Welcome, Neighbors!

Public Meeting

Kenwood – Arrowhead Intersection

Thursday, July 23, 2015

THE CITY OF DULUTH MINNESOTA

Agenda

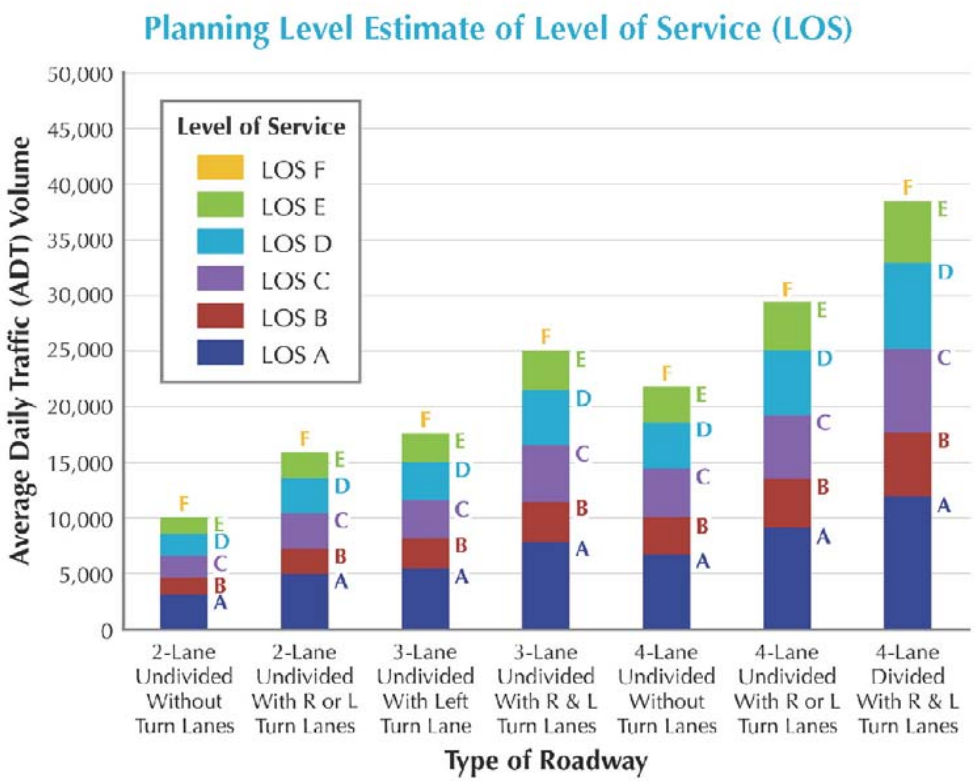
- **Traffic Studies Conducted**
- **Intersection Safety**
- **Potential Improvements**
- **Funding**
- **Next Steps**

Keith Hamre, Director of Planning and Construction Services
Cindy Voigt, City Engineer

Issues

- Pedestrian safety
- Existing traffic operations
- Turning conflicts

Level of Service (LOS)



Capacity Assumptions*

Through Only Lane	800 vph
LT/TH Lane	600 vph
TH/RT Lane	700 vph
TH/RT/FT Lanes	600 vph
Turn Lanes	350 vph

* Assumes 1/4 mile signal spacing. For less than 1/4 mile signal spacing, roadway becomes too volatile to determine LOS by ADT.

Peak Hour Percentages

Arterial Roadway	10%
Directional Orientation	60/40

Note: Approximate values based on highly dependent assumptions. Do not use for operational analyses or final design.

Traffic Studies

- 2012 conditions:
  - Overall intersection LOS B (15.5 – 19.9 seconds of delay per vehicle)
  - Higher than expected crash rate for this type of facility.
- 2013 forecasts:
  - Overall LOS C and D during a.m./p.m. peak hours
  - Northbound approach (Kenwood Avenue) expected to have delays over 100 seconds per vehicle

Traffic Studies

- Previous Recommendations:
  - Near-term: striping improvements and traffic signal timing improvements
  - Mid-term: Multilane roundabout or traffic signal with additional geometrics and capacity. Consider additional analysis as redevelopment occurs and incorporate access modifications.
  - Long-term: Corridor access management by coordinating access modifications and integrating backage roads into site plans.

Traffic Studies – Kenwood Village (2015)

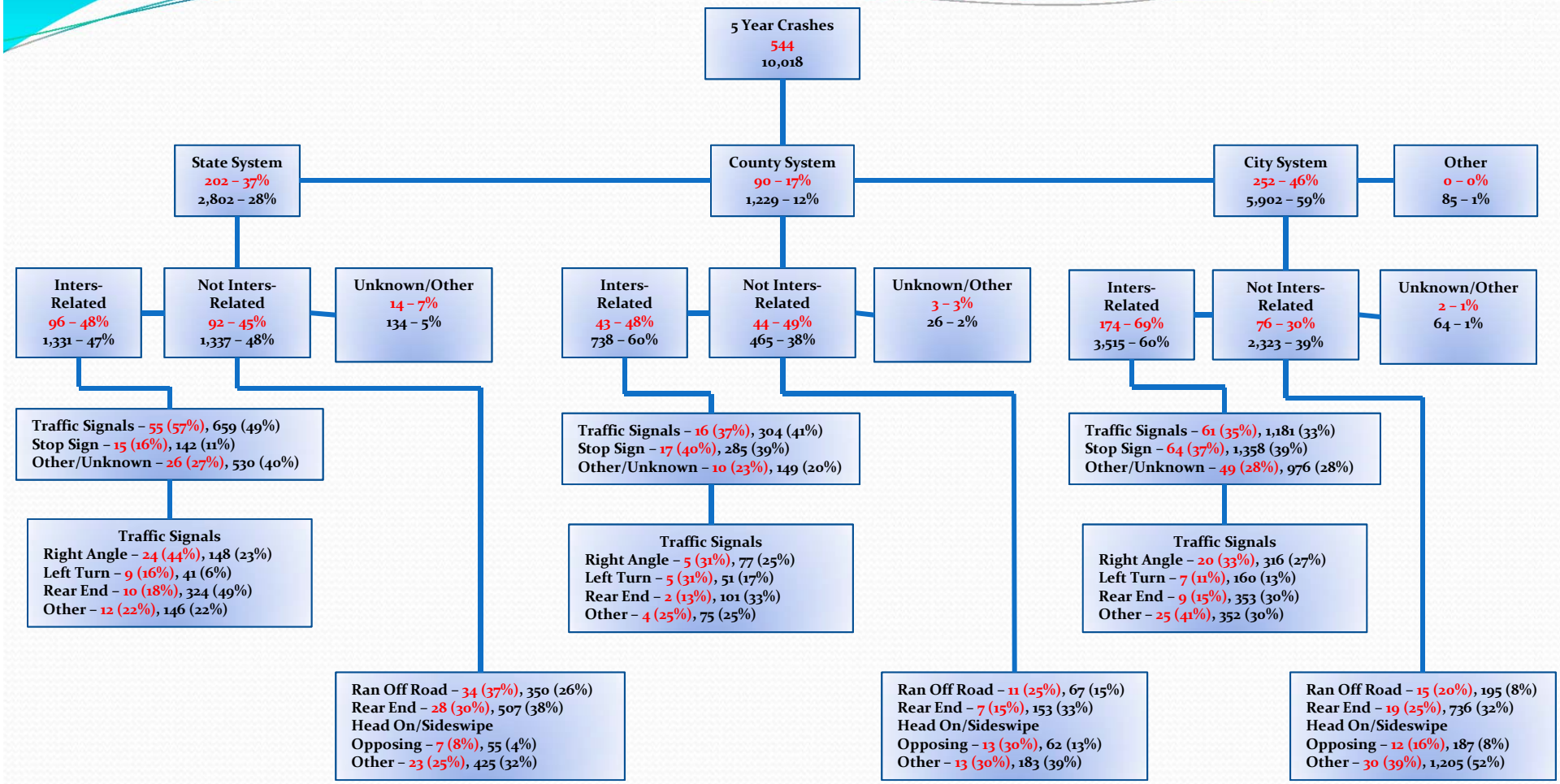
- Overall intersection LOS B in 2015 and 2016 scenarios
- Proposed development will have a nominal impact on the traffic operation of nearby intersections.
- Recommendations: Signal optimization, install zebra crosswalks, move yield sign on free right, consider pedestrian advance warning sign

Public & Neighbor Comments

- Calm speeds
- Update signal facilities to allow ample crossing times
- Enhance the visibility of pedestrians
- Create pedestrian refuges where possible
- "Free right" at eastbound Arrowhead: perceived safety concerns regarding vehicle speed and pedestrian visibility
- Consider HAWK or similar pedestrian signal at Cleveland if no signal placed.
- Number of accesses to local businesses are a concern

Overall Intersection Safety Characteristics

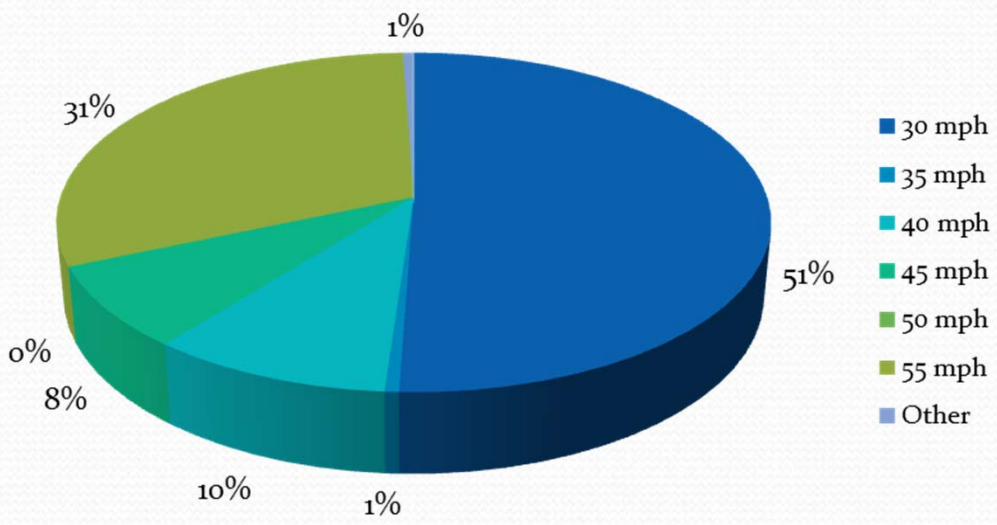
- Access control
- Vehicle safety
- Pedestrian/bike safety



Source: MnCMAT Crash Data, 2009-2013
Serious Crash is defined as fatal, incapacitating and non-incapacitating crashes (K+A+B)

All Serious Traffic Signal Crashes by Speed Limit

Five Year Period of 2009-2013, State/County/City Roads

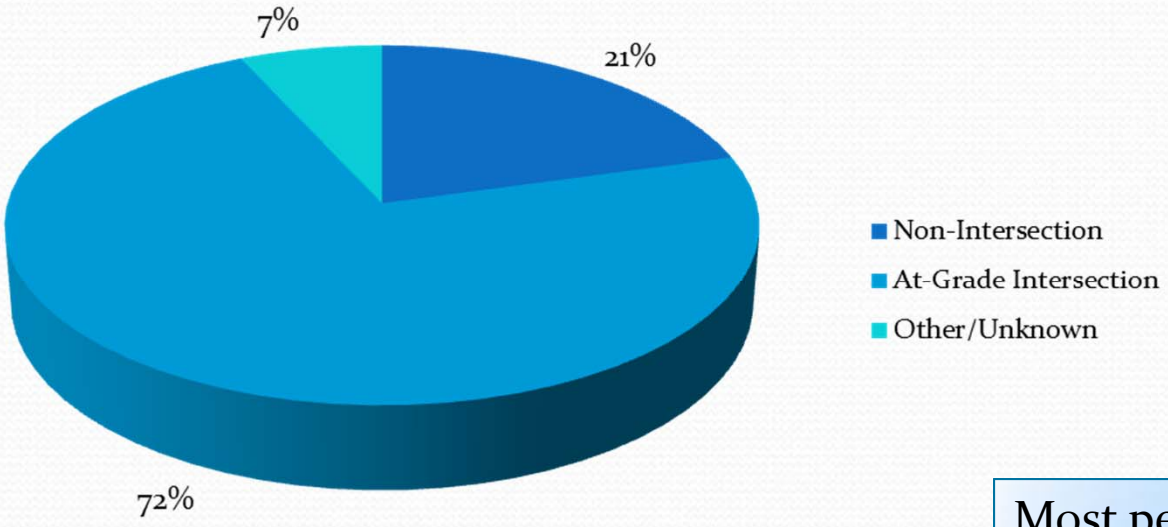


62% of serious crashes at traffic signals occur on roads with a speed limit 40 mph or less.

Data Source: MnCMAT

All Serious Pedestrian/Bicyclist Crashes by Relation to an Intersection

Five Year Period of 2009-2013, State/County/City Roads

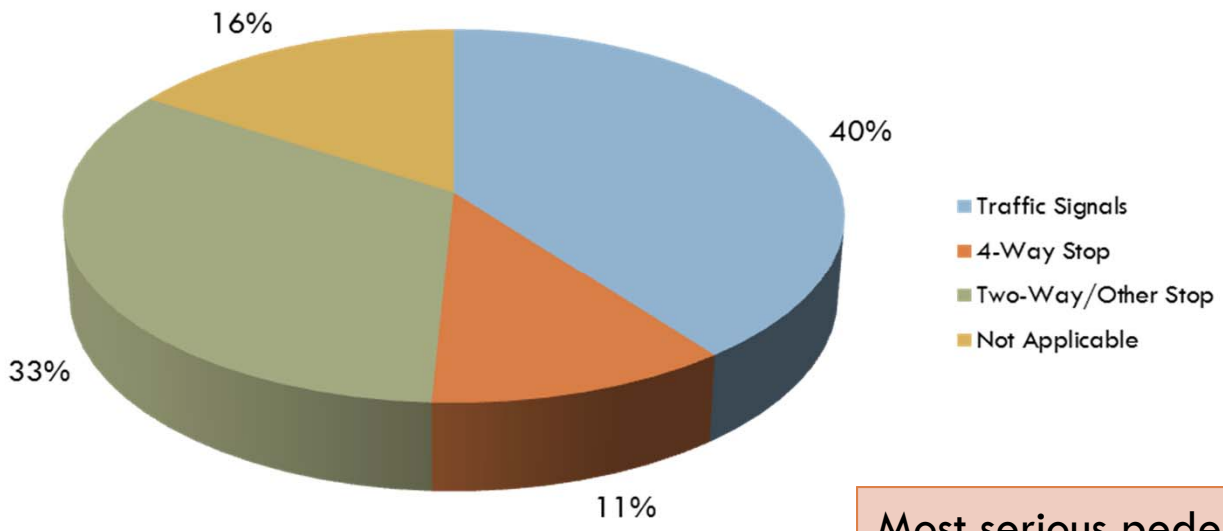


Most pedestrian/bicyclist crashes, 72%, occur at at-grade intersections.

Data Source: MnCMAT

All Serious Pedestrian/Bicyclist Crashes at At-Grade Intersections by Traffic Control Device

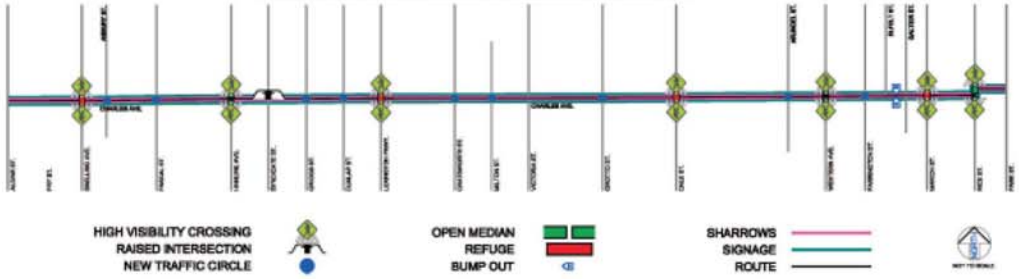
Five Year Period of 2009-2013, State/County/City Roads



Most serious pedestrian/bicyclist crashes (40%) occur at traffic signals.

Data Source: MnCMAT

Pedestrian/Bike Strategies



Highlights

- Some more recent pedestrian and bicycle strategies include:
  - **Countdown Timers** – Countdown timers are flashing timers, usually installed with pedestrian indication lights, which provide the number of seconds remaining during the pedestrian phase.
  - **Leading Pedestrian Interval** – A leading pedestrian interval provides the pedestrian walk 2 or 3 seconds ahead of the vehicle green, allowing pedestrians a head start and the ability to enter the crosswalk before right-turning vehicles can turn into the crosswalk.
  - **HAWK Signals** – Should only be used in conjunction with a marked crosswalk and typically not at an intersection
  - **Bike Boulevards** – still considered experimental – however, one study looking at seven bike boulevards in Berkeley, found a 60% reduction in bicycle-involved crashes.

Goals

- Enhance and encourage pedestrian amenities
- Accommodate current and future vehicle traffic
- Minimal impact on existing properties

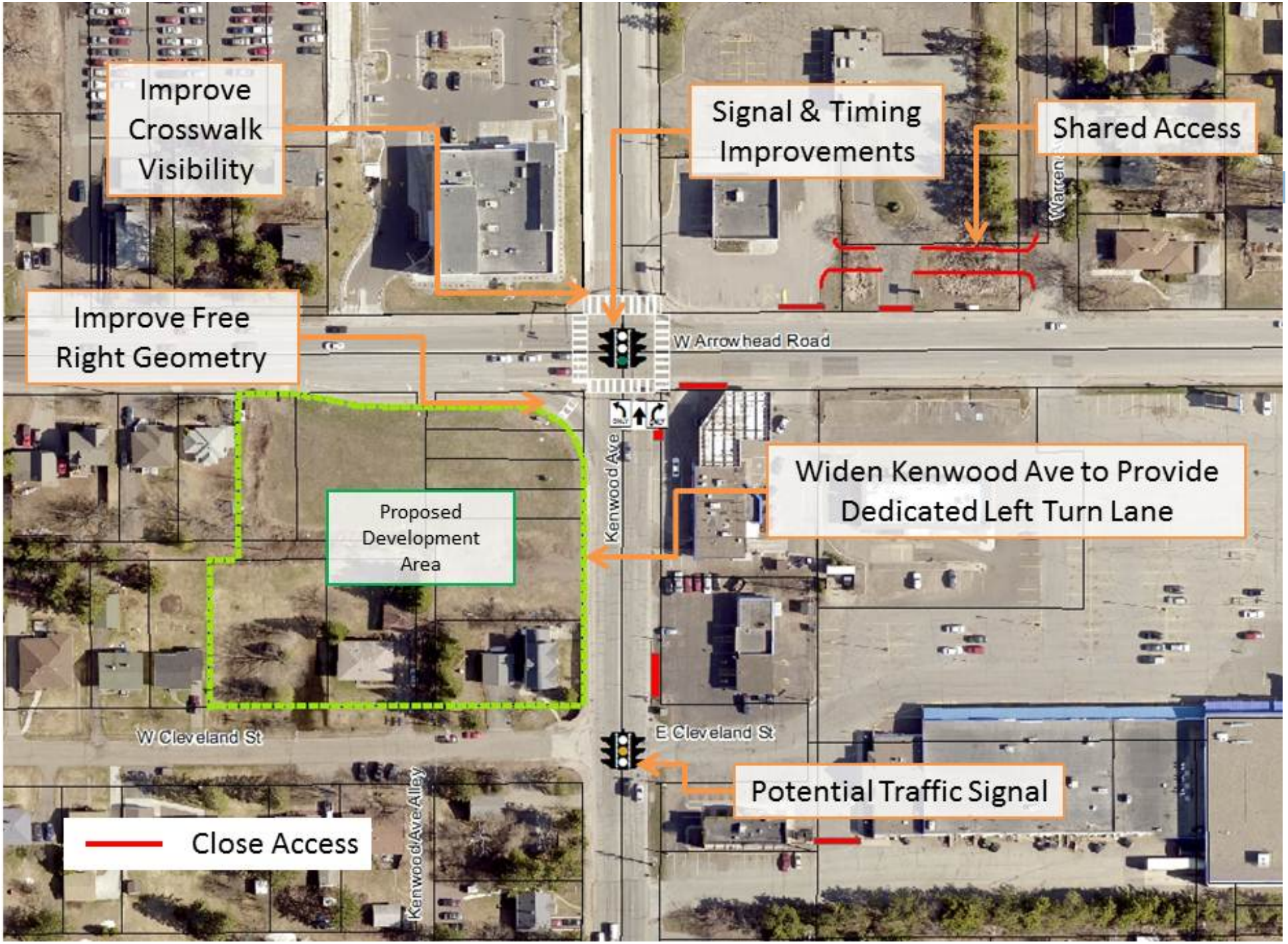
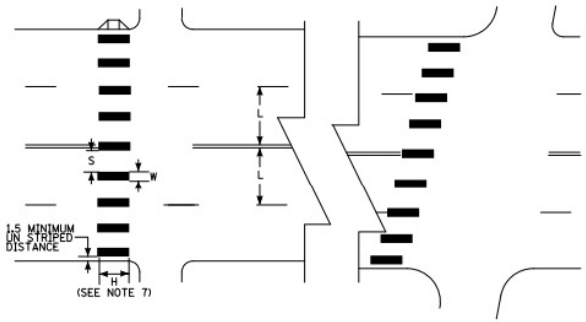

Improve Crosswalk Visibility
Signal & Timing Improvements
Shared Access
Improve Free Right Geometry
W Arrowhead Road
Kenwood Ave
Widen Kenwood Ave to Provide Dedicated Left Turn Lane
Proposed Development Area
W Cleveland St
E Cleveland St
Potential Traffic Signal
Close Access
Kenwood Ave Alley

Figure 1

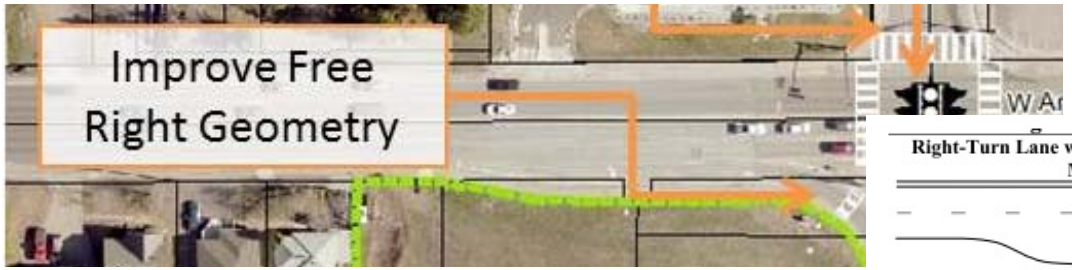
MARKINGS FOR PEDESTRIAN CROSSWALKS

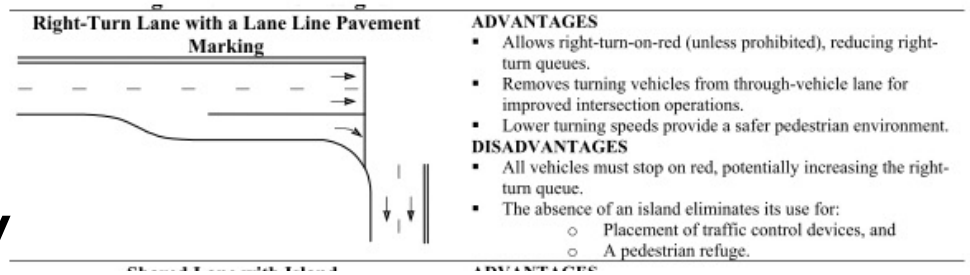
(L) WIDTH OF INSIDE LANE	(W) WIDTH OF PAINTED AREA	(S) WIDTH OF SPACE	ALTERNATE (W) WIDTH OF PAINTED AREA	ALTERNATE (S) WIDTH OF PAINTED AREA
9′	2.0′	2.5′	—	—
10′	2.5′	2.5′	2.0′	3.0′
11′	2.5′	3.0′	2.0′	3.5′
12′	3.0′	3.0′	2.5′	3.5′
13′	3.0′	3.5′	—	—



Improve Crosswalk Visibility

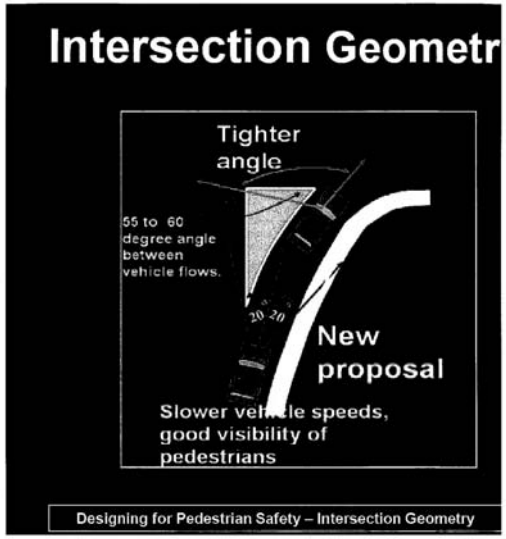
- Zebra striping on eastbound approach – 2015
- Zebra striping on other legs of intersection
- Move yield sign at "free right" before the crosswalk





Improve Free Right Geometry

- Traffic study shows converting to right-turn lane does not severely impact Level of Service, but lengthens stacking at peak times.
- Could also tighten angle to slow traffic and improve visibility

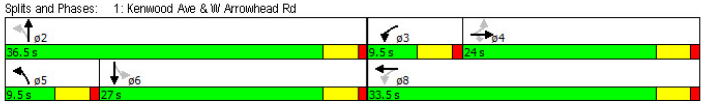


Timings
1: Kenwood Ave & W Arrowhead Rd 4/9/2015

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	18	244	181	93	354	156	48	40	163
Turn Type	Perm	NA	Perm	pm+pt	NA	pm+pt	NA	Perm	NA
Protected Phases		4		3	8	5	2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	4	4	4	3	8	5	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	23.5	23.5	23.5	9.5	23.5	9.5	23.5	23.5	23.5
Total Split (s)	24.0	24.0	24.0	9.5	33.5	9.5	36.5	27.0	27.0
Total Split (%)	34.3%	34.3%	34.3%	13.6%	47.9%	13.6%	52.1%	38.6%	38.6%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0		0.0		0.0		0.0
Total Lost Time (s)		4.5	4.5		4.5		4.5		4.5
Lead/Lag	Lag	Lag	Lag	Lead		Lead		Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes		Yes		Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	Max
Act Effct Green (s)		15.9	15.9		15.9		32.2		32.2
Actuated g/C Ratio		0.28	0.28		0.28		0.56		0.56
v/c Ratio		0.32	0.34		0.64		0.32		0.15
Control Delay		16.9	4.5		21.4		8.2		6.4
Queue Delay		0.0	0.0		0.0		0.0		0.0
Total Delay		16.9	4.5		21.4		8.2		6.4
LOS		B	A		C		A		A
Approach Delay		11.8			21.4		8.2		6.4
Approach LOS		B			C		A		A

Intersection Summary	
Cycle Length: 70	
Actuated Cycle Length: 57.1	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 13.5	Intersection LOS: B
Intersection Capacity Utilization 50.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 1: Kenwood Ave & W Arrowhead Rd



Signal & Timing Improvements

- Will reduce wait times
- Improve pedestrian crossing times

Shared Access

- Consolidate access with alley to Warren Avenue

Widen Kenwood Avenue

- Developer will dedicate 10' along Kenwood Avenue for new left turn lane

Potential Traffic Signal

- Traffic study suggests signal will not meet warrants for volume.
- Traffic signal meets warrants for safety/crashes
- Traffic signal may be needed for pedestrian access

Funding & Phasing

- Need to determine what improvements will be made.
- Need to program funding for design and construction.
- Funding partners:
  - Developer
  - County
  - City
  - Property owners

Next Steps

- Continue discussions with Kenwood Village developers and other existing businesses
- Approval by Council for funding alternatives