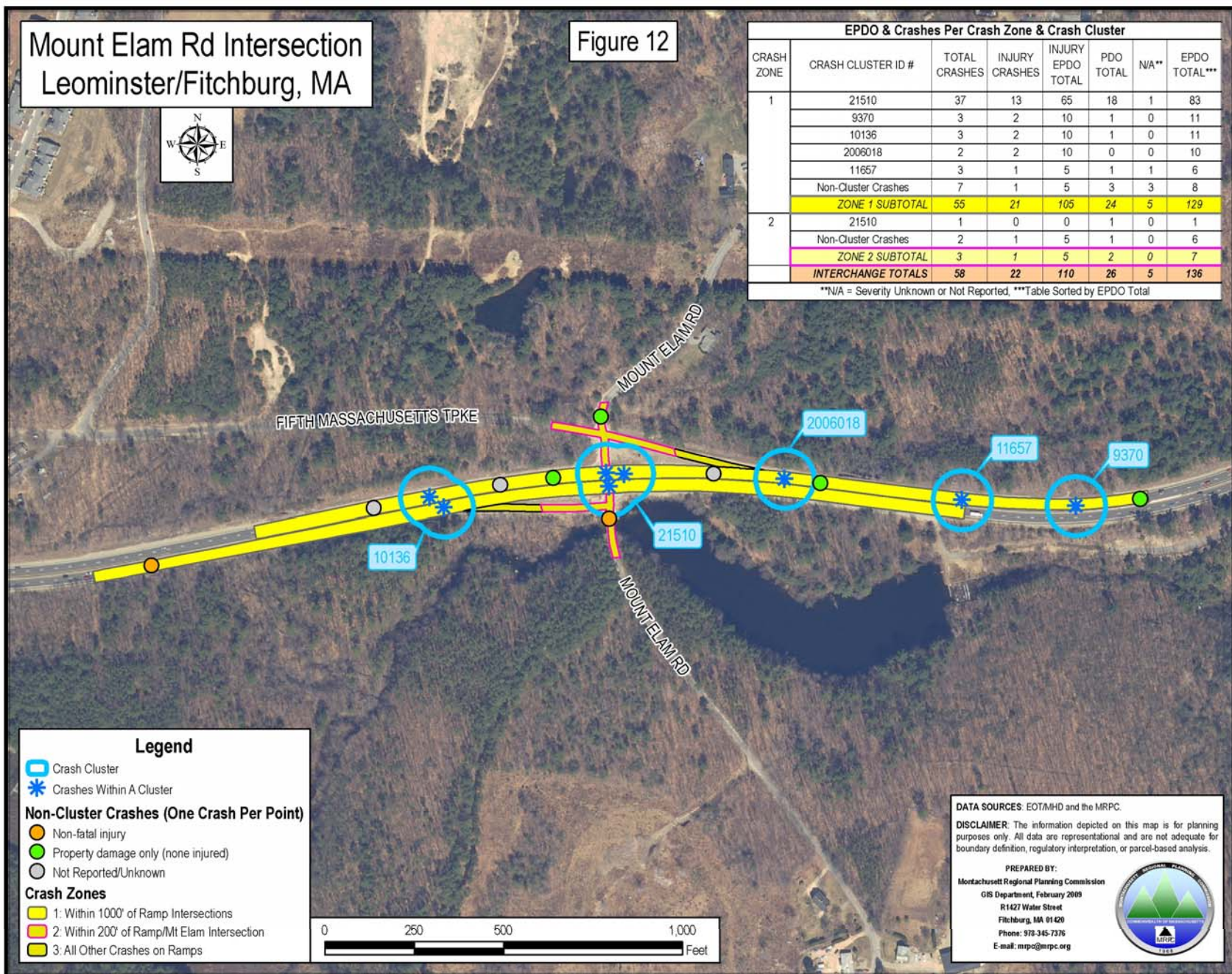
Exit 30 Interchange Leominster/Fitchburg, MA

Figure 11



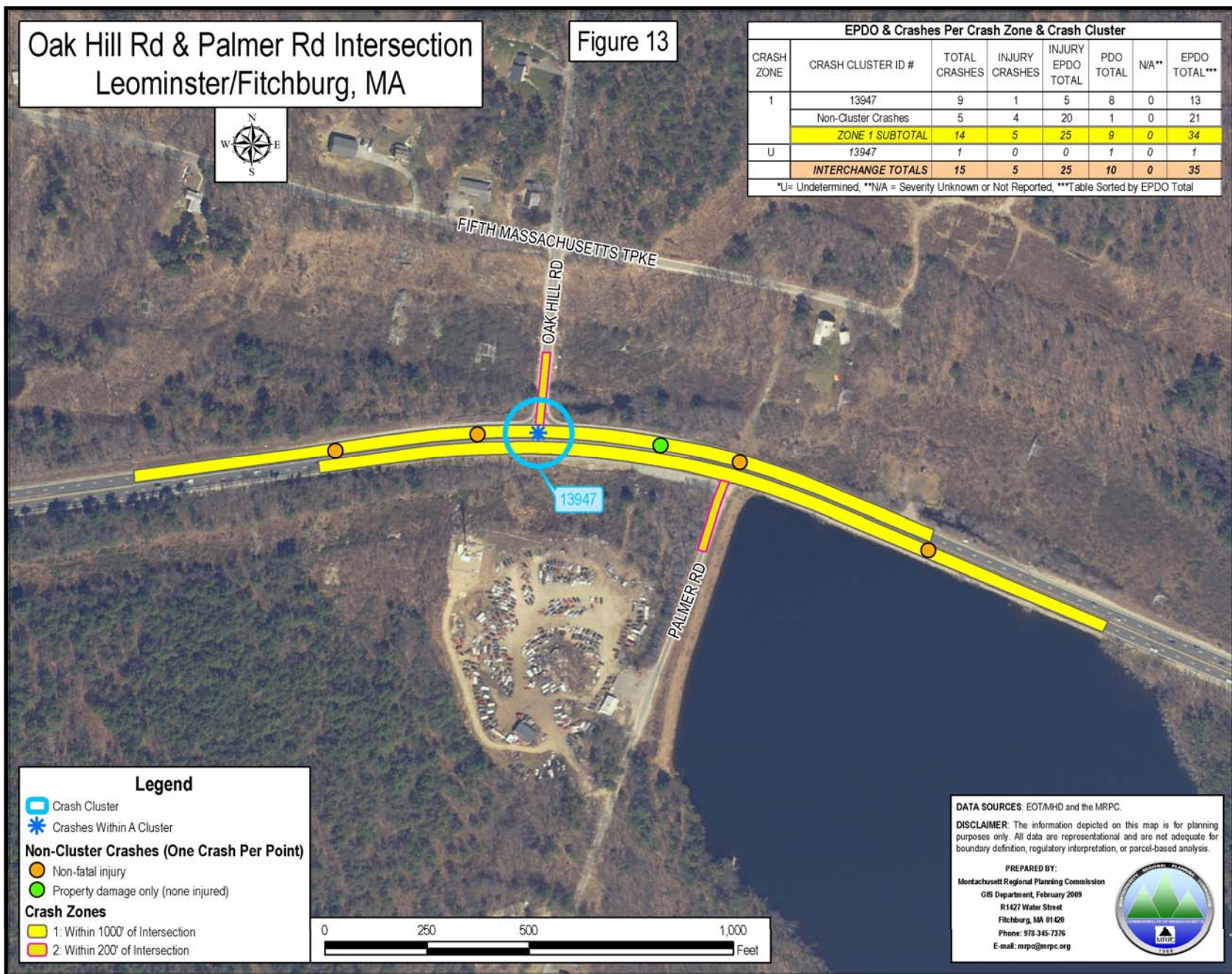
Mt Elam Rd Intersection Access Safety Analysis Results (see Fig 12 & Appendix)

A	Type of Control: EB Signalized, WB Flashing Lights		
B	Interchange EPDO Total:	136	
	Phase I Report EPDO Total:	119	
	Phase I Report Region Rank:	17th	
	EPDO Total Difference:	17 points or 14.3%	
	EPDO Total & Rank Significant?	Yes	
C	Intersection Total Crashes:	58	
	Number of Injury Crashes:	22	(no fatal injury)
	Percent of Total Crashes:	38%	
	Total Fatal & Injury Percentage of Total Crashes:	38%	
	Percentage Significant?*	Yes	
D	Most Dangerous Crash Zone:	Zone 1	
	EPDO Total:	129	
	Percentage of Interchange EPDO Total:	94.9%	
	Percentage Significant?	Yes	
E	Most Dangerous Crash Cluster:	21510	
	EPDO Total:	83	
	Percentage of Interchange EPDO Total:	61.0%	
	Percentage Significant?*	Yes	
F	Top 3 Most Harmful Events (MHE):	% of Total Crashes:	% of Injury Crashes:
	1. Motor Vehicle in Traffic:	36%	45%
	2. Not reported:	26%	14%
	3. Guardrail:	16%	23%
	Total for # 1 & #3:	52%	68%
	All others Total:	48%	32%
	Most Significant Results: Crash Zone 1 accounts for 94.3% of the #1 & #3 Top 3 MHE.		
G	Location Patterns of Crash Clusters:		
Zone 1:	Cluster 21510 is located at the signalized intersection in the WB & EB lanes. Clusters 9370, 2006018, & 11657 are located in the WB lane approximately within 1,300 feet east of the intersection. Cluster 10136 is located approximately within 600 feet west of the signalized intersection in the WB & EB lanes.		
H	Location Patterns of Non-cluster Crashes:		
Zone 1:	6 of 7 crashes occurred in the WB lane. All crashes approximately within 990 feet of intersection.		
I	Analysis Conclusions & Recommendation:		
	The results of the analysis indicate that of the EPDO Total: 62% occurred at the intersection of which 5 were WB injury crashes & 8 were EB injury crashes. 58% (79 points) occurred in the WB lanes which includes 12 injury crashes. 37% (50 points) occurred in the EB lanes which includes 9 injury crashes.		
	Recommend Further Study of the following to improve safety		
	The highest priority location is the signalized (EB)-flashing light WB) intersection that includes Crash Cluster 21510 The second highest priority location is the full length of the WB lanes.		
J	Minor Street Traffic Counts Summary:		
	Minor Street Total: 2,254. Directional Split: WB 96%, EB 4%		
	Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank	
WB:	AM: 1 On Ramp: 7:45 (56) / 1 Off Ramp: 2) 11:00 (72)	4) 128	
	PM: 1 On Ramp: 5:00 (34) / 1 Off Ramp: 1) 4:45 (271)	1) 305	
EB:	AM: 1 On Ramp: 4) 11:00 (6) / 1 Off Ramp: 11:00 (5)	2) 11	
	PM: 1 On Ramp: 2:00 (7) / 1 Off Ramp: 3) 7:30 (8)	3) 15	
	*30% & higher considered significant in this analysis.		**Vehicles



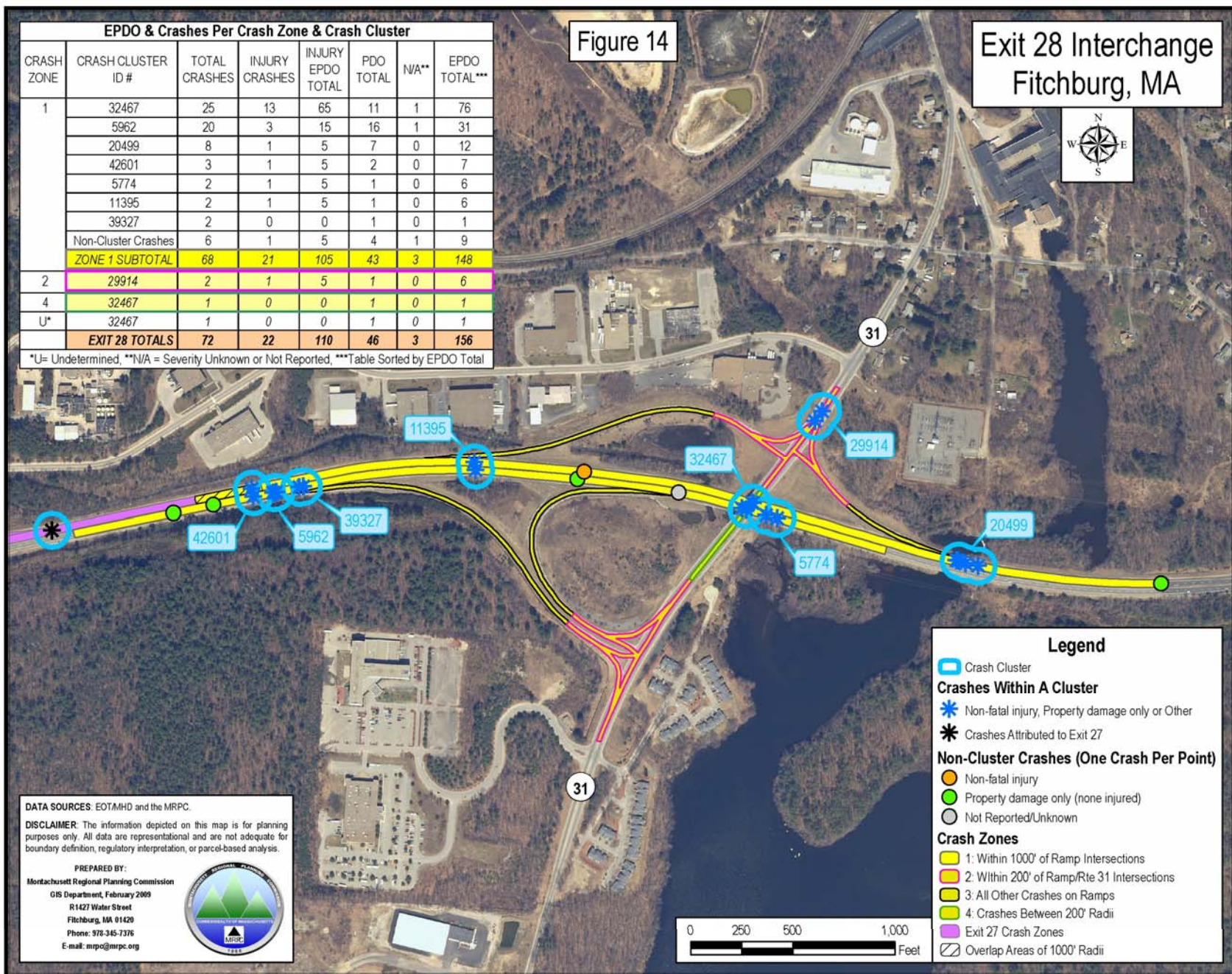
Oak Hill & Palmer Rds Intersection Access Safety Analysis Results (see Fig 13 & Appendix)

A	Type of Control:	On Ramps: STOP
B	Intersection EPDO Total:	35
	Phase I Report EPDO Total:	not calculated
	Phase I Report Region Rank:	not ranked
	EPDO Total & Rank Significant?	No
	No Most Harmful Events analysis was undertaken.	
C	Analysis Conclusions & Recommendation:	
	No significant existing safety problems.	
	Recommend monitoring the crash situation at this intersection	
D	Minor Street Traffic Counts Summary for Oak Hill Road:	
	Minor Street Total: 1,928. Directional Split: NB (Off ramp) 64%, SB (On ramp) 36%	
	Peak Hours & (Vehicle Count) & Rank	
NB:	AM: 1 Off Ramp: 4) 7:30 (59)	
	PM: 1 Off Ramp: 1) 4:45 (168)	
SB:	AM: 1 On Ramp: 2) 7:00 (72)	
	PM: 1 On Ramp: 3) 4:45 (60)	



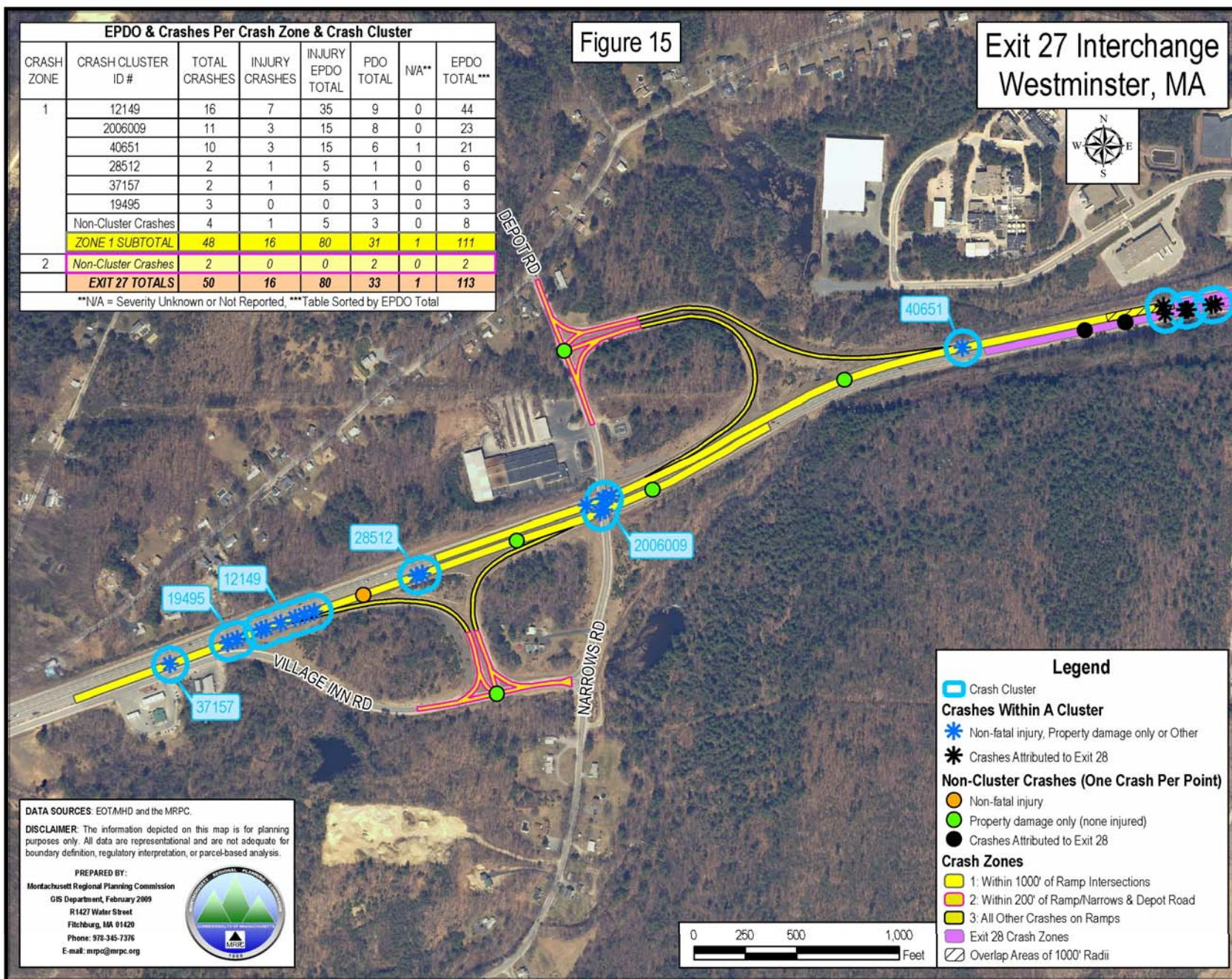
Exit 28 Interchange Access Safety Analysis Results (see Figure 14 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	156
	Phase I Report EPDO Total:	93
	Phase I Report Region Rank:	25th
	EPDO Total Difference:	63 points or 67.7%
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	72
	Number of Injury Crashes:	22 (no fatal injury)
	Percent of Total Crashes:	31%
	Total Fatal & Injury Percentage of Total Crashes:	31%
	Percentage Significant?*	Yes
D	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	148
	Percentage of Interchange EPDO Total:	94.9%
	Percentage Significant?*	Yes
E	EPDO Total of Crash Clusters 32467EB, 5962, 42601EB, 5774, & 39327:	103
	EPDO Total of 4 Non-cluster crashes:	3
	Combined EPDO Total:	106
	Percentage of Interchange EPDO Total:	67.9%
	Percentage Significant?*	Yes
F	EPDO Total of Crash Clusters 32467WB, 20499, 42601WB, 11395WB:	36
	EPDO Total of 2 Non-cluster crashes:	6
	Combined EPDO Total:	42
	Percentage of Interchange EPDO Total:	26.9%
	Percentage Significant?*	No
G	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	40% 45%
	2. Not Reported:	26% 23%
	3. Median Barrier:	13% 9%
	Total for # 1 & #3:	53% 54%
	All others Total:	47% 46%
	Most Significant Results: Crash Zone 1 accounts for 94.7% of the #1 & #3 Top 3 MHE.	
H	Location Patterns of Crash Clusters:	
Zone 1:	Clusters 32467EB & 5774 are located approximately within 600 feet east of the EB acceleration lane.	
	Clusters 5962, 42601EB, 39327 are located approximately within a 150 foot radius of the EB deceleration lane.	
I	Location Patterns of Non-cluster Crashes:	
Zone 1:	2 crashes are located within a 300 foot radius west of Cluster 42601.	
J	Analysis Conclusions & Recommendation:	
	The results indicates that 68% of the EPDO Total occurred approximately within 1,000 foot radius of EB accel/decel lanes.	
	These are locations where vehicles are at the highest speed differentials and where merging and weaving take place.	
	Recommend Further Study of the following to improve safety	
	The highest priority locations are the EB accel/decel lanes in Crash Zone 1.	
	The second highest priority location is the WB decel lane in Crash Zone 1.	
K	Ramp Traffic Counts Summary:	
	All Ramps Total: 10,931. Directional Split: WB 45%, EB 55%	
	Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank
WB:	AM: 1 On Ramp: 8:30 (96) / 1 Off Ramp: 4) 7:45 (221)	4) 317
	PM: 1 On Ramp: 5:30 (188) / 1 Off Ramp: 2) 4:45 (293)	2) 481
EB:	AM: 1 On Ramp: 1) 8:45 (313) / 1 Off Ramp: 8:30 (254)	1) 567
	PM: 1 On Ramp: 3) 4:00 (267) / 1 Off Ramp: 5:30 (214)	2) 481
	*30% & higher considered significant in this analysis.	**Vehicles



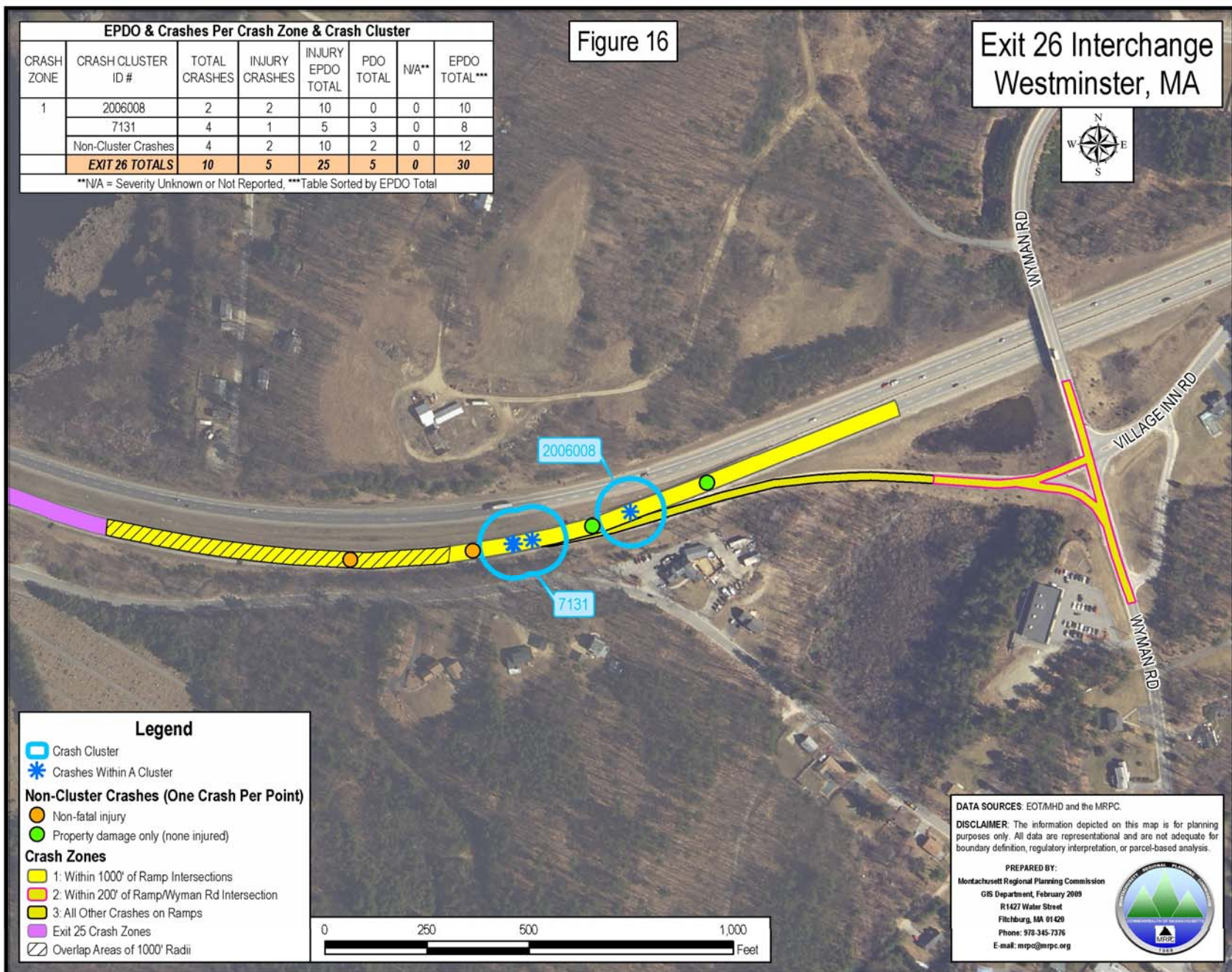
Exit 27 Interchange Access Safety Analysis Results (see Figure 15 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	113
	Phase I Report EPDO Total:	96
	Phase I Report Region Rank:	22nd
	EPDO Total Difference:	17 points or 17.7%
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	50
	Number of Injury Crashes:	16 (no fatal injury)
	Percent of Total Crashes:	32%
	Total Fatal & Injury Percentage of Total Crashes:	32%
	Percentage Significant?*	Yes
D	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	111
	Percentage of Interchange EPDO Total:	98.2%
	Percentage Significant?*	Yes
E	EPDO Total of Crash Clusters 12149, 2006009EB, 28512, 37157, 19495:	71
	EPDO Total of 3 Non-Cluster Crashes:	7
	Combined EPDO Total:	78
	Percentage of Interchange EPDO Total:	69%
	Percentage Significant?*	Yes
F	EPDO Total of Crash Cluster 40651 & 2006009WB:	34
	EPDO Total of 1 Non-Cluster Crash:	1
	Combined EPDO Total:	35
	Percentage of Interchange EPDO Total:	31%
	Percentage Significant?*	Yes
G	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	40% 31%
	2. Median Barrier:	18% 25%
	3. Rollover:	14% 19%
	Total:	72% 75%
	All others Total:	28% 25%
	Most Significant Results: Crash Zone 1 accounts for 94.4% of the Top 3 Events.	
H	Location Patterns of Crash Clusters:	
Zone 1:	Cluster 12149 is located at the EB deceleration lane.	
	Clusters 28512, 37157, & 19495 are located approximately within a 800 foot radius of the EB decel lane.	
	Cluster 40651 is located at the WB decel lane.	
	Cluster 2006009EB is located at the WB accel lane.	
I	Location Patterns of Non-cluster Crashes:	
Zone 1:	3 crashes are located in the EB lane. 1 crash is located in the WB lane.	
J	Analysis Conclusions & Recommendation:	
	The results of the analysis indicate that 69% of the EPDO Total occurred approximately within a 800 foot radius of EB accel/decel lanes in Crash Zone 1.	
	Also, 31% of the EPDO Total occurred at WB accel/decel lanes in Crash Zone 1.	
	These are locations where vehicles are at the highest speed differentials and where merging and weaving take place.	
	Recommend Further Study of the following to improve safety	
	The EB Crash Zone 1 accel/decel lanes described in sections E, H, & I above are the highest priority locations.	
	The WB Crash Zone 1 accel/decel lanes described in sections F, H, & I above are the second highest priority locations.	
K	Ramp Traffic Counts Summary:	
	All Ramps Total: 5,724. Directional Split: WB 50%, EB 50%	
	Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank
WB:	AM: 1 On Ramp: 7:45 (29) / 1 Off Ramp: 4) 8:00 (116)	4) 145
	PM: 1 On Ramp: 4:00 (41) / 1 Off Ramp: 2) 4:45 (301)	1) 342
EB:	AM: 1 On Ramp: 1) 8:00 (305) / 1 Off Ramp: 6:45 (20)	2) 325
	PM: 1 On Ramp: 3) 3:45 (166) / 1 Off Ramp: 3:30 (24)	3) 190
	*30% & higher considered significant in this analysis.	**Vehicles



Exit 26 Interchange Access Safety Analysis Results (see Figure 16 & Appendix)

A	Type of Control:	No On Ramp	
B	Interchange EPDO Total:	30	
	Phase I Report EPDO Total:	not calculated	
	Phase I Report Region Rank:	not ranked	
	EPDO Total & Rank Significant?	No	
C	Interchange Total Crashes:	10	
	Number of Injury Crashes:	5	(no fatal injury)
	Percent of Total Crashes:	50%	
	Total Fatal & Injury Percentage of Total Crashes:	50%	
	Percentage Significant?*	Yes	
D	Most Dangerous Crash Zone:	Zone 1	
	EPDO Total:	30	
	Percentage of Interchange EPDO Total:	100.0%	
	Percentage Significant?*	Yes	
E	Most Dangerous Crash Cluster:	2006008	
	EPDO Total:	10	
	Percentage of Interchange EPDO Total:	33.3%	
	Percentage Significant?*	Yes	
F	Non-Cluster Crashes:	4	
	EPDO Total:	12	
	Percentage of Interchange EPDO Total:	40.0%	
G	Top 3 Most Harmful Events (MHE):	% of Total Crashes:	% of Injury Crashes:
	1. Guardrail:	40%	20%
	2. Rollover:	20%	40%
	3. Motor Vehicle in Traffic:	20%	0%
	Total:	80%	60%
	All others Total:	20%	40%
	Most Significant Results:	Rollovers account for 40% of the Injury Crashes.	
H	Location Patterns of Crash Clusters:		
	Zone 1: Clusters 2006008 & 7131 are located at the EB deceleration lane.		
I	Location Patterns of Non-cluster Crashes:		
	Zone 1: 4 crashes are located within a 450 foot radius of the EB deceleration lane		
J	Analysis Conclusions & Recommendation:		
	The results of the analysis indicate that 100% of the EPDO Total occurred at the EB deceleration lane.		
	This is a location where vehicles are at the highest speed differentials and where merging and weaving take place.		
	Recommend monitoring the crash situation at this interchange due to being unranked & low EPDO Total.		
K	Ramp Traffic Counts Summary:		
	Ramp Total: 1,175. Directional Split: WB 00%, EB 100%		
	Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank	
EB:	AM: 1 Off Ramp: 8:15 (132)	1) 132	
	PM: 1 Off Ramp: 2:15 (101)	2) 101	
	*30% & higher considered significant in this analysis.		**Vehicles



Exit 25 Interchange Access Safety Analysis Results (see Figure 17 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	179
	Phase I Report EPDO Total:	180
	Phase I Report Region Rank:	9th
	EPDO Total difference (if less ()):	(1) points or (0.6%)
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	76
	Number of Fatal Crashes:	1
	Percent of Total Crashes:	1.3%
	Number of Injury Crashes:	25
	Percent of Total Crashes:	32.9%
	Total Fatal & Injury Percentage of Total Crashes:	34%
	Percentage Significant?*	Yes
D	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	85
	Percentage of Interchange EPDO Total:	47.5%
	EPDO Total of Contiguous/Overlapping Crash Clusters 670 & 2167WB:	37
	EPDO of 2 Nearby Non-Cluster Crashes:	6
	Combined EPDO Total:	43
	Percentage of Interchange EPDO Total:	24.0%
	EPDO Total of Crash Clusters 19124 & 21678EB:	39
	EPDO of 1 Nearby Non-Cluster Crash:	1
	Combined EPDO Total:	40
	Percentage of Interchange EPDO Total:	22.3%
	Percentage Significant for Either Location?*	No
E	Analysis of Contiguous Crash Zones (CZ(s)) 2 & 4	
	EPDO Total of Crash Clusters 12852, 709, 36078, 21678N/SB:	79
	EPDO Percentage Total of Clusters:	44.1%
	Percentage Significant?*	Yes
F	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	55% 48%
	All others Total:	45% 52%
	Most Significant Results: Crash Zone 2 & 4 account for 57% of the #1 Top 3 MHE.	
G	Location Patterns of Crash Clusters:	
Zone 2:	Clusters 12852, 709, & 36078 are located at the ramp/Main St & Rte 140 intersection.	
Zone 4:	Cluster 21678N/SB is located on Rte 2A/140 approximately 350 feet north of Cluster 709.	
Zone 1:	Clusters 670 & 21678WB are located at the Rte 2 WB deceleration lanes.	
	Cluster 19124 is located at the Rte 2 EB decel lane. Cluster 21678EB is located approximately 530' west of Cluster 19124.	
H	Location Patterns of Non-cluster Crashes:	
Zone 1:	2 WB Non-Cluster crash are located approximately within a 500 foot radius of Clusters 670 & 21678.	
	1 EB Non-Cluster crash is located approximately 230 feet west of Cluster 21678.	

(continued next page)

Exit 25 Interchange Access Safety Analysis Results (continued)

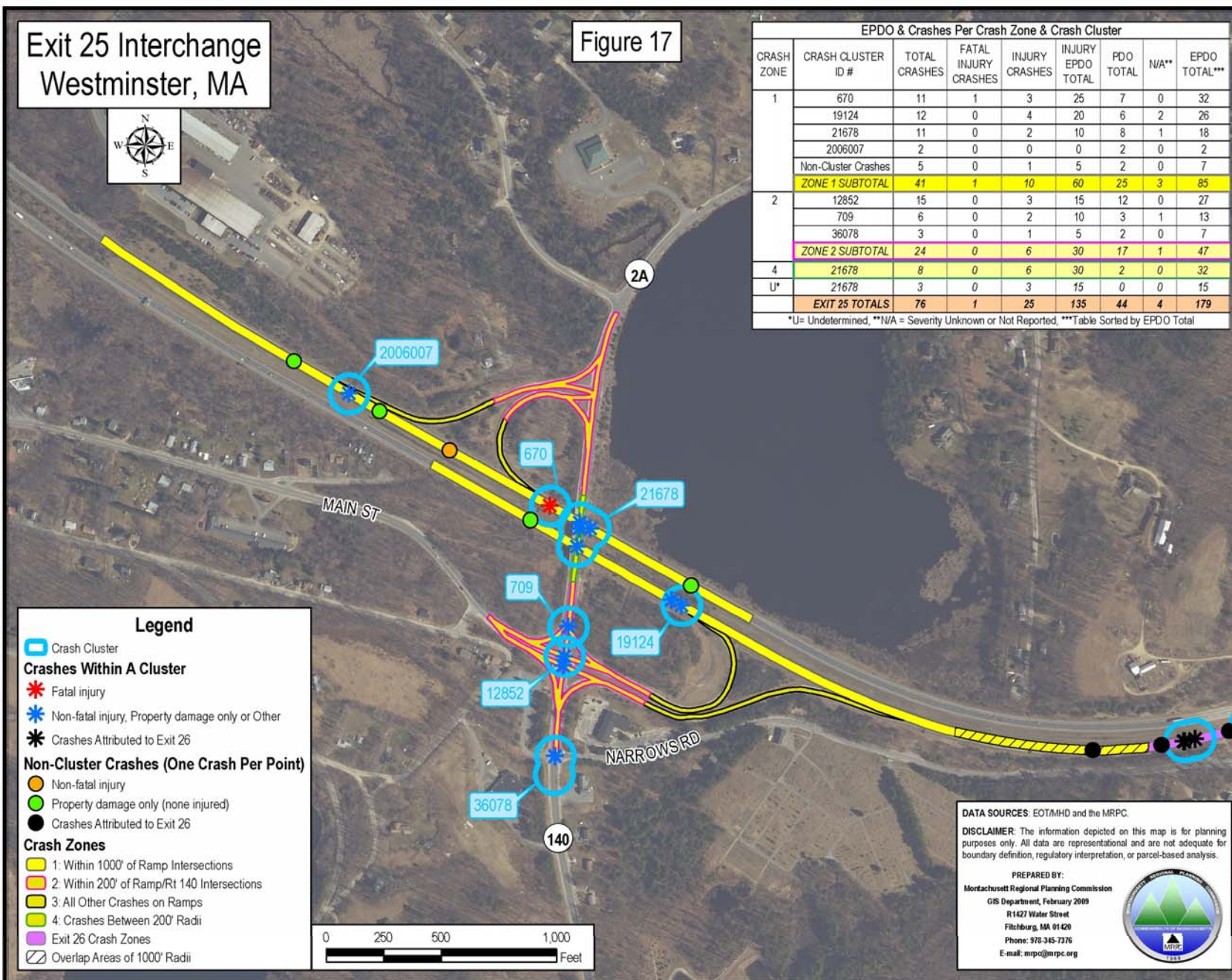
I	<p>Analysis Conclusions & Recommendation:</p> <p>The results indicates that 44% of the EPDO Total occurred approximately within a 1,100 foot section of CZs 2 & 4. This is a section of Rte 2A/140 that includes Clusters 21678, 12852, 709, & 36078.</p> <p>The results also indicates that 46% of the EPDO Total occurred within a 530 foot radius of Rte 2 deceleration lanes. These are locations where vehicles are at the highest speed differentials and where merging and weaving take place.</p> <p>Recommend Further Study of the following to improve safety</p> <p>The 1,100 foot road segment that falls within CZs 2 & 4 described in section E & G above is the highest priority location. The second highest priority is the WB decel lane on Route 2 that includes Crash Clusters 670 & 21678WB. The third highest priority location is the EB decel lane on Route 2 that includes Crash Clusters 19124 & 21678EB.</p>																
J	<p>Ramp Traffic Counts Summary:</p> <p>All Ramps Total: 12,288. Directional Split: WB 51%, EB 49%</p> <table> <tr> <th></th><th>Peak Hours (red) & (Vehicle Count) & Rank</th><th>Total Veh** & Rank</th></tr> <tr> <td>WB:</td><td>AM: 1 On Ramp: 4) 8:45 (168) / 1 Off Ramp: 11:00 (152)</td><td>4) 320</td></tr> <tr> <td></td><td>PM: 1 On Ramp: 1) 5:45 (398) / 1 Off Ramp: 4:45 (363)</td><td>1) 761</td></tr> <tr> <td>EB:</td><td>AM: 1 On Ramp: 2) 7:15 (388) / 1 Off Ramp: 2) 7:15 (311)</td><td>2) 699</td></tr> <tr> <td></td><td>PM: 1 On Ramp: 3) 1:15 (242) / 1 Off Ramp: 2:30 (157)</td><td>3) 283</td></tr> </table> <p>*30% & higher considered significant in this analysis. **Vehicles</p>			Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank	WB:	AM: 1 On Ramp: 4) 8:45 (168) / 1 Off Ramp: 11:00 (152)	4) 320		PM: 1 On Ramp: 1) 5:45 (398) / 1 Off Ramp: 4:45 (363)	1) 761	EB:	AM: 1 On Ramp: 2) 7:15 (388) / 1 Off Ramp: 2) 7:15 (311)	2) 699		PM: 1 On Ramp: 3) 1:15 (242) / 1 Off Ramp: 2:30 (157)	3) 283
	Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank															
WB:	AM: 1 On Ramp: 4) 8:45 (168) / 1 Off Ramp: 11:00 (152)	4) 320															
	PM: 1 On Ramp: 1) 5:45 (398) / 1 Off Ramp: 4:45 (363)	1) 761															
EB:	AM: 1 On Ramp: 2) 7:15 (388) / 1 Off Ramp: 2) 7:15 (311)	2) 699															
	PM: 1 On Ramp: 3) 1:15 (242) / 1 Off Ramp: 2:30 (157)	3) 283															

Exit 25 Interchange Westminster, MA

Figure 17

EPDO & Crashes Per Crash Zone & Crash Cluster								
CRASH ZONE	CRASH CLUSTER ID #	TOTAL CRASHES	FATAL INJURY CRASHES	INJURY CRASHES	INJURY EPDO TOTAL	PDO TOTAL	N/A**	EPDO TOTAL***
1	670	11	1	3	25	7	0	32
	19124	12	0	4	20	6	2	26
	21678	11	0	2	10	8	1	18
	2006007	2	0	0	0	2	0	2
	Non-Cluster Crashes	5	0	1	5	2	0	7
	ZONE 1 SUBTOTAL	41	1	10	60	25	3	85
2	12852	15	0	3	15	12	0	27
	709	6	0	2	10	3	1	13
	36078	3	0	1	5	2	0	7
	ZONE 2 SUBTOTAL	24	0	6	30	17	1	47
4	21678	8	0	6	30	2	0	32
U*	21678	3	0	3	15	0	0	15
	EXIT 25 TOTALS	76	1	25	135	44	4	179

*U= Undetermined, **N/A = Severity Unknown or Not Reported, ***Table Sorted by EPDO Total



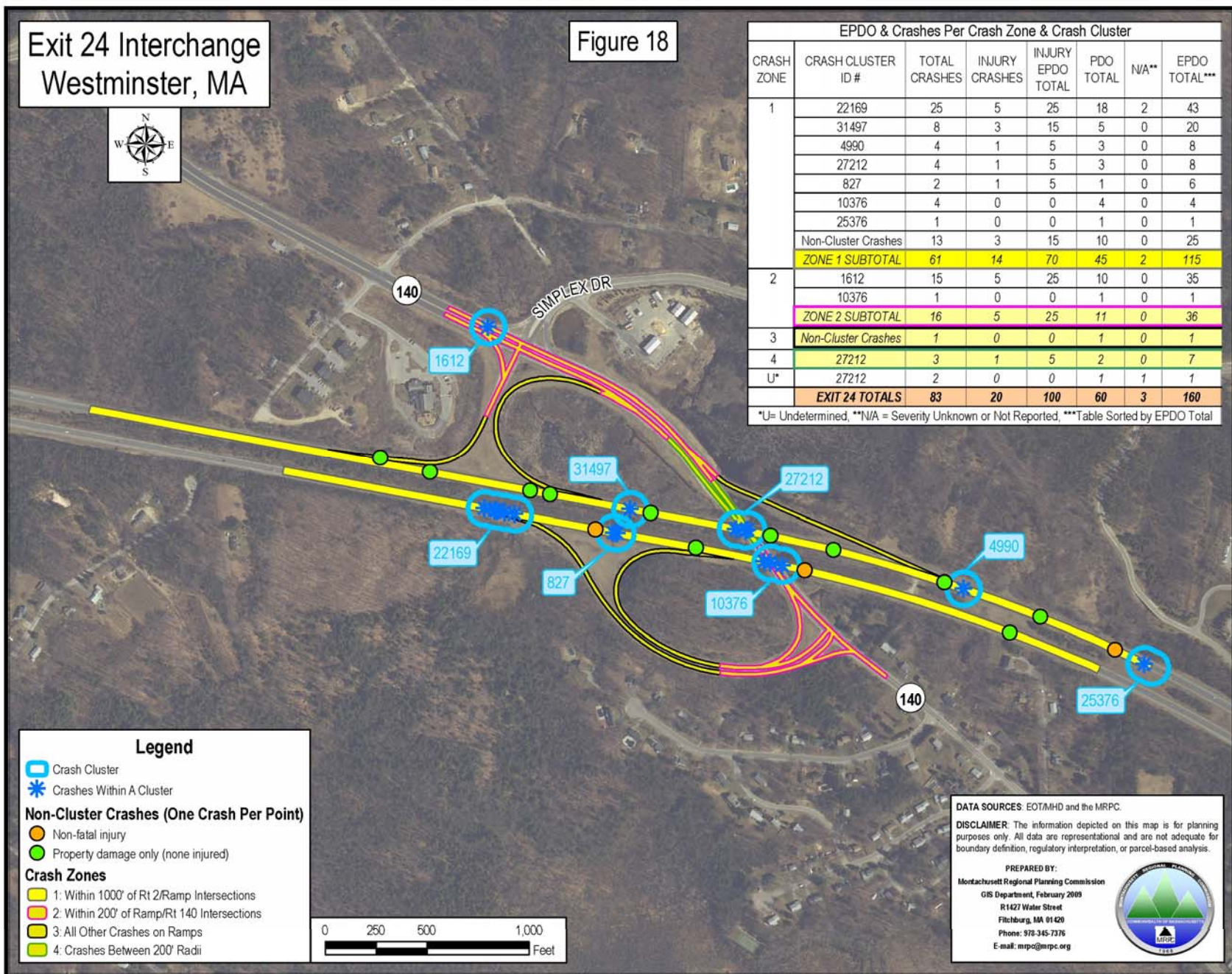
Exit 24 Interchange Access Safety Analysis Results (see Figure 18 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	160
	Phase I Report EPDO Total:	163
	Phase I Report Region Rank:	13th
	EPDO Total difference (if less ()):	(3) points or (1.8%)
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	83
	Number of Injury Crashes:	20 (no fatal injury)
	Percent of Total Crashes:	24%
	Total Fatal & Injury Percentage of Total Crashes:	24%
	Percentage Significant?*	No
D	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	115
	Percentage of Interchange EPDO Total:	71.9%
	Percentage Significant?	Yes
E	EPDO Total of Clusters 22169, 827, & 10376:	53
	EPDO Total of 3 Nearby Non-Cluster Crashes:	11
	Combined EPDO Total:	64
	Percentage of Interchange EPDO Total:	40.0%
	Percentage Significant?*	Yes
F	EPDO Total of Clusters 31497, 4990, 27212, 25376:	37
	EPDO Total of 8 Nearby Non-Cluster Crashes:	12
	Combined EPDO Total:	49
	Percentage of Interchange EPDO Total:	30.6%
	Percentage Significant?*	Yes
G	EPDO Total of Crash Zone 2 Cluster 1612:	35
	Percentage of Interchange EPDO Total:	21.9%
	Percentage Significant?*	No
H	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	40% 50%
	2. Guardrail:	17% 25%
	3. Other:	7% 5%
	Total for # 1 & #2:	57% 75%
	All others Total:	43% 25%
	Most Significant Results:	Crash Zone 1 accounts for 66% of the #1 & #2 Top 3 MHE.
I	Location Patterns of Crash Clusters:	
Zone 1:	Clusters 22169 & 10376 are located at EB accel/decel lanes approximately within 1,450 feet of each other.	
	Cluster 827 in between Clusters 22169 & 10376.	
	Clusters 31497, & 4990, are located at WB decel lanes. Cluster 27212 is located in between 31497 & 4990. Cluster 25376 is located approximately 990 feet east of Cluster 4990. The 4 Clusters are approximately within 2,700 feet of each other.	
Zone 2:	Cluster 1612 is located at the ramp and Rte 140 intersection.	
J	Location Patterns of Non-cluster Crashes:	
Zone 1:	3 crashes are located near EB Crash Clusters. 8 crashes are located near WB Crash Clusters.	

(continued next page)

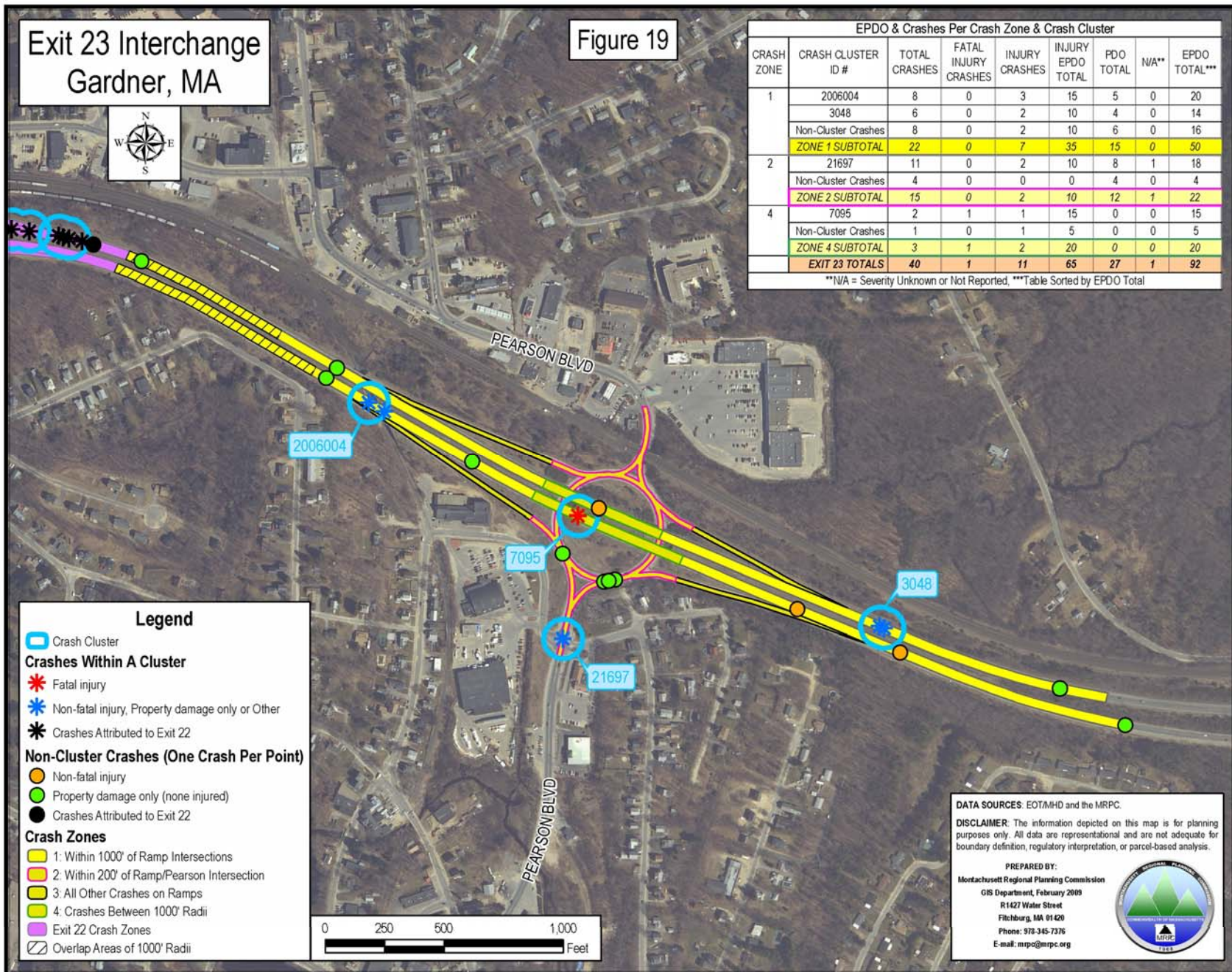
Exit 24 Interchange Access Safety Analysis Results (continued)

K	<p>Analysis Conclusions & Recommendation:</p> <p>The results of the analysis indicate that 40% of the EPDO Total occurred approximately within a 300 foot radius of the EB acceleration & deceleration lanes.</p> <p>Also, 31% of the EPDO Total occurred approximately within a 990 foot radius of the WB decel lanes.</p> <p>This are locations where vehicles are at the highest speed differentials and where merging and weaving take place.</p> <p>Recommend Further Study of the following to improve safety</p> <p>The EB 1,600 foot roadway segment that falls within CZ 1 described in sections E, I, & J is the highest priority location.</p> <p>The WB 3,200 foot roadway segment that falls within CZ 1 described in sections F, I, J is the 2nd highest priority location.</p> <p>The third highest priority location is in Crash Zone 2 that includes Cluster 1612.</p>																
L	<p>Ramp Traffic Counts Summary:</p> <p>All Ramps Total: 15,654. Directional Split: WB 50%, EB 50%</p> <table> <tr> <th></th><th>Peak Hours (red) & (Vehicle Count) & Rank</th><th>Total Veh** & Rank</th></tr> <tr> <td>WB:</td><td>AM: 1 On Ramp: 7:15 (6) / 2 Off Ramps: 11:00 (81), 3) 7:30 (547)</td><td>3) 634</td></tr> <tr> <td></td><td>PM: 1 On Ramp: 6:30 (5) / 2 Off Ramps: 5:30 (168), 1) 5:30 (705)</td><td>1) 878</td></tr> <tr> <td>EB:</td><td>AM: 1 On Ramp: 2) 7:30 (598) / 1 Off Ramp: 7:45 (189)</td><td>2) 787</td></tr> <tr> <td></td><td>PM: 1 On Ramp: 4) 4:15 (404) / 1 Off Ramp: 12:45 (147)</td><td>4) 551</td></tr> </table> <p>*30% & higher considered significant in this analysis.</p> <p>**Vehicles</p>			Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank	WB:	AM: 1 On Ramp: 7:15 (6) / 2 Off Ramps: 11:00 (81), 3) 7:30 (547)	3) 634		PM: 1 On Ramp: 6:30 (5) / 2 Off Ramps: 5:30 (168), 1) 5:30 (705)	1) 878	EB:	AM: 1 On Ramp: 2) 7:30 (598) / 1 Off Ramp: 7:45 (189)	2) 787		PM: 1 On Ramp: 4) 4:15 (404) / 1 Off Ramp: 12:45 (147)	4) 551
	Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank															
WB:	AM: 1 On Ramp: 7:15 (6) / 2 Off Ramps: 11:00 (81), 3) 7:30 (547)	3) 634															
	PM: 1 On Ramp: 6:30 (5) / 2 Off Ramps: 5:30 (168), 1) 5:30 (705)	1) 878															
EB:	AM: 1 On Ramp: 2) 7:30 (598) / 1 Off Ramp: 7:45 (189)	2) 787															
	PM: 1 On Ramp: 4) 4:15 (404) / 1 Off Ramp: 12:45 (147)	4) 551															



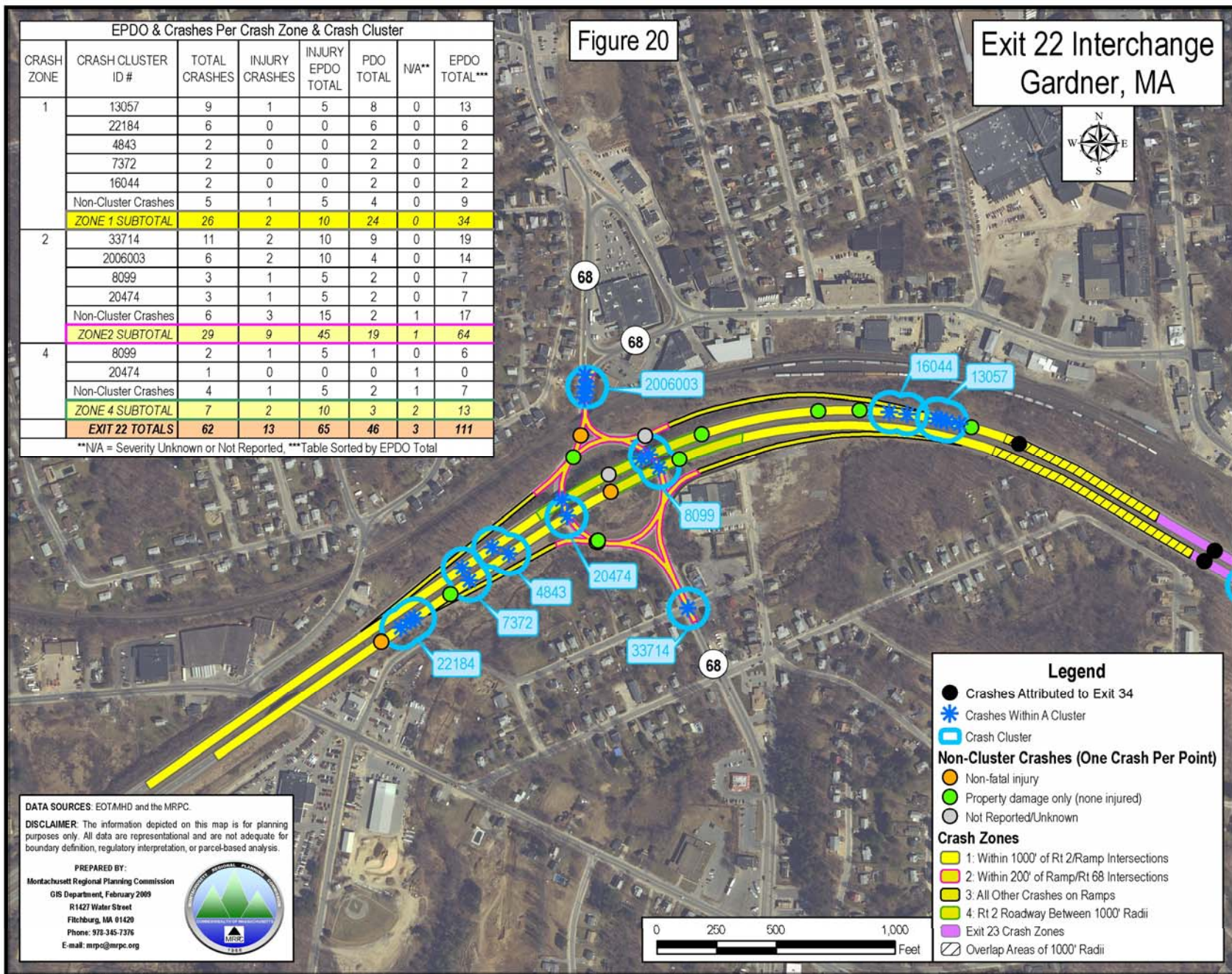
Exit 23 Interchange Access Safety Analysis Results (see Figure 19 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	92
	Phase I Report EPDO Total:	73
	Phase I Report Region Rank:	46th
	EPDO Total Difference:	19 points or 26%
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	40
	Number of Fatal Crashes:	1
	Percent of Total Crashes:	2.5%
	Number of Injury Crashes:	11
	Percent of Total Crashes:	27.5%
	Total Fatal & Injury Percentage of Total Crashes:	30.0%
	Percentage Significant?*	Yes
D	EPDO of Contiguous Crash Zones 1 & 4:	70
	Percentage of Interchange EPDO Total:	76.1%
	Percentage Significant?*	Yes
E	EPDO Total of Crash Clusters 2006004 & 7095:	35
	EPDO Total of 5 Non-cluster crashes:	13
	Combined EPDO Total:	48
	Percentage of Interchange EPDO Total:	52.2%
	Percentage Significant?*	Yes
	No analysis for WB Crash Zones. EPDO not significant.	
F	EPDO of Cluster 21697 & Non-cluster crashes in Crash Zone 2:	22
	Percentage of Interchange EPDO Total:	23.9%
	Percentage Significant?*	No
G	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	50% 55%
	2. Other:	18% 9%
	3. Guardrail:	15% 27%
	Total:	65% 82%
	All others Total:	35% 18%
	Most Significant Results: Crash Zone 2 accounts for 50% of the #1 & #3 Top 3 MHE.	
H	Location Patterns of Crash Clusters:	
	Zone 1: Clusters 2006004 is located at deceleration lanes.	
	Zone 2: Cluster 21697 is located at an intersection.	
I	Location Patterns of Non-cluster Crashes:	
	Zone 4: 1 fatal Injury rollover crash and 1 injury crash occurred at the same EB location.	
	Zone 2: 5 crashes occurred in the EB lane.	
J	Analysis Conclusions & Recommendation:	
	The results of the analysis indicate that 52% of the EPDO Total occurred in the EB lane beginning at the EB decel lane.	
	Recommend Further Study of the following to improve safety	
	The highest priority location is the EB lane beginning at the decel lane & concluding at the accel lane in Crash Zone 1.	
	The second highest priority location is the Crash Zone 2 Ramp & Pearson Blvd intersection that includes Cluster 21697.	
K	Ramp Traffic Counts Summary:	
	All Ramps Total: 13,963. Directional Split: WB 50%, EB 50%	
	Peak Hours (red) & (Vehicle Count) & Rank	
WB:	AM: 1 On Ramp: 11:00 (126) / 1 Off Ramp: 4) 7:45 (243)	4) 369
	PM: 1 On Ramp: 5:15 (217) / 1 Off Ramp: 1) 4:30 (554)	1) 771
EB:	AM: 1 On Ramp: 2) 6:45 (478) / 1 Off Ramp: 8:45 (221)	2) 699
	PM: 1 On Ramp: 3) 2:00 (323) / 1 Off Ramp: 1:15 (215)	3) 538
	*30% & higher considered significant in this analysis.	
	**Vehicles	



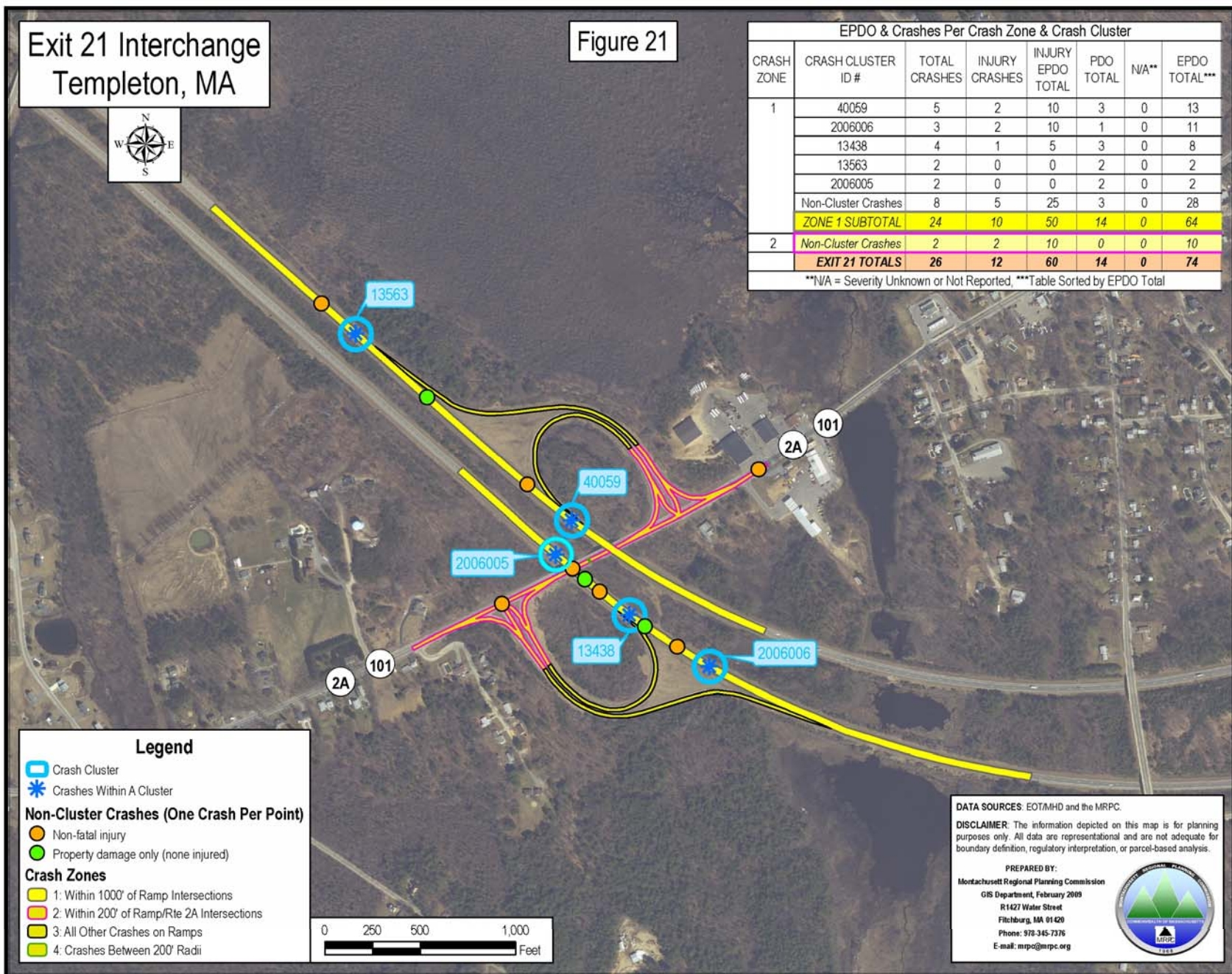
Exit 22 Interchange Access Safety Analysis Results (see Figure 20 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	111
	Phase I Report EPDO Total:	89
	Phase I Report Region Rank:	29th
	EPDO Total Difference:	22 points or 24.7%
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	62
	Number of Injury Crashes:	13 (no fatal injury)
	Percent of Total Crashes:	21%
	Total Fatal & Injury Percentage of Total Crashes:	21%
	Percentage Significant?*	No
D	Most Dangerous Crash Zone:	Zone 2
	EPDO Total:	64
	Percentage of Interchange EPDO Total:	57.7%
	Percentage Significant?*	Yes
E	EPDO Total of Crash Clusters 33714, 8099NB, & 20474SB:	33
	EPDO Total of 3 Non-cluster crashes:	11
	Combined EPDO Total:	44
	Percentage of Interchange EPDO Total:	39.6%
	Percentage Significant?*	Yes
	No analysis for Crash Zone 2 north of Rte 2. EPDO not significant.	
F	EPDO of Contiguous Crash Zones 1 & 4:	48
	EPDO Total of WB Crash Clusters:	23
	EPDO of 4 WB Non-cluster Crashes:	4
	Combined EPDO Total:	27
	Percentage of Interchange EPDO Total:	24.3%
	Percentage Significant?*	No
	No analysis for EB Crash Zone 1 & 4. EPDO not significant.	
G	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	48% 46%
	2. No Reported:	18% 23%
	3. Other:	16% 15%
	Total for #1:	48% 46%
	All others Total:	52% 54%
	Most Significant Results: Crash Zone 2 accounts for 70% of the #1 Top 3 MHE.	
H	Location Patterns of Crash Clusters:	
	Zone 2: Clusters 33714 & 2006003 are located at Crash Zone 2 intersections.	
	Zone 1: Clusters 13057, 22184, 16044 are located approximately within 600 feet of deceleration lanes.	
I	Location Patterns of Non-cluster Crashes:	
	Zone 1: 3 crashes near Clusters 13057 & 16044.	
	Zone 2: 3 crashes near OFF Ramp & Rotary intersection.	
J	Analysis Conclusions & Recommendation:	
	The results indicate that 40% of the EPDO Total occurred at a CZ 2 intersection that includes Crash Cluster 33714.	
	Recommend Further Study of the following to improve safety	
	The highest priority location is the Crash Zone 2 intersections that includes Crash Clusters 33714, 8099NB, & 20474SB.	
	The second highest priority location is the Crash Zone 2 intersection that includes Crash Cluster 2006003.	
	The third highest priority location is the WB deceleration lane in Crash Zone 1 that includes Crash Clusters 13057 & 16044.	
K	Ramp Traffic Counts Summary:	
	All Ramps Total: 16,650. Directional Split: WB 47%, EB 53%	
	Peak Hours (red) & (Vehicle Count) & Rank	
WB:	AM: 1 On Ramp: 11:00 (102) / 1 Off Ramp: 4) 8:00 (290)	Total Veh** & Rank 4) 392
	PM: 1 On Ramp: 4:30 (204) / 1 Off Ramp: 1) 5:00 (755)	1) 959
EB:	AM: 1 On Ramp: 2) 8:15 (697) / 1 Off Ramp: 8:30 (221)	2) 918
	PM: 1 On Ramp: 3) 3:45 (470) / 1 Off Ramp: 5:30 (171)	3) 641
	*30% & higher considered significant in this analysis.	
	**Vehicles	



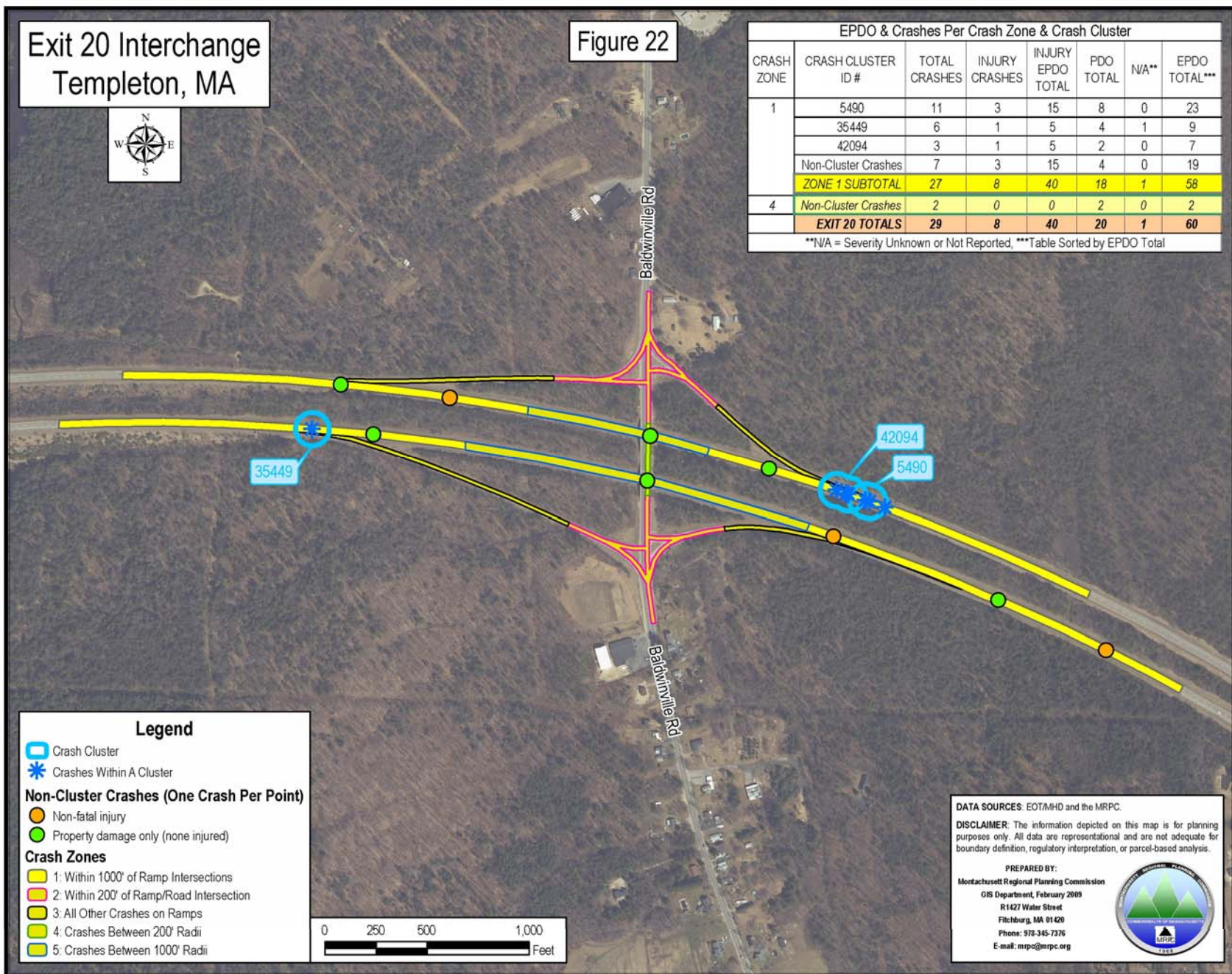
Exit 21 Interchange Access Safety Analysis Results (see Figure 21 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	74
	Phase I Report EPDO Total:	79
	Phase I Report Region Rank:	39th
	EPDO Total difference (if less ()):	(5) points or (6.3%)
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	26
	Number of Injury Crashes:	12 (no fatal injury)
	Percent of Total Crashes:	46%
	Total Fatal & Injury Percentage of Total Crashes:	46%
	Percentage Significant?*	Yes
D	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	64
	Percentage of Interchange EPDO Total:	86.5%
	Percentage Significant?	Yes
E	EPDO Total of Clusters 2006006, 13438, & 2006005:	21
	EPDO Total of 5 Nearby Non-Cluster Crashes:	17
	Combined EPDO Total:	38
	Percentage of Interchange EPDO Total:	51.4%
	Percentage Significant?*	Yes
F	EPDO Total of Clusters 40059 & 13563:	15
	EPDO Total of 3 Nearby Non-Cluster Crashes:	11
	Combined EPDO Total:	26
	Percentage of Interchange EPDO Total:	35.1%
	Percentage Significant?*	Yes
G	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	23% 42%
	2. Wildlife:	23% 8%
	3. Guardrail:	15% 17%
	3. Tree:	15% 17%
	Total:	76% 84%
	All others Total:	24% 16%
	Most Significant Results: Crash Zone 1 accounts for 90% of the Top 3 MHE.	
H	Location Patterns of Crash Clusters:	
	Zone 1: Clusters 2006006, 13438, & 2006005 are located within approximately a 600 foot radius of the EB deceleration lane.	
I	Location Patterns of Non-cluster Crashes:	
	Zone 1: 5 Non-Cluster crashes are located between Crash Clusters 2006006 & 2006005.	
	2 Non-Cluster crashes are located between Crash Clusters 13563 & 40059 and 1 just west of Cluster 13563.	
J	Analysis Conclusions & Recommendation:	
	The results of the analysis indicates that 51.4% of the EPDO Total occurred within a 600 foot radius of the EB decel lane.	
	Also, the analysis indicates that 35% of the EPDO Total occurred at the WB accel/decel lanes.	
	These are locations where vehicles are at the highest speed differentials and where merging and weaving take place.	
	Recommend Further Study of the following to improve safety	
	The highest priority location includes the EB decel lane and the roadway between Crash Clusters 2006006 & 2006005.	
	The second highest priority location WB accel/decel lanes and the roadway between Crash Clusters 13563 & 40059.	
K	Ramp Traffic Counts Summary:	
	All Ramps Total: 7,211. Directional Split: WB 50%, EB 50%	
	Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank
WB:	AM: 1 On Ramp: 11:00 (76) / 1 Off Ramp: 4) 10:45 (93)	4) 169
	PM: 1 On Ramp: 3:30 (131) / 1 Off Ramp: 2) 4:45 (321)	1) 452
EB:	AM: 1 On Ramp: 1) 7:15 (342) / 1 Off Ramp: 6:30 (84)	2) 342
	PM: 1 On Ramp: 3) 1:15 (175) / 1 Off Ramp: 4:30 (76)	3) 251
	*30% & higher considered significant in this analysis.	
	**Vehicles	



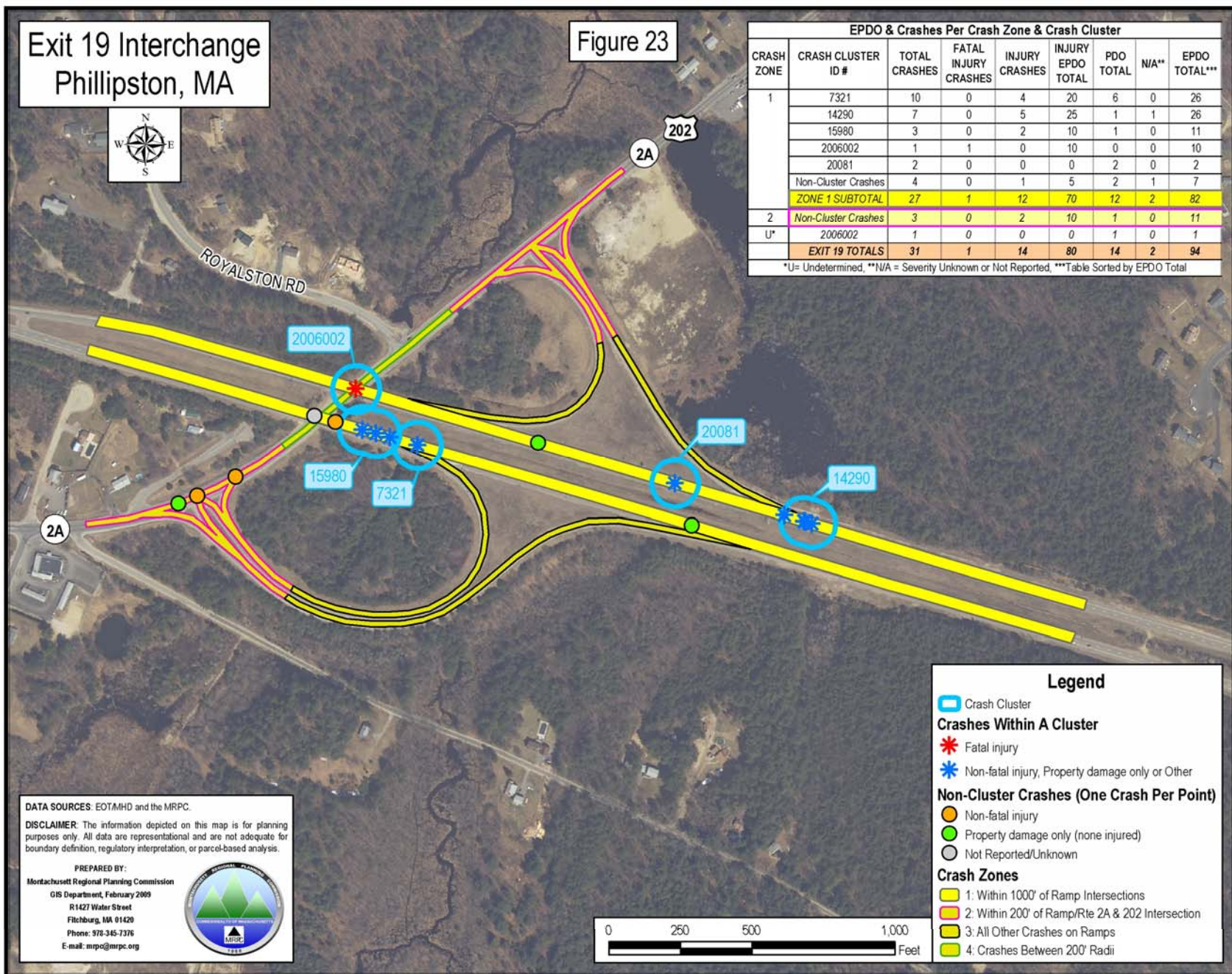
Exit 20 Interchange Access Safety Analysis Results (see Figure 22 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	60
	Phase I Report EPDO Total:	79
	Phase I Report Region Rank:	39th
	EPDO Total difference (if less ()):	(19) points or (24.1%)
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	29
	Number of Injury Crashes:	8 (no fatal injury)
	Percent of Total Crashes:	28%
	Total Fatal & Injury Percentage of Total Crashes:	28%
	Percentage Significant?*	No
D	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	58
	Percentage of Interchange EPDO Total:	96.7%
	Percentage Significant?*	Yes
E	Contiguous or Overlapping Crash Clusters:	5490, 42094
	EPDO Total:	30
	Percentage of Interchange EPDO Total:	50.0%
	Percentage Significant?*	Yes
F	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Guardrail:	28% 25%
	2. Tree:	14% 0%
	2. Wildlife:	14% 0%
	Total:	56% 25%
	All others Total:	44% 75%
	Most Significant Results:	Crash Zone 1 accounts for 93.8% of the Top 3 MHE.
G	Location Patterns of Crash Clusters:	
Zone 1:	Clusters 5490 & 42094 are located at the WB deceleration lane.	
	Cluster 35449 is located at the EB deceleration lane.	
H	Location Patterns of Non-cluster Crashes:	
Zone 1:	No significant pattern emerges among the 9 crashes.	
I	Analysis Conclusions & Recommendation:	
	The results of the analysis indicate that 50% of the EPDO Total occurred at the WB deceleration lane.	
	This is a location where vehicles are at the highest speed differentials and where merging and weaving take place.	
	Recommend Further Study of the following to improve safety	
	The highest priority location is the Route 2 WB decel lane in Crash Zone 1 that includes Crash Clusters 5490 & 42094.	
J	Ramp Traffic Counts Summary:	
	All Ramps Total: 3,443. Directional Split: WB 51%, EB 49%	
	Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank
WB:	AM: 1 On Ramp: 7:30 (36) / 1 Off Ramp: 4) 11:00 (76)	4) 112
	PM: 1 On Ramp: 3:30 (36) / 1 Off Ramp: 2) 4:45 (155)	1) 191
EB:	AM: 1 On Ramp: 1) 7:00 (157) / 1 Off Ramp: 10:45 (27)	2) 184
	PM: 1 On Ramp: 3) 2:00 (84) / 1 Off Ramp: 2:30 (37)	3) 121
	*30% & higher considered significant in this analysis.	
	**Vehicles	



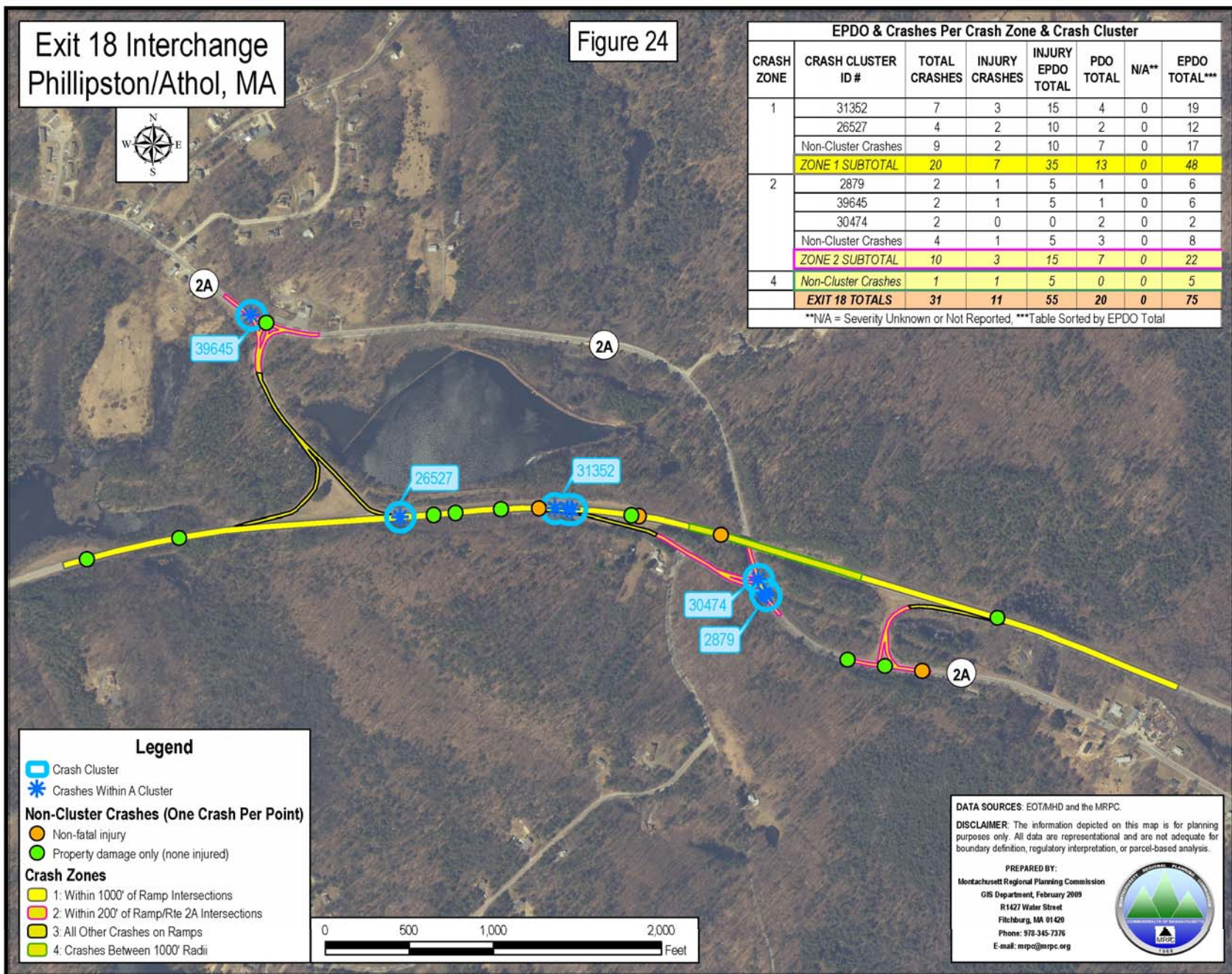
Exit 19 Interchange Access Safety Analysis Results (see Figure 23 & Appendix)

A	Type of Control:	On Ramps: YIELD
B	Interchange EPDO Total:	94
	Phase I Report EPDO Total:	91
	Phase I Report Region Rank:	26th
	EPDO Total Difference:	3 points or 3.3%
	EPDO Total & Rank Significant?	Yes
C	Interchange Total Crashes:	31
	Number of Fatal Crashes:	1
	Percent of Total Crashes:	3.2%
	Number of Injury Crashes:	14
	Percent of Total Crashes:	45.2%
	Total Fatal & Injury Percentage of Total Crashes:	48.4%
	Percentage Significant?*	Yes
D	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	82
	Percentage of Interchange EPDO Total:	87.2%
	Percentage Significant?*	Yes
E	EPDO Total of Clusters 7321 & 15980:	37
	EPDO Total of 2 Non-Cluster Crashes:	5
	Combined EPDO Total:	42
	Percentage of Interchange EPDO Total:	44.7%
	Percentage Significant?*	Yes
F	EPDO Total of Clusters 14290, 2006002, & 20081:	38
	EPDO Total of 1 Non-Cluster Crash:	1
	Combined EPDO Total:	39
	Percentage of Interchange EPDO Total:	40%
	Percentage Significant?*	Yes
G	Top 3 Most Harmful Events (MHE):	% of Total Crashes: % of Injury Crashes:
	1. Motor Vehicle in Traffic:	32% 36%
	2. Wildlife:	16% 21%
	3. Other:	16% 14%
	Total for #1 & #2:	48% 57%
	All others Total:	52% 43%
	Most Significant Results: Crash Zone 1 accounts for 86.7% of #1 & #2 Top 3 MHE.	
H	Location Patterns of Crash Clusters:	
Zone 1:	Clusters 7321 & 15980 are located at the EB deceleration lane.	
	Cluster 14290 is located at the WB deceleration lane & Cluster 20081 is approximately 400 feet west.	
	Cluster 2006002 is located at the WB accel lane.	
I	Location Patterns of Non-cluster Crashes:	
Zone 1:	2 Non-Cluster crashes in Zone 1 are just outside Crash Cluster 15980.	
J	Analysis Conclusions & Recommendation:	
	The results of the analysis indicate that 75% of the EPDO Total occurred within or very close to Rte 2 decel/accel lanes.	
	These are locations where vehicles are at the highest speed differentials and where merging and weaving take place.	
	Recommend Further Study of the following to improve safety	
	The highest priority location is the EB deceleration lane in Crash Zone 1 that includes Crash Clusters 7321 & 15980.	
	The second highest priority location is the WB decel/accel lanes in CZ 1 that includes Clusters 14290, 2006002 & 20081.	
K	Ramp Traffic Counts Summary:	
	All Ramps Total: 4,353. Directional Split: WB 46%, EB 54%	
	Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank
WB:	AM: 1 On Ramp: 7:30 (44) / 1 Off Ramp: 4) 10:00 (57)	4) 101
	PM: 1 On Ramp: 5:45 (47) / 1 Off Ramp: 1) 5:30 (211)	1) 258
EB:	AM: 1 On Ramp: 2) 7:15 (212) / 1 Off Ramp: 10:00 (39)	2) 251
	PM: 1 On Ramp: 3) 2:15 (124) / 1 Off Ramp: 4:15 (51)	3) 175
	*30% & higher considered significant in this analysis.	**Vehicles



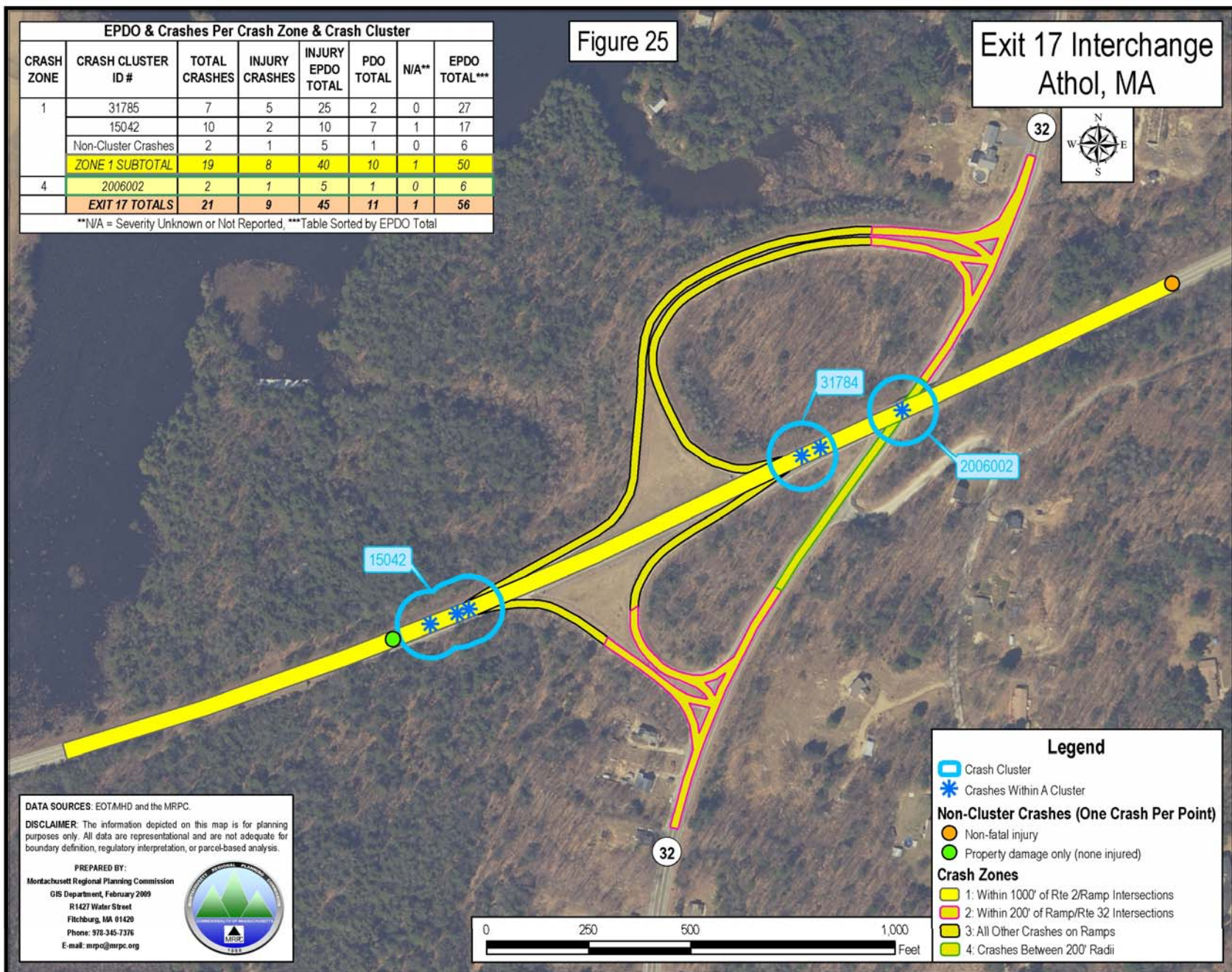
Exit 18 Interchange Access Safety Analysis Results (see Figure 24 & Appendix)

A	Type of Control: On Ramps: YIELD		
B	Project Update (Project # 602943) for this Interchange Concurrent to the years of this analysis, MassHighway undertook and completed geometric improvements to the accel and decel lanes. Due to this situation the locations of, and the characteristics of, crashes at this interchange may change significantly. Monitoring the crash conditions should be the focus over at least the next 3 years to see how crashes are affected. The partial analysis below describes the crash conditions during the construction period. No <i>Most Harmful Events</i> analysis was undertaken.		
C	Interchange EPDO Total:	75	
	Phase I Report EPDO Total:	48	
	Phase I Report Region Rank:	81st	
	EPDO Total Difference:	27 points or 56.3%	
	EPDO Total & Rank Significant?		Yes
D	Interchange Total Crashes:	31	
	Number of Injury Crashes:	11	(no fatal injury)
	Percent of Total Crashes:	35%	
	Total Fatal & Injury Percentage of Total Crashes:	35%	
	Percentage Significant?*		Yes
E	Most Dangerous Crash Zone:	Zone 1	
	EPDO Total:	48	
	Percentage of Interchange EPDO Total:	64.0%	
	Percentage Significant?*		Yes
F	EPDO Total of Clusters 31352 & 26527:	31	
	EPDO Total of 6 Nearby Non-Cluster Crashes:	14	
	Combined EPDO Total:	45	
	Percentage of Interchange EPDO Total:	60.0%	
	Percentage Significant?*		Yes
G	Location Patterns of Crash Clusters:		
Zone 1:	Clusters 31352 & 26527 are located at acceleration/deceleration lanes.		
H	Location Patterns of Non-cluster Crashes:		
Zone 1:	4 Non-cluster crashes are in between Clusters 26527 & 31352.		
	2 Non-cluster crashes are just east of Crash Cluster 31352.		
I	Analysis Conclusions & Recommendation:		
	The results of the analysis indicate that 60% of the EPDO Total occurred in Crash Zone 1 centered on accel/decel lanes.		
	The crashes described in sections E, G, & H above occurred approximately within a 1,500 foot section of Crash Zone 1.		
	This is a location where vehicles are at the highest speed differentials and where merging and weaving take place.		
	Recommendation: monitor the crash situation at this interchange as discussed in section B.		
J	Ramp Traffic Counts Summary:		
	All Ramps Total: 5,282. Directional Split: WB 52%, EB 48%		
	Peak Hours (red) & (Vehicle Count) & Rank		Total Veh** & Rank
WB:	AM: 1 On Ramp: 6:15 (17) / 1 Off Ramp: 4) 7:30 (120)		4) 137
	PM: 1 On Ramp: 1:00 (16) / 1 Off Ramp: 1) 5:30 (323)		1) 339
EB:	AM: 1 On Ramp: 2) 7:30 (288) / 1 Off Ramp: 10:15 (20)		2) 308
	PM: 1 On Ramp: 3) 5:00 (151) / 1 Off Ramp: 4:15 (19)		3) 170
*30% & higher considered significant in this analysis.			
**Vehicles			



Exit 17 Interchange Access Safety Analysis Results (see Figure 25 & Appendix)

A	Type of Control: On Ramps: YIELD	
B	Project Update (Project # 602943) for this Interchange	
	Concurrent to the years of this analysis, MassHighway undertook and completed geometric improvements to the accel and decel lanes. Due to this situation the locations of, and the characteristics of, crashes at this interchange may change significantly. Monitoring the crash conditions should be the focus over at least the next 3 years to see how crashes are affected. The partial analysis below describes the crash conditions during the construction period. No <i>Most Harmful Events</i> analysis was undertaken.	
C	Interchange EPDO Total:	56
	Phase I Report EPDO Total:	44
	Phase I Report Region Rank:	95th
	EPDO Total Difference:	12 points or 27.3%
	EPDO Total & Rank Significant?	Yes
D	Interchange Total Crashes:	21
	Number of Injury Crashes:	9 (no fatal injury)
	Percent of Total Crashes:	43%
	Total Fatal & Injury Percentage of Total Crashes:	43%
	Percentage Significant?*	Yes
E	Most Dangerous Crash Zone:	Zone 1
	EPDO Total:	50
	Percentage of Interchange EPDO Total:	89.3%
	Percentage Significant?*	Yes
F	EPDO Total of Clusters 31785 & 15042:	44
	EPDO Total of 2 Non-Cluster Crashes:	6
	Combined EPDO Total:	50
	Percentage of Interchange EPDO Total:	89.3%
	Percentage Significant?*	Yes
G	Location Patterns of Crash Clusters:	
	Zone 1: Clusters 31785 & 15042 are located at acceleration/deceleration lanes.	
H	Location Patterns of Non-cluster Crashes:	
	Zone 1: 2 nearby crashes.	
I	Analysis Conclusions & Recommendation:	
	The results of the analysis indicate that 89% of the EPDO Total occurred within or very close to accel/decel lanes. These are locations where vehicles are at the highest speed differentials and where merging and weaving take place.	
	Recommendation: monitor the crash situation at this interchange as discussed in section B.	
J	Ramp Traffic Counts Summary:	
	All Ramps Total: 1,978. Directional Split: WB 56%, EB 44%	
	Peak Hours (red) & (Vehicle Count) & Rank	Total Veh** & Rank
WB:	AM: 1 On Ramp: 3) 9:30 (42) / 1 Off Ramp: 9:00 (35)	3) 77
	PM: 1 On Ramp: 4:15 (39) / 1 Off Ramp: 1) 5:00 (80)	1) 119
EB:	AM: 1 On Ramp: 1) 8:00 (80) / 1 Off Ramp: 10:00 (31)	2) 111
	PM: 1 On Ramp: 1:15 (31) / 1 Off Ramp: 4) 3:30 (35)	4) 66
	*30% & higher considered significant in this analysis.	
	**Vehicles	



III: OTHER ISSUES/STUDIES:

Two other major studies have been completed or near completion that address safety conditions in the Montachusett Region:

Phase I Report: Roadway Safety Conditions in the Montachusett Region (completed)

Phase II Report: Roadway Safety Conditions in the Montachusett Region (DRAFT)

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APPENDIX
ROUTE 2 INTERCHANGE & AT-GRADE INTERSECTION
MOST HARMFUL EVENT ANALYSIS

Exit 38 Interchange				MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:																	
						2nd				1st				3rd		4th					
Crash Zone	Crash Cluster**	Wildlife	Non Fatal Injury	Embankment	Non Fatal Injury	Guardrail	Non Fatal Injury	Median Barrier	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Tree	Non Fatal Injury	Rollover	Non Fatal Injury	Not Reported	Non Fatal Injury	Other	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	3171*	1	0	1	0	11	3	1	0	13	3	2	1	1	1	10	4	1	1	41	13
	8820	0	0	0	0	5	3	0	0	4	3	1	0	0	0	1	0	4	0	15	6
	17417	1	0	0	0	5	2	0	0	4	2	0	0	1	1	0	0	0	0	11	5
	11385	0	0	0	0	3	1	0	0	9	1	0	0	1	1	2	0	1	0	16	3
	13700	0	0	1	0	2	1	0	0	1	0	0	0	0	0	0	0	1	0	5	1
	31340	0	0	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	0	4	0
	27729	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	3	0
	NCC*	0	0	0	0	3	1	1	1	1	0	0	0	0	0	0	0	0	0	5	2
	Totals	2	0	3	0	30	11	3	1	33	9	3	1	4	3	14	4	8	1	100	30
	Percent	50%	n/a	100%	n/a	100%	100%	100%	100%	66%	60%	75%	100%	100%	100%	93%	100%	89%	100%	82%	83%
2	41165	1	0	0	0	0	0	0	0	6	3	0	0	0	0	0	0	1	0	8	3
	9335	1	0	0	0	0	0	0	0	5	1	0	0	0	0	0	0	0	0	6	1
	3171*	0	0	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	3	1
	NCC	0	0	0	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	3	1
	Totals	2	0	0	0	0	0	0	0	16	6	0	0	0	0	1	0	1	0	20	6
	Percent	50%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	32%	40%	n/a	n/a	n/a	n/a	7%	n/a	11%	n/a	16%	17%
U*	3171*	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	0
	Totals	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	0
	Percent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2%	n/a	25%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2%	0%
	TOTALS	4	0	3	0	30	11	3	1	50	15	4	1	4	3	15	4	9	1	122	36
	PERCENT	3%	0%	2%	0%	25%	31%	2%	3%	41%	42%	3%	3%	3%	8%	12%	11%	7%	3%	% Injury	
*NCC = Non-cluster Crashes *U = Undetermined **Table sort identical to Fig 2																				29.5%	
*Cluster 3171 in 2 Crash Zones & Undetermined Crash Zone																					

Exit 36 Interchange				MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:													
				4th				1st				2nd		3rd			
Crash Zone	Crash Cluster**	Wildlife	Non Fatal Injury	Guardrail	Non Fatal Injury	Median Barrier	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Tree	Non Fatal Injury	Reported Not	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	28054	2	1	2	0	3	1	11	1	1	1	4	1	2	2	25	7
	34170	0	0	1	1	1	0	8	4	1	1	2	0	2	2	15	8
	12230	1	0	1	1	0	0	3	1	0	0	0	0	0	0	5	2
	14010	0	0	0	0	0	0	1	0	0	0	0	0	2	1	3	1
	10183	0	0	1	0	0	0	1	1	0	0	0	0	0	0	2	1
	NCC*	0	0	0	0	0	0	2	0	0	0	2	1	0	0	4	1
	Totals	3	1	5	2	4	1	26	7	2	2	8	2	6	5	54	20
	Percent	100%	100%	83%	100%	100%	100%	96%	100%	67%	100%	80%	100%	100%	100%	92%	100%
2	16500	0	0	1	0	0	0	0	0	0	0	2	0	0	0	3	0
	2006016	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2	0
	Totals	0	0	1	0	0	0	1	0	1	0	2	0	0	0	5	0
	Percent	n/a	n/a	17%	n/a	n/a	n/a	4%	n/a	33%	n/a	20%	n/a	n/a	n/a	8%	n/a
	TOTALS	3	1	6	2	4	1	27	7	3	2	10	2	6	5	59	20
	PERCENT	5%	5%	10%	10%	7%	5%	46%	35%	5%	10%	17%	10%	10%	25%	% Injury	
*NCC = Non-cluster Crashes **Table sort identical to table in Figure 4																33.9%	
***Combined Total of Remaining Most Harmful Events (including Other)																	

Exit 35 Interchange											
MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:											
		3rd		1st		2nd		4th			
Crash Zone	Crash Cluster**	Guardrail	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Not Reported	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	39850	4	3	12	3	3	1	1	1	20	8
	29360	3	0	10	6	3	0	0	0	16	6
	4826*	0	0	3	0	3	1	1	1	7	2
	12633	0	0	2	0	0	0	0	0	2	0
	38165	0	0	1	0	0	0	1	0	2	0
	8043*	1	0	1	0	2	0	0	0	4	0
	2006015	1	0	0	0	1	0	0	0	2	0
	NCC*	4	0	3	2	0	0	1	1	8	3
	Totals	13	3	32	11	12	2	4	3	61	19
Percent	100%	100%	76%	61%	55%	33%	100%	100%	75%	63%	
2	21126	0	0	4	3	3	1	0	0	7	4
	1531	0	0	4	2	2	0	0	0	6	2
	Totals	0	0	8	5	5	1	0	0	13	6
	Percent	n/a	n/a	19%	28%	23%	17%	n/a	n/a	16%	20%
4	4826*	0	0	1	1	4	3	0	0	5	4
	8043*	0	0	0	0	1	0	0	0	1	0
	Totals	0	0	1	1	5	3	0	0	6	4
	Percent	n/a	n/a	2%	6%	23%	50%	n/a	n/a	7%	13%
U*	4826*	0	0	1	1	0	0	0	0	1	1
	Totals	0	0	1	1	0	0	0	0	1	1
	Percent	n/a	n/a	2%	6%	n/a	n/a	n/a	n/a	1%	3%
	TOTALS	13	3	42	18	22	6	4	3	81	30
	PERCENT	16%	10%	52%	60%	27%	20%	5%	10%	% Injury	
*NCC= Non-cluster Crashes										**Table sort identical to table in Fig 5	
										37.0%	
*Clusters 4826 & 8043 in 2 Crash Zones, 4826 also in Undetermined Crash Zone											
***Combined Total of Remaining Most Harmful Events (including Other)											

Rte 2 & Rte I-190 Intersection / Exits 33 & 8 Interchanges																	
MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:																	
		2nd				1st					3rd		4th				
Crash Zone	Crash Cluster**	Guardrail	Non Fatal Injury	Median Barrier	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Fatal Injury	Rollover	Non Fatal Injury	Reported Not	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury	Fatal Injury
1	17942	5	3	0	0	4	4	0	1	1	2	1	0	0	12	9	0
	33894	2	0	0	0	4	1	1	0	0	0	0	1	0	7	1	1
	10950	2	1	1	0	5	1	0	0	0	1	0	1	0	10	2	0
	5619*	0	0	1	0	3	1	0	0	0	0	0	0	0	4	1	0
	2006014	1	0	0	0	0	0	0	0	0	0	0	1	1	2	1	0
	32062	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0
	16367	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	0
	NCC*	1	0	0	0	2	0	0	0	0	2	0	2	1	7	1	0
	Total	11	4	2	0	18	7	1	2	2	6	1	6	2	45	16	1
	Percent	79%	67%	67%	n/a	69%	78%	100%	67%	67%	60%	33%	75%	50%	70%	62%	100%
4	39647	2	1	0	0	6	1	0	1	1	4	2	2	2	15	7	0
	NCC*	0	0	1	1	2	1	0	0	0	0	0	0	0	3	2	0
	Total	2	1	1	1	8	2	0	1	1	4	2	2	2	18	9	0
	Percent	14%	17%	33%	100%	31%	22%	n/a	33%	33%	40%	67%	25%	50%	28%	35%	n/a
	U*	5619*	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1
	Total	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0
	Percent	7%	17%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2%	4%	n/a
	TOTALS	14	6	3	1	26	9	1	3	3	10	3	8	4	64	26	1
	PERCENT	22%	23%	5%	4%	41%	35%	100%	5%	12%	16%	12%	13%	15%	% Injury & Fatal		
*NCC= Non-cluster Crashes *U = Undetermined **Table sort identical to table in Figure 7															42.2%		
***Combined Total of Remaining Most Harmful Events (including Other)										*Cluster 5619 in a Crash Zone & Undetermined Crash Zone							

Exit 32 Interchange		MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:																	
						4th		1st		2nd						3rd			
Crash Zone	Crash Cluster**	Wildlife	Non Fatal Injury	Guardrail	Non Fatal Injury	Median Barrier	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Reported Not	Non Fatal Injury	Pole	Non Fatal Injury	Movable Object	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	36862	3	0	2	1	3	2	16	3	7	1	2	1	2	0	7	3	42	11
	25974*	0	0	1	0	2	0	11	3	5	1	2	0	0	0	1	0	22	4
	26812	0	0	1	1	0	0	1	1	2	0	0	0	0	0	0	0	4	2
	11177	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	3	1
	2006012	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	2	1
	2006013	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	2	1
	NCC*	0	0	0	0	0	0	3	2	1	0	0	0	0	0	0	0	4	2
	Totals	3	0	4	2	5	2	37	12	15	2	4	1	3	0	8	3	79	22
	Percent	100%	n/a	100%	100%	100%	100%	77%	92%	94%	67%	100%	100%	100%	n/a	80%	100%	85%	92%
2	7900	0	0	0	0	0	0	6	1	0	0	0	0	0	0	2	0	8	1
	NCC	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3	0
	Totals	0	0	0	0	0	0	9	1	0	0	0	0	0	0	2	0	11	1
	Percent	n/a	n/a	n/a	n/a	n/a	n/a	19%	8%	n/a	n/a	n/a	n/a	n/a	n/a	20%	n/a	12%	4%
U*	25974*	0	0	0	0	0	0	2	0	1	1	0	0	0	0	0	0	3	1
	Totals	0	0	0	0	0	0	2	0	1	1	0	0	0	0	0	0	3	1
	Percent	n/a	n/a	n/a	n/a	n/a	n/a	4%	n/a	6%	33%	n/a	n/a	n/a	n/a	n/a	n/a	3%	4%
	TOTALS	3	0	4	2	5	2	48	13	16	3	4	1	3	0	10	3	93	24
	PERCENT	3%	0%	4%	8%	5%	8%	52%	54%	17%	13%	4%	4%	3%	0%	11%	13%	% Injury	
*NCC= Non-cluster Crashes *U = Undetermined **Table sort identical to table in Figure 8																		25.8%	
***Combined Total of Remaining Most Harmful Events (includes Other)																		*Cluster 25974 in 1 Crash Zone & Undetermined Crash Zone	

Exit 31 Interchange		MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:											
		4th		3rd		1st		2nd					
Crash Zone	Crash Cluster**	Guardrail	Non Fatal Injury	Median Barrier	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Reported Not	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	3399*	5	0	8	4	47	18	26	9	1	0	87	31
	4722	1	1	1	0	13	3	6	2	1	0	22	6
	10691	1	1	0	0	7	1	1	0	0	0	9	2
	13954	2	0	1	0	3	0	3	1	0	0	9	1
	NCC*	0	0	1	0	2	0	1	0	0	0	4	0
	Total	9	2	11	4	72	22	37	12	2	0	131	40
	Percent	100%	100%	100%	100%	79%	88%	80%	92%	50%	n/a	81%	89%
2	3399*	0	0	0	0	4	0	2	0	1	0	7	0
	NCC	0	0	0	0	5	2	0	0	0	0	5	2
	Total	0	0	0	0	9	2	2	0	1	0	12	2
	Percent	n/a	n/a	n/a	n/a	10%	8%	4%	n/a	25%	n/a	7%	4%
4	3399*	0	0	0	0	7	1	4	0	1	1	12	2
	Total	0	0	0	0	7	1	4	0	1	1	12	2
	Percent	n/a	n/a	n/a	n/a	8%	4%	9%	n/a	25%	100%	7%	4%
U*	3399*	0	0	0	0	3	0	3	1	0	0	6	1
	Total	0	0	0	0	3	0	3	1	0	0	6	1
	Percent	n/a	n/a	n/a	n/a	3%	n/a	7%	8%	n/a	n/a	4%	2%
	TOTALS	9	2	11	4	91	25	46	13	4	1	161	45
	PERCENT	6%	4%	7%	9%	57%	56%	29%	29%	2%	2%	% Injury	
*NCC= Non-cluster Crashes *U = Undetermined												28.0%	
**Table sort identical to table in Figure 9												*Cluster 3399 in 3 Crash Zones & Undetermined Crash Zone	
***Combined Total of Remaining Most Harmful Events (includes Other)													

Exit 30 Interchange													
MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:													
				3rd		1st		2nd		4th			
Crash Zone	Crash Cluster**	Guardrail	Non Fatal Injury	Median Barrier	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Not Reported	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	18804	1	0	4	1	3	0	5	2	2	2	15	5
	7984	2	0	3	0	3	1	3	0	1	1	12	2
	32391*	0	0	0	0	4	2	3	0	1	0	8	2
	NCC*	0	0	2	0	4	3	3	1	1	0	10	4
	Total	3	0	9	1	14	6	14	3	5	3	45	13
	Percent	60%	n/a	90%	100%	21%	46%	78%	75%	56%	100%	41%	62%
2	24566	1	0	0	0	26	6	1	0	2	0	30	6
	15303*	0	0	0	0	5	0	0	0	0	0	5	0
	2006011	0	0	0	0	3	0	1	0	0	0	4	0
	8042	0	0	0	0	2	0	0	0	0	0	2	0
	20404	0	0	0	0	1	0	1	0	0	0	2	0
	2006010	0	0	0	0	2	0	0	0	0	0	2	0
	NCC	0	0	0	0	4	0	0	0	0	0	4	0
	Total	1	0	0	0	43	6	3	0	2	0	49	6
	Percent	20%	n/a	n/a	n/a	63%	46%	17%	n/a	22%	n/a	45%	29%
4	32391*	1	0	1	0	6	1	0	0	1	0	9	1
	15303*	0	0	0	0	5	0	1	1	1	0	7	1
	Total	1	0	1	0	11	1	1	1	2	0	16	2
	Percent	20%	n/a	10%	n/a	16%	8%	6%	25%	n/a	n/a	15%	10%
	TOTALS	5	0	10	1	68	13	18	4	9	3	110	21
	PERCENT	5%	0%	9%	5%	62%	62%	16%	19%	8%	14%	% Injury	
*NCC= Non-cluster Crashes **Table sort identical to table in Figure 11												19.1%	
*Clusters 32391 & 15303 in 2 Crash Zones													
***Combined Total of Remaining Most Harmful Events (including Other)													

Mt Elam Rd Intersection															
MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:															
		3rd		4th		1st				2nd		4th			
Crash Zone	Crash Cluster**	Guardrail	Non Fatal Injury	Median Barrier	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Tree	Non Fatal Injury	Reported Not	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	21510	3	2	3	0	15	6	1	1	13	3	3	1	38	13
	9370	1	1	0	0	1	1	0	0	0	0	1	0	3	2
	10136	2	1	1	1	0	0	0	0	0	0	0	0	3	2
	2006018	1	1	0	0	1	1	0	0	0	0	0	0	2	2
	11657	0	0	1	0	1	0	1	1	0	0	0	0	3	1
	NCC*	2	0	0	0	1	1	1	0	2	0	1	0	7	1
	Total	9	5	5	1	19	9	3	2	15	3	5	1	56	21
	Percent	100%	100%	100%	100%	90%	90%	100%	100%	100%	100%	n/a	n/a	97%	95%
2	NCC	0	0	0	0	2	1	0	0	0	0	0	0	2	1
	Total	0	0	0	0	2	1	0	0	0	0	0	0	2	1
	Percent	n/a	n/a	n/a	n/a	10%	10%	n/a	n/a	n/a	n/a	n/a	n/a	3%	5%
	TOTALS	9	5	5	1	21	10	3	2	15	3	5	1	58	22
	PERCENT	16%	23%	9%	5%	36%	45%	5%	9%	26%	14%	9%	5%	% Injury	
*NCC= Non-cluster Crashes **Table sort identical to table in Figure 12														37.9%	
***Combined Total of Remaining Most Harmful Events (including Other)															

Exit 28 Interchange																
MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:																
					3rd		1st		2nd		4th					
Crash Zone	Crash Cluster**	Wildlife	Non Fatal Injury	Guardrail	Non Fatal Injury	Median Barrier	Non Fatal Injury	Motor Vehicle In Traffic	Non Fatal Injury	Not Reported	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury	
1	32467*	0	0	2	1	4	1	6	4	8	4	5	3	25	13	
	5962	2	0	0	0	1	0	11	2	5	1	1	0	20	3	
	20499	0	0	0	0	1	0	4	1	3	0	0	0	8	1	
	42601	0	0	0	0	1	1	0	0	1	0	1	0	3	1	
	5774	0	0	1	1	0	0	1	0	0	0	0	0	2	1	
	11395	1	0	0	0	0	0	1	1	0	0	0	0	2	1	
	39327	0	0	0	0	1	0	1	0	0	0	0	0	2	0	
	NCC*	0	0	1	0	1	0	3	1	1	0	0	0	6	1	
	Totals	3	0	4	2	9	2	27	9	18	5	7	3	68	21	
Percent	100%	n/a	80%	100%	100%	100%	93%	90%	95%	100%	100%	100%	94%	95%		
2	29914	0	0	1	0	0	0	1	1	0	0	0	0	2	1	
	Totals	0	0	1	0	0	0	1	1	0	0	0	0	2	1	
	Percent	n/a	n/a	20%	n/a	n/a	n/a	3%	10%	n/a	n/a	n/a	n/a	3%	5%	
4	32467*	0	0	0	0	0	0	0	0	1	0	0	0	1	0	
	Totals	0	0	0	0	0	0	0	0	1	0	0	0	1	0	
	Percent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5%	n/a	n/a	n/a	1%	n/a	
U*	32467*	0	0	0	0	0	0	1	0	0	0	0	0	1	0	
	Totals	0	0	0	0	0	0	1	0	0	0	0	0	1	0	
	Percent	n/a	n/a	n/a	n/a	n/a	n/a	3%	n/a	n/a	n/a	n/a	n/a	1%	n/a	
	TOTALS	3	0	5	2	9	2	29	10	19	5	7	3	72	22	
	PERCENT	4%	0%	7%	9%	13%	9%	40%	45%	26%	23%	10%	14%	% Injury		
*NCC= Non-cluster Crashes *U = Undetermined **Table sort identical to table in Figure 14														30.6%		
***Combined Total of Remaining Most Harmful Events (including Other)																
*Cluster 32467 in 2 Crash Zones & Undetermined Crash Zone																

Exit 27 Interchange															
MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:															
				2nd		1st		3rd				4th			
Crash Zone	Crash Cluster**	Guardrail	Non Fatal Injury	Median Barrier	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Rollover	Non Fatal Injury	Reported Not	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	12149	3	2	5	3	5	1	2	1	1	0	0	0	16	7
	2006009	0	0	0	0	6	2	0	0	2	0	3	1	11	3
	40651	1	0	1	0	4	1	3	2	1	0	0	0	10	3
	28512	0	0	0	0	0	0	0	0	0	0	2	1	2	1
	37157	0	0	0	0	2	1	0	0	0	0	0	0	2	1
	19495	0	0	0	0	2	0	0	0	0	0	1	0	3	0
	NCC*	0	0	2	1	0	0	2	0	0	0	0	0	4	1
	Total	4	2	8	4	19	5	7	3	4	0	6	2	48	16
	Percent	100%	100%	89%	100%	95%	100%	100%	100%	100%	n/a	100%	100%	96%	100%
2	NCC	0	0	1	0	1	0	0	0	0	0	0	0	2	0
	Total	0	0	1	0	1	0	0	0	0	0	0	0	2	0
	Percent	n/a	n/a	11%	n/a	5%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4%	n/a
	TOTALS	4	2	9	4	20	5	7	3	4	0	6	2	50	16
	PERCENT	8%	13%	18%	25%	40%	31%	14%	19%	8%	0%	12%	13%	% Injury	
*NCC= Non-cluster Crashes **Table sort identical to table in Figure 15														32.0%	
***Combined Total of Remaining Most Harmful Events (including Other)															

Exit 26 Interchange		MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:											
		1st		4th		3rd		2nd					
Crash Zone	Crash Cluster**	Guardrail	Non Fatal Injury	Median Barrier	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Rollover	Non Fatal Injury	Reported Not	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	2006008	0	0	1	1	0	0	0	0	1	1	2	2
	7131	2	0	0	0	1	0	1	1	0	0	4	1
	NCC*	2	1	0	0	1	0	1	1	0	0	4	2
	Total	4	1	1	1	2	0	2	2	1	1	10	5
	Percent	100%	100%	100%	100%	100%	n/a	100%	100%	100%	100%	100%	100%
	TOTALS	4	1	1	1	2	0	2	2	1	1	10	5
	PERCENT	40%	20%	10%	20%	20%	0%	20%	40%	10%	10%	% Injury	
*NCC= Non-cluster Crashes **Table sort identical to table in Figure 16												50.0%	

Exit 25 Interchange																	
MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:																	
						4th		1st			3rd		2nd				
Crash Zone	Crash Cluster**	Ditch	Non Fatal Injury	Wildlife	Non Fatal Injury	Guardrail	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Fatal Injury	Reported	Not Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury	Fatal Injury
1	670	1	0	1	0	1	0	4	1	1	0	0	4	2	11	3	1
	19124	2	0	2	0	2	2	1	0	0	2	0	3	2	12	4	0
	21678*	0	0	0	0	1	1	9	1	0	1	0	0	0	11	2	0
	2006007	0	0	1	0	0	0	0	0	0	1	0	0	0	2	0	0
	NCC*	0	0	0	0	2	0	2	1	0	0	0	1	0	5	1	0
	Total	3	0	4	0	6	3	16	3	1	4	0	8	4	41	10	1
	Percent	100%	n/a	100%	n/a	86%	100%	38%	25%	100%	44%	n/a	73%	57%	54%	40%	100%
2	12852	0	0	0	0	0	0	12	1	0	2	1	1	1	15	3	0
	709	0	0	0	0	1	0	4	2	0	1	0	0	0	6	2	0
	36078	0	0	0	0	0	0	2	0	0	0	0	1	1	3	1	0
	Total	0	0	0	0	1	0	18	3	0	3	1	2	2	24	6	0
	Percent	n/a	n/a	n/a	n/a	14%	n/a	43%	25%	n/a	33%	33%	18%	29%	32%	24%	n/a
4	21678*	0	0	0	0	0	0	6	4	0	1	1	1	1	8	6	0
	Total	0	0	0	0	0	0	6	4	0	1	1	1	1	8	6	0
	Percent	n/a	n/a	n/a	n/a	n/a	n/a	14%	33%	n/a	11%	33%	9%	14%	11%	24%	n/a
U*	21678*	0	0	0	0	0	0	2	2	0	1	1	0	0	3	3	0
	Total	0	0	0	0	0	0	2	2	0	1	1	0	0	3	3	0
	Percent	n/a	n/a	n/a	n/a	n/a	n/a	5%	17%	n/a	11%	33%	n/a	n/a	4%	12%	n/a
	TOTALS	3	0	4	0	7	3	42	12	1	9	3	11	7	76	25	1
	PERCENT	4%	0%	5%	0%	9%	12%	55%	48%	100%	12%	12%	14%	28%	% Injury & Fatal		
*NCC= Non-cluster Crashes *U = Undetermined **Table sort identical to table in Figure 17															34.2%		
***Combined Total of Remaining Most Harmful Events (including Other)															*Cluster 21678 in 2 Crash Zones & Undetermined Crash Zone		

Exit 24 Interchange																	
MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:																	
						2nd		1st				4th		3rd			
Crash Zone	Crash Cluster**	Wildfire	Non Fatal Injury	Embnk	Non Fatal Injury	Guardrail	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Rollover	Non Fatal Injury	Reported Not	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	22169	2	0	0	0	6	1	9	3	4	0	2	0	2	1	25	5
	31497	0	0	1	1	2	1	1	1	0	0	1	0	3	0	8	3
	4990	1	0	0	0	0	0	1	0	0	0	0	0	2	1	4	1
	27212*	0	0	0	0	1	1	0	0	0	0	3	0	0	0	4	1
	827	0	0	0	0	1	1	0	0	0	0	0	0	1	0	2	1
	10376*	1	0	0	0	0	0	1	0	0	0	0	0	2	0	4	0
	25376	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
	NCC*	1	0	0	0	3	1	5	1	0	0	2	1	2	0	13	3
	Totals	5	0	1	1	14	5	17	5	4	0	8	1	12	2	61	14
	Percent	100%	n/a	33%	50%	100%	100%	52%	50%	80%	n/a	73%	100%	100%	100%	73%	70%
2	1612	0	0	0	0	0	0	13	5	0	0	2	0	0	0	15	5
	10376*	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
	Totals	0	0	0	0	0	0	14	5	0	0	2	0	0	0	16	5
	Percent	n/a	n/a	n/a	n/a	n/a	n/a	42%	50%	n/a	n/a	18%	n/a	n/a	n/a	19%	25%
3	NCC	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
	Totals	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
	Percent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	20%	n/a	n/a	n/a	n/a	n/a	1%	n/a
4	27212*	0	0	2	1	0	0	1	0	0	0	0	0	0	0	3	1
	Totals	0	0	2	1	0	0	1	0	0	0	0	0	0	0	3	1
	Percent	n/a	n/a	67%	50%	n/a	n/a	3%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4%	5%
U*	27212*	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2	0
	Totals	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2	0
	Percent	n/a	n/a	n/a	n/a	n/a	n/a	3%	n/a	n/a	n/a	9%	n/a	n/a	n/a	2%	n/a
	TOTALS	5	0	3	2	14	5	33	10	5	0	11	1	12	2	83	20
	PERCENT	6%	0%	4%	10%	17%	25%	40%	50%	6%	0%	13%	5%	14%	10%	% Injury	
*NCC= Non-cluster Crashes *U = Undetermined																24.1%	
***Combined Total of Remaining Most Harmful Events **Table sort identical to table in Figure 18																	
*Cluster 27212 in 2 Crash Zones & Undetermined Crash Zone *Cluster 10376 in 2 Crash Zones																	

Exit 23 Interchange		MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:																
		3rd		1st		Fatal Crash			4th		2nd							
Crash Zone	Crash Cluster**	Guardrail	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Rollover	Non Fatal Injury	Fatal Injury	Reported Not	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury	Fatal Injury			
1	2006004	3	1	3	2	0	0	0	1	0	1	0	8	3				
	3048	1	0	1	1	1	1	0	2	0	1	0	6	2				
	NCC*	1	1	2	0	0	0	0	1	0	4	1	8	2				
	Total	5	2	6	3	1	1	0	4	0	6	1	22	7	n/a			
	Percent	83%	67%	30%	50%	50%	100%	n/a	80%	n/a	86%	100%	55%	64%	n/a			
2	21697	0	0	10	2	0	0	0	1	0	0	0	11	2				
	NCC	0	0	3	0	0	0	0	0	0	1	0	4	0				
	Total	0	0	13	2	0	0	0	1	0	1	0	15	2	n/a			
	Percent	n/a	n/a	65%	33%	n/a	n/a	n/a	20%	n/a	14%	n/a	38%	18%	n/a			
4	7095	0	0	1	1	1	0	1	0	0	0	0	2	1	1			
	NCC	1	1	0	0	0	0	0	0	0	0	0	1	1				
	Total	1	1	1	1	1	0	1	0	0	0	0	3	2	1			
	Percent	17%	33%	5%	17%	50%	n/a	100%	n/a	n/a	n/a	n/a	8%	18%	100%			
	TOTALS	6	3	20	6	2	1	1	5	0	7	1	40	11	1			
	PERCENT	15%	27%	50%	55%	5%	9%	100%	13%	0%	18%	9%	% Injury & Fatal					
*NCC= Non-cluster Crashes													**Table sort identical to table in Figure 19			30.0%		
***Combined Total of Remaining Most Harmful Events																		

Exit 22 Interchange													
MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:													
				4th		1st		2nd		3rd			
Crash Zone	Crash Cluster**	Wildlife	Non Fatal Injury	Guardrail	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Reported Not	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	13057	0	0	2	0	2	0	2	0	3	1	9	1
	22184	2	0	1	0	2	0	0	0	1	0	6	0
	4843	0	0	1	0	1	0	0	0	0	0	2	0
	7372	2	0	0	0	0	0	0	0	0	0	2	0
	16044	0	0	1	0	1	0	0	0	0	0	2	0
	NCC*	0	0	1	1	1	0	0	0	3	0	5	1
	Totals	4	0	6	1	7	0	2	0	7	1	26	2
	Percent	100%	n/a	86%	50%	23%	n/a	18%	n/a	70%	50%	42%	15%
2	33714	0	0	0	0	10	2	0	0	1	0	11	2
	2006003	0	0	0	0	3	1	2	1	1	0	6	2
	8099*	0	0	0	0	2	0	1	1	0	0	3	1
	20474*	0	0	0	0	2	0	1	1	0	0	3	1
	NCC	0	0	0	0	4	3	2	0	0	0	6	3
	Totals	0	0	0	0	21	6	6	3	2	0	29	9
	Percent	n/a	n/a	n/a	n/a	70%	100%	55%	100%	20%	n/a	47%	69%
4	8099*	0	0	0	0	1	0	0	0	1	1	2	1
	20474*	0	0	0	0	0	0	1	0	0	0	1	0
	NCC	0	0	1	1	1	0	2	0	0	0	4	1
	Totals	0	0	1	1	2	0	3	0	1	1	7	2
	Percent	n/a	n/a	14%	50%	7%	n/a	27%	n/a	10%	50%	11%	15%
	TOTALS	4	0	7	2	30	6	11	3	10	2	62	13
	PERCENT	6%	0%	11%	15%	48%	46%	18%	23%	16%	15%	% Injury	
*NCC= Non-cluster Crashes **Table sort identical to table in Figure 20												21.0%	
***Combined Total of Remaining Most Harmful Events *Clusters 8099 & 20474 in 2 Crash Zones													

Exit 21 Interchange															
MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:															
		2nd		3rd		1st		3rd							
Crash Zone	Crash Cluster**	Wildlife	Non Fatal Injury	Guardrail	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Tree	Non Fatal Injury	Not Reported	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	40059	1	1	0	0	0	0	2	1	2	0	0	0	5	2
	2006006	1	0	0	0	1	1	0	0	0	0	1	1	3	2
	13438	0	0	1	0	1	1	0	0	1	0	1	0	4	1
	13563	2	0	0	0	0	0	0	0	0	0	0	0	2	0
	2006005	1	0	0	0	1	0	0	0	0	0	0	0	2	0
	NCC*	1	0	3	2	1	1	2	1	0	0	1	1	8	5
	Totals	6	1	4	2	4	3	4	2	3	0	3	2	24	10
	Percent	100%	100%	100%	100%	67%	60%	100%	100%	100%	n/a	100%	100%	92%	83%
2	NCC	0	0	0	0	2	2	0	0	0	0	0	0	2	2
	Totals	0	0	0	0	2	2	0	0	0	0	0	0	2	2
	Percent	n/a	n/a	n/a	n/a	33%	40%	n/a	n/a	n/a	n/a	n/a	n/a	8%	17%
	TOTALS	6	1	4	2	6	5	4	2	3	0	3	2	26	12
	PERCENT	23%	8%	15%	17%	23%	42%	15%	17%	12%	0%	12%	17%	% Injury	
*NCC= Non-cluster Crashes **Table sort identical to table in Figure 21														46.2%	
***Combined Total of Remaining Most Harmful Events															

Exit 20 Interchange		MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:															
		2nd				1st				2nd		5th		2nd			
Crash Zone	Crash Cluster**	Wildlife	Non Fatal Injury	Embnk	Non Fatal Injury	Guardrail	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Tree	Non Fatal Injury	Rollover	Non Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury
1	5490	2	0	2	1	3	0	0	0	1	0	2	2	1	0	11	3
	35449	1	0	1	1	1	0	1	0	1	0	0	0	1	0	6	1
	42094	0	0	0	0	1	1	0	0	1	0	0	0	1	0	3	1
	NCC*	1	0	0	0	2	1	1	1	1	0	1	1	1	0	7	3
	Totals	4	0	3	2	7	2	2	1	4	0	3	3	4	0	27	8
	Percent	100%	n/a	100%	100%	88%	100%	67%	100%	100%	n/a	100%	100%	n/a	n/a	93%	100%
4	NCC	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	0
	Totals	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	0
	Percent	n/a	n/a	n/a	n/a	13%	n/a	33%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7%	n/a
	TOTALS	4	0	3	2	8	2	3	1	4	0	3	3	4	0	29	8
	PERCENT	14%	0%	10%	25%	28%	25%	10%	13%	14%	0%	10%	38%	14%	0%	% Injury	
*NCC= Non-cluster Crashes **Table sort identical to table in Figure 22																27.6%	
***Combined Total of Remaining Most Harmful Events																	

Exit 19 Interchange		MOST HARMFUL EVENT (CRASHES WITH) RANK & CRASH SEVERITY:																		
		2nd		4th		1st				Fatal Crash			3rd							
Crash Zone	Crash Cluster**	Wildlife	Non Fatal Injury	Guardrail	Non Fatal Injury	Motor Vehicle in Traffic	Non Fatal Injury	Tree	Non Fatal Injury	Rollover	Non Fatal Injury	Fatal Injury	Other***	Non Fatal Injury	Total Crashes	Non Fatal Injury	Fatal Injury			
1	7321	3	1	1	0	4	3	0	0	2	0	0	0	0	10	4				
	14290	1	1	2	2	2	0	1	1	0	0	0	1	1	7	5				
	15980	1	1	0	0	0	0	1	0	0	0	0	1	1	3	2				
	2006002*	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1			
	20081	0	0	0	0	1	0	0	0	1	0	0	0	0	2	0				
	NCC*	0	0	1	1	1	0	1	0	0	0	0	1	0	4	1				
	Total	5	3	4	3	8	3	3	1	4	0	1	3	2	27	12	1			
	Percent	100%	100%	100%	100%	80%	60%	100%	100%	100%	n/a	100%	60%	100%	87%	86%	100%			
2	NCC	0	0	0	0	2	2	0	0	0	0	0	1	0	3	2				
	Total	0	0	0	0	2	2	0	0	0	0	0	1	0	3	2	n/a			
	Percent	n/a	n/a	n/a	n/a	20%	40%	n/a	n/a	n/a	n/a	n/a	20%	n/a	10%	14%	n/a			
U*	2006002*	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0				
	Total	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	n/a			
	Percent	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	20%	n/a	3%	n/a	n/a			
	TOTALS	5	3	4	3	10	5	3	1	4	0	1	5	2	31	14	1			
	PERCENT	16%	21%	13%	21%	32%	36%	10%	7%	13%	0%	100%	16%	14%	% Injury & Fatal					
*NCC= Non-cluster Crashes		*U = Undetermined		**Table sort identical to table in Figure 23											48.4%					
***Combined Total of Remaining Most Harmful Events																		*Cluster 2006002 in 1 Crash Zone & Undetermined Crash Zone		