IOWA DOT
I-380 Planning Study

INTERSTATE 380
PLANNING STUDY (PEL)

Goals & Guiding Principles
Office of Location & Environment, April 2017

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STUDY FRAMEWORK, VISION, AND GOALS

SETTING AND FRAMEWORK

The Interstate 380 (I-380) Corridor is one of the fastest-growing corridors in Iowa. Within the seven county region, I-380 connects Cedar Rapids and Iowa City, the state's second- and fourth-largest metro areas and is home to nearly 500,000 residents and over 30 fortune 500 companies. Over two dozen communities within the 7 county region have experienced considerable growth in population and development over the past 20 years thanks in part to the diverse multi-modal transportation system in this area. This increased population and growth has led to a similar increase in traffic along I-380 which is a key artery in the regional highway network. This increase in traffic has also led to an increase in crashes in the corridor. Between 2010 and 2014 there were 97 fatalities (5% of the statewide total) and 531 major traffic injuries along the I-380 corridor between Cedar Rapids and Iowa City. I-380 was ranked as Iowa's 6th most congested corridor in 2014 and according to Texas Transportation Institute's Mobility Report*, I-380 in the Cedar Rapids and Iowa City area experienced 2.2 million hours of delay which cost $47 million in that same year.

This corridor has been designated as Iowa's Creative Corridor and has been the subject of increased study and research around emerging traffic technology. The corridor is mostly rural in nature and has a great amount of adjacent land use and development which exacerbates the existing heavy traffic volumes. Traffic volumes are projected to significantly increase over the next 30 years and this reflects the growing importance of this corridor to regional travel within the state and the continuing growth of communities in the study area. As a result, additional roadway capacity will be needed for the I-380 Corridor to function at acceptable levels of service.

Due to the uncertainty in the timing of economic development, funding availability, and technological advances that could affect capacity, it is desirable to advance a plan for the I-380 corridor that offers vision and goals based on known information, but is also flexible enough to change as conditions change in the future. In this corridor, modal choices such as commuter rail service have the potential to affect the carrying capacity of the I-380 corridor and during the course of this study, those modal options will also be investigated and results documented.

**According to Texas Transportation Institute's Urban Mobility Report (2014).*

This study will follow the Planning Environmental Linkages (PEL) model, allowing the Iowa Department of Transportation (DOT) to make system level decisions that will help shape individual projects throughout the corridor as they are further studied, developed, and constructed over time. The data gathered, analysis performed, input gathered, and subsequent decisions made will be documented within a series of technical memorandum related to the particular topic or issue. These technical memoranda will provide recommendations that will help shape the final vision regarding I-380 infrastructure investment. These technical memoranda will all have a healthy degree of overlap. A document finished later in the process has the potential to affect and possibly change recommendations made earlier in the process, but we will continue to be forthright when this happens and highlight any areas of overlap and final decisions within the final study documentation near the end of the process.

This planning study will attempt to address system level goals and decisions that would affect all future projects along the I-380 corridor. As projects are subsequently identified for further development and funding, it is our intent to allow the information collected during this planning study to help begin the conversation and inform subsequent National Environmental Policy Act (NEPA) and development efforts for these specific projects.

STUDY GOALS

As mentioned above, the final vision, which will help shape infrastructure investment within the corridor, may adjust somewhat throughout the course of this study. That said, several key study goals have been identified related to this planning study and it is our intent to formulate a vision for future infrastructure investment within the corridor as we evaluate information related to each of these goals in the correlating technical memorandum.

The goals (and the correlating tech memo deliverable) that have been identified for review during this study are as follows:

GOAL # 1 – Foster Engagement by Stakeholders

The involvement of agency partners and public stakeholders is a vital component of a successful corridor planning effort. Community stakeholders and the public will be provided the opportunity to help shape the outcome of this study. The primary method of public outreach will be through the I-380 Planning Study webpage, available at www.iowadot.gov/I380PlanningStudy. The webpage contains information pertaining to the I-380 study, online public meetings, links to social media, and contact information for stakeholders and the public to present their ideas, comments, and questions

to the DOT. In addition to online meetings, at the conclusion of the I-380 planning study, a public hearing will be held to present the findings to the public and to solicit feedback. Please refer to the Public Involvement Plan for more information regarding stakeholder engagement.

Deliverable: Technical Memorandum #1 - Public Involvement Plan (PIP)

GOAL # 2 – Identify key goals and guiding principles to help shape the vision for infrastructure investment within the I-380 corridor

This effort will help to identify system level goals and guiding principles surrounding areas of uncertainty or issues that need to be addressed at higher or system level so that subsequent projects within the corridor will be able to be developed having the benefit or an overarching vision. This information will be documented within this technical memorandum.

Deliverable: Technical Memorandum #2 – Goals and Guiding Principles

GOAL # 3 - Investigate the existing conditions and operations within the corridor as well as the setting (human and natural) and the potential impacts of identified improvement needs. Determine cost effective ways to increase mobility, safety and system efficiency within the corridor.

Roadways provide mobility and access. Mobility is the ability to move people or goods from place to place. Access is getting those people and goods to or from specific locations adjacent to the roadway, such as another road or a driveway. As mobility increases, access generally decreases and vice versa. Interstates are intended to maximize mobility but limit access since each point of access adds interference to the free movement of traffic.

Interstate design standards provide the highest design speed for geometric features, limit entrance and exit locations, and provide a forgiving roadside design. These features allow interstates to provide a high degree of mobility, safety, and system efficiency. That said, as the volume of traffic approaches the actual designed carrying capacity, opportunities for breakdown in the flow increase and the likelihood of more detrimental effects to the ability of the highway to serve the intended purpose of safe and free flow travel.

Ostensibly, it appears that existing traffic volumes along the I-380 corridor will exceed the existing carrying capacity of the four-lane section in the short term and six-lanes are likely needed in the near term. As part of the right sizing discussion and traditional methodologies, we will determine how many lanes of traffic are needed now and in the future as well as how Integrated Corridor

Management (ICM) strategies might help. Traffic volume on the interstate system has grown over the years, and is expected to continue to grow. A traffic forecast prepared by the Iowa DOT Office of Systems Planning for the Design Year of 2040 will be used as the basis of the traffic volumes for operations evaluations. We will also evaluate how ICM strategies might extend the timeline for when the additional lanes might be needed and how having them in place might also extend the lifetime of the six-lane cross section long term.

The posted speed limit for the I-380 corridor between Cedar Rapids and Iowa City is 70 mph. The design speed for these portions will be set at 75 mph, consistent with expected operating speeds. The interstate is a fully controlled access facility with access allowed only at interchanges. Minimum desirable spacing for interchanges is three-miles within the rural corridor. Additional interchanges in rural areas of I-380 are not anticipated. Additional interchanges or significant modifications to existing interchanges would require a detailed study and Federal Highway Administration (FHWA) approval

Since the original construction of the Interstate System, and partially in response to lessons learned during that time, a framework of laws and best practices has been established to provide acceptable stewardship of the environment during the development and operation of highway facilities. During the planning of these improvements, the Iowa DOT will seek to protect and enhance our waterways, minimize harm to endangered and threatened species, reduce impacts to ecosystems, moderate the effects of traffic noise, and identify and address potential disproportionately high adverse effects on minority or low-income populations.

While environmental impacts may result from highway improvements, efforts will be made to avoid, minimize and/or mitigate these impacts. After this initial study, segments of the interstate will be further studied to lead to the development of construction plans. During that development, a thorough evaluation of environmental impacts will occur for each project.

This technical memorandum will investigate in further detail the existing conditions of the existing I-380 facility and surrounds, but also how future conditions might affect the needs along the corridor.

Deliverable: Technical Memorandum #3 – Existing Conditions and Operations

GOAL # 4 - Examine the Operations along the corridor and review what capacity improvements may be required within the corridor in consideration of emerging technologies.

In a traditional sense, a capacity analysis will have been done in previous technical memorandum #3. This effort will include consideration of emerging technology such as automated vehicles and how these technologies affect capacity and the timing of these improvements.

Several technologies are developing with the potential to alter our transportation system and the method by which we measure the performance of the system. These may include driving assist features, automated vehicles, real-time traffic analysis and regulation of traffic control devices, interconnectivity of vehicles and infrastructure, and the capability to gather and analyze large amounts of data.

These technologies will likely have an effect on the performance and operation of the transportation system as well as how we actually measure performance and operations. Transportation needs and priorities will be difficult to discern, as the facility planned today and built in the near future, will have a life expectancy of fifty to seventy years and full adoption and maturity of these technologies will absolutely occur within this timeline. For that reason, we will use an approach that considers long-term traffic growth, but also allows for occasional re-evaluation of the necessary facilities, including pavement, communication devices, and intelligent transportation components.

The Department will augment a more traditional capacity analysis of the I-380 corridor with a view toward emerging automated vehicle technology. While it is anticipated that full acceptance of automated vehicle technology will occur within the lifespan of the current planned improvements within the corridor, exactly when the technology will reach a critical mass and adequate saturation for system-wide adoption to allow realization of significant efficiencies and gains in both capacity and mobility across the system is uncertain.

Two primary components currently make up highway operations evaluations, traffic flow and crashes. One method to measure the quality of traffic flow is the Highway Capacity Manual Level of Service (LOS) grade scale. The Highway Capacity Manual provides commonly accepted definitions for LOS based on the number of vehicles within a section of roadway or the delay associated with a roadway feature, such as an intersection. For a free-flow roadway, such as an interstate, LOS is based on vehicle density. Figure 1 gives illustrative examples of various LOS “letter grades”.

The Federal Highway Administration (FHWA) regulates interstate design standards (23 CFR Part 625). Two of the documents cited in 23 CFR are A Policy on Geometric Design of Highways and Streets, commonly referred to as the AASHTO Greenbook, and A Policy on Design Standards – Interstate System. In accordance with these documents, our criteria for acceptable LOS will be "B" for rural portions of the interstate and "C" for any urban portions.

While LOS is the FHWA's currently accepted performance measure for evaluating capacity of the interstate system, LOS is not strictly a performance measure. LOS is a method of reporting one or more selected numerical performance measures in a system of easily understandable letter grades. While this is undoubtedly confusing, we'll try (as best we can) to be clear in our use of the terms throughout this study.

As automated vehicle technology continues to proliferate the system, we will need to increasingly rely on other measures of effectiveness (MOE) in addition to capacity LOS to evaluate system performance. It is our desire within the context of this study to attempt to identify the appropriate MOE for I-380 between Cedar Rapids and Iowa City. It is our hope that these MOE's would also hold some applicability across the entire interstate system

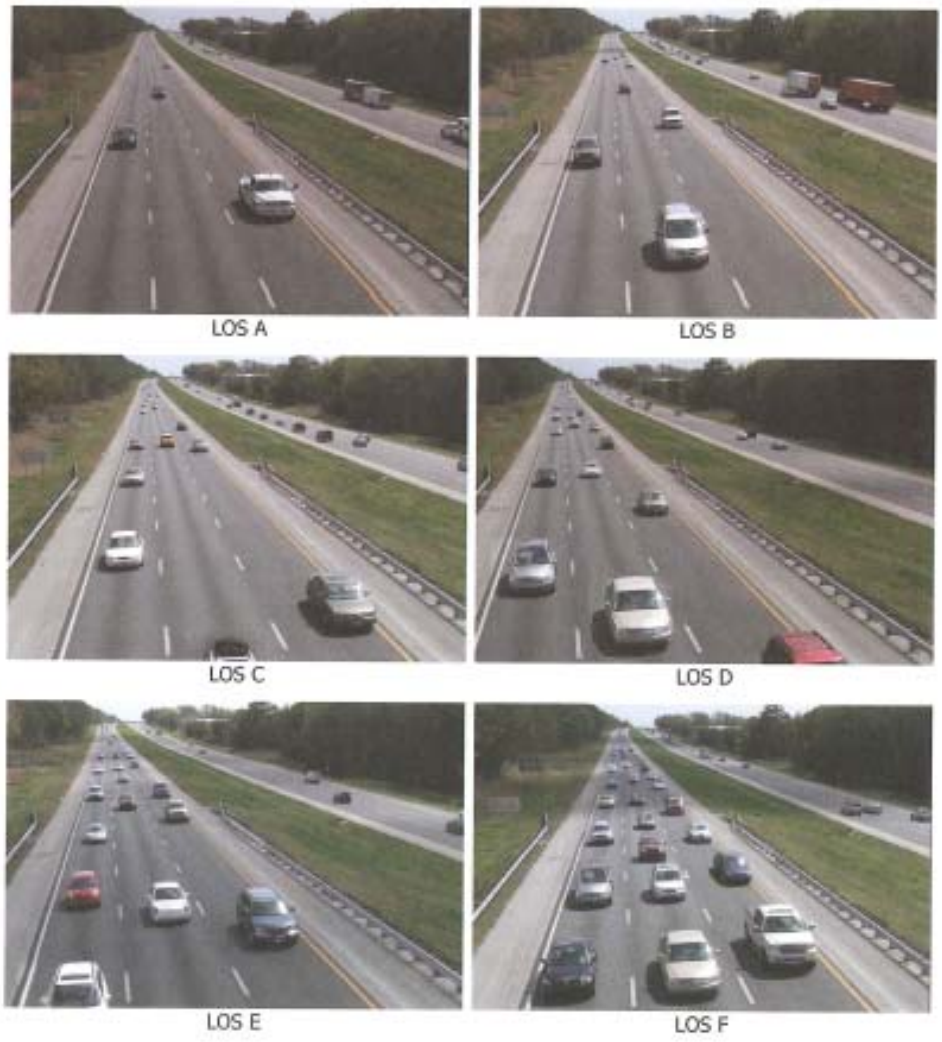
Regarding automated vehicle technology, it is our intent through this study to attempt to answer the following specific questions relating to the technology and the potential effect on traffic operations in the corridor:

- Does I-380 reach unacceptable LOS based on accepted MOE's, such as Volume to Capacity or LOS, under base conditions and if so when would conditions necessitate additional lanes on I-380?
- Evaluate the MOE's of the system based with differing percentages (saturation rates) of the vehicle mix containing Automated Vehicles (AV) and determine at what saturation rate the technology begins to have a benefit to MOE's.
- What percent of AV saturation in the vehicle fleet mix is required for I-380 to achieve acceptable (or unacceptable) MOE in base condition as well as evaluate these same MOE's for 2026, and 2045 (horizon year)?
- How will the AV saturation rates affect operations and safety within the I-380 corridor?
- How will AV technology affect traditional design elements within the corridor?

Without a clear understanding of what the transportation system will be beyond our planning timeframe, the key decision at this point may be to acknowledge that emerging technologies will have an effect on both capacity and design and determine what thresholds at which we should pause and re-evaluate where we are in terms of actual saturation.

Deliverable: Technical Memorandum #4 – Automated Vehicles and Emerging Technologies

Figure 1. HIGHWAY CAPACITY MANUAL LOS EXHIBIT



GOAL # 5 - Evaluate the vulnerability of the infrastructure within the corridor to flooding and snow events and what can be done in the context of project development to increase the resiliency of the infrastructure to future events.

Weather events can cause significant delay and decrease mobility. During the course of this study, effort will be made to identify areas or hotspots that appear to be more vulnerable to significant weather events as well as offer practical suggestions that can be considered for implementation with the projects developed within the corridor

Deliverable: Technical Memorandum #5 – Resiliency and Vulnerability

GOAL # 6 - Evaluate alternative modes of transportation within and near the corridor and determine what need these modes serve as well as which strategies relieve or have the potential to relieve traffic congestion within the I-380 corridor.

Alternative modes of transportation satisfy separate yet distinct traveling needs. They also serve to relieve congestion of the highway system. As part of this study we will review other recent and related studies and outreach involving alternative modes of transportation within or near the I-380 corridor (as well as already implemented modal strategies) and make recommendations for future corridor investment. These recent and related studies and outreach include, but are not limited to:

- Study of potential passenger rail implementation or other modal utilization in the Cedar Rapids and Iowa City Railway Co. (CRANDIC) Corridor, including the Iowa City-Cedar Rapids Passenger Rail Conceptual Feasibility Study (Iowa DOT and CRANDIC, 2015), Iowa City-North Liberty Passenger Rail Conceptual Feasibility Study (Iowa DOT and CRANDIC, 2016), and Iowa State Rail Plan (Iowa DOT, 2017).
- Multimodal study of the Interstate 380 Corridor, including the Interstate 380 Coralville to Cedar Rapids Corridor Multimodal and Operations Study (Iowa DOT, 2014) and Iowa Commuter Transportation Study (Iowa DOT, 2014).
- Stakeholder outreach conducted during the development of the studies listed in the two bullets above

Deliverable: Technical Memorandum #6 – Viability of Modal Options

GOAL # 7 - Within the context of public and agency involvement and considering the identified improvement needs, develop a vision for infrastructure investment within the I-380 corridor.

With growing volumes of traffic, the I-380 corridor is reaching the limits of its capacity. While the Iowa Interstate Corridor Plan provides a general framework for developing an implementation plan that incorporates both aging infrastructure and capacity concerns, critical items that need incorporated into this plan for I-380 are:

- An implementation schedule that addresses the locations causing the largest delays first
- Consideration of mobility and travel time reliability during construction
- Continuity of the interstate system, especially with respect to increased capacity
- Where practical, build in the ability to provide future needed capacity with the least amount of disruption

This study represents the initial steps in undertaking the reconstruction of I-380 between Cedar Rapids and Iowa City. These efforts will require several years to develop and construct and require a significant amount of funding.

It is critical to acknowledge public funds are finite and highway investments need to be made considering all life cycle costs of the infrastructure. Adequate capacity is necessary to minimize crashes and promote economic vitality. Building capacity beyond that needed is an unwise investment. It unnecessarily increases upfront expenditures; but also stretches already thin operational budgets throughout the life of the infrastructure. A delicate balance exists to provide needed capacity but not an excessive amount of underutilized capacity.

If the best choice for improvement of a section of the interstate is complete reconstruction, consideration will be given to strategies that allow a future capacity improvement to be added with the least disruption to the users of the roadway. An incremental approach to adding capacity may also be the chosen approach to provide the greatest possible mobility for the system as a whole within the design life of the improvements.

The final report will include an investment strategy or vision for funding improvements within the I-380 corridor as well as address how these investment strategies met our initial goals established within this tech memo.

Deliverable: Technical Memorandum # 7 –Vision for Infrastructure Investment & Final Recommendations

GUIDING PRINCIPLES

While the Goals represent what we hope to accomplish during the course of this study, the guiding principles are how we are committed to doing the work. These principles may seem fundamental, but they comprise the core to maintaining consistency and trust between everyone collaborating throughout the course of this work. The principles outlined below will serve to guide the development of the I-380 interstate planning study between Cedar Rapids and Iowa City:

GOOD STEWARDSHIP

The Department has been entrusted to maintain the transportation system throughout the State of Iowa. In many ways this requires a healthy balance between many competing needs. Good Stewardship involves reaching a balance between the need for higher LOS and the cost of maintaining the system or providing the added capacity or infrastructure. It is also finding the balance between the transportation need and the human and natural environment that is impacted by the construction of additional infrastructure. The DOT is committed to finding the appropriate balance between these competing needs and doing it transparently with involvement from the public and other federal, state, and local agencies along the way.

Often the needs of those living near a transportation corridor like I-380 are met by construction of additional infrastructure, but those living near the transportation corridor are also usually impacted the most by this construction. While it's essential that we plan and build for the needs of the many, good stewardship also means we try to avoid impacts to the degree that we can.

Throughout the course of this study, we commit to applying the practice of good stewardship in balancing the needs and impacts while developing a vision for infrastructure investment within the I-380 corridor.

TRANSPARENCY

At key points throughout the course of this study, we will publicize our findings in an effort to garner feedback on the recommendations. The consequence of doing this at discrete points in time can

serve to give the impression that we have decided on a course of action when in reality we have not. That said, we are committed to being transparent throughout the course of this study. We will be hosting three online meetings at the project website, but will also be available individually or for meetings as requested to discuss the findings as well as approach of this study. Everyone's feedback is important and we commit to treating it as such.

DESIGN PRINCIPLES

Several specific initial and base design parameters intended to guide the preliminary design of the interstate have been discussed and are presented in Table 1. As the project develops, additional design criteria will supplement these parameters, but it is important that we establish a baseline for consideration and discussion as we move forward.

Table 1. DESIGN PARAMETERS

DESIGN YEAR	2040
DESIGN SPEED	75 mph (rural)
MINIMUM INTERCHANGE SPACING	3 miles (rural), 1 mile (urban)
LEVEL OF SERVICE	B (rural), C (urban)
MEDIAN WIDTH	82 feet

These design parameters, will have great influence on the final layout of the interstate. As part of the vision for improvement discussed in the final tech memo, we will further identify other design parameters that fit within the context of the goals and information that was developed as part of this study.

As mentioned earlier, there will be a good deal of overlap between goals and recommendations that will be evaluated within the technical memorandums and often the recommendations from one technical memo to another may affect our final decisions, recommendations, and vision. This is particularly true with regard to design parameters and we will do our best to highlight these issues as they arise.

REFERENCES

TRB. *Highway Capacity Manual* (HCM) 2010. Transportation Research Board of the National Academies. Washington, DC.

AASHTO. *A Policy on Design Standards - Interstate System* January 2005. American Association of State Highway and Transportation. Washington, DC

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(TTI) Texas Transportation Institute – Mobility Report (2014)

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