Metropolitan Planning Organization of Johnson County

Date: June 17, 2014

To: Dave Schechinger, V-K Engineering
Greg Parker, Johnson County Engineer

From: Kris Ackerson, Assistant Transportation Planner
Brad Neumann, Assistant Transportation Planner

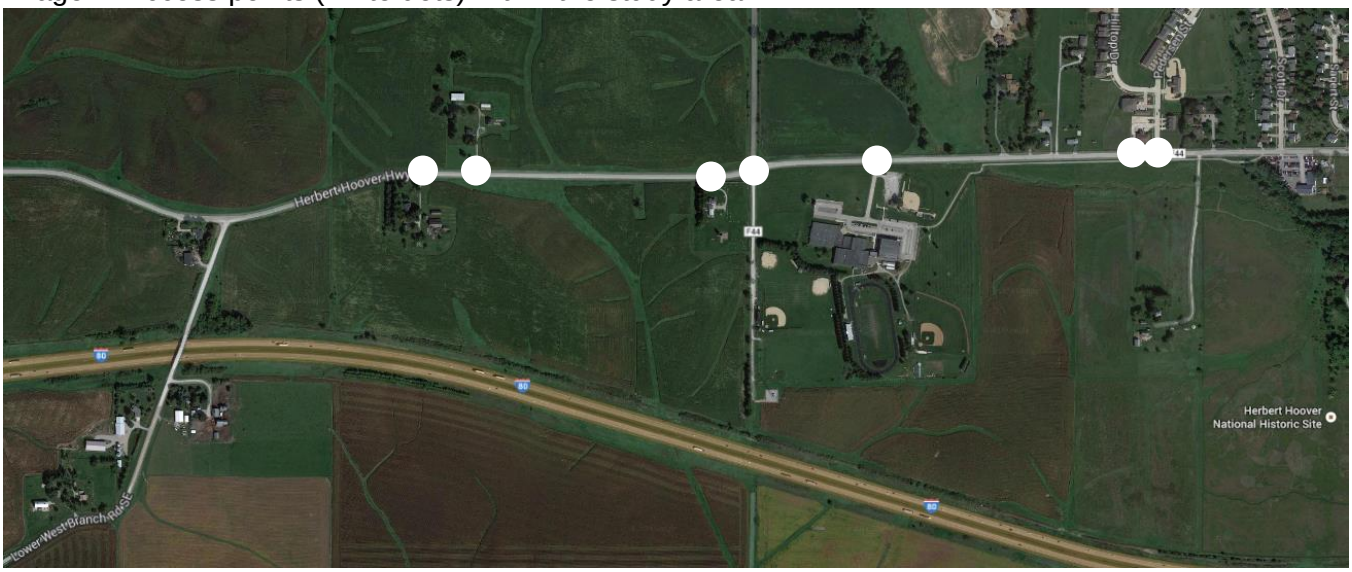
Re: The Meadows Subdivision traffic impact analysis

Per your request, the following memorandum provides our assessment of the potential traffic impacts related to The Meadows Subdivision in West Branch.

Existing conditions

The study area generally is along West Main Street (County Road F44) between Lower West Branch Road SE in Johnson County and Scott Drive in the City of West Branch. County Road F44 (Herbert Hoover Highway) turns into West Main Street within the West Branch city limits. The highway is a paved rural two-lane east-west corridor with open ditches and narrow shoulders. The study area includes three private farm access drives west of Johnson Cedar Road and six private drive access points between Johnson Cedar Road and Scott Drive. There is one four-way intersection at Johnson Cedar Road and three three-way intersections: at West Branch High School, at Community State Bank, and at Pedersen Street. Traffic does not stop at any point on West Main Street in the study area.

Image 1: Access points (white dots) within the study area



In 2010, the Iowa DOT conducted traffic counts on Main Street east of Johnson Cedar Road and calculated an average daily traffic volume of 3,160 vehicles per day.

In the past ten years, there have been three collisions at the intersection of F44 (Johnson Cedar Road) – see enclosed collision report. All three occurred during daylight hours and under snowy conditions. Two of the collisions involved two vehicles and one collision was a single vehicle incident.

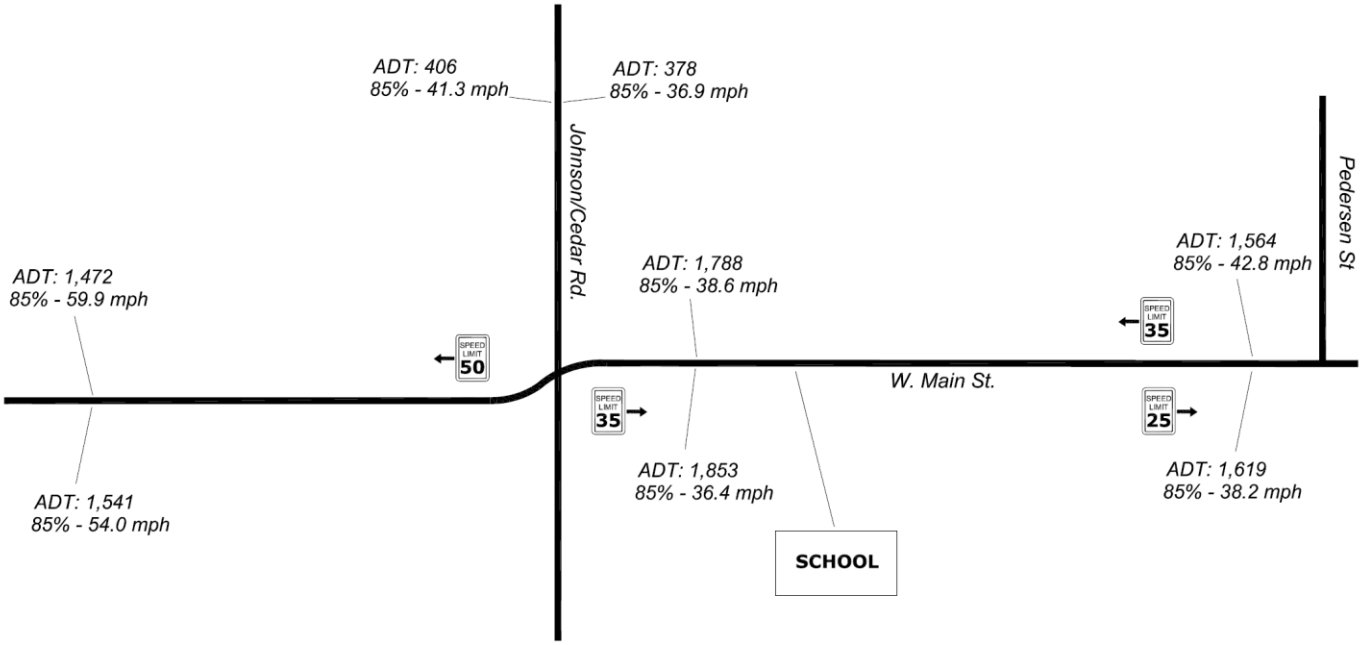
Speed and Volume Analysis

Staff recorded average daily traffic volumes and speeds over a three day period on West Main Street (F44) between Lower West Branch Road and Scott Drive on April 22-25, 2014. The 85th percentile speed is a term for the speed at which 85% of vehicles are traveling at or below, and is considered to be an indication of the speed of a safe and reasonable motorist (Speed Zoning information is attached).

The 85th percentile speeds on West Main Street in the 50 mph zone were recorded at 55 mph in the westbound lane and 54 mph in the eastbound lane. The 85th percentile speeds in the 35 mph speed zone (in front of the high school) were 36-37 mph. The 85th percentile speeds in the 25 mph speed zone were 38-42 mph. The 85th percentile speeds on northbound Johnson Cedar Road were 36 mph (ADT/speed summary pages are attached).

The 85th percentile speeds in our study indicate that the current posted speeds are appropriately set except the 25 mph zone where the high speeds are likely due to the open, mostly undeveloped (fewer access points) nature of the area. Although the area is predominantly residential, the houses are set back similar to a more rural setting allowing for good sight distance. We recommend leaving the posted speed limits at their current levels and moving the 35 mph speed zone further east to Scott Drive. The data indicates that drivers are generally comfortable driving faster than 25 mph. Alternatively, increased enforcement should be considered if the speed limit remains at 25 mph. Radar feedback speed signs could also be considered in the 25 mph posted zone.

Figure 1: Traffic volume and speed data (April 22-25, 2014)



Proposed development

Based on the plat of The Meadows Subdivision, 151 dwelling units are proposed. As proposed, the development includes three access points to neighboring properties; one to the east, one access point on Main Street (south), and two on Johnson Cedar Road (west).

Table 1: Projected trip generation for The Meadows Subdivision

Description	Single Family
Dwellings	151
Weekday daily traffic rate/dwelling	9.57
Total Daily Trips	**1445**
AM peak period rate	0.75
PM peak period rate	1.01
Total AM Peak Trips	**113**
AM In*	28
AM Out*	85
Total PM Peak Trips	**153**
PM In*	95
PM Out*	58

* Rates and entering/exiting ratios from Institute of Transportation Engineers

Additionally, the school district proposes expanding the high school campus to also include middle school students at the same campus. The following table outlines the traffic volumes entering/exiting for the combined facility based on the current number of middle and high school students provided by the School District.

Table 2: Projected trip generation for combined middle/high school

Description	High School	Middle School	Total
Students	250	258	508
Weekday daily traffic rate	1.71	1.62	n/a
Total Daily Trips	**428**	**418**	**845**
AM peak period rate	0.41	0.53	n/a
PM peak period rate	0.14	0.15	n/a
Total AM Peak Trips	**103**	**137**	**239**
AM In*	71	75	146
AM Out*	32	62	93
Total PM Peak Trips	**35**	**39**	**74**
PM In*	16	20	37
PM Out*	19	19	37

* Rates and entering/exiting ratios from Institute of Transportation Engineers

Sight Distance

The posted speed limit is 50 mph at the intersection of West Main Street and Johnson Cedar Road – the *85th-percentile speed* is 55 mph. As development occurs eastbound vehicles are more likely to encounter a vehicle stopped in the roadway as it waits for an opportunity to turn left (north). In this case, trailing vehicles need adequate time to slow and/or stop without colliding; the *Geometric Design of Highways and Streets* manual recommends a stopping sight distance of 495 feet on roadways with design speeds of 55 mph. However, the existing sight distance for motorists looking west from the north and south legs is approximately 390 feet and 375 feet, respectively.

The sight distance concerns have not resulted in a collision history but could lead to collisions as development occurs and traffic volumes increase. To improve visibility, the west leg of the intersection could be lowered, the intersection could be moved east 150 feet or more, and/or a left-turn lane could be added for eastbound to northbound turning movements.

Turn-lane analyses

The following turn lane warrant analyses are based on the following assumptions and can be adjusted upon request by the city:

- To be conservative, school traffic projections are based on combined high school and middle school student body (508 students).
- Although afternoon peak hours are earlier for schools than residential development, to be conservative we used the peak hour traffic levels for both uses to evaluate the turn lane warrants.
- Incoming student traffic is split 60% coming from the east and 40% from the west.
- Based on the school district's preliminary concept plan for the joint middle and high school campus, we assume all entering/exiting traffic will utilize one driveway on Main Street – not via Johnson Cedar Road.
- We assume Dawson Drive and the new school access drive will be located across from each other, creating a four way intersection.

- Morning peak hour trips are split 25% entering and 75% exiting the development. Afternoon peak hour trips are split 63% entering and 37% exiting the development.

- We assume half of incoming and outgoing traffic from The Meadows Subdivision will utilize Dawson Drive and the other half will utilize Johnson Cedar Road.

Main Street / Dawson Drive / school campus access

We project this intersection would carry approximately 4,300 vehicles per day – existing traffic (3,160 vehicles), plus middle school traffic (418 vehicles) and half of The Meadows Subdivision traffic (722 vehicles) – if/when the school is expanded and The Meadows Subdivision is fully developed. This level of traffic on Main Street is substantially higher than the minor side streets (Dawson Drive and school access).

Based on projected volumes and the assumption that Dawson Drive and the new school access will meet at the same point on Main Street, turn lanes will not be warranted when The Meadows Subdivision is built-out and the middle school and high school are joined (Figures 2-5). However, as development north and east of The Meadows Subdivision continues the need for additional infrastructure (e.g. turn lanes, roundabouts, curb and gutter) on Main Street may arise.

The following outlines an all-way stop analysis for the Main Street/Dawson Drive/school campus access. To warrant an all-way stop controlled intersection, one of the following four criteria found in the *Manual on Uniform Traffic Control Devices* (MUTCD) must be satisfied:

A. Where traffic control signals are justified, the multi-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.

    - A traffic signal is not planned; therefore **Warrant A is not met**.

B. A collision problem, as indicated by 5 or more reported collisions in a 12-month period that are correctable by a multi-way stop installation. Such collisions include right- and left-turn collisions as well as right-angle collisions.

    - Since the proposed intersection does not exist, we cannot evaluate this criterion, therefore **Warrant B is not applicable**.

C. Minimum volumes:

    1. The vehicular volume entering the intersection from the major street approaches (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day.

        - Traffic on the Main Street approaches entering the intersection do not exceed 300 vehicles per hour for eight hours, therefore **Warrant C1 is not met**.

    2. The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour.

        - We do not project traffic from the (north) Dawson Drive or school drive (south) approaches entering the intersection will average 200 vehicles per hour for eight hours. The delay to minor street traffic, especially vehicles

exiting the school property, could exceed 30 seconds per vehicle. Therefore, **Warrant C1 could be studied further by modeling the projected delay using Synchro Software. This should be monitored as development occurs.**

3. If the 85th-percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the above values.

    - The 85th percentile speeds in the 35 mph speed zone (in front of the high school) were 36-37 mph; therefore **Warrant C3 is not met**.

D. Where no single criterion is satisfied, but where Criteria B, C1, and C2 are all satisfied to 80 percent of the minimum values. Criterion C3 is excluded from this condition.

    - Criterion C2 requires further study; therefore **Warrant D is not evaluated.**

Four additional optional criteria are available to use based on engineering judgment.

I. The need to control left-turn conflicts

    - The intersection design does not create visibility issues. Staff does not anticipate a significant number of left-turn conflicts; therefore optional **Warrant I is not met**.

II. The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;

    - We do not project a high volume of pedestrians at this intersection. As such, staff does not anticipate a high number of pedestrian conflicts. Therefore, **optional Warrant II is not met**.

III. Locations where a road user, after stopping, cannot see conflicting traffic and is not able to reasonably safely negotiate the intersection unless conflicting cross traffic is also required to stop; and

    - The intersection design does not create visibility issues, therefore **optional Warrant III is not met.**

IV. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection.

    - Main Street is a higher volume, arterial street relative to the lower volume minor approaches. The addition of an all-way stop would impede traffic efficiency by introducing more delay to the eastbound and westbound traffic, therefore **optional Warrant IV is not met**.

Warrant Summary – Warrants A, B, C1, C3, and D were not met, nor were any of the four optional warrants; Warrant C2 could be studied further. As such, and all-way stop control is not recommended at this time as it would introduce more delay for eastbound and westbound motorists and lower the level of service throughout the day. Based on traffic engineering practices the side streets should be stop controlled and Main Street uncontrolled.

Figure 2: Morning peak hour westbound left turn lane warrant at Dawson/Main St/School

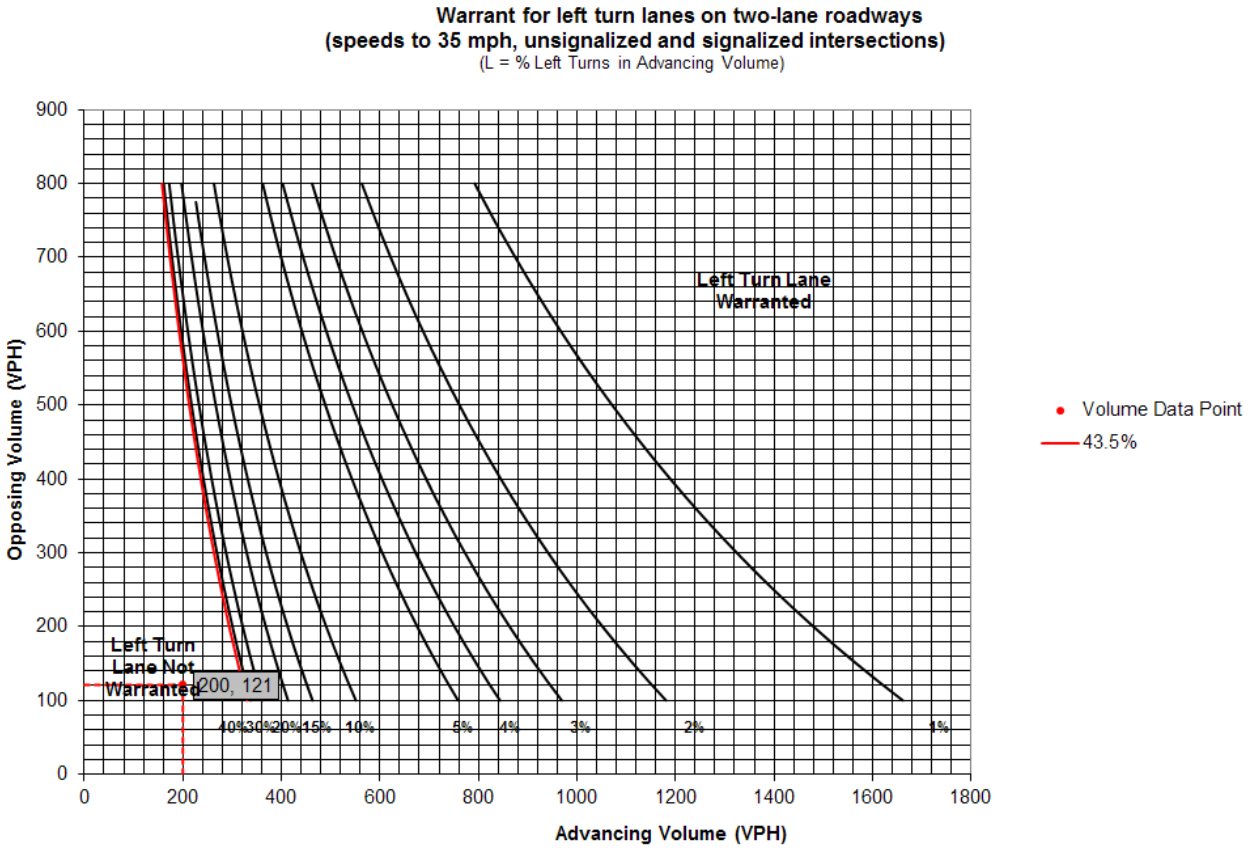


Figure 3: Afternoon peak hour westbound left turn lane warrant at Dawson/Main St/School

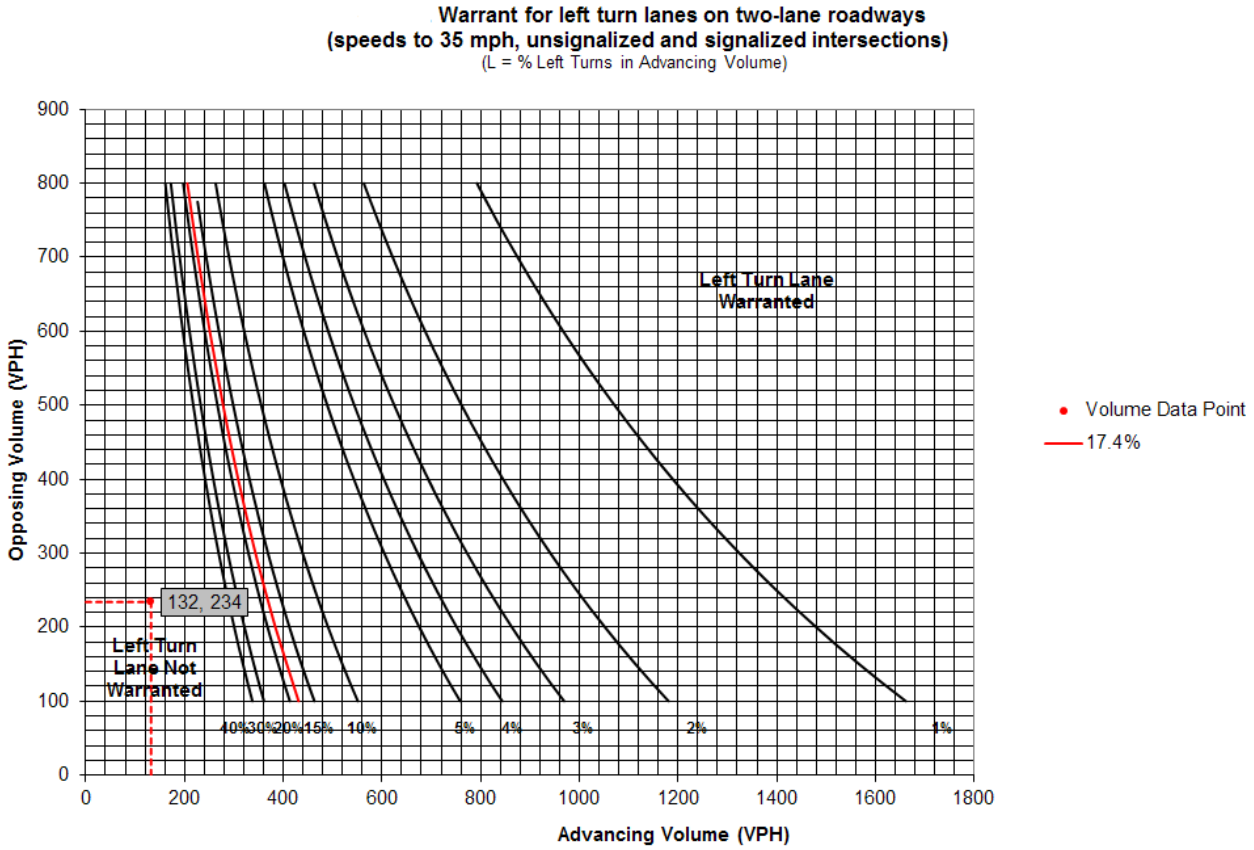


Figure 4: Morning peak hour eastbound left turn warrant at Dawson/Main St/School

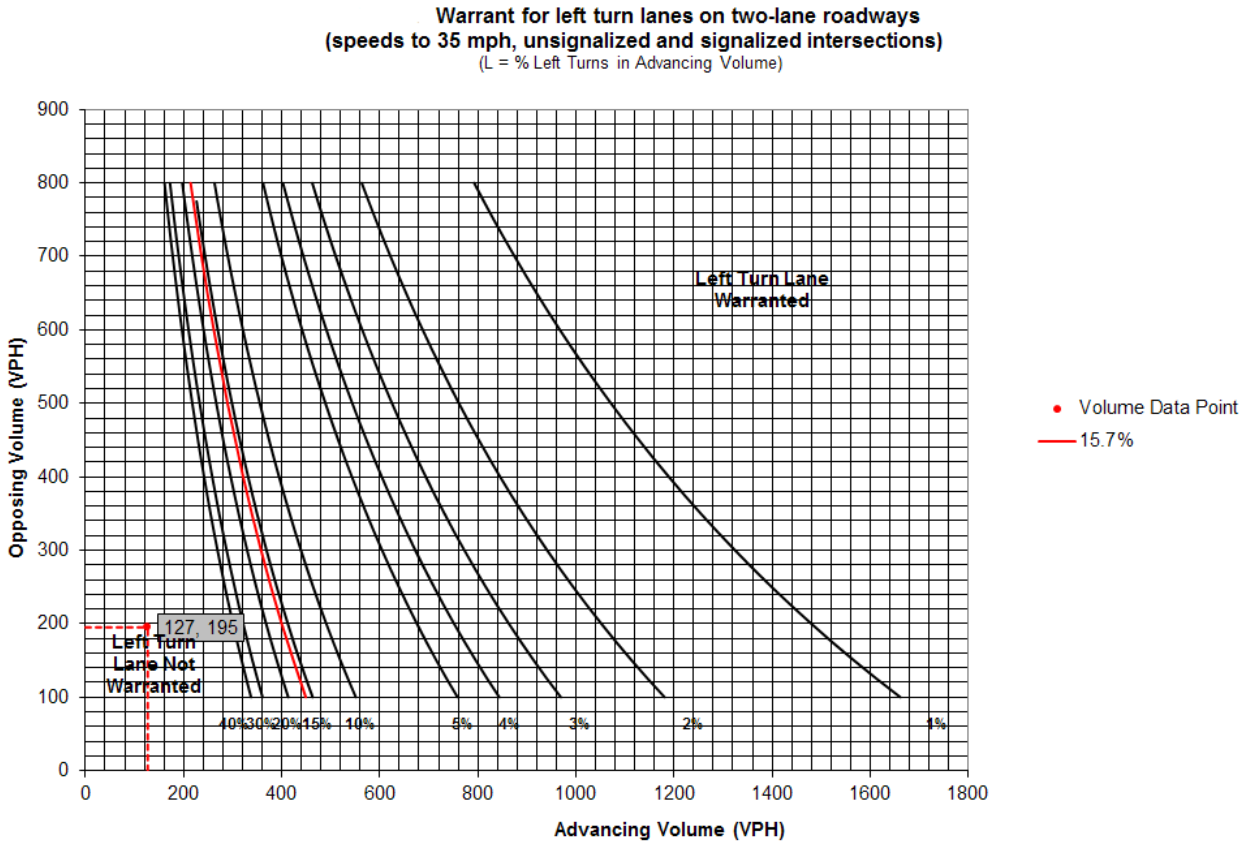
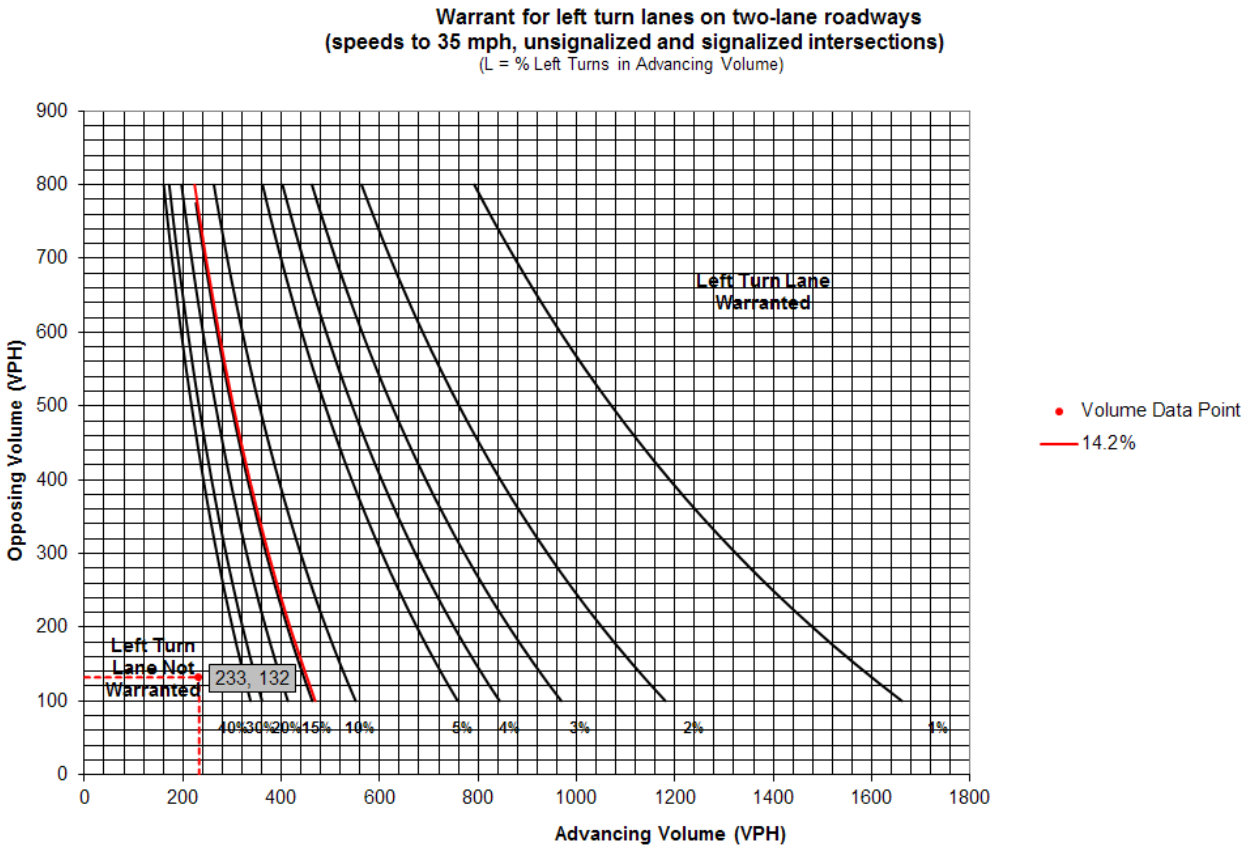


Figure 5: Afternoon peak hour eastbound left turn warrant at Dawson/Main St/School



Main Street / Johnson Cedar Road Intersection

Based on peak hour traffic counts (Tables 3 and 4) and the projected traffic volumes generated by The Meadows Subdivision, a left-turn lane is not warranted for eastbound traffic during the morning peak hour (Figure 5). The afternoon peak hour calculation indicates an eastbound left turn is also not warranted (Figure 6), but two additional factors should be considered. First, the intersection has limited sight distance for eastbound vehicles approaching the intersection, which could lead to an increase in rear-end collisions as the volume of left-turning (east- to northbound) traffic increases. Additionally, if the *actual* volume of left-turning traffic during the PM peak hour is eighteen or more cars higher than *projected* in this report due to adjacent development, then a left-turn lane will be warranted. As a result, staff recommends that the City install a left-turn lane for eastbound vehicles when Gilbert Drive and Orange Street are connected to Johnson Cedar Road, at which time Johnson Cedar Road should also be reconstructed.

Table 3: Morning peak hour data collected April 22, 2014

	HERBERT HOOVER Eastbound				HERBERT HOOVER Westbound				JOHNSON CEDAR Northbound				JOHNSON CEDAR Southbound			
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
07:15 AM	1	20	0	0	0	60	4	0	0	0	1	0	5	0	5	0
07:30 AM	2	25	0	0	1	47	2	0	0	0	0	0	6	0	10	0
07:45 AM	4	35	0	0	0	31	5	0	0	0	0	0	12	0	8	0
08:00 AM	6	27	1	0	0	57	2	0	0	0	0	0	13	0	7	0
Total	**13**	**107**	**1**	**0**	**1**	**195**	**13**	**0**	**0**	**0**	**1**	**0**	**36**	**0**	**30**	**0**

Table 4: Afternoon peak hour data collected April 24, 2014

	HERBERT HOOVER Eastbound				HERBERT HOOVER Westbound				JOHNSON CEDAR Northbound				JOHNSON CEDAR Southbound			
Start Time	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds
04:30 PM	3	50	0	0	0	25	10	0	0	0	0	0	3	0	5	0
04:45 PM	4	39	0	0	0	26	1	0	0	0	0	0	5	0	1	0
05:00 PM	4	43	0	0	0	33	6	0	0	0	0	0	8	0	6	0
05:15 PM	10	55	0	0	0	17	2	0	0	0	0	0	7	0	0	0
Total	**21**	**187**	**0**	**0**	**0**	**101**	**19**	**0**	**0**	**0**	**0**	**0**	**23**	**0**	**12**	**0**

Figure 6: Morning peak hour eastbound left turn warrant at Main St/Johnson Cedar Road

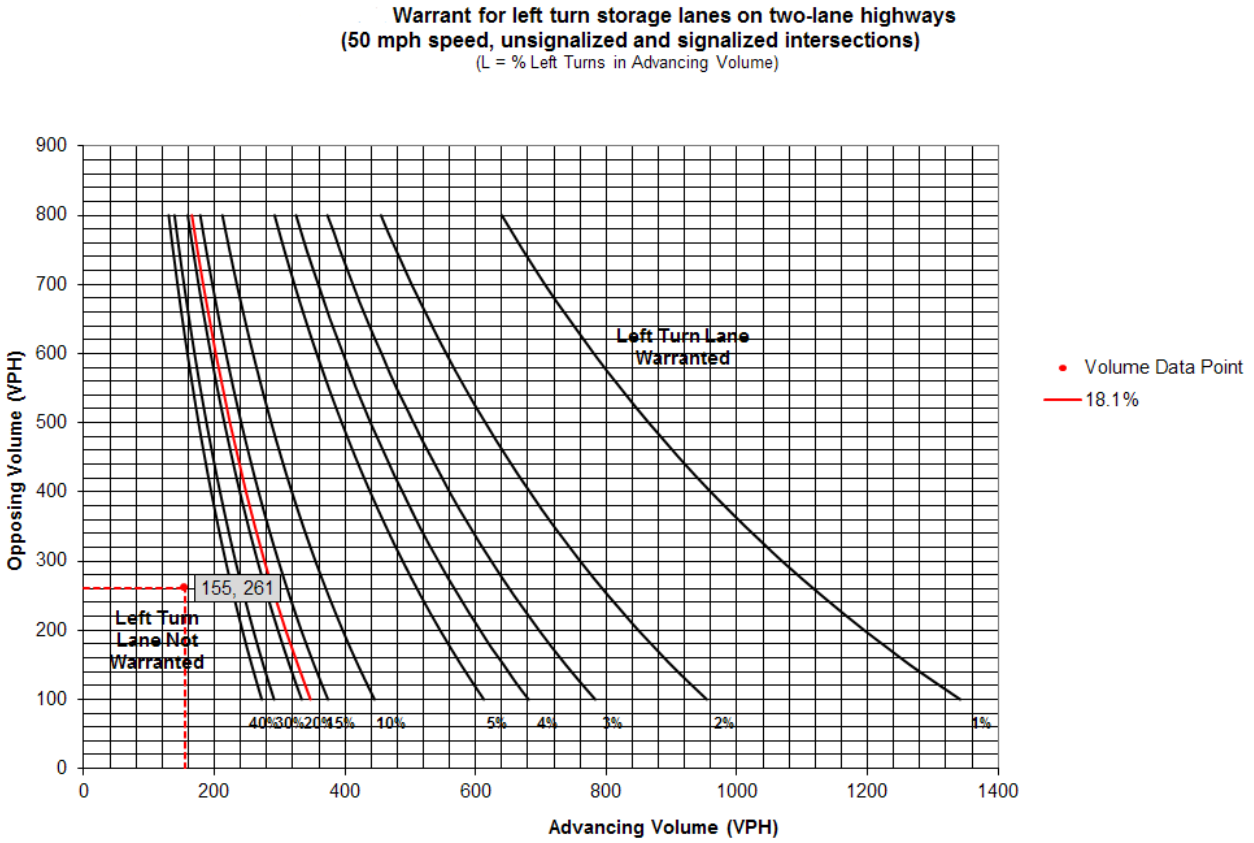
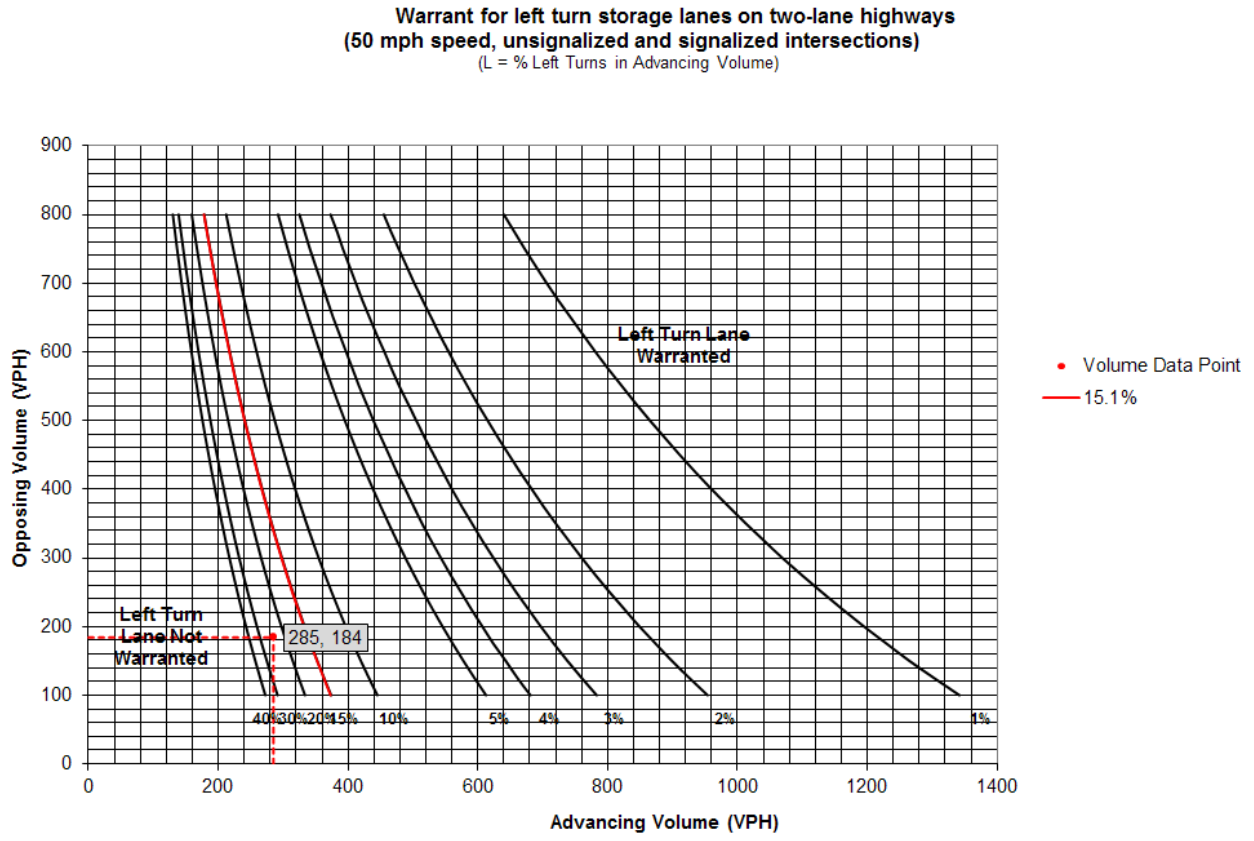


Figure 7: Afternoon peak hour eastbound left turn warrant at Main St/Johnson Cedar Road



Vehicle access control and street cross-sections

Main Street and Johnson Cedar Road are currently, and will continue to be, arterial roadways providing access through West Branch. As such, future access points should be limited. This approach will facilitate increasing traffic volumes and minimize collisions as development continues within West Branch.

If it has not already, the city may want to consider adopting a policy to obtain right-of-way from abutting properties as they develop along Main Street and Johnson Cedar Road to accommodate future turn lanes, roundabouts, and/or curb and gutter. Developing a concept plan for future infrastructure needs, based on broader traffic forecasting, could be a helpful tool at this stage to identify potential right-of-way needs. Additionally, as development occurs the city should continue requiring sidewalks along all streets to provide pedestrian connectivity.

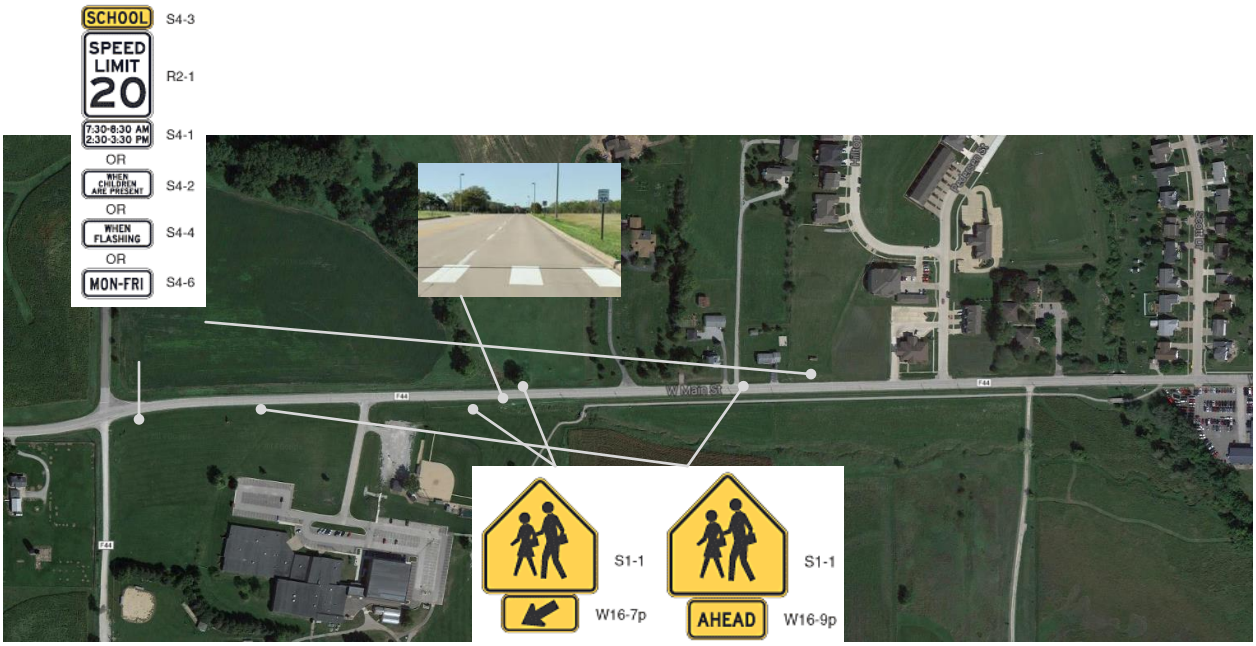
The cross-section for the Main Street corridor will ultimately depend on the frequency of access points. A two lane cross-section that is 35 feet from back-of-curb to back-of-curb would provide two travel lanes (24 feet) and two bike lanes (10 feet), and at intersections where turn lanes are warranted two travel lanes (24 feet) and one turn lane (11 feet) could be striped. The provision of bike lanes and sidewalks will enable the City to access grant funds, including DOT's Iowa Clean Air Attainment Program (ICAAP), for 'complete streets' projects, and allow students to bike to school.

If the City permits single family residences to front West Main Street with driveways at the street, then a three lane cross-section should be considered.

The recommended street cross-section on Johnson Cedar Road could be a 31-foot (back of curb to back of curb) neighborhood collector, including flattening of the vertical curves to ensure proper sight distances are provided.

Pedestrian crosswalk location and signage

The preferred location for crosswalks is at street intersections. Staff recommends a school crosswalk at a single intersection of Main Street, Dawson Drive, and the school access drive. To highlight the crosswalk, the following signage and pavement markings should be considered on Main Street: school speed zone (20-25 mph); continental crosswalk markings; school *advance* warning signs; and school *crosswalk* warning (see flashing LED sign option enclosed).



Currently there are no sidewalk connections across Main Street at Pedersen Street and Scott Drive, although bot intersections have sidewalks on both the north and south side of the street. These intersections could be enhanced with north-south sidewalk extensions, and no signs or pavements markings would be necessary.

Recommendations

The following list of recommendations summarizes the potential improvements and enhancements that should be considered as The Meadows Subdivision is developed:

Speeds

- Staff recommends leaving the posted speed limits at their current levels.
- Consider moving the 35 mph speed zone on Main Street further east to Scott Drive. The data indicates that drivers are generally comfortable driving at much higher speeds in this 25 mph zone. Increased enforcement should be considered if the speed limit remains 25 mph.
- Consider installing radar feedback speed signs in the 25 mph posted zone.

Dawson Drive/School Access

- Align Dawson Drive with the new school entrance to create a four-leg intersection, which will improve traffic circulation.
- Consider requesting a detailed analysis from the school district evaluating the pros and cons of separated entrance and exit points from the school property to improve circulation, reduce queuing, and prevent turning conflicts from motorists entering the school driveway from the east at the same time motorists are attempting to turn left (toward employment centers) out of the school exit.
- Install a signed and painted crosswalk at this new four-way intersection. Consider LED crosswalk warning system and proper signage.
- Connect existing trail along the south side of West Main Street to this intersection.

Main Street/Johnson Cedar Road Intersection

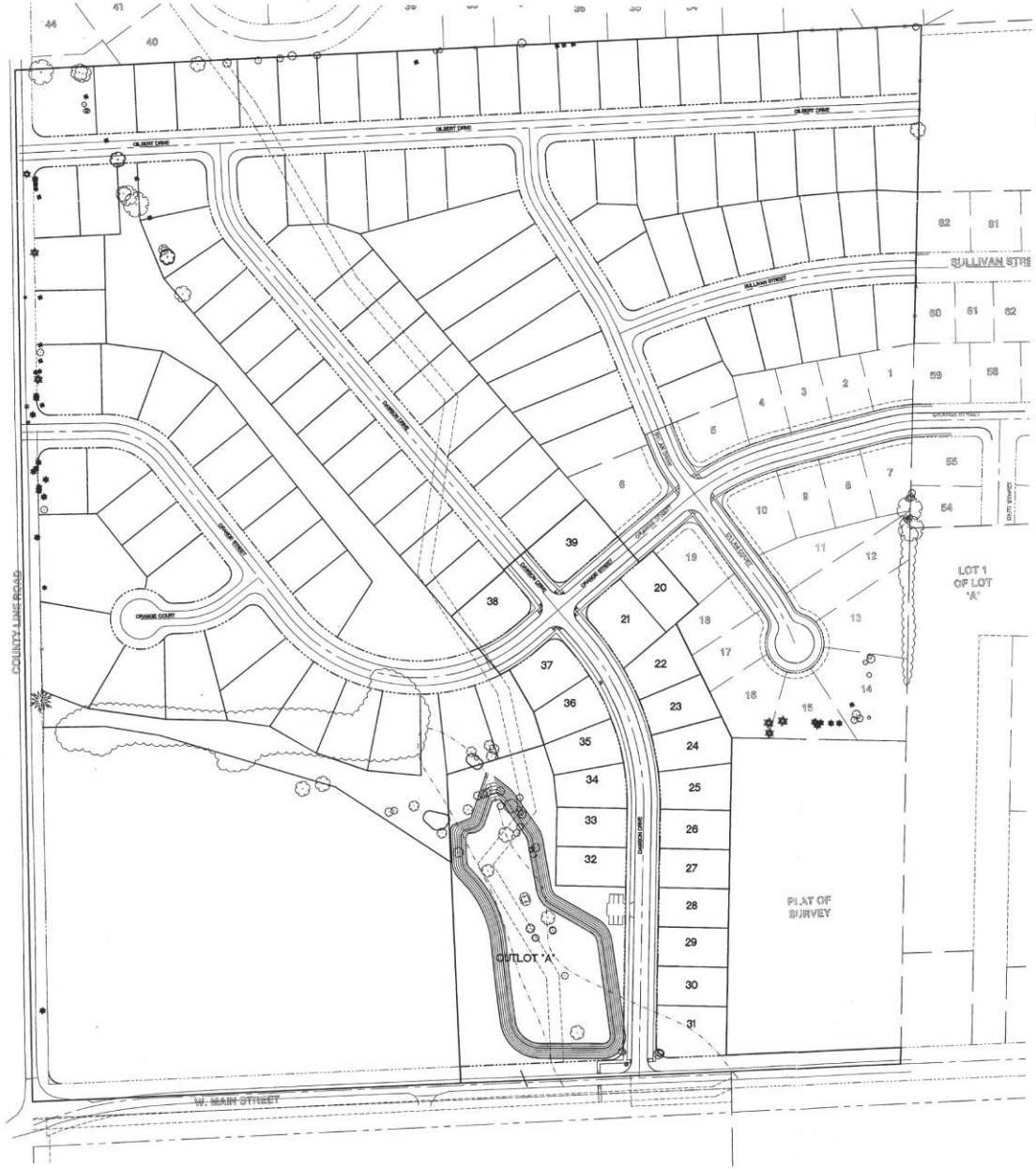
- The preferred option is to flatten the s-curve, including modifications to the vertical curve, of the west leg to improve sight distance. This would reduce the potential for rear end collisions on Main Street and improve visibility for entering traffic on Johnson Cedar Road – allowing the school to utilize the south leg as a secondary access to their property.
    - Staff recommends that the City install a left-turn lane for eastbound vehicles when Gilbert Drive and Orange Street are connected to Johnson Cedar Road, at which time Johnson Cedar Road should also be reconstructed.
- Alternatively, shift the north leg of Johnson Cedar Road east approximately 150-200 feet, based on engineering analysis, to achieve the minimum stopping sight distance of 495 feet.
    - Consider vacating the south leg of Johnson Cedar Road, but provide access to ball fields from campus; and/or
    - Consider a secondary access point for the school. If the intersection is realigned it could be provided by Johnson Cedar Road.

Street Section

- As development proposals are submitted to the City, consider obtaining additional right-of-way as needed for long term capacity of West Main Street and Johnson Cedar Road.

- A two lane cross-section that is 35 feet from back-of-curb to back-of-curb would provide two travel lanes (25 feet) and two bike lanes (10 feet), and at intersections where turn lanes are warranted two travel lanes (24 feet) and one turn lane (11 feet) could be striped.
- Utilize the *Statewide Urban Design and Specifications* manual for cross section recommendations.
- Consider lowering some of the hills on Johnson Cedar Road near the development access.
- The recommended street cross-section on Johnson Cedar Road would be a 31-foot (back of curb to back of curb) neighborhood collector, including flattening of the vertical curves to ensure proper sight distances are provided. This project is recommended at the time when Orange Street and Gilbert Drive intersect at Johnson Cedar Road.
- Continue the city's policy of requiring sidewalks on both sides of streets as development occurs, including the north side of Main Street between Scott Drive and Dawson Drive.

Source: http://www.tapconet.com/solar-led-division/rectangular-rapid-flash-beacons/



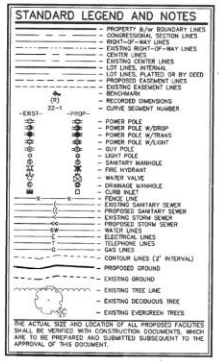
LOT LAYOUT EXHIBIT
THE MEADOWS SUBDIVISION
WEST BRANCH, IOWA

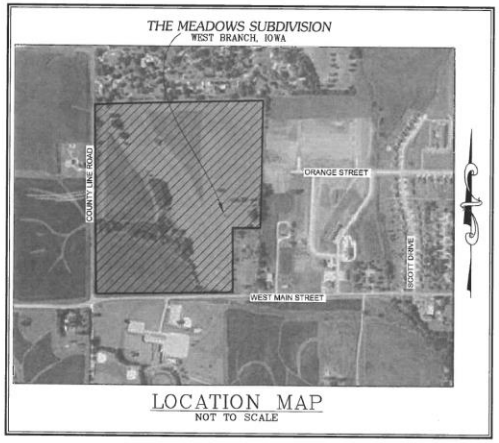
GRAPHIC SCALE IN FEET
1"=100'

PLAT PREPARED BY:
MMS CONSULTANTS INC.
1917 S. GILBERT STREET
IOWA CITY, IOWA 52240

OWNER/SUBDIVIDER:
KLM INVESTMENTS, INC.
25 EASTVIEW PLACE NE
IOWA CITY, IOWA 52240

SUBDIVIDER'S ATTORNEY:
MICHAEL W. KENNEDY
920 S. DUBUQUE STREET
IOWA CITY, IOWA 52240





LOCATION MAP
NOT TO SCALE

MMS
CIVIL ENGINEERS
LAND PLANNERS
LAND SURVEYORS
LANDSCAPE ARCHITECTS
ENVIRONMENTAL SPECIALISTS
1917 S. GILBERT ST.
IOWA CITY, IOWA 52240
(319) 351-8282
www.mmsconsultants.net

Date | Revision

LOT LAYOUT EXHIBIT

THE MEADOWS SUBDIVISION
WEST BRANCH
CEDAR COUNTY
IOWA

MMS CONSULTANTS, INC.
Date: 01-02-14
Designed by: PVA | Field Book No.:
Drawn by: JDM | Scale: 1"=100'
Checked by: PVA | Sheet No.: 1
Project No.: IOWA CITY 8815002 | of: 1

1 SITE PLAN
SCALE: 1" = 80'-0"

STRUXTURE ARCHITECTS

West Branch High School
West Branch, Iowa

ARCHITECTURE
INTERIOR DESIGN
MASTER PLANNING
www.struxture.com

Iowa Department of Transportation

Crash Detail Report

2004265457 12/31/2004 07:57 CEDAR/JOHNSON CO LINE RD AND IOWA 0979 / HOOVER HWY
County:16 City:West Branch

Major Cause: Ran off road - left
Roadway Type: Intersection: Other intersection
Severity: PDO
Manner of Crash: Non-collision
Fatalities: 0
Surface Conditions: Ice
Major Injuries: 0
Light Conditions: Daylight
Minor Injuries: 0
Weather Conditions: Clear
Possible Injuries: 0
Drug/Alc Involved: none indicated
Unknown Injuries: 0
Property Damage: $5000
Number of Vehicles: 1

	Unit 1	Unit 2	Unit 3
Init Trav Dir:	East	0	0
Veh Action:	Essentially straight	0	0
Configuration:	Sport utility vehicle	0	0
Driver Age:	16	0	0
Driver Gender:	M		
Driver Cond:	Normal	0	0
Drivr Contr 1:	Lost control	0	0
Drivr Contr 2:	not reported	0	0
Fixed Object:	none	0	0

2008421162 01/18/2008 07:55 F044 / HOOVER HWY NE and MAIN ST and CEDAR/JOHNSON CO LINE RD
County:16 City:West Branch

Major Cause: FTY from stop sign
Roadway Type: Intersection: T - intersection
Severity: PDO
Manner of Crash: Broadside
Fatalities: 0
Surface Conditions: Snow
Major Injuries: 0
Light Conditions: Daylight
Minor Injuries: 0
Weather Conditions: Clear
Possible Injuries: 0
Drug/Alc Involved: none indicated
Unknown Injuries: 0
Property Damage: $4000
Number of Vehicles: 2

	Unit 1	Unit 2	Unit 3
Init Trav Dir:	South	East	0
Veh Action:	Stopped for sign/signal	Essentially straight	0
Configuration:	Passenger car	Passenger car	0
Driver Age:	17	33	0
Driver Gender:	M	F	
Driver Cond:	Normal	Normal	0
Drivr Contr 1:	FTY from stop sign	none	0
Drivr Contr 2:	not reported	not reported	0
Fixed Object:	none	none	0

Iowa Department of Transportation

Crash Detail Report

2009510504 03/29/2009 02:30 F044 / HOOVER HWY NE
County: 52 City:

Major Cause: unknown
Roadway Type: Non-intersection: No special feature
Severity: Poss/Unk
Manner of Crash: Sideswipe, same direction
Fatalities: 0
Surface Conditions: Snow
Major Injuries: 0
Light Conditions: Dark - roadway not lighted
Minor Injuries: 0
Weather Conditions: Snow
Possible Injuries: 1
Drug/Alc Involved: none indicated
Unknown Injuries: 0
Property Damage: $10087
Number of Vehicles: 2

	Unit 1	Unit 2	Unit 3
Init Trav Dir:	North	North	0
Veh Action:	unknown	Slowing/stopping	0
Configuration:	Passenger car	Sport utility vehicle	0
Driver Age:	31	unknown	0
Driver Gender:	M	M	
Driver Cond:	not reported	Normal	0
Drivr Contr 1:	unknown	unknown	0
Drivr Contr 2:	not reported	not reported	0
Fixed Object:	none	none	0

Speed Zoning Information

A Case of "Majority Rule"
(Within the United States)

EXECUTIVE SUMMARY

What Realistic Speed Limits Do:

- Encourage compliance from the majority of drivers;
- Give a clear reminder of reasonable and prudent speeds;
- Provide an effective enforcement tool to the police;
- Minimize public antagonism toward police enforcement, which results from obviously unreasonable regulations; and
- Encourage drivers to travel at the speed where the risk of crash involvement is the lowest.

What Unrealistic Speed Limits Do:

- Discourage voluntary compliance;
- Create the perception of "speed traps;"
- Cause public antagonism toward the police;
- Create a bad image for a community in the eyes of tourists; and
- May increase the potential for crashes.

WHY SPEED LIMITS?

Generally, traffic laws that reflect the behavior of the majority of motorists are found to be successful, while laws that arbitrarily restrict the majority of motorists encourage violations, lack public support and usually fail to bring about desirable changes in driving behavior. This is especially true of speed zoning.

Speed zoning is based on several fundamental concepts deeply rooted within the American system of government and law:

A. Driving behavior is an extension of social attitude and the majority of drivers respond in a safe and reasonable manner as demonstrated by consistently favorable driving records;
B. The normally careful and competent actions of a reasonable person should be considered appropriate;
C. Laws are established for the protection of the public and the regulation of unreasonable behavior on the part of individuals; and
D. Laws cannot be effectively enforced without the consent and voluntary compliance of the public majority.

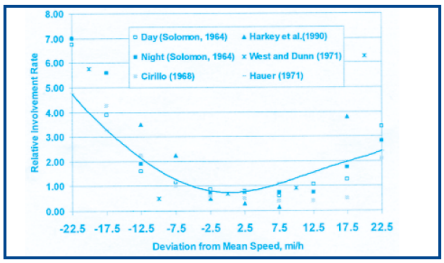
COMMON MISCONCEPTIONS

The public normally accepts the concepts noted above. However, when emotionally aroused in a specific instance, the same public will often reject these fundamentals and rely instead on more comfortable and widely-held misconceptions such as:

A. Reducing the speed limit will slow the speed of traffic;
B. Reducing speed limits will decrease the number of crashes and increase safety;
C. Raising the posted speed limit will cause an increase in the speed of traffic;
D. Any posted speed limit must be safer than an unposted speed limit; and
E. Drivers will always go 5 mph over the posted speed limit.

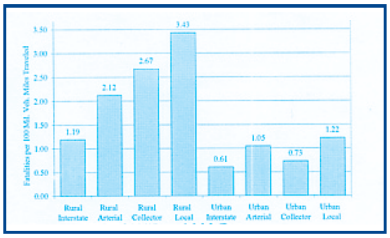
INTENT OF SPEED ZONING

The most widely accepted method by state and local agencies is to set the limit at or below the speed at which 85 percent of the traffic is moving. The 85th percentile speed is how drivers "vote with their feet." Studies have shown crash rates are lowest at around the 85th percentile speed. Drivers traveling significantly faster OR slower than this speed are at a greater risk for being in a crash. It is not high speeds alone that relate to crash risk; it is the variation of speed within the traffic stream.



Source: U.S. DOT PUBLICATION NO. FHWA-RD-98-154, 1998.

In fact, on a per mile driven basis, high speed roadways, like interstates, have a lower speeding related fatality rate than low speed roadway. Large variations in speed within the traffic stream create more conflicts and passing maneuvers.



Source: U.S. DOT Year 2000 Data.

HOW SPEED LIMITS ARE ESTABLISHED

According to a Federal Highway Administration study, all states and most local agencies use the 85th percentile speed of free flowing traffic as the basic factor in establishing speed limits.

Radar, laser and other methods are used to collect speed data from random vehicles on a given roadway. This speed is subject to revision based upon such factors as: crash experience, roadway geometrics, parking, pedestrians, curves, adjacent development and engineering judgment. This practice is in accordance with the MUTCD.

In the final analysis, it is the judgment of the traffic engineer that determines which, if any, of the factors in the speed study warrant an adjustment of the 85th percentile speeds. After all variables are considered and a speed limit is established, traffic should flow at a safe and efficient level.

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