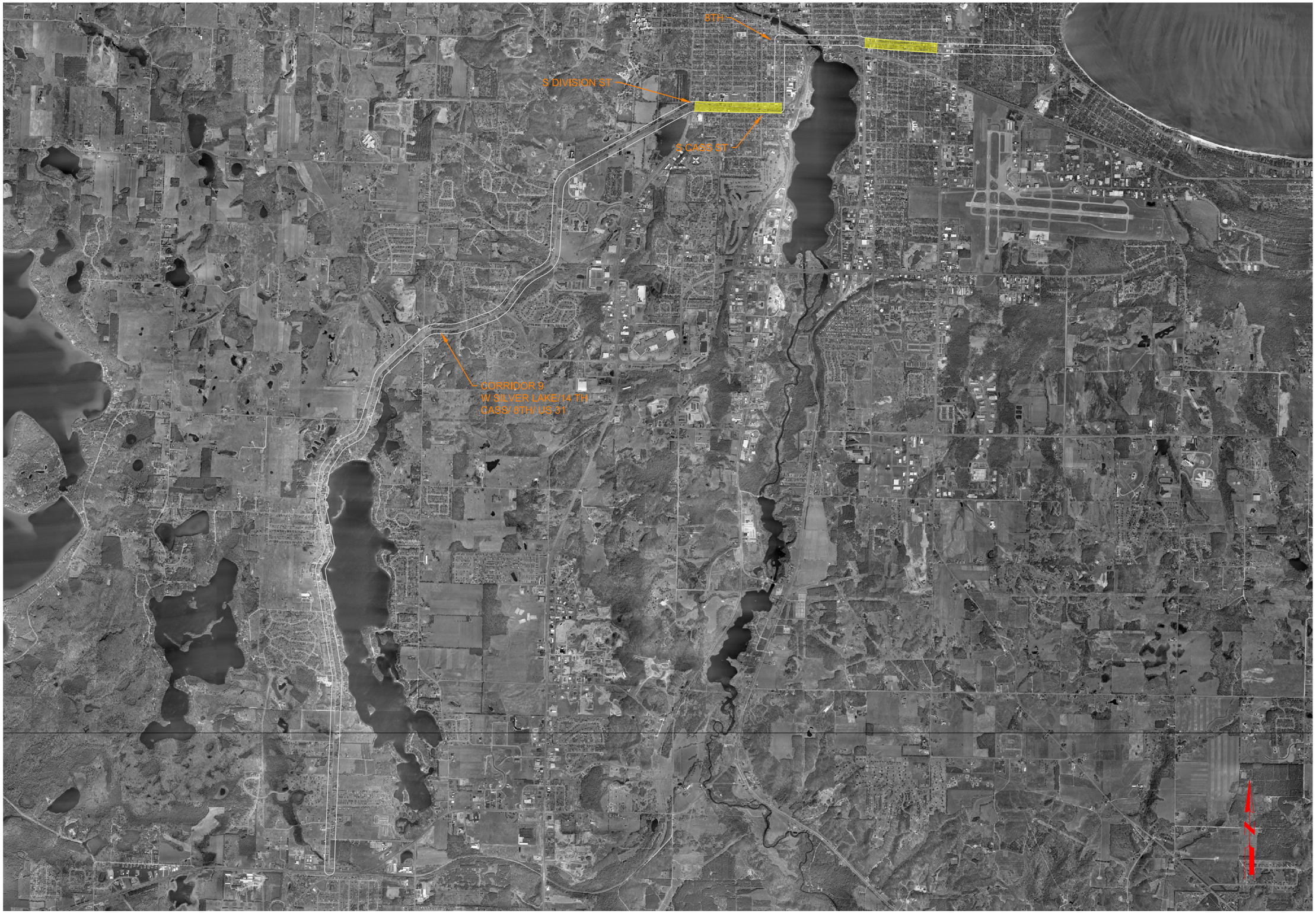

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TC-TALUS
FIGURE 7

REVISION

M&H NO.: 20154-00-07001
DATE: 10.1.2010
DESIGNED BY: JPH
DRAWN BY: JPH
CHECKED BY: DVC

DO NOT SCALE DRAWINGS

SHEET CONTENTS
CORRIDOR 9

12.0 Corridor 10

The North Long Lake Road corridor is located in Grand Traverse County in the townships of Long Lake and Garfield. The corridor is approximately 9.4 miles long, and it begins at the Benzie County line and terminates at Silver Lake Road. North Long Lake Road has two lanes with a posted speed of 55 miles per hour and has a functional classification of Minor Arterial. Key intersections include Barnes Road, and W. Silver Lake Road.

Corridor 10 Vision discussion: This corridor connects Lake Ann and other locations in Benzie County to Traverse City. It has some large lot single family lots fronting directly on the road and some rural and suburban style residential developments accessing the road, but it is primarily a route between village developments and the central city. As village developments grow over time, the function of the corridor will remain the same. Local land use regulations should restrict sprawling development patterns along the corridor. Near Traverse City, West High School is located on this corridor which may drive additional single-family residential development in the area. There are already residential neighborhoods on Barnes Road between Long Lake and Briarcliff Roads. A new development node with pedestrian routes, mixed uses and new grid street connections off of the main corridor would support the Grand Vision concept.

Mode choices: This route may carry vanpool or shuttle vehicles to reduce the number of people driving alone. It may also be a route for recreational bicyclists although the length is longer than most people will choose for commuting to work. Around the High School and closer to Silver Lake Road there is more opportunity for short bicycle and walking trips.

Current land use: The majority of the corridor is forest, agricultural or open land combined with large lot subdivisions and other low-density single family residential developments. The High School stands alone as an institutional use. Barnes Road serves a collection of auto-oriented subdivisions and ends at a small commercial node at Silver Lake Road.

Future land use discussion from 3.5 report: The compact development patterns in Traverse City and in villages around the region prevent new suburban or strip commercial development along the corridor. There is some new development to the east of the High School but otherwise land uses remain essentially unchanged. Growth planning can help restrict urban development in rural areas.

Proposed improvements: This corridor continues into the future with a passing LOS rating along the length of the corridor. As a result, no road widening is proposed. A multi-modal pathway along the east end of the corridor is recommended as a tool to shift from driving to non-motorized modes on trips to the high school from nearby housing.

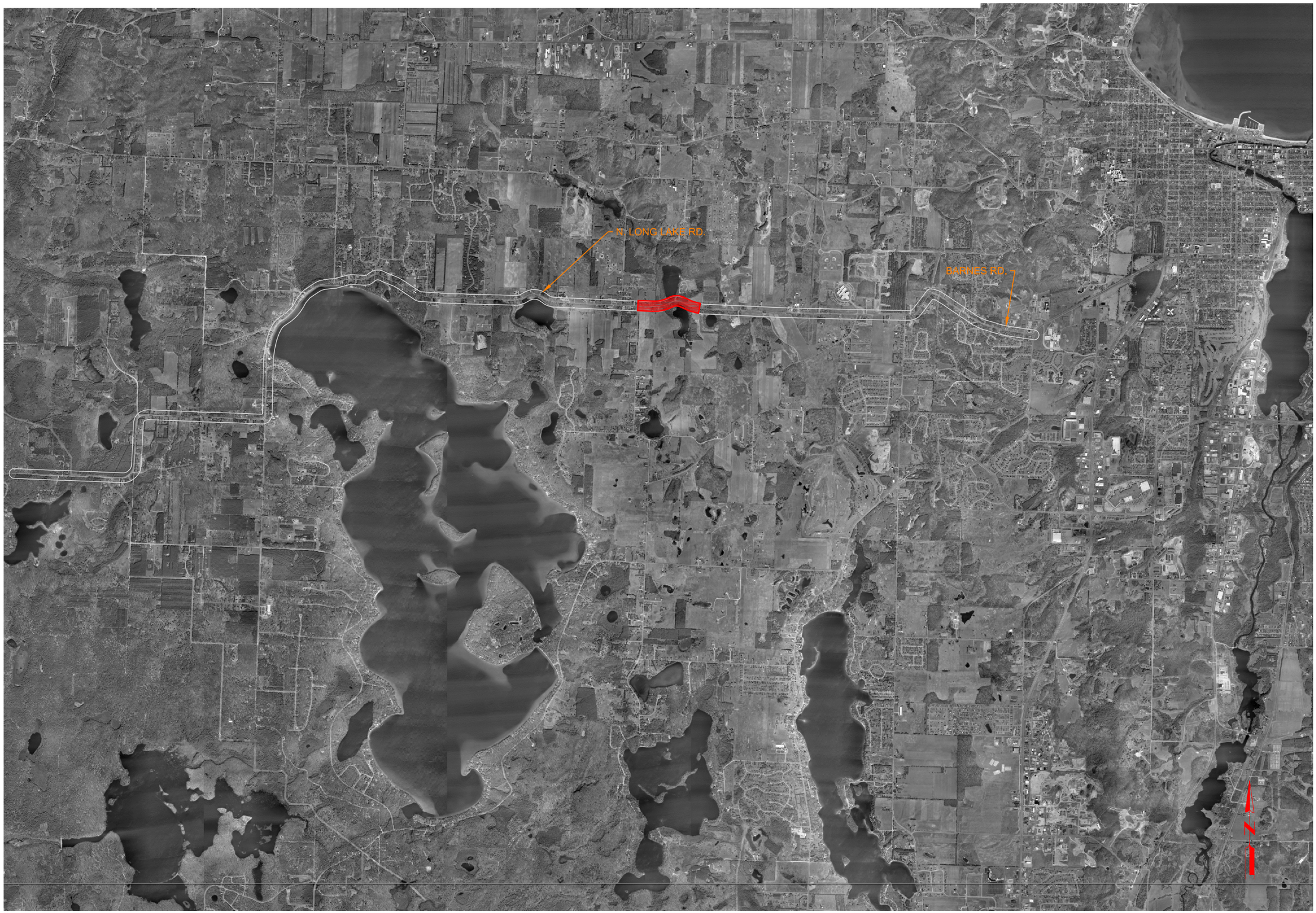
Table 16 Corridor 10 Segment Capacity Gaps

Street Name	From	To	2007 Validation ADT	TDM Growth rate	2035 ADT	2035 Directional Design Hour Volume	Capacity	Volume to Capacity Ratio	LOS
Corridor 10									
N Long Lake Rd	Benzie CL	Zimmerman Rd.	6625	68.21%	11144	622	1638	38%	B
N Long Lake Rd	Zimmerman Rd	Barnes	10746	67.24%	17971	1003	1638	61%	C
Barnes	N Long Lake Rd	Briarcliff Rd	7495	67.68%	12568	701	1638	43%	B

The crash analysis indicates that the segment of N. Long Lake Road between Timbers Trail and Hardy Road has a concentration of curve-related accidents. Although this segment is not projected to have capacity issues during the time horizon of this study, safety related improvements should be considered. Nine fixed-object and two overturning crashes resulting in 2 injuries were noted in the 10-year crash history. See **Figure 8.**

NCHRP Report 500, Volume 7 *A Guide for Reducing Collisions on Horizontal Curves* provides recommended strategies for mitigating the types of accidents found at this location. The most relevant strategies for this segment of roadway include:

- Provide advance warning of unexpected changes in the horizontal alignment
- Enhance delineation along the curve
- Install shoulder rumble strips
- Install centerline rumble strips



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TC-TALUS
FIGURE 8

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SHEET CONTENTS
CORRIDOR 10

13.0 Corridor 11

The Cass Road corridor is located in Grand Traverse County in the township of Garfield. The corridor is approximately 4.2 miles long; it begins at Keystone Road and ends at 14th Street. Cass Road has two lanes with a posted speed range from 25 miles per hour to 45 miles per hour. The functional classification of Cass Road is Minor Arterial north of Hartman Road and Major Collector south of Hartman Road. Key intersections include Keystone Road, S. Airport Road and 14th Street.

Corridor 11 Vision discussion: This Cass Road corridor runs parallel to Division Street (US-31, M-37) on the west side of the Boardman River, providing an alternative route into the downtown from the south end of the urbanized area. The road corridor begins at Keystone and then crosses the Boardman River over a one-lane dam which limits its effectiveness as a route for regional traffic. The future removal of this dam and replacement of the bridge will increase the importance of this corridor. There are intersections at Hartman and S. Airport that feed into the corridor as well. This corridor is part of the urban transportation network on the south side of the city.

Mode choices: The area north of 17th Street begins a residential development pattern that is walkable to downtown Traverse City. There are no sidewalks along this corridor. This area is also a designated bicycle route by the TART Trails organization but there are no special facilities to accommodate bicycles outside of the travel lanes. There are opportunities here to improve the non-motorized network. BATA has an urban route with a stop on the north end of this corridor at 14th Street connecting to the Hall Street Station downtown and the Grand Traverse Mall to the south.

South of 17th Street, most of the corridor serves an industrial area. This corridor is not a prime candidate for non-motorized infrastructure. There is an office area that includes the Northwestern Michigan College (NMC) University Center which may be well suited to transit service and some employers may be able to offer vanpool service from the transit center. Planning is underway for a non-motorized pathway running along the west side of Boardman Lake completing a loop around the lake.

Current land use: The corridor follows the Great Lakes Central Railroad and has industrial development along most of its length on the south side of 17th Street. There are some natural areas and a golf course and the NMC Boardman Lake campus as well. The few blocks north of 17th Street on this corridor are residential uses in the traditional grid street pattern of Traverse City.

Future land use discussion from 3.5 report: There is very little new development on this corridor. Instead, the compact development pattern of the Villages scenario concentrates new development downtown and at nodes along other major transportation corridors. Growth planning has little impact on this area.

Proposed improvements: As detailed in the Corridor 2 section, the intersection at Cass Rd. and S. Airport Road would benefit from safety improvements. Also, within corridor 11, it is important to maintain a connection at Cass Road and Keystone Road, along with a crossing of the Boardman River. The existing river crossing is at a dam location and is a one-lane, one-way traffic signal controlled crossing. Because

the other existing and anticipated Boardman River crossings are at Bietner Road to the south and Airport Road to the north, this crossing is a critical link in the regional transportation network and should be maintained. The benefits of maintaining this crossing include providing emergency access in the event one of the other structures is closed, providing an alternate route for local traffic to cross the river, and providing non-motorized connectivity. This gap analysis assumes that this crossing will be funded and constructed as part of the ongoing Boardman River Dam Removal project. The safety improvement is identified in **Figure 2.**

Table 17 Corridor 11 Segment Capacity Gaps

Street Name	From	To	2007 Validation ADT	TDM Growth rate	2035 ADT	2035 Directional Design Hour Volume	Capacity	Volume to Capacity Ratio	LOS
Corridor 11									
Cass	Keystone	S. Airport	6720	108.77%	14029	783	1638	48%	B
Cass	S. Airport	14th	12778	19.11%	15220.1	849	1638	52%	C

14.0 Introduction to detailed corridor analysis

The balance of this report is to utilize the data and analysis from previous reports, supplement the data as necessary, and provide more detailed information for each corridor. The detailed information and analysis is at the intersection level of detail. In conjunction with TC-TALUS, key intersections were identified along each corridor. These intersections represent locations where potential traffic bottlenecks may occur in the future. The selection of the corridor key intersections is based on a combination of consultant recommendations and input from local road agencies.

15.0 Corridor inventory (key intersections)

An inventory was performed for each of the 11 corridors to determine specific characteristics at key locations. The key intersections for each corridor are:

Corridor 1
M-72 intersecting with:
- Lautner Road
- US-31 (in Acme)

M-72/US-31 intersecting with:
- Holiday Road
- 4 Mile Road
- 3 Mile Road
- Fair St. (NMC entrance)
- Garfield Road
- Front Street
- Union Street
- Division Street

M-72 intersecting with:
- M-22 (West Bay Shore Drive)
- Bugai Road / Gray Road

Corridor 2
S. Airport Road intersecting with:
- 3 Mile Road
- Townline Road
- Garfield Road
- LaFranier Road
- Park Street
- Cass Street
- Veterans Drive
- Division Street (US-31)
- W. Silver Lake Road

Corridor 3
Division Street (M-37 / US-31) intersecting with:
- M-113
- Vance Road
- Beitner Road (US-31 in Chum's Corners)
- S. Airport Road
- 14th Street
- 11th Street
- 7th Street
- Front Street
- Grandview Parkway

Corridor 4
W. US-31 intersecting with:
- M-137 in Interlochen
- W. Silver Lake Road
- M-37 / Division Street in Chum's Corners

Beitner Road intersecting with:
- Williams Road
- River Road

Keystone Road intersecting with:
- Cass Road
- Birmley Road
- Hammond Road
- S. Airport Road

Corridor 5
Garfield Rd. intersecting with:
- M-113
- Voice Road
- River Road
- Birmley Road
- Hammond Road
- S. Airport Road
- Boon Street
- Carver Street
- Hannah Street
- 8th Street
- M-72 (Front Street)

Corridor 6
Hammond Road intersecting with:
- 4 Mile Road
- 3 Mile Road
- Garfield Road
- LaFrainer Road
- Keystone Road

Corridor 7
3 Mile Road intersecting with:
- Hammond Road
- S. Airport Road
- M-72 / US-31

Corridor 8
M-22 (West Bay Shore Drive) intersecting with:
- M-72
- Cherry Bend Road

Corridor 9
W. Silver Lake Rd. intersecting with:
- US-31 (in Grawn)
- Secor Road
- Zimmerman Road
- Barnes Road
- Franke Road
- Division Street (M-72 / US-31)

14th Street intersecting with:
- Cass Street

Cass Street intersecting with:
- 8th Street

8th Street intersecting with:
- Boardman Avenue
- Woodmere Avenue
- Garfield Road
- US-31, M-72 (Munson Street)

Corridor 10
N. Long Lake Rd intersecting with:
- Barnes Road

Barnes Road intersecting with:
- W. Silver Lake Road

Corridor 11
Cass Rd. intersecting with:
- Keystone Road
- S. Airport Road
- 14th Street

The results of the inventory for each of the key intersections are presented below.

	Lane Assignment LT	Thru	RT	Signal Phasing	Storm Water Facilities	Pavement Condition	Sidewalk	Ada
M-72 / M-22 / US-31 intersecting with:								
Lautner								
NB		1		Stop sign				
SB		1		Stop sign				
EB		1	1	None				
WB		1	1	None				
M-72					curb and gutter	good	none	no
NB	1	2	1	LTGA				
SB	1	2	0	LTGA				
WB	2	0	1	LTGA				
Holiday					curb and gutter	fair	none	no
WB	1	2	0	2 phase				
NB	1	0	1	2 phase				
EB	0	2	0	2 phase				
4 Mile					curb and gutter	fair	4' all quads	yes
WB	1	2	0	2 phase				
NB	1	0	1	2 phase				
EB	0	2	1	2 phase				
3 Mile					curb and gutter	fair	6' all quads	yes
WB	1	2	0	LTGA				
NB	1	0	2	2 phase				
EB	0	2	0	2 phase				
Fair (NMC)								
NB	0	1	1	2 phase				
SB	0	1	1	2 phase				
EB	1	2	0	2 phase				
WB	1	2	0	2 phase				
Garfield					curb and gutter	fair	4' all quads	yes
NB	1	1	0	LTGA				
SB	1	1	0	LTGA				
EB	1	2	0	LTGA				
WB	1	2	0	LTGA				
Union								
NB	1	1	0	2 phase				
SB	1	1	0	2 phase				
EB	1	2	0	2 phase				
WB	1	2	0	2 phase				
Division					curb and gutter	fair	8' all quad	yes
WB	1	2	0	LTGA				
NB	1	0	1	2 phase				
EB	0	2	1	2 phase				
M-22					curb and gutter	poor	8' west side only	yes
NB	1	1	0	LTGA				
SB	0	2	0	2 phase				
EB	1	0	1	2 phase				
Bugai								

	Lane Assignment			Signal	Storm Water	Pavement	Sidewalk	Ada
	LT	Thru	RT	Phasing	Facilities	Condition		
NB	1	1	0	2 phase				
SB	1	1	0	2 phase				
EB	1	1	1	2 phase				
WB	1	1	1	2 phase				
S. Airport Road intersecting with:								
3 Mile					curb and gutter	good	none	no
NB	1	2	0	LTGA				
SB	0	2	0	2 phase				
EB	2	0	1	2 phase				
Townline					curb and gutter	good	none	no
EB	1	1	0	LTGA				
WB	1	1	1	LTGA				
NB	1	1	0	2 phase				
SB	1	1	0	2 phase				
Garfield					curb and gutter	good	4' all quads	yes
NB	1	2	0	LTGA				
SB	1	2	1	LTGA				
EB	1	2	0	LTGA				
WB	1	2	0	LTGA				
LaFranier					curb and gutter	good	4' all quads	yes
NB	1	1	1	LTGA				
SB	1	2	1	LTGA				
EB	1	2	1	LTGA				
WB	1	2	1	LTGA				
Park					curb and gutter	good	none	no
NB	1	1	0	2 phase				
SB	1	1	1	2 phase				
EB	1	2	1	LTGA				
WB	1	2	1	LTGA				
Cass					curb and gutter	good	none	no
NB	1	2	0	LTGA				
SB	1	2	0	LTGA				
EB	1	2	1	LTGA				
WB	1	2	1	LTGA				
Veterans					curb and gutter	good	none	no
NB	1	1	0	2 phase				
SB	1	1	0	2 phase				
EB	1	2	1	LTGA				
WB	1	2	1	LTGA				
Division					curb and gutter	good	none	no
NB	1	2	1	LTGA				
SB	1	2	1	LTGA				
EB	1	2	0	LTGA				
WB	2	1	1	LTGA				
Silver Lake					curb and gutter	good	none	no
NB	1	1	0	LTGA				
SB	1	1	0	LTGA				
EB	0	1	0	2 phase				

	Lane Assignment			Signal Phasing	Storm Water Facilities	Pavement Condition	Sidewalk	Ada
	LT	Thru	RT					
WB	1	1	0	LTGA				
Division (M-37 / US-31) intersecting with:								
M-113								
NB	1	1	1	Flasher				
SB	1	1	0	Flasher				
EB	0	1	0	Stop				
WB	1	1	0	Stop				
Vance					curb and gutter	good	none	no
NB	1	1	0	Flasher				
SB	1	1	0	Flasher				
EB	1	1	0	Flasher				
WB	1	1	0	Flasher				
Beitner					curb and gutter	good	none	no
NB	1	2	0	LTGA				
SB	1	2	1	LTGA				
EB	2	2	0	LTGA				
WB	2	1	1	LTGA				
14th					curb and gutter	fair	4' sidewalk north quads only	no
NB	1	2	0	LTGA				
SB	1	2	0	LTGA				
EB	1	1	1	LTGA				
WB	1	1	0	LTGA				
11th								
NB	0	2	0	None				
SB	0	2	0	None				
EB	0	1	0	Stop				
WB	0	1	0	Stop				
7th								
NB	0	2	0	2 phase				
SB	0	2	0	2 phase				
EB	x	1	1	2 phase				
WB	x	1	1	2 phase				
Front					curb and gutter	fair	4' sidewalk	no
NB	1	2	0	LTGA				
SB	1	2	0	LTGA				
EB	1	2	0	LTGA				
WB	1	2	0	LTGA				
W US-31 / Beitner / Keystone intersecting with:								
M-137 (Interlochen)					curb and gutter	good	none	no
NB	1	1	0	2 phase				
SB	1	1	0	2 phase				
EB	1	1	0	2 phase				
WB	1	1	0	2 phase				
W. Silver lake					curb and gutter	good	none	no
NB	1	1	1	2 phase				
SB	1	1	1	2 phase				

	Lane Assignment			Signal	Storm Water	Pavement	Sidewalk	Ada
	LT	Thru	RT	Phasing	Facilities	Condition		
EB	1	1	0	2 phase				
WB	1	1	1	2 phase				
Williams								
NB	0	1	0	Stop				
SB	0	1	0	Stop				
EB	0	1	0	None				
WB	0	1	1	None				
River								
NB	0	1	1	None				
SB	1	1	0	None				
EB	0	1	0	Stop				
Cass					open drainage	poor	none	no
NB	1	1	0	2 phase				
SB	0	1	0	2 phase				
EB	1	0	1	2 phase				
Birmley					curb and gutter	poor	none	no
NB	0	1	0	2 phase				
SB	1	1	0	2 phase				
WB	1	0	1	2 phase				
Hammond					curb and gutter	good	none	no
NB	1	1	0	2 phase				
SB	1	1	1	2 phase				
EB	1	2	1	LTGA				
WB	1	2	1	LTGA				
Garfield Rd. intersecting with:								
M-113					curb and gutter	good	4' all quads	yes
NB	0	1	0	flasher				
SB	0	1	0	flasher				
EB	0	1	0	flasher				
WB	0	1	0	flasher				
Voice								
NB	0	1	1	None				
SB	1	1	0	None				
WB	0	1	0	Stop				
River								
NB	0	1	1	None				
SB	0	1	0	None				
EB	0	1	0	Stop				
WB	0	1	0	Stop				
Birmley					open drainage	fair	none	no
NB	1	1	0	2 phase				
SB	1	1	0	2 phase				
EB	1	1	0	2 phase				
WB	1	1	0	2 phase				
Hammond					curb and gutter	fair	none	no
NB	1	2	0	2 phase				
SB	1	2	0	2 phase				
EB	1	2	0	2 phase				

	Lane Assignment			Signal	Storm Water	Pavement	Sidewalk	Ada
	LT	Thru	RT	Phasing	Facilities	Condition		
WB	1	2	0	2 phase				
Boon								
NB	1	2	0	2 phase				
SB	1	2	0	2 phase				
EB	1	1	0	2 phase				
WB	1	1	0	2 phase				
Carver								
NB	1	2	0	2 phase				
SB	1	2	0	2 phase				
EB	1	1	0	2 phase				
WB	1	1	0	2 phase				
Hannah								
NB	0	2	0	2 phase				
SB	0	2	0	2 phase				
EB	0	1	0	2 phase				
WB	1	1	0	2 phase				
8th								
NB	1	1	0	LTGA	curb and gutter	fair	4' all quads	yes
SB	1	1	0	LTGA				
EB	1	1	0	LTGA				
WB	1	1	0	LTGA				
Hammond Rd. intersecting with:								
4 Mile					curb and gutter	fair	none	no
NB	1	1	0	2 phase				
SB	1	1	0	2 phase				
EB	1	1	1	LTGA				
WB	1	1	1	LTGA				
3 Mile					curb and gutter	fair	none	no
NB	1	1	0	LTGA				
SB	1	1	0	LTGA				
EB	1	1	0	LTGA				
WB	1	1	0	LTGA				
LaFranier								
NB	1	1	0	LTGA				
SB	1	1	0	LTGA				
EB	1	1	1	LTGA				
WB	1	1	1	LTGA				
M-22 intersecting with:								
Cherry Bend					curb and gutter	poor	8' west side only	yes
NB	1	1	0	2 phase				
SB	0	1	0	2 phase				
EB	1	1	0	2 phase				
W. Silver Lake Rd. / 14th St / Cass St. / 8th St. / US-31 intersecting with:								
Secor Rd.								
NB	0	1	0	None				
SB	0	1	0	None				

	Lane Assignment			Signal	Storm Water	Pavement	Sidewalk	Ada
	LT	Thru	RT	Phasing	Facilities	Condition		
WB	0	1	0	Stop				
Zimmerman								
NB	1	1	1	2 phase				
SB	1	1	0	2 phase				
EB	1	1	0	2 phase				
WB	1	1	1	2 phase				
Barnes								
NB	1	2	0	LTGA				
SB	1	1	1	LTGA				
EB	1	1	1	LTGA				
WB	1	1	0	LTGA				
Franke								
NB	1	1	1	Signal				
EB	0	2	0	LTGA				
WB	1	2	0	LTGA				
Cass					curb and gutter	fair	4' sidewalk	yes
NB	0	1	0	2 phase				
SB	0	1	0	2 phase				
EB	0	1	0	2 phase				
WB	0	1	0	2 phase				
8th								
NB	x	1	0	Signal				
SB	0	1	0	Signal				
EB	1	1	0	LTGA				
WB	1	1	0	LTGA				
Boardman								
SB	1	0	1	2 phase				
EB	0	2	0	2 phase				
WB	0	2	0	2 phase				
Woodmere								
NB	2	0	1					
EB	0	2	0	LTGA				
WB	1	1	0	LTGA				
US-31					curb and gutter	fair	4' sidewalk	no
NB	1	2	0	LTGA				
SB	1	2	0	LTGA				
EB	0	1	1	2 phase				
WB	0	1	0	2 phase				
N. Long Lake Rd / Barnes Rd. intersecting with:								
Barnes					curb and gutter	fair	4' sidewalk	no
SB	1	1	0	2 phase				
NB	0	1	0	2 phase				
WB	0	1	0	2 phase				
Silver Lake								
SB	0	1	1	2 phase				
NB	1	2	0	LTGA				
EB	1	1	0	LTGA				

16.0 Key intersection turning movements

Turning movement counts were obtained for the intersections. Results of the turning movement counts are presented below.

15 minute turning movement counts	Turning Movements LT	RT
M-72 / M-22 / US-31 intersecting with:		
Lautner		
NB	4	6
SB	2	5
EB	8	10
WB	4	3
M-72		
NB	0	143
SB	132	0
WB	156	64
Holiday		
WB	45	0
NB	117	71
EB	0	23
4 Mile		
WB	112	0
NB	117	75
EB	0	56
3 Mile		
WB	98	0
NB	165	134
EB	0	12
Fair (NMC)		
NB	4	6
SB	8	12
EB	15	11
WB	15	14
Garfield		
NB	256	53
SB	34	87
EB	14	65
WB	55	18
Union		
NB	9	13
SB	3	2
EB	23	14
WB	16	19
Division		
WB	45	0
NB	176	143
EB	0	119
M-22		
NB	134	0

15 minute turning movement counts	Turning Movements LT	RT
SB	0	32
EB	23	78
Bugai		
NB	5	2
SB	7	9
EB	6	12
WB	17	19
S. Airport Road intersecting with:		
3 Mile		
NB	34	0
SB	0	55
EB	91	111
Townline		
EB	19	3
WB	0	34
NB	1	3
SB	23	15
Garfield		
NB	45	19
SB	34	167
EB	88	76
WB	31	55
LaFranier		
NB	43	12
SB	13	8
EB	41	15
WB	11	6
Park		
NB	4	7
SB	3	17
EB	47	12
WB	17	55
Cass		
NB	17	55
SB	15	19
EB	23	67
WB	45	49
Veterans		
NB	0	2
SB	15	14
EB	54	0
WB	0	36
Division		
NB	75	98
SB	157	31
EB	35	23
WB	175	201
Silver Lake		

15 minute turning movement counts	Turning Movements LT	RT
NB	1	40
SB	66	0
EB	1	0
WB	34	59
Division (M-37 / US-31) intersecting with:		
M-113		
NB	3	7
SB	8	2
EB	1	6
WB	0	3
Vance		
NB	2	5
SB	0	2
EB	7	2
WB	3	1
Beitner		
NB	47	82
SB	65	99
EB	174	88
WB	26	31
14th		
NB	22	64
SB	95	43
EB	67	45
WB	23	89
11th		
NB	13	9
SB	3	11
EB	5	9
WB	2	4
7th		
NB	12	7
SB	15	6
EB	0	10
WB	0	8
Front		
NB	15	78
SB	55	12
EB	12	16
WB	44	35
W US-31 / Beitner / Keystone intersecting with:		
M-137 (Interlochen)		
NB	8	17
SB	4	8
EB	8	15
WB	16	3
W. Silver lake		
NB	5	9

15 minute turning movement counts	Turning Movements LT	RT
SB	17	4
EB	8	15
WB	17	2
Williams		
NB	0	1
SB	2	4
EB	3	1
WB	0	2
River		
NB	0	2
SB	15	0
EB	13	21
Cass		
NB	28	0
SB	0	13
EB	45	59
Birmley		
NB	0	22
SB	31	0
WB	25	32
Hammond		
NB		
SB		
EB		
WB		
Garfield Rd. intersecting with:		
M-113		
NB	2	7
SB	39	12
EB	14	3
WB	1	56
Voice		
NB	2	1
SB	6	2
WB	2	17
River		
NB	7	0
SB	1	3
EB	0	3
WB	2	4
Birmley		
NB	14	12
SB	1	13
EB	3	1
WB	3	6
Hammond		
NB	14	23
SB	11	16
EB	12	18

15 minute turning movement counts	Turning Movements LT	RT
WB	13	17
Boon		
NB	11	6
SB	13	7
EB	2	5
WB	6	2
Carver		
NB	13	12
SB	16	8
EB	5	9
WB	8	7
Hannah		
NB	14	11
SB	6	15
EB	10	13
WB	15	21
8th		
NB	43	17
SB	12	55
EB	9	10
WB	12	15
Hammond Rd. intersecting with:		
4 Mile		
NB	14	27
SB	32	17
EB	34	12
WB	16	25
3 Mile		
NB	14	1
SB	16	14
EB	19	25
WB	32	17
LaFranier		
NB	0	3
SB	5	0
EB	3	15
WB	0	0
M-22 intersecting with:		
Cherry Bend		
NB	15	0
SB	0	7
EB	25	33
W. Silver Lake Rd. / 14th St / Cass St. / 8th St. / US-31 intersecting with:		
Secor Rd.		
NB	3	0
SB	0	5
WB	10	13
Zimmerman		

15 minute turning movement counts	Turning Movements LT	RT
NB	14	19
SB	13	22
EB	23	9
WB	15	11
Barnes		
NB	2	1
SB	11	16
EB	15	17
WB	29	22
Franke		
NB	23	28
EB	0	14
WB	17	0
Cass		
NB	25	3
SB	0	45
EB	56	12
WB	2	5
8th		
NB	0	33
SB	17	12
EB	4	15
WB	16	7
Boardman		
SB	14	13
EB	19	0
WB	0	21
Woodmere		
NB	23	29
EB	0	12
WB	16	0
US-31		
NB	14	2
SB	4	17
EB	23	37
WB	42	14
N. Long Lake Rd / Barnes Rd. intersecting with:		
Barnes		
SB	5	0
NB	0	2
WB	82	32
Silver Lake		
SB	0	3
NB	23	0
EB	51	65

The turning movements for the intersections were translated into 2035 hourly volumes.

2035 Projected hourly movements by intersection	Volumes LT	Thru	RT
M-72 / M-22 / US-31 intersecting with:			
Lautner			
NB	15	171	23
SB	8	183	19
EB	64	1,725	80
WB	32	1,814	24
M-72			
NB	-	1,264	606
SB	560	1,310	-
WB	617	-	253
Holiday			
WB	191	1,679	-
NB	440	-	267
EB	-	1,772	98
4 Mile			
WB	475	1,395	-
NB	440	-	282
EB	-	2,240	237
3 Mile			
WB	407	2,018	-
NB	654	-	531
EB	-	2,335	80
Fair (NMC)			
NB	19	63	28
SB	38	15	57
EB	73	2,288	54
WB	73	2,274	68
Garfield			
NB	1,106	465	229
SB	128	245	327
EB	59	1,580	274
WB	233	1,184	76
Union			
NB	43	446	62
SB	14	47	9
EB	145	998	88
WB	101	1,010	120
Division			
WB	183	1,144	-
NB	702	-	570
EB	-	755	476
M-22			
NB	536	695	-
SB	-	1,141	163
EB	128	-	434
Bugai			
NB	27	72	11
SB	28	60	36

2035 Projected hourly movements by intersection	Volumes LT	Thru	RT
EB	30	462	59
WB	84	373	94
S. Airport Road intersecting with:			
3 Mile			
NB	133	358	-
SB	-	943	218
EB	370	-	452
Townline			
EB	78	715	12
WB	-	675	138
NB	5	-	15
SB	198	273	129
Garfield			
NB	222	591	94
SB	156	500	765
EB	341	1,522	294
WB	127	454	224
LaFranier			
NB	185	63	52
SB	56	210	34
EB	159	1,940	58
WB	43	2,091	23
Park			
NB	17	253	30
SB	13	214	73
EB	182	1,929	46
WB	66	1,878	213
Cass			
NB	128	242	413
SB	64	703	81
EB	89	1,809	259
WB	174	1,793	190
Veterans			
NB	-	291	9
SB	65	175	60
EB	209	1,948	-
WB	-	2,018	139
Division			
NB	383	776	501
SB	713	1,180	141
EB	149	547	98
WB	677	702	778
Silver Lake			
NB	6	348	234
SB	386	202	-
EB	6	4	-
WB	145	398	252
Division (M-37 / US-31) intersecting with:			

2035 Projected hourly movements by intersection	Volumes LT	Thru	RT
M-113			
NB	12	815	27
SB	31	815	8
EB	4	270	26
WB	-	287	13
Vance			
NB	8	826	20
SB	-	1,074	10
EB	30	261	9
WB	13	283	4
Beitner			
NB	238	432	415
SB	328	812	499
EB	708	94	358
WB	122	74	145
14th			
NB	86	1,137	251
SB	379	850	171
EB	326	614	219
WB	116	931	450
11th			
NB	46	1,323	32
SB	11	1,351	39
EB	25	79	46
WB	9	122	18
7th			
NB	42	1,333	25
SB	53	1,326	21
EB	-	343	57
WB	-	419	31
Front			
NB	60	1,029	311
SB	219	998	48
EB	53	426	71
WB	195	200	155
W US-31 / Beitner / Keystone intersecting with:			
M-137 (Interlochen)			
NB	34	292	73
SB	17	248	34
EB	30	492	57
WB	64	808	12
W. Silver lake			
NB	41	630	74
SB	139	573	33
EB	32	792	60
WB	69	1,084	8
Williams			
NB	-	26	4

2035 Projected hourly movements by intersection	Volumes LT	Thru	RT
SB	8	37	15
EB	32	740	11
WB	-	762	21
River			
NB	-	762	21
SB	161	622	-
EB	75	205	120
Cass			
NB	111	179	-
SB	-	274	59
EB	338	-	444
Birmley			
NB	-	232	101
SB	356	481	-
WB	112	-	143
Hammond			
NB			
SB			
EB			
WB			
Garfield Rd. intersecting with:			
M-113			
NB	8	25	27
SB	190	321	58
EB	60	425	13
WB	4	254	240
Voice			
NB	10	554	5
SB	29	530	10
WB	10	255	85
River			
NB	34	535	-
SB	5	550	15
EB	-	335	15
WB	9	54	17
Birmley			
NB	68	293	58
SB	3	783	43
EB	13	232	4
WB	12	120	24
Hammond			
NB	46	707	76
SB	54	774	79
EB	132	1,687	199
WB	64	1,241	83
Boon			
NB	48	1,727	26
SB	6	171	3
EB	9	292	23

2035 Projected hourly movements by intersection	Volumes LT	Thru	RT
WB	28	288	9
Carver			
NB	56	1,692	52
SB	7	170	3
EB	23	260	42
WB	37	255	33
Hannah			
NB	60	1,692	48
SB	3	171	6
EB	47	218	61
WB	70	157	98
8th			
NB	186	1,541	73
SB	52	1,511	238
EB	40	872	44
WB	49	32	62
Hammond Rd. intersecting with:			
4 Mile			
NB	58	204	113
SB	133	171	71
EB	180	991	64
WB	88	659	137
3 Mile			
NB	37	201	3
SB	63	373	55
EB	83	1,043	109
WB	191	1,096	101
LaFranier			
NB			
SB			
EB			
WB			
M-22 intersecting with:			
Cherry Bend			
NB	76	1,228	-
SB	-	550	33
EB	103	-	136
W. Silver Lake Rd. / 14th St / Cass St. / 8th St. / US-31 intersecting with:			
Secor Rd.			
NB	15	435	-
SB	-	425	25
WB	50	235	65
Zimmerman			
NB	70	184	95
SB	65	174	110
EB	114	292	44
WB	74	321	54
Barnes			

2035 Projected hourly movements by intersection	Volumes LT	Thru	RT
NB	10	335	5
SB	55	215	80
EB	74	292	84
WB	143	198	109
Franke			
NB	115	94	141
EB	-	381	69
WB	84	366	-
Cass			
NB	99	672	12
SB	-	735	192
EB	283	1,153	61
WB	8	59	19
8th			
NB	-	708	142
SB	73	726	51
EB	18	666	66
WB	76	441	33
Boardman			
SB	68	319	63
EB	82	768	-
WB	-	760	90
Woodmere			
NB	101	521	128
EB	-	892	58
WB	77	873	-
US-31			
NB	57	77	8
SB	16	57	70
EB	98	1,240	157
WB	178	1,257	59
N. Long Lake Rd / Barnes Rd. intersecting with:			
Barnes			
SB	30	973	-
NB	-	991	12
WB	495	13	193
Silver Lake			
SB	-	1,144	15
NB	134	454	-
EB	308	-	392

Each intersection was analyzed using Highway Capacity Software (HCS 2000), using the planning analysis mode. The results of each intersection analysis are presented in **Appendix A**.

17.0 Access management

Access management can be defined in several ways. The most commonly used definition is “a process that provides or manages access to land development while simultaneously preserving the flow of traffic on the surrounding road system in terms of safety, capacity needs, and speed.” The more technical approach describes access management as “the systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway.” In other words, access management plans offer communities recommendations for providing and maintaining safe and efficient traffic flow along a roadway corridor while allowing reasonable access to adjacent properties. Access management also allows for improved traffic flow within parcels as well as between adjacent parcels. Not only does access management benefit the flow of traffic along main roadways, but improved internal circulation on existing and future sites facilitates safe customer and resident access to parcels with minimal driver distractions and reduced potential for crash points between vehicles.

The development of driveway design and layout criteria is an essential part of access management. The Institute of Transportation Engineers, in their report *Guidelines for Driveway Location and Design* notes that “the efficiency and safety of a street or highway depend on the amount and character of interferences affecting vehicles moving along it. Significant interferences are caused on most roads by vehicles entering, leaving, or crossing at intersecting streets and driveways. In order to minimize accidents and to ensure the overall use of the road by the general public, it is necessary to regulate vehicle movements in and out of abutting developments and cross streets.”

Access management plans offer several benefits to communities along a corridor. The Michigan Department of Transportation (MDOT) and other transportation agencies say that effective access management programs:

- Can accommodate for potential future improvements
- Set the stage for future capital improvements
- Reduce crashes and crash potential
- Preserve roadway capacity and the useful life of roads
- Decrease travel time and congestion
- Improve access to properties
- Coordinate land use and transportation decisions
- Improve air quality
- Maintain travel efficiency and related economic prosperity

Because access management can involve trade-offs between through-traffic volume and local access to property, a thorough analysis of the corridor is vital. This document will provide a basis for both an analysis of current roadway conditions and a working tool for local officials, which can be referenced when considering new development and redevelopment of current land uses along the corridor.

Each corridor has a unique set of governmental stakeholders, and has the involvement of land owners along the corridor and the general public. Therefore, it is imperative that a consistent approach be taken to manage access along the corridor and preserve the integrity of the roadway.

Motivating local officials along the corridor to embrace the concept and implementation of access management is essential if the recommendations of this study are to be effective. Local officials must work under the assumption that the roadway corridor should be preserved at every opportunity, which includes limiting the proliferation of inadequately designed driveways, curb cuts, uncoordinated development on adjacent parcels, and uncoordinated traffic signals.

Access management is particularly important along arterial roadways due to the required balance between access to adjacent properties and the relatively large volume of through-traffic. Affording local property owners safe and efficient access to their properties, and maintaining the capacity necessary to move through-traffic between major activity centers, are the ultimate goals of the recommendations found in an access management document. The planning of future land use control and access points is essential for preserving the efficiency of the corridor well into the future. Future access management improvements in the region, as well as the improvement of the individual corridors, must be planned for now in order to plan for the future efficiency of the corridor.

Expansion projects for the improvement of capacity would be costly in terms of real estate and construction dollars for many areas within the corridors, especially areas within the urban core. Capacity improvements would also alter the character of existing corridors, which is contrary to regional goals. With transportation funding options becoming more and more limited due to budget limitations, it is imperative that every effort be made to maintain existing facilities with available resources. In our current revenue-constrained environment, effective access management is not an option—it is a requirement. **Exhibits 1-1a** and **1-1b** depict a parcel as it currently stands, and then as it could be developed with access management techniques in place, such as landscaping and access point definition.

Exhibit 1-1a Parcel example with poor access management

Exhibit 1-1b Same parcel with access management techniques (Landscaping and access point definition, must comply with all traffic and safety standards)

Many interest groups reap benefits from the implementation of access management plans. These interest groups range from the actual motorists driving on the roadway to non-motorized users of the corridor, and from businesses along the corridor to local governmental agencies. Each of these groups can expect to attain a variety of benefits from the implementation of an access management plan. The list below presents a sample of interest groups and their anticipated benefits.

17.1.1 Motorists

- Fewer decision points and traffic conflicts, which will simplify driving
- Increased driver safety
- Fewer traffic delays and a related decrease in travel time

17.1.2 Non-motorized users

- Fewer decision points and traffic conflicts, which will simplify travel and increase safety for cyclists and pedestrians
- More predictable motorist travel patterns
- Fewer access points where motorists enter and exit the roadway, which will again improve safety along major roadways
- Separate pathways for bicyclists and pedestrians along the corridor

17.1.3 Businesses

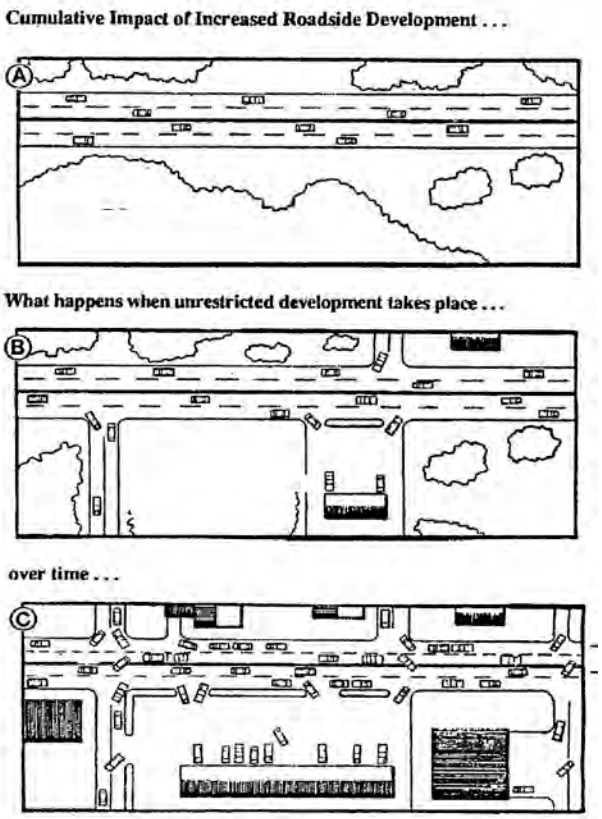
- More efficient roadway system capturing a broader market area
- Stable property values due to a well-managed roadway corridor
- More predictable and consistent development environment
- Delivery benefits from reduced delay and increased safety
- Lower transportation costs and shorter delivery times

17.1.4 Government agencies

- Lower cost of delivering an efficient and safe transportation system
- Improved internal and intergovernmental coordination
- More effectiveness in accomplishing transportation objectives

17.1.5 Communities

- Safer transportation system
- Reduce need for road widening, thus reducing or eliminating displacement of businesses, homes and communities
- More attractive roadway corridors
- Protection and preservation of investment in transportation facilities and possible reduction of capital improvement costs for widened or reconstructed roadways



Source: Center for Transportation Research and Education, Iowa State University, *Iowa Access Management Guidebook*, October 2000, p. 19.

Exhibit 1-2 Results of unmanaged growth

Ignoring the need for access management can lead to the deterioration of the roadway, and can have adverse impacts on the stakeholders previously identified. Specifically, the function and character of the corridor could deteriorate rapidly without the implementation of access management. Failure to manage access along a corridor is often associated with the following adverse social, economic and environmental impacts—the results of increased congestion along the corridor as seen in **Exhibit 1-2**.

- Increased vehicular crashes
- More collisions involving pedestrians and cyclists
- Unsightly commercial strip development
- Degradation of scenic landscapes
- More cut-through traffic in residential areas
- Adverse effects to homes and businesses from a continuous cycle of roadway widening
- Increased commute times, fuel consumption, and vehicular emissions

These impacts are currently being experienced along the corridor, suggesting that managing access is of immediate concern. Without an aggressive access management plan, these negative impacts will continue to contribute to the degradation of this essential resource.

Maintaining a public facility is often challenging, and managing one that traverses through three separate municipalities is even more complex. As shown in **Exhibit 1-3**, there are many stakeholders involved with the access management of the corridor. Based upon the number of stakeholders, it can be assumed that there are often opportunities for approval and coordination to become complex. **Exhibit 1-4** reflects how the process could, and often does happen with limited coordination. **Exhibit 1-5** reflects the recommended process which should be implemented as part of this access management plan. The driveway decisions along the corridor ultimately reside with the governing road authority; however, the facility owner must recognize that coordination with local municipalities is essential. It is recommended that land owners and developers be financially responsible for certain aspects of driveway design and management since they are the primary source of generation of new conflict points along the corridor.

Exhibit 1-3 Shared authority and responsibility

Authority	Developers	Townships	Villages	County Planning Commission	MDOT	County Road Commission
Plan for future public roads and improvements			X		X	X
Plan future land use		X	X	X		
Zone land		X	X	X*		
Provide preliminary site plan review		X	X	X	X	X
Approve access through site plan review		X	X	X*		
Approve driveway permits in proposed subdivision		X	X			X
Approve driveway permits on a local road		X**	X			X
Approve driveway permits on a county road						X
Approve driveway permits on a state highway					X	
Service drives	X					

** Only in townships without their own zoning*
*** Some roads have been built under township control and driveways on these roads are regulated by the township.*

Exhibit 1-4 Separate review process of driveway permits

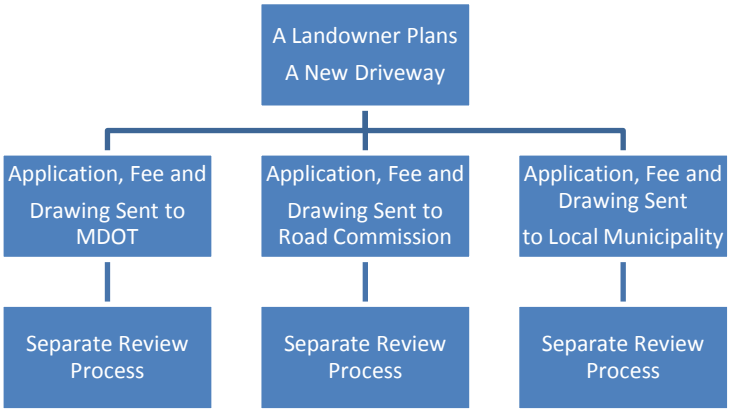
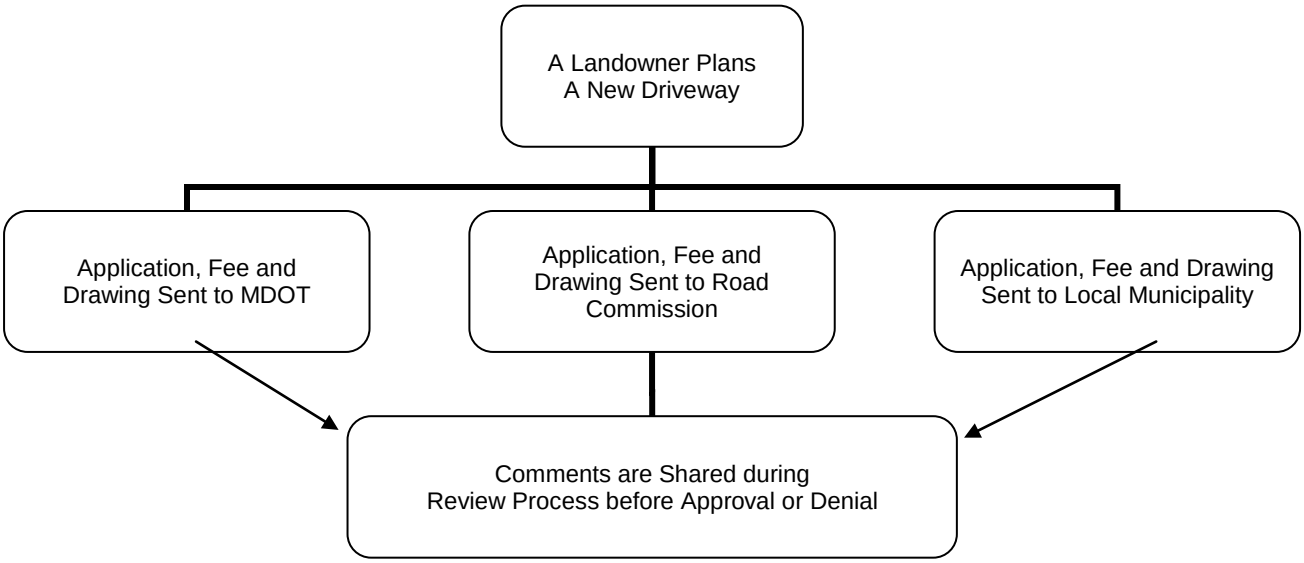


Exhibit 1-5 Recommended coordinated review process for driveway permits



During the review process, it is determined whether or not the request for access is reasonable and does not negatively affect traffic operation and safety. In addition, reasonable alternatives may be available. By managing roadway access, government agencies can extend the life of the roadway, increase public safety, and reduce traffic congestion while improving the appearance and quality of the built environment. Not only does access management preserve the transportation functions of roadways, it can also preserve long-term property values and the economic viability of abutting development.

The primary goal for local officials will be to maximize the use of existing resources to achieve and preserve the desired level of service while limiting capital expenditures for new improvements along the corridor. Planning for the future is important in preserving the efficiency and aesthetics of the corridor. The implementation of access management techniques is the most cost-effective method of preserving the existing facility. However, each community along the corridor must take an active role in the

implementation of the tools outlined in this document. Financing of any improvements should be done in conjunction with developers or land owners as additional development or existing properties are redeveloped.

17.2 Access management recommendations

Based on the number of access points per mile and each corridor's projected Level of Service (LOS) based on projected volume to capacity ratios, the following corridors are recommended as priority corridors for implementation of access management plans:

Corridor	Termini	2035 LOS	Access Points per Mile
Garfield Road	Birmley to US-31	F	62
M-37 / US-31	M-113 to 14th Street	E	46
M-22	M-72 to Cherry Bend	F	40
US-31 / Beitner / Keystone	Benzie CL to Hammond	F	24

18.0 Intersection capacity analysis

Key intersections were analyzed using Highway Capacity Software (HCS 2000) to determine anticipated intersection levels of service. The detailed reports for each intersection are included in **Appendix A**, and are summarized in the table below.

Intersection	2035 projected v/c ratio	2035 LOS	In core area?	Associated Project
US-31/M-72 & Garfield	2.25	F	Yes	Corridor 1 Signal Optimization
Division & 14th	2.05	F	Yes	Corridor 3 Signal Optimization
Garfield & 8th	2.01	F	Yes	Corridor 5 Signal Optimization
Hammond & 3 Mile	1.78	F	No	Hammond Road Widening
US-31/M-72 & 3 Mile	1.76	F	Yes	Corridor 1 Signal Optimization
US-31 & S. Airport	1.69	F	Yes	Corridor 3 Signal Optimization
S. Airport & Garfield	1.66	F	Yes	Corridor 5 Signal Optimization
14th & Cass	1.61	F	Yes	
US-31/M-72 & 4 Mile	1.57	F	Yes	Corridor 1 Signal Optimization
US-31/M-72 & Holiday	1.45	F	Yes	Corridor 1 Signal Optimization
M-72 & M-22	1.31	F	Yes	Corridor 1 Signal Optimization
W. Silver Lake & Barnes	1.22	F	Yes	
Airport and W. Silver Lake	1.19	F	Yes	Corridor 2 Signal Optimization
M-72 & US-31 (Acme)	1.15	F	Yes	Corridor 1 Signal Optimization
S. Airport & Cass	1.14	F	Yes	Corridor 2 Signal Optimization
M-72 (Grandview) & Division (US-31)	1.13	F	Yes	Corridor 3 Signal Optimization
S. Airport & Veterans	1.06	F	Yes	Corridor 2 Signal Optimization
N. Long Lake & Barnes	1.03	F	Yes	
US-31 (Division) & Beitner	0.99	E	Yes	Corridor 3 Signal Optimization
US-31 (Division) & Front	0.98	E	Yes	Corridor 3 Signal Optimization
S. Airport & Park	0.98	E	Yes	
S. Airport & 3 Mile	0.96	E	No	
Garfield & Hammond	0.96	E	No	
M-22 & Cherry Bend	0.94	E	Yes	
US-31 & W. Silver Lake	0.91	E	No	Corridor 3 Signal Optimization
S. Airport & Townline	0.90	E	No	
US-31 & M-137	0.90	E	Yes	
Hammond & 4 Mile	0.90	E	No	Hammond Road Widening
US-31 & 8th	0.85	D	Yes	
Keystone & Birmley	0.80	D	No	
Garfield & M-113	0.73	C	Yes	
Keystone & Cass	0.71	C	No	
M-37 & Vance	0.62	C	No	

APPENDIX A

Highway Capacity Software Intersection analysis reports