IOWA DOT
I-80 Planning Study

# INTERSTATE 80
## PLANNING STUDY (PEL)

### Truck Accommodations

Office of Location and Environment | July 2017

# Table of Contents

# List of Tables



# List of Figures

## 1. EXECUTIVE SUMMARY

The Iowa DOT is conducting a long-range planning study of the rural portions of I-80 in Iowa. This study is being conducted using the federally adopted Planning and Environmental Linkage (PEL) Study process. As such, the study's findings can be referenced by subsequent environmental and engineering studies for the implementation of the recommended improvements. The goal of the PEL Study is to identify the best long-term vision for improving the rural portions of the I-80 Corridor, extending from Council Bluffs to the Quad Cities. This will enable near-term improvements to be planned, designed and constructed in accordance with the long-term plan, as funding allows.

The Iowa DOT is evaluating a number of alternative improvement strategies in the PEL Study, including the rehabilitation, reconstruction and possible widening of the existing I-80 infrastructure. As an Interstate, I-80 currently serves regional and local freight and auto travel, including a relatively high percentage of cross-country trucks. Given its role as part of the Interstate and the high number of trucks, the PEL Study is also evaluating the possible viability of a truck-only facility along I-80 in Iowa. The purpose of this technical memorandum is to assess the feasibility of a truck-only facility in lieu of general roadway widening and to identify what provisions should be considered in the overall improvement plan to facilitate truck operations in the future.

Improvements to the I-80 Corridor across Iowa are being evaluated to meet the Corridor's future and long-term mobility and safety needs. Truck operations can significantly affect the overall capacity and safety of the roadway. Providing exclusive lanes for trucks would separate autos and trucks within the overall traffic flow and could improve the overall system's performance. However, constructing separate lanes for trucks would considerably increase the overall costs of the improvement plan, as compared to general lane widening. As overall affordability is an important and essential consideration, pursuant to the PEL decision making process, improvement strategies that cannot be reasonably implemented with existing and foreseeable funding sources can be eliminated from further consideration. Therefore, the intent of this technical memorandum is to:

- Define and estimate the overall construction costs for the Truck-Only Lane Strategy.
- Assess the ability of Iowa DOT to construct the Truck-Only Lane Strategy with current funding.

- Provide recommendations for the further consideration of the Truck-Only Lane Strategy and truck-related provisions within the Corridor's improvement plan.

As a standalone improvement strategy, the Truck-Only Lane Strategy would entail constructing a four-lane truck-only facility within the median of I-80. Operational and design features for Longer Combination Vehicles (LCVs) would allow heavier loads, longer trucks and improved overall freight efficiencies. For this strategy to work effectively, a high percentage of truck traffic would need to use the new, exclusive facility, except to exit or enter the Interstate. New State legislation would likely be required to enforce lane restrictions and violations. Assuming operational policies and enforcement can be put in place, Table 1 presents the required lanes across Iowa for the General Widening and Truck-Only Lanes Strategies.

***TABLE 1- I-80 LANE NEEDS IN 2040***

| Location | General Purpose Lanes Needed | Lanes Needed with Truck-Only Lanes |
|---|---|---|
| Council Bluffs to Des Moines | 6 | 4 (+4) |
| Des Moines to Iowa City | 6 | 6 (+4) |
| Iowa City to Davenport | 6 | 6 (+4) |

It is estimated that the Truck-Only Lane Strategy would cost $5,889,300,000 to construct today, while the General Widening Strategy would cost $2,926,400,000, both based on 2016 construction costs. This analysis also assumed LCVs would be permitted and encouraged through coordination with adjoining states, thereby improving the overall freight movement efficiency of the Corridor. However, while this strategy could be beneficial and further improve overall performance, the additional costs would be exorbitant and beyond the currently available resources of the State. Furthermore, this strategy would need to be constructed in its entirety to realize its operational benefits, including LCV provisions through the metropolitan areas and connections with nearby states. Even if all future Iowa Interstate funds were dedicated to I-80, something not reasonably possible given Iowa's statewide needs, it would take over 65 years to construct this strategy.

It is therefore recommended that the Truck-Only Lane Strategy not be considered as a reasonable solution for the I-80 Corridor. While it would provide many benefits, its effectiveness would depend on high LCV usage, requiring coordination with adjoining states, and the ability to reasonably afford its timely completion, which cannot be accomplished with current projected funds.

While this improvement strategy is not a reasonable standalone solution for the Corridor, there are other opportunities to improve overall truck operations along I-80 that may be affordable and beneficial. These opportunities should continue to be evaluated and considered in the PEL Study as part of the overall vision for the Corridor. These opportunities could include:

- Lane Restrictions for Trucks – Implementing new policies that restrict truck traffic from the inside lane to improve overall traffic operations. This could require legislation granting Iowa DOT this authority. Coordination with the motor carriers would be required. This operational measure would require six or more lanes to be implemented.
- Speed Restrictions for Trucks – Implementing a policy mandating a difference between the prevailing speed of cars and trucks to improve traffic operations and safety. Choosing this strategy would be dependent upon studies showing conclusive positive results in a similar environment. This could require legislation granting Iowa DOT this authority. Coordination with the motor carriers would be required.
- Recommendations from the Iowa Statewide Freight Plan – A number of strategic initiatives are identified in this plan that could be relevant to I-80, including intermodal facilities and truck-related support facilities such as rest stops and parking.

## 2. INTRODUCTION

I-80 is one of the primary east-west travel and freight corridors in the United States and the primary one in Iowa. Currently as I-80 crosses the state, it carries vehicle volumes ranging from 20,000 to 35,000 vehicles per day with heavy truck/freight traffic making up anywhere from 15 to 30 percent of the mix. As part of planning study for the I-80 Interstate system, this paper will investigate various treatments that may be used in consideration of high volumes of truck traffic, evaluate the economic feasibility of a truck-only facility, and make recommendations for potential provisions for consideration in subsequent studies.

I- 80 extends nearly 3,000 miles from California to New Jersey. 307 miles of the route fall within the borders of Iowa. Original construction within the state occurred between 1958 and 1972 as a four-lane divided highway. For most of its length, I-80 passes through rural areas. Urban areas are Council Bluffs in the Omaha Metropolitan Area, the Des Moines Metropolitan Area, the Iowa City Metropolitan Area and the Quad Cities Metropolitan Area. The capacity of the original design has been exceeded in the metropolitan areas of the state, and in those areas, additional lanes have been added, are being added, or, in some cases, are under study for being added.

The capacity of some stretches of the rural portion is also being reached. As the volume of traffic nears and exceeds capacity, bottlenecks and delays will occur with increasing frequency. These delays negatively impact travelers and the profitability of freight companies. An in-depth analysis of roadway capacity and travel time reliability will be presented in another Technical Memorandum. Interstate 80 in Iowa is vital to the state and national economy, providing the infrastructure to move people and goods across Iowa and throughout the nation. Figure 1 highlights the relationship between the amount of freight moved and the gross domestic product of the United States [(1)(2)(3)]. There is a strong correlation between the ability to move goods and the growth of the economy.

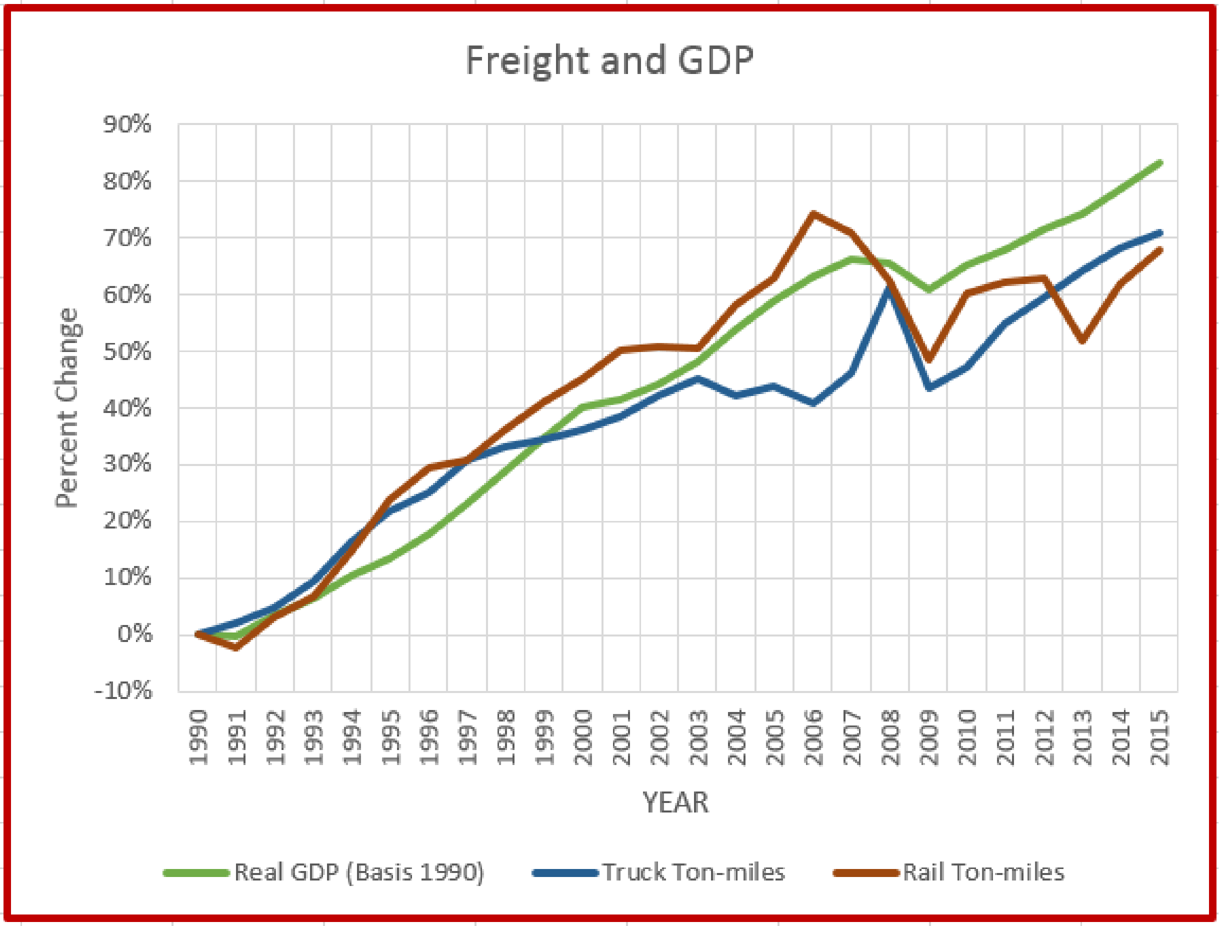



***Figure 1. Correlation of Freight Movement and GDP***

Iowa has navigable rivers on each side, eight commercial service airports spread across the state, several major rail lines, 3 interstate routes and multiple pipelines. While freight is carried by all of these modes, rail and highways transport the majority of freight through, to and from the state of Iowa. Figure 2 presents the percentages of freight by weight and value moved into, out of and within the state by each mode in 2015 and that projected for 2040. [3]

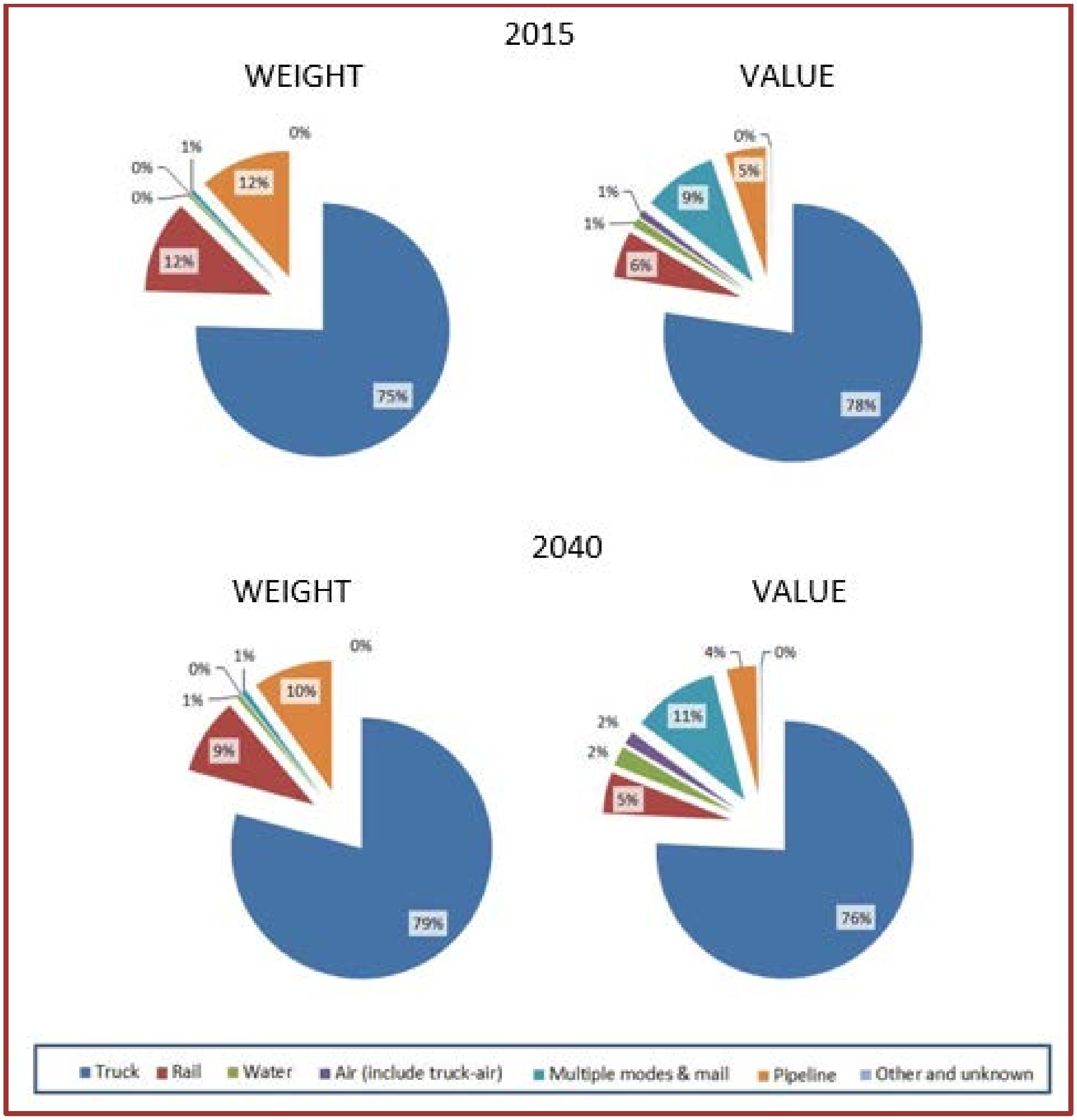



***Figure 2. Current and Future Modal Split for Freight in Iowa***

Figure 3 presents the same information in terms of tonnage of freight moved in 2015 and projected to be moved in 2040 via the various modes within state of Iowa. [3] It is evident most freight is moved by trucks on highway system and this is expected to continue to be the case.

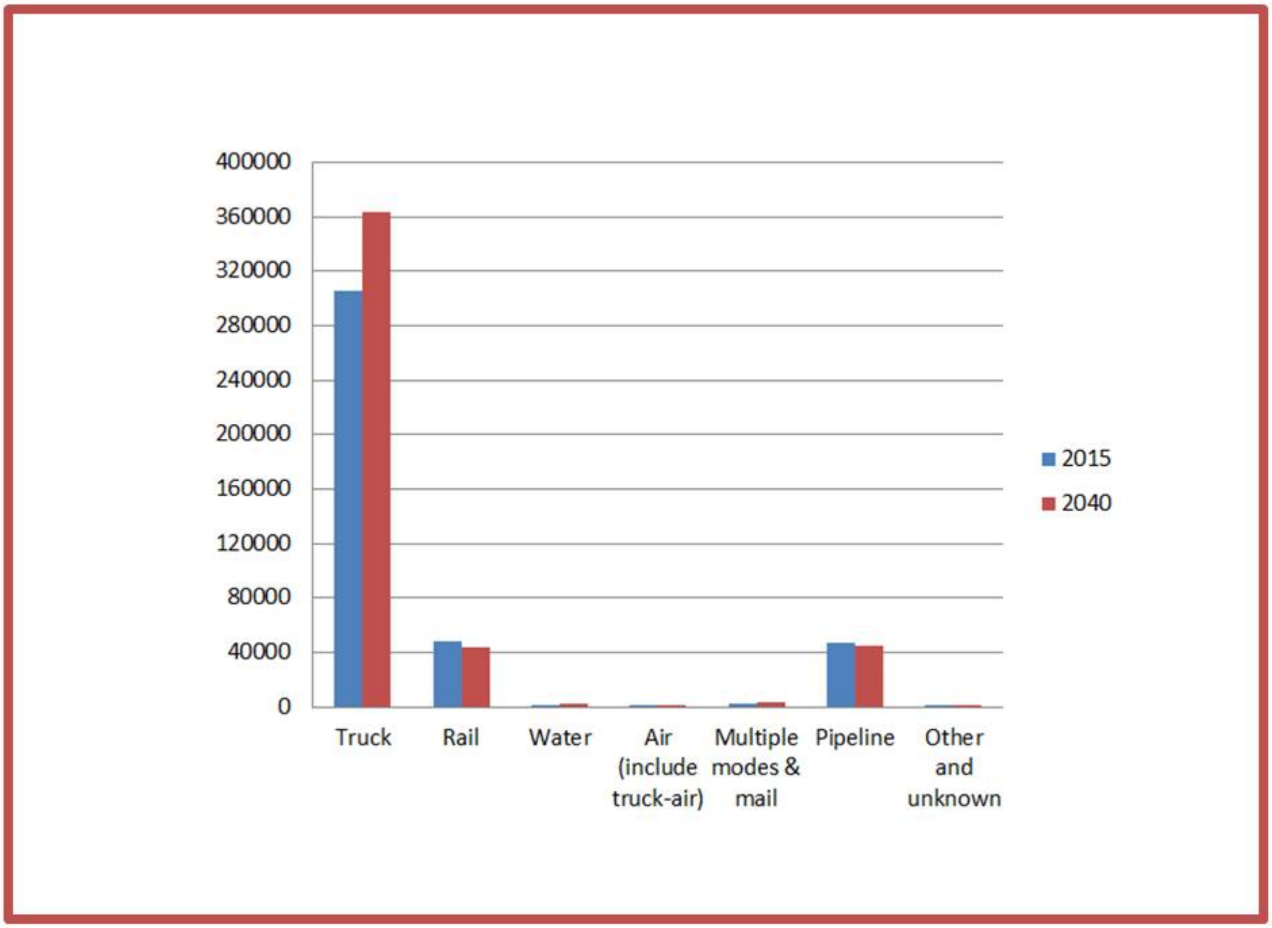



*Figure 3. Weight of Freight by Mode (in thousands of tons)*

Within the State of Iowa, the majority of the miles driven by trucks are on Interstate routes, as shown in Figure 4. [(4)]

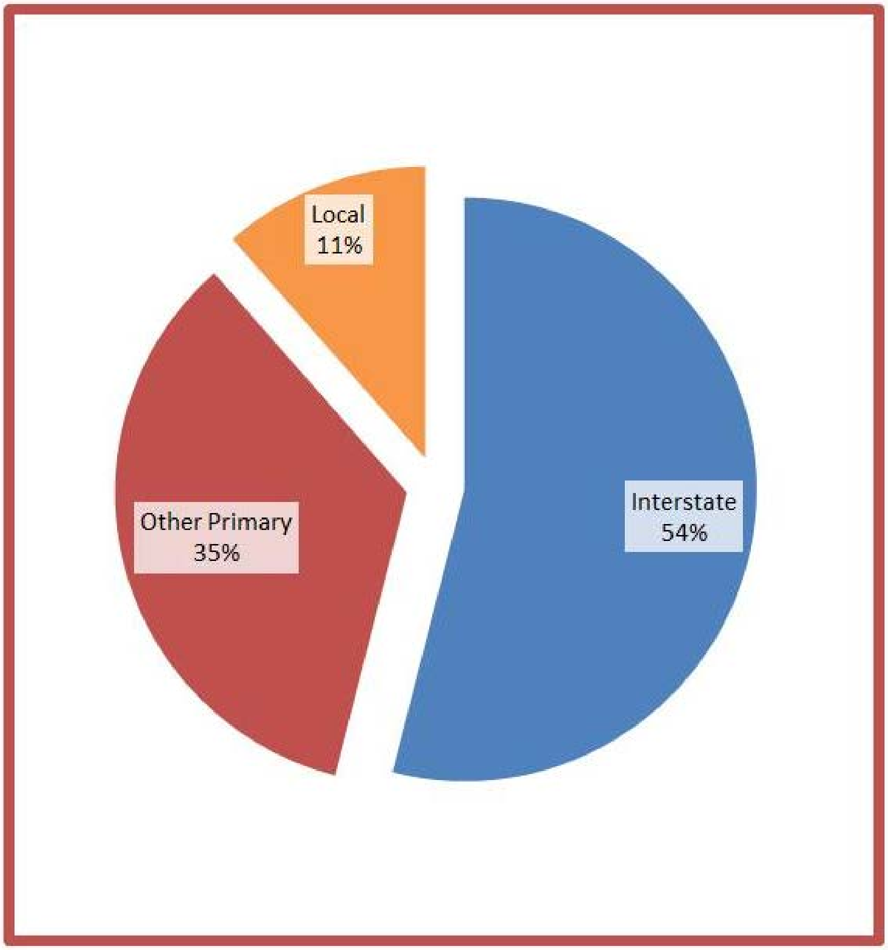



***Figure 4. Route Type Split for Trucks (2005-2014)***

Designs for new highways or improvements to existing highways are planned to handle future traffic volumes and vehicles mixes. Iowa DOT usually designs for a "horizon year" about 20 years from when construction is expected to occur. Iowa Department of Transportation Office of Systems Planning prepared a traffic forecast for overall vehicle volumes and truck volumes for the horizon year of 2040 for this study. Table 2 provides the 2014 counts and 2040 projections for several locations across the state.

***TABLE 2. TRAFFIC DATA AT SELECT LOCATIONS***

| Location | 2014 | | 2040 | |
|---|---|---|---|---|
| | All Traffic | Trucks | All Traffic | Trucks |
| 1.5 miles west of County Road M16<br>Pottawattamie County | 24,441 | 8225 | 35,100 | 13,000 |
| 2 miles east of US 71<br>Cass County | 21,331 | 7039 | 31,900 | 12,700 |
| 1 mile west of US 63<br>Poweshiek County | 27,320 | 8469 | 48,700 | 18,000 |
| 2 miles east of IA 149<br>Iowa County | 32,352 | 10,029 | 59,300 | 19,600 |
| 2.5 miles east of County Road X40<br>Cedar County | 34,421 | 11,359 | 73,900 | 27,350 |

Trucks are a major component of the overall traffic mix. The forecast indicates traffic volumes for heavy vehicles (trucks) and light vehicles (passenger vehicles including cars and pick-ups) are expected to continue to grow. Figure 5 shows the number of trucks is expected to grow at an even greater rate than the overall traffic growth for locations within this study.

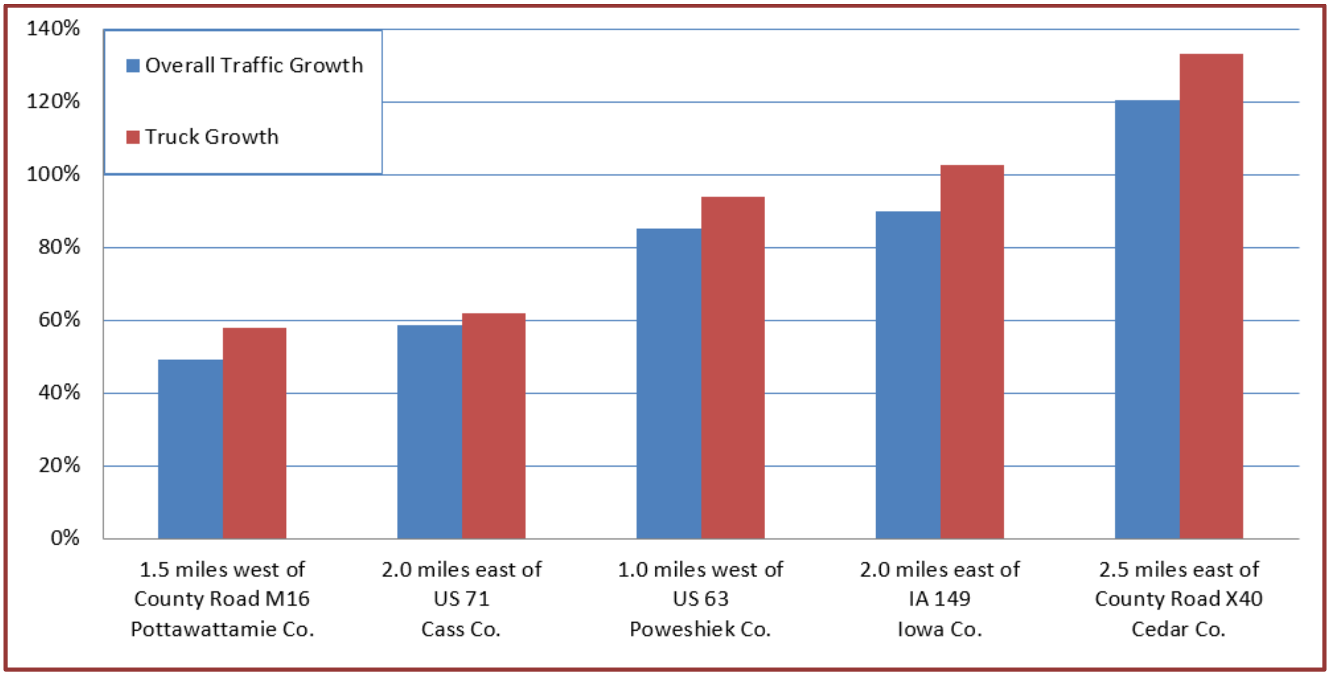



***Figure 5. Overall Traffic and Truck Growth from 2014 to 2040***

In the past several years, many jurisdictions across the country have evaluated various approaches to manage the growing volumes of trucks, with the goals of reducing congestion, improving mobility, and enhancing safety while encouraging economic development. Cars and trucks differ in a few characteristics that introduce a host of competing needs when they begin to interact, among these are:

- Trucks often do not have the ability to maintain speeds on long up-grades, and generally have slower acceleration and deceleration rates than passenger vehicles.
- The differences in size and operating abilities between the two types of vehicles increases the discomfort level in some car drivers. (5)
- Peak hour congestion, primarily caused by commuters in cars, greatly impacts travel reliability and profitability of freight movement by trucks by reducing the consistency in trip travel times. (6)
- Crashes involving light passenger vehicles and trucks have more severe consequences for the light vehicle occupants than do crashes involving only light vehicles. (5)

The various approaches looked at fall into four general categories: (7)

- Use an additional travel mode
- provide for a speed differential by the use of truck speed reduction
- restrict trucks from defined areas by lane or by time periods
- provide facilities exclusively for truck use

## 3. ADDITIONAL MODE

This is adding an additional, not alternate, means of travel. A common example is transport of cars on a ferry. For an overland corridor such as I-80, adding a mode of travel could likely involve carrying trucks on rail to avoid a segment of roadway, especially an extremely congested segment. The Gotthard Base Tunnel is an example of the application of this approach. In this location in the Swiss Alps, a tunnel designed for high-speed trains carrying trucks bypasses a congested, hazardous mountainous roadway. This is a 36-mile corridor with an approximate cost to build of twelve billion dollars. (8) This type of solution is obviously better suited to situations much more drastic than any found along the I-80 corridor in Iowa.

## 4. SPEED DIFFERENTIAL

This involves setting a different, usually lower, speed for trucks than for other vehicles. Several states set a speed limit for trucks five to fifteen miles per hour less than that for cars.

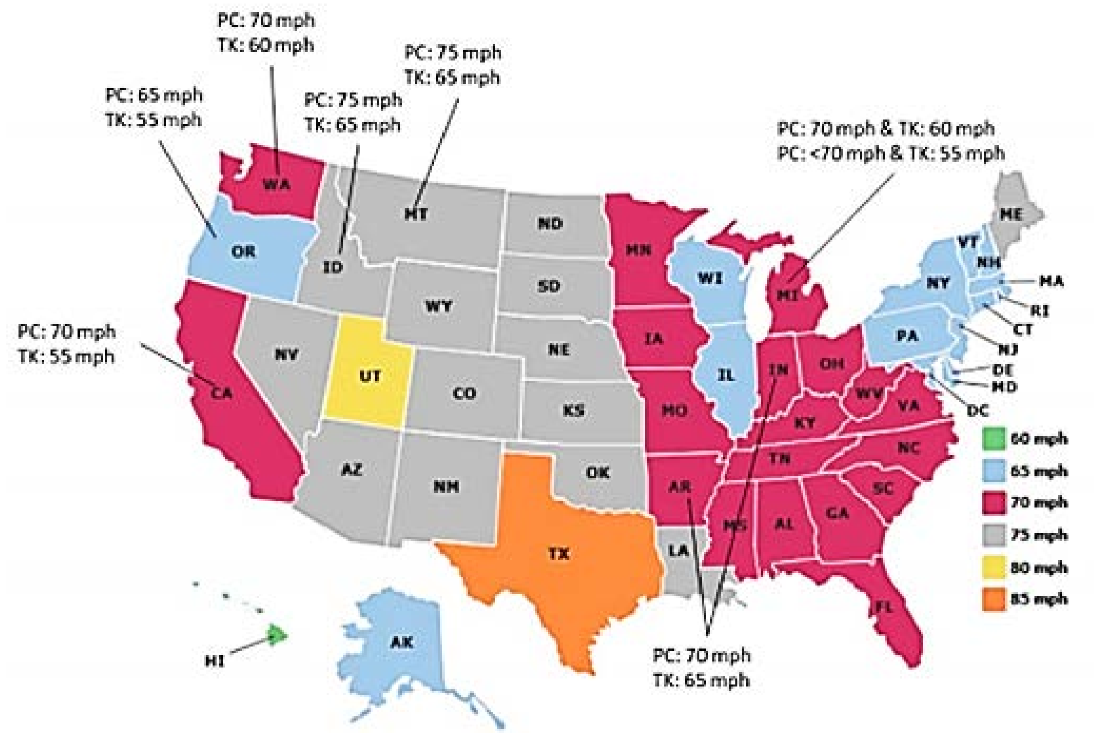



*Figure 6. Interstate Speed Limits*

The reasons given to implement this approach are to provide for the increased stopping distance for trucks, to reduce truck-car interactions thus reducing crashes, and for improved fuel efficiency. For Idaho, initial studies indicated the differential speed limit reduced truck speeds and corresponded to a reduction in crash rates. (9) However, research conducted for the State of Wyoming was unable to draw the same conclusions. (10)

Speed differentials can be applied to an interstate facility with two or more lanes in each direction. This approach would require legislation to implement and likely increased enforcement for compliance. With the exception of some additional speed limit signing, no additional construction would be required. This treatment would be a viable option to implement at any point in the future. However, as previously mentioned, studies of locations this has been implemented have been inconclusive as far as showing a positive impact on safety and operations.

## 5. RESTRICTIONS

A restriction can be a ban of all trucks, or certain classes of trucks, from a roadway; not allowing trucks the use of specified lanes; or limiting truck use of a facility to specific times. As previously established, I-80 is such a vital freight corridor for Iowa and the country that an outright ban is not feasible. A restriction of some of the lanes may accomplish both desirable outcomes of providing mobility for freight and reducing the interaction of heavy and light vehicles. The most commonly used lane restriction is the banning of trucks on the two inside lanes (median lanes) of a facility with at least three lanes per direction.

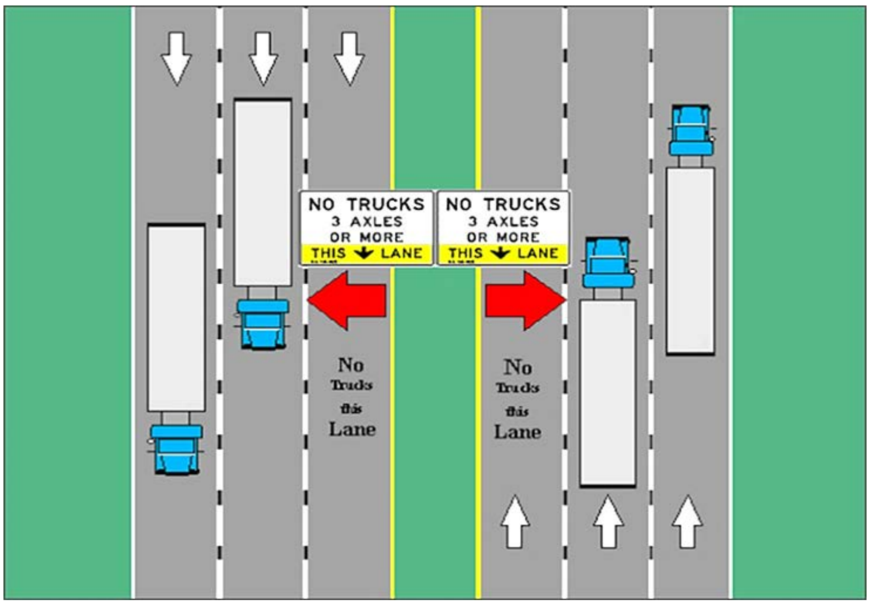



***Figure 7. Lane Restriction***

Frequently noted benefits of restrictions are improved safety for all users and improved mobility for light vehicles in the traffic mix.

Banning trucks from the median lanes of a six-lane facility, as with the speed restriction, would require no change to a widened cross section. Additional regulatory signs, likely mounted overhead, would be required. Virginia implemented a requirement restricting trucks to the outside lanes of a four-lane roadway when the speed of the heavy vehicles dropped to less than fifteen miles per hour below the posted maximum speed limit in 2004. Initial studies in 2007 reported improved operations with this requirement, but a follow-up study conducted in 2009 found no improvement in either safety or operations with this requirement. [11] This is another option that doesn't affect potential initial widening and could be applied at some point in the future.

## 6. EXCLUSIVE FACILITIES

This strategy involves providing a duplicate facility, often within the same corridor, solely for use by trucks. Examples include bypass facilities and truck-only lanes. Bypass facilities are for a discrete, limited location. For example, bypass facilities in California are built in areas where weaving between interchanges lead to operational problems. This treatment is typically more suited to an urban location, although there may be locations suitable for more in-depth analysis in future studies focused on smaller segments of I-80. Truck-only lanes, as discussed in this paper, would consist of a separated set of lanes within the interstate corridor. This strategy provides the benefits of separation of vehicle types and the added benefit of an adjacent route for incident management purposes. This option would look similar to the dual-divided facility planned for the Council Bluffs Interstate, with two separated roadways in each direction, as shown in Figure 8. When constructed, traffic passing through Council Bluffs can choose to be separated from the traffic making local trips to avoid the weaving and merging traffic at interchanges.

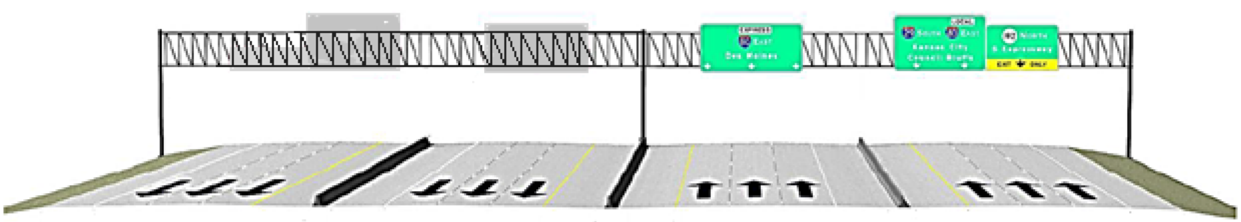


*Figure 8. Council Bluffs I-29/I-80 Dual Divided Concept*

The items that may change are the number of lanes, the widths of the shoulders and the type of separation between roadways, either a barrier or a ditch. Missouri DOT has completed a great deal of study for the consideration of truck-only lanes for I-70, with their selected configuration as shown in Figure 9.

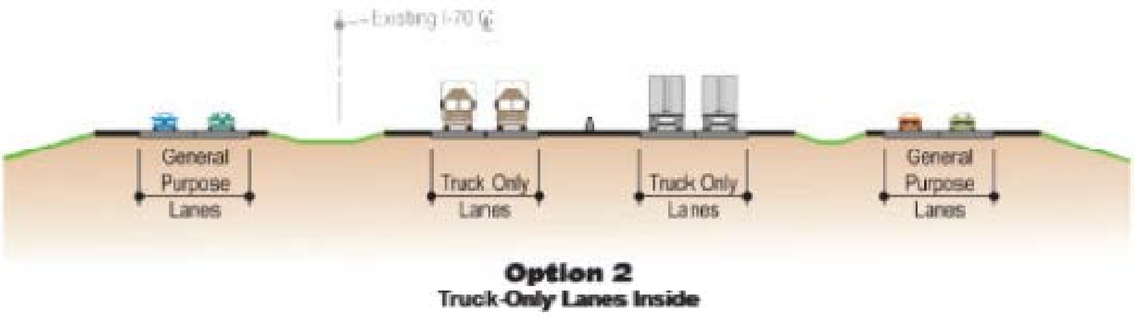



*Figure 9. Missouri DOT Preferred Configuration for Truck-Only Lanes* (12)

At the conclusion of the Missouri study, the following reasons for the selection of the preferred cross section were presented as: (13)

> *"• Incorporating a physical grass separation provides greater safety benefits than truck restrictions to outside lanes;*
>
> *• It minimized truck-car conflicts and could reduce the severity of crashes;*
>
> *• General-purpose traffic needs to exit more than truck traffic does at most interchanges;*
>
> *• Locating general-purpose traffic on the outside maintains a higher visibility for adjacent businesses and corridor interchanges; and*
>
> *• With trucks located on the inside and located further away from businesses and residences along the corridor, there is less highway noise associated with heavy trucks*."

The use of a concrete barrier increases construction costs from the addition of both the barrier and associated drainage systems, as well as creates drifting and clearing problems for snow. On the other hand, a grass separation requires additional ROW and has greater environmental and farmland impacts as a result.

All options considered for improvements to I-80 will need to provide for the capacity needs of the projected 2040 traffic volumes. As presented in Table 1, these volumes range from about 36,000 vehicles per day midway between Council Bluffs and Des Moines to near 75,000 vehicles per day between Iowa City and Davenport. Trucks will make up over a third of this volume. A four-lane facility for the truck-only facility allows continuous passing opportunities for the trucks. The additional lanes also allow some capacity to use the truck-only lanes for incident management if the general-purpose lanes are blocked.

Utilization of the truck-only lanes depends upon ease of access, the operational performance of the facility, and the nature of the trip. There are not any truck-only lane facilities in use in the United States in similar settings so actual utilization rates for a similar facility are not known. A conservative assumption has been made that 75% of the trucks will use the truck-only lanes to determine the number of general purpose lanes needed.

Highway Capacity Manual methods for freeway segments were used to determine representative lane needs without truck-only lanes and with truck-only lanes with 75% of the trucks assigned to the truck-only lanes. The lane needs for these scenarios are presented in Table 3.

*TABLE 3. LANES NEEDED FOR LOS B FOR 2040*

| Location | General Purpose Lanes Needed without Truck-Only Lanes | | | General Purpose Lanes Needed with 75% Trucks utilizing Truck-Only Lanes | | |
|---|---|---|---|---|---|---|
| | All Traffic | Truck Volume | Number of Lanes | Adjusted Traffic | Remaining Truck Volume | Number of Lanes |
| 1.5 miles west of Co. Rd. M16 Pottawattamie County | 35,100 | 13,000 | 6 | 25,350 | 3250 | 4 (+4) |
| 1 mile west of US 63 Poweshiek County | 48,700 | 18,000 | 6 | 35,200 | 4500 | 6 (+4) |
| 2.5 miles east of Co. Rd. X40 Cedar County | 73,900 | 27,350 | 6 | 53,390 | 6840 | 6 (+4) |

Access to the truck-only lanes would not be allowed at all interchanges; generally, only those serving intersecting US or Iowa routes or known large freight centers. Access would be via direct connection ramps or slip lanes located enough distance from the interchanges for the trucks to be able to work their way to the outside lane across the general purpose lanes. Trucks wanting to access the local routes at the remaining interchanges would need to utilize the general purpose lanes for greater distances. A balance would need to be found to minimize the interactions between trucks and cars while allowing reasonable truck access to local routes to optimize the benefits of building a facility of this type. Access types and locations would require further analysis in subsequent engineering studies.

*Figure 10. Missouri DOT Slip Lane Display*

## 7. LONGER COMBINATION VEHICLES

If truck-only lanes were to be constructed, most of the interactions between large trucks and passenger cars would be prevented. With the concerns associated with this interaction alleviated, it is likely that even larger trucks, those referred to as Longer Combination Vehicles (LCV's), would be allowed on the truck-only lanes. The FHWA Freight Management and Operations define LCV's as

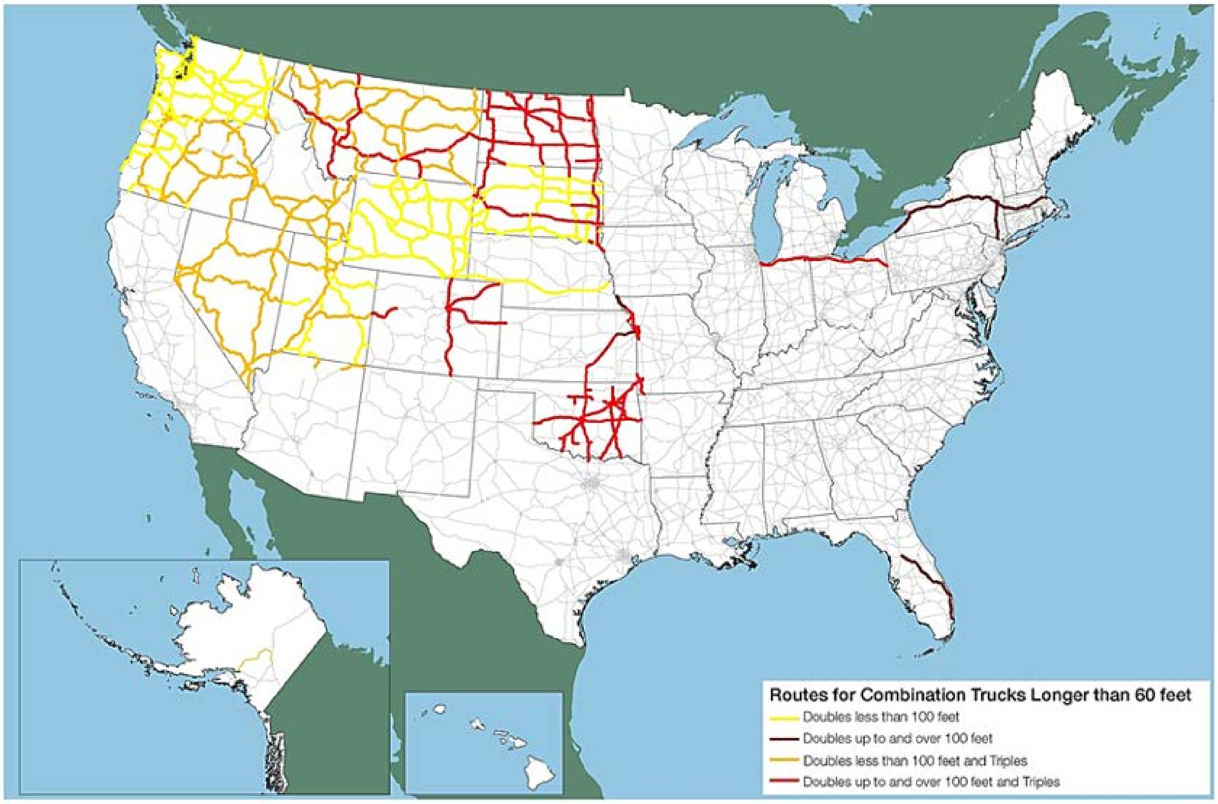
> *"A subgroup of combination trucks, LCVs are double and triple trailer combinations that can exceed 80,000 lbs... All vehicles have seven or more axles consisting of three or more units, one of which is a tractor or a straight truck power unit."*

Some configurations are shown in Figure 11.


***Figure 11. Longer Combination Vehicle Examples***

Reason Foundation Policy Study 294[14], which recommends truck-only lanes, also recommends direct connection ramps. The first noted benefit of this Policy Study is the extension and connection of current LCV routes, shown in Figure 12 [15]. The use of LCV increases freight productivity by reducing fuel consumption and by reducing the number of drivers required. Currently, configurations of twin trailers up to one hundred feet long are allowed in Nebraska on I-80 and the same configurations, in addition to triple trailers, are allowed in Indiana and Ohio. Regional or national coordination of truck configurations would be required to maximize the benefits achievable with LCV.

With these types of configurations, concerns with the interaction of the double- and triple-bottom trucks with passenger vehicles would be magnified. LCV would be prohibited from using the slip lanes to the interchanges to avoid interaction with passenger vehicles. LCV would need to be provided separate access at a very select few locations across the state. These would be the only locations designed for these larger vehicles to enter and exit the truck-only lanes. Services, as well as facilities to provide a location for reconfiguring LCV's to shorter combination trucks that would be allowed to use the remainder of the road system would be located at these locations. These would need to be located near each intersection of I-80 with other major interstate routes and at each side of the urban centers along I-80.




Note: Empty triples are allowed on I-80 in Nebraska.
Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, special compilation by the Freight Operations and Technology Team, 2009.

*Figure 12. Combination Truck Routes in the United States (2009)*

## 8. BENEFITS OF TRUCK ONLY LANES

Among the potential benefits gained by providing a separate facility for trucks are:

- the increased safety from separating the heavy and light vehicles;
- increased reliability of travel times for freight;
- reduced fuel consumption and air pollution associated with removing freight bottlenecks;
- improved operations for light vehicles;
- increased productivity to be gained with LCV; and
- the opportunity to utilize either the general purpose lanes or the truck only lanes as a parallel facility for incident management.

The first four listed benefits would, to some extent, result from the addition of capacity, regardless of whether the additional were truck-only or general purpose lanes.

## 9. COSTS OF TRUCK-ONLY LANES

Table 4 presents per mile construction costs, based on 2016 Iowa DOT bid history, and on-going maintenance costs.

***TABLE 4. CONSTRUCTION AND MAINTENANCE COSTS***

| Scenario | 2016 Construction Cost (per Mile) | 2012 Maintenance Cost (per Mile) (16) |
|---|---|---|
| 6 General Purpose Lanes | $ 11,400,000 | $ 93,223 |
| 4 General Purpose Lanes plus 4 Truck-Only Lanes | $ 23,800,000 | $ 130,733 |
| 6 General Purpose Lanes plus 4 Truck-Only Lanes | $ 25,900,000 | $ 155,751 |

For the approximate 248 miles of rural I-80 across Iowa, the 2016 cost to construct the options is presented in Figure 13.

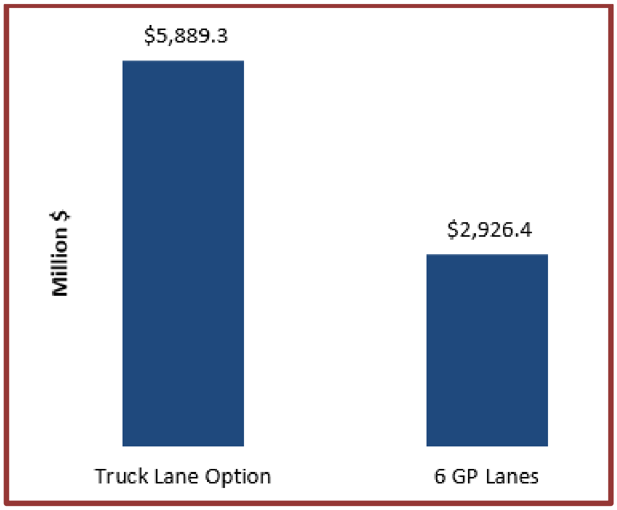



***Figure 13. Initial Construction Costs (2016 costs)***

Other costs can be much more difficult to determine. For example, when a road is widened, there can be impacts to environmental resources such as wetlands, threatened and endangered species, woodlands, farmland, and others. A cost associated with providing replacement wetlands and habitat is included in the per mile costs in Table 4, but intangibles, such as the societal cost of taking land out of farm production, are not included.

Maintenance costs include items such as painting pavement lines, minor surface repairs, mowing, repairing struck guardrail, snow/ice control, etc. Snow and ice control tends to be one of the largest, if not the largest, annual cost for maintenance. Iowa experiences an average of 16-20 days of snowfall in excess of ¾ of an inch each winter. This is typically the greatest impediment to travel time reliability experienced in this state. [(17)] The additional lane miles associated with a dual facility will increase the effort required for clearing this snow, and depending upon resource commitment, may increase the time required to clear the snow, as well. With additional roadway to clear, the net result of weather related delays will either decrease the benefits or increase the costs.

## 10. FUNDING AND CONSTRUCTION TIMELINE

If funding levels were not a consideration, a truck-only lane facility would still require several years to build to realize the full benefits. The State of Iowa uses the "pay-as-you-go" approach for funding the Primary Road System over which the Iowa DOT has jurisdiction. Annual spending on the Primary Road System is limited to the amount in State Road Funds and federal allocations. In recent years, the Iowa DOT has spent around $340,000,000 per year for interstate capacity and stewardship. Capacity improvements have primarily been projects located within the urban areas of the state. Assuming the funding for capacity and stewardship stays constant, and all of the funding is applied to improving I-80, it would take around 65 years to fund the construction of the truck-only lane facility. The duration needed to construct the truck-only lane facility or a six general purpose lanes facility for various funding levels is shown in Figure 14.

There will continue to be other competing needs on the other remaining interstate routes within the state. It isn't realistic to assume all the of funding available for interstate spending can be dedicated to the rural portions of I-80. An alternative financing approach would be necessary to build this larger facility within a reasonable timeframe. Possible options would be the sale of bonds or private financing. Either of these options would create debt that would need repaid. Servicing this debt with future State Road Funds or Federal Funds would greatly impact the Department's ability to maintain the road system. A system of mileage-based fees or tolls would likely be the method needed for repayment of the funds needed to construct a truck-only lane facility.

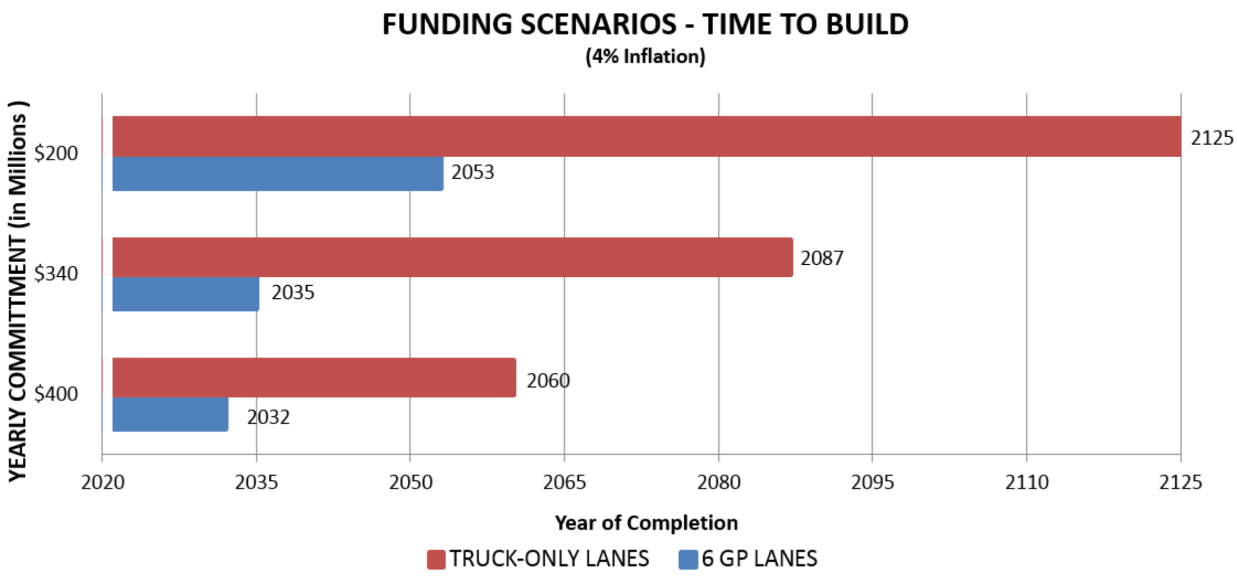



*Figure 14. Construction Durations for Various Funding Levels*

## 11. OTHER CONSIDERATIONS

Between 1975 and 2014, the general trend for the annual number of fatal crashes involving large trucks has been a slow decrease, while the miles traveled by large trucks has increased significantly. [18] Correspondingly, the crash rate per million vehicle miles traveled for large trucks has decreased from in excess of 5 to under 1.5 during this timeframe. The data presented in Figure 15 shows these trends for all roadways within the United States. Research completed by the University of Iowa found 16% of fatalities in Iowa involving large trucks occurred on an Interstate facility, and 22% of those involved median cross over crashes. [19] The median cross over crashes are now substantially being addressed with cable guardrail.

New driver assist technologies, such as automated braking and lane-keeping systems, are becoming standard safety equipment on trucks and will result in fewer potential crashes turning into actual crashes. However, as traffic volumes continue to increase, the opportunity for crashes also increases. Other emerging technologies, such as those that would allow platooning of trucks, will impact both safety and operational efficiency of freight. Information regarding roadway and traffic conditions is increasing being made available in real time by the Department and other vendors, assisting in improving traveling efficiencies.

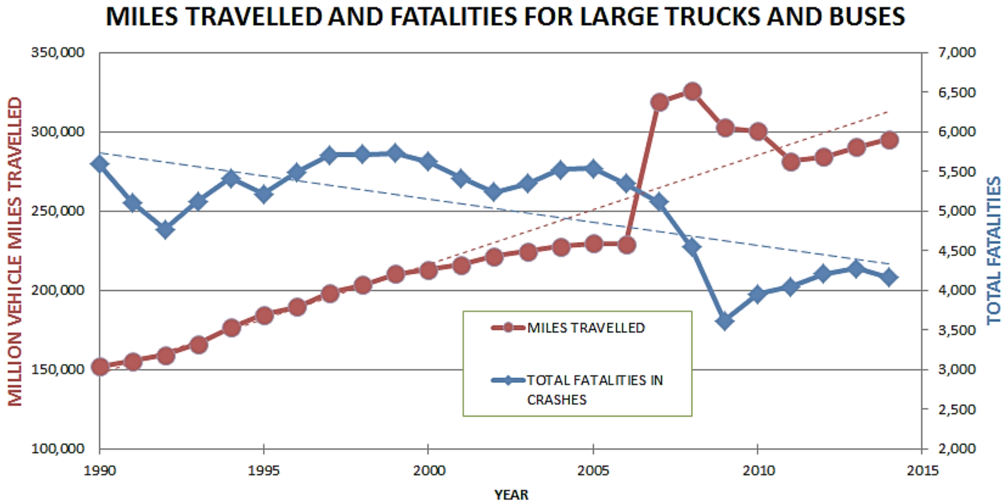



*Figure 15. Trends in Truck Travel and Fatalities*

If truck-only lanes were to be implemented, consideration would need to be given to the urban areas to maintain continuity. These areas present a much different set of conditions than the rural portions. In these areas, volumes throughout the day and especially at peak periods are much higher, interchanges are generally spaced much closer, and most interchanges serve a large number of trucks. ROW costs to construct additional lanes, either truck-only or general-purpose lanes, are much higher than rural areas, often requiring acquisition of buildings with an associated high cost. Restricting the inside lanes from trucks results in a greater percentage of trucks in the outside lane. This can create a barrier effect by interfering with the weaving movements in the outside lanes due to the close spacing of interchanges and the high volumes of entering and exiting vehicles. Providing an exclusive facility can be cost prohibitive with the number of lanes already required to meet general-purpose traffic volume demand in the future.

## 12. SUMMARY

While beneficial to operations and safety, truck-only lanes are cost-prohibitive with the current financial constraints of the Iowa DOT. A General Widening concept of providing a six-lane roadway for I-80 across the rural portions of Iowa will provide many of the same benefits. While neither lane restrictions nor differential speed limits are a recommendation of this memorandum, either remain a viable option that could be pursued in the future with a six-lane roadway.

## REFERENCES

(1) US Bureau of Economic Analysis, GDP and Personal Income, 27 Jan. 2017, Table 1.1.3 Real Gross Domestic Product, Quantity Indexes, <https://www.bea.gov/iTable/iTable.cfm?ReqID=9&step=1#reqid=9&step=3&isuri=1&904=1990&903=3&906=a&905=2016&910=x&911=0>

(2) US DOT Bureau of Transportation Statistics, Transportation Statistics Annual Report, 21 Feb. 2017, <https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/transportation_statistics_annual_report/index.html>

(3) FHWA, “Freight Analysis Framework Version 4”, www.ops.fhwa.dot.gov>freight>freight_analysis>faf, 26 Apr. 2016, <http://faf.ornl.gov/faf4/Default.aspx>

(4) Iowa DOT Office of Systems Planning, Vehicle –miles traveled (VMT)*, VMT by classification,* 27 Apr. 2016, <http://www.iowadot.gov/maps/msp/vmt/vmt.html>

(5) Edward Offei and Rhonda Young, “Quantifying the Impact of Large Percent Trucks Proportion on Rural Freeways”, Feb. 2014, MPC 13-265, Moutain-Plains Consortium,

<http://www.mountain-plains.org/pubs/pdf/MPC13-265.pdf>

(6) Robin Lindsey, “Has the Time Come for Truck-Only Toll Lanes?”, Mar 16, 2009

(7) Dan Middleton, Steve Venglar, Cesar Quiroga, Dominique Lord, and Debbie Jack, Sept. 2006,“Strategies for Separating Trucks from Passenger Vehicles: Final Report”, Report 0-4663-2, Texas Transportation Institute , <http://tti.tamu.edu/documents/0-4663-2.pdf>

(8) Camila Domonoske, “Sound The Alphorns: World's Longest, Deepest Tunnel Is Officially Open”,Jun 1, 2016, The two-way, breaking news form NPR, <http://www.npr.org/sections/thetwo-way/2016/06/01/480255088/sound-the-alphorns-worlds-longest-deepest-tunnel-is-officially-open>

(9) Micheal Dixon, Ahmed Abdel-Rahim, Sherief Elbassuoni, “Evalustion of the Impacts of Differential Speed Limts on the Interstate Highways in Idaho”, Oct 2012, Idaho DOT Research Program, < itd.idaho.gov/highways/research/archived/reports/DSL%20Final%20Report%2011-26-12.pdf

(10) Nicole Novotny, “Impacts of Differential Speed Limits”, Jan 11,2005, Wyoming Legislative Service Office, <http://legisweb.state.wy.us/PubResearch/2005/05IB002.pdf>

(11) Michael Fountaine, Lance Dougland, Chiranjivi Bhamidipati, “Evaluation of Truck Lane Restrictions in Virginia: Phase II”, Oct 2009, Virginia Transportation Research Council

(12) Wilber Smith Associates, “Engineering Specification for Construction of Truck Only and Vehicle Only Travelways in Missouri”, Sept 2009, Prepared for the Missouri DOT

(13) Record of Decision FHWA-MO-EIS-09-01-FSEIS Interstate 70 Corridor Kansas City to St. Louis, Missouri Supplemental Environmental Impact Statement, <http://www.improvei70.org/pdf/FinalI70SEIS.pdf>

(14)Peter Samuel, Robert W. Poole, Jr. and Jose Holguin-Veras, "TOLL TRUCKWAYS: A NEW PATH TOWARD SAFER AND MORE EFFICIENT FREIGHT TRANSPORTATION" , June 2002, Reason Foundation

(15)Lcv Map http://ops.fhwa.dot.gov/freight/freight_analysis/nat_freight_stats/images/hi_res_jpg/nhspermlgcombveh2009.jpg

(16)Linda Surber, Jasper County I-80 Maintenance Costs, Sept 2016, Iowa DOT

(17) Jing Dong, Chris Albrecht, Patrick Johnson, and Micah Makaiwi, "Study of the Regulatory Issues Affecting Truck Freight Movement in the Midwest", Dec 2014, MATC, http://www.intrans.iastate.edu/research/projects/detail/?projectID=1750423433

(18) Federal Motor Carrier Safety Administration, "Large Truck and Bus Crash Facts 2014", Apr 2016 https://www.fmcsa.dot.gov/safety/data-and-statistics/large-truck-and-bus-crash-facts-2014

(19)David Forkenbrock,"Transportation Policy Strategies for Iowa to Advance the Quality of Life", Jan 2004, University of Iowa