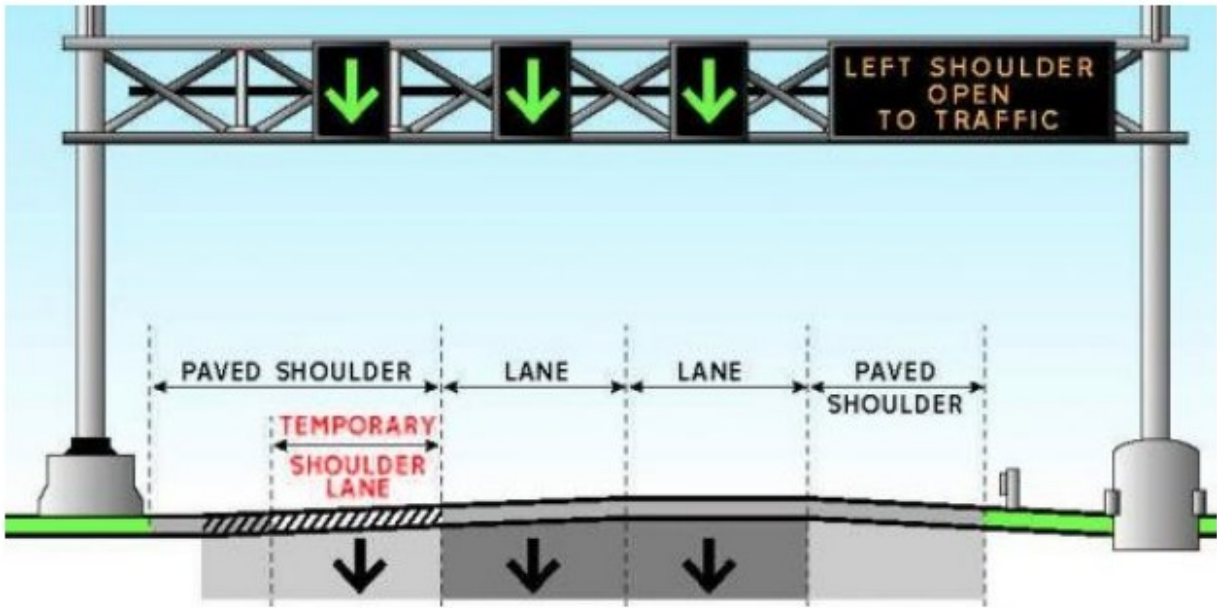


Improving the US-23 Flex Route: An Analysis of the First Responder and other Local Focus Groups



Eva Kassens-Noor, PhD
Gabrielle Herin
Travis Decaminada
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Executive Summary

Most focus group members agreed that the US-23 Flex route, called the Flex hereafter, significantly reduced congestion and made the morning and evening drive much more pleasant and efficient. Across the focus groups, solutions for improving the Flex were proposed. Summarized below are the ones that received the most support.

Proposed improvements to US-23

Most agreed the best solution to the pinch point at Whitmore Lake was to extend the Flex north to I-96. If that was not possible, the Flex lane on US-23 NB should end earlier to leave a shoulder stretch for late mergers between the end of the Flex and the concrete barrier.

Most attendees agreed that educating the public on the zipper method and enforcing its compliance was the best solution in order to fix issues regarding any bottleneck congestion that occurred after the introduction of the Flex.

Freeway Courtesy Patrol (FCP) members requested that checking on people involved in a crash should take priority over clearing the Flex lane.

It was recommended to remove the 60 mph from the gantries and instead post them as advisory speeds (yellow signs) next to the Flex.

Some participants would like MDOT to change solid yellow lane markings to white or at least yellow dashes on stretches where switching lanes is allowed.

Strategies for future Flex routes

Identify natural starting, merging, and ending points

- Ideally, the Flex connects two highways and naturally increases to more lanes – avoiding completely any reduction from three to two lanes.
- If a merge from three lanes to two must occur, there should be an exit in parallel to the merge stretch while the merging point should not be in a curve

The end of the Flex should not be marked by a concrete barrier forcing a merger from three to two lanes. Instead, there should be a shoulder stretch between the end of the Flex and the concrete barrier that ends the shoulder.

Ensure concrete barriers stretch along the entire length of future Flex routes to protect drivers.

In the future design of Flex routes, a crash investigation site on the opposite side at merging points would be very helpful for enforcement.

Make emergency median crossings, which first responders called turnarounds a priority in the design of future Flex routes on 1-2 mile stretches that do not have exit & entrance ramps.

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Summary of first responders focus group

Michigan State University's (MSU) Department of Urban and Regional Planning convened a focus group on behalf of the Michigan Department of Transportation (MDOT) to explore the performance and safety of the first Flex route in Michigan, located on US-23 from north of Ann Arbor to Whitmore Lake. MDOT's goal is to evaluate the challenges and successes of the Flex and identify solutions for challenges based on public input. These potential solutions will be considered for US-23 and in the design and operation of future Flex routes.

Background

In November 2017, MDOT opened the first Flex lane in Michigan on an 8.5-mile section of US-23 between M-14 and where M-36 meets 9 Mile Road (MDOT, 2017). The lane is an attempt to clear congestion during peak commute times in the mornings and afternoon, as well as during crashes. Before the Flex's introduction, people often experienced delays and were frustrated about traffic congestion during peak commute times. Since the introduction, there have been varied opinions regarding its efficacy and implementation, though in general positive perceptions are common. In order to learn what US-23 commuters thought about the Flex, focus groups in the municipalities of Whitmore Lake and Brighton were conducted. Three groups were convened, the last of which was composed solely of first responders, who voiced their opinions and responded to the concerns/comments mentioned by the other two groups.

Methods

Dr. Kassens-Noor, the principal investigator for the project, sent out invitations twice to all first responders in areas surrounding the Flex; these invitations included options to choose a date and time for the proposed meetings. One meeting was specifically dedicated to first responders, while other meetings included the general public; some demographics and driving habits were recorded. Five participants attended the first-responders focus group and one chose to participate in the focus group for the general public. One attendee was the Chief of Police for Green Oak Township. He drives the Flex daily for his job and as a commuter. The second attendee was a sergeant with the Brighton Police Department, who also drives the Flex as a commuter and for his position. The third, a dispatcher for local emergency medical services EMS, drives the Flex daily. The fourth attendee was a member of FCP. He works primarily in Ann Arbor and Ypsilanti but occasionally works the Flex. The fifth attendee was also a member of the FCP, who works the Flex daily; as a part of his job he opens the Flex, clears it, and helps prepare the lane for incoming police officers. The last participant was a first responder, but he preferred to attend the focus group with Brighton community members on October 23.

The meeting was held at the Brighton Coffee House and Theater located in Brighton. Two recording devices were placed in the middle of the room to record the ensuing conversation. The focus group lasted for an hour and a half, and five core questions were asked, specifically:

1. What does not work on US-23?
2. How can we fix it?
3. Please give us your thoughts on the following concerns from the Whitmore Lake and

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Brighton focus groups.

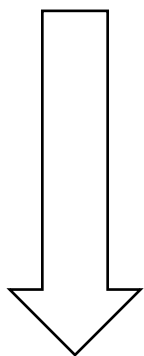
4. Are there more or less crashes on US-23 since the Flex was implemented?
5. What works for you on US-23?

Methods for note-taking and data analysis were retrieved from Onwuegbuzie et al (2009). It was recorded whether one, some, or most of the participants agreed with whomever was speaking at the time. The word “some” meant two-three participants agreed. The word “most” meant four to five participants agreed. An agreement was indicated by a nod of the head or a verbal “yes.” Constant comparison analysis was used to group the data into eight categories of problems addressed with their potential solutions (Onwuegbuzie et al, 2009).

To determine the relative importance of each of the categories discussed, it was examined how long the participants spent on each topic and how many attendees were in agreement. Next, topics were ordered by importance from most to least. Then, topics were further analyzed to turn the discussion into a structured narrative mixing concerns with potential solutions. In the following narrative, the problems discussed and any solutions suggested are listed in order of importance.

Concerns with US-23

First responders were asked what does not work about the Flex. Each explained their view of the Flex in turn and then the topics were discussed individually.



- | | |
|---------------------------------|-----------------|
| 1. Pinch point at Whitmore Lake | Most important |
| 2. Southbound Congestion | |
| 3. Incidents/ Crashes | |
| 4. Turnarounds | |
| 5. Communication | |
| 6. Induced Demand | |
| 7. Advisory Speed of 60 | Least important |

1. Pinch Point at Whitmore Lake

Most agreed the solution was to extend the Flex north to I-96.

A police officer noted that the Flex ends going northbound where there is not an exit, taking away the choice to merge off in any direction and dispersing the traffic onto another major highway; most other attendees agreed. Instead, the Flex reroutes drivers onto US-23. The participants understood that not extending the Flex to another major highway was because of a lack of funds; though they remained concerned regardless, advocating for said extension. A FCP member illustrated to the group that where the Flex ends going NB stops at a corner and changes

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from three lanes into two. All the participants agreed and the other FCP member was adamant that the reduction in lanes is a problem. One of the police officers proposed extending the Flex a ½ mile to the next exit (54B). This proposed half-mile extension would cause traffic to back up before that exit and allow people a chance to merge. The same first responder added that if the Flex ended on a straight section of the road, people would be able to notice any back-ups sooner.

One of the FCP members said after he clears the Flex in the mornings a bottleneck in traffic forms, which makes it difficult to merge into the primary lanes of US-23. This bottleneck also makes it difficult for the FCP to reenter the lane. He generalized the issue by saying he believes the bottleneck is worse where the Flex ends on US-23 NB.

There was laughter when a FCP member mentioned that they see a lot of people using the Flex when there are red X's on the gantries (because it was such a common occurrence). They knew that a red "X" appears on gantries above a lane indicating that it is closed to traffic. The same FCP member said the meaning of the red X's should be self-explanatory to drivers as well, but apparently is not.

One FCP member explained that traffic gets backed up on evenings and especially Friday nights going northbound. People try to avoid the congestion by driving on secondary roads. This behavior ultimately clogs up exits, creates congestion on secondary roads, and causes more frequent crashes on these roads.

Some attendees agreed with a police officer who noted most crashes occur on secondary roads when drivers are in unfamiliar territory. Some of these crashes occur when people try to avoid roundabouts on Lee Road. Drivers also get lost and realize there is nowhere to go during a backup. The dispatcher for EMS explained two miles are lost in the northbound direction of US-23 because there is traffic to 6 Mile Road for people who want to merge back to two lanes. One FCP member agreed.

Additionally, most attendees agreed that people are usually just passing through or are going to the Fenton area. One first responder mentioned that the SB bottleneck was just moved north from M-14 and US-23 to 8 Mile and US-23. Another explained that the Flex is opened at various times depending on traffic. They will open the Flex up sometimes at 2:40 pm or even 1:40 pm. The dispatcher for EMS agreed that the Flex works well for football games.

Most attendees agreed that education was the best solution in order to fix issues regarding the bottleneck. A first responder asked if there was something available to help people understand how the Flex works; he justified the need for education with several reasons. A FCP member commented that the Flex should be on the right shoulder, and two other first responders agreed with him. Another solution was to have a training program for, or better communication with, drivers to explain that the Flex should only be used as a shoulder when it is closed; the other FCP members agreed. A third solution, presented by the member of Corrigan Oil, was to have the Secretary of State provide training while people are sitting and waiting (on the SoS monitors).

Another solution that some attendees agreed on was to not use the Flex as a shoulder at all, even when the Flex lane was closed, which would theoretically reduce the chances of a driver crashing

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into a stopped vehicle. One attendee described that his son is learning to drive now and he is instructing him to never use the shoulder of the Flex, even if the Flex is not in operation.

2. *Southbound Congestion*

Two participants noted that the Flex takes drivers, going southbound, onto two different freeways when it ends. In the mornings, people and trucks use the center lane on I-96 WB to US-23 SB, and merge over at the last minute to avoid waiting for Exit 148; or are avoiding the bumpy roads on I-96 WB. A police officer agreed that I-96 WB is in bad shape. Bottlenecks are an issue on US-23 SB, especially on Mondays. A FCP member said, “*Traffic will backup for three miles from Exit 145, 147 or 148 to go south on US-23 from I-96 WB. This is mainly due to the semis, people not choosing the right lane, and others merging from Grand River.*” Some impatient drivers often merge into an exit lane well in front of drivers who had been waiting in traffic. The other FCP member said the backup is because of the merge. A backup occurs north of I-96 on US-23 and continues until south of I-96; this backup can sometimes be as long as five miles. Some attendees agreed with one of the police officers that once drivers pass M-36 going south on US-23, driving the Flex is easy.

3. *Incidents/ Crashes*

A FCP member explained that the Flex lane eliminates the shoulder first responders need to use in order to effectively reach crash sites. The available shoulder is often not open long enough, nor clear enough to quickly traverse. Some agreed there is no place for the first responders to go when there is a crash, meaning that the Flex must be shut down. This caused some laughter among attendees. Everyone in attendance agreed and laughed when a first responder noted that everyone should be taught a technique called the “plus one,” which means they would learn to expect drivers to give them an open lane to respond to a crash. The FCP member explained that his team is taught the plus one, but that emergency medical technicians also need to be taught it. One attendee commented “*absolutely.*” Most attendees agreed that using the Flex as a shoulder is dangerous when it is open to traffic. One attendee remembered observing a lady who had stopped her vehicle on a curve in the Flex while it was open, right in the path of traffic.

Some agreed that the Flex lane should be cleared for first responders after a crash. A FCP member stated that the lane only clears when an observer (watching traffic cameras) sees the crash and changes the electronic signs. For example, when a truck crossed over the median into the lanes going in the opposite direction, the right lane was shut down and the Flex opened in that area just so traffic could be diverted, and the first responders could get to the crash. People followed the directive, so the above plan worked. The EMS dispatcher agreed. However, all attendees agreed that crashes within the Flex lane itself result in chaos. Both drivers and first responders are forced into the right lane after a crash in the Flex, which is backed up with traffic.

A FCP member noted that after crashes are resolved and the Flex is reopened that it takes longer for people to get past the area affected by the crash. One suggested that if the Flex was extended to I-96, people would stay on the highway instead of moving onto secondary roads. One exit, in particular, Lee Road, is a problem for some drivers, especially those unfamiliar with

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roundabouts. The attendee reiterated the fact that a lot of crashes happen because people are unfamiliar with secondary roads and just want to avoid a backup.

A FCP member noted that one of the best aspects of the Flex is the crash investigation sites. Some agreed that having them on the right shoulder aids in mobility and allows a safe place for drivers to pull over. These sites also allow first responders to more easily clear crashes. However, people generally do not understand how to use the crash investigation sites effectively. For example, a FCP member expounded that *“people with flat tires pull out of the site because they think they are only useful for crashes. They drive to the right shoulder, which gives little room for the first responders.”* The other FCP member agreed and three people laughed. Additionally, some drivers do not want to move from the site of the crash because they are worried about insurance problems. A police officer agreed. A solution some attendees agreed with was to give an explanation on *“TV bulletins”* (municipal television channels). A police officer suggested, with some laughter, to put it in a manual that every driver should read. Another issue is that some emergency dispatchers do not know the crash investigation sites exist or were never taught about them.

4. Turnarounds

Most agreed that turnarounds are necessary for first responders and that the reduction in turnarounds included in the design of the Flex is not adequate for first responders, especially fire trucks. The first responders noted that because there are fewer turnarounds than before the Flex, it results in them driving further to reach one. Some agreed the elimination of turnarounds is a big problem regarding the Flex. The dispatcher for EMS and a FCP member agreed that having to use the turnaround four miles away from where they need to be is difficult and slows their response time. An example the same two first responders agreed on, was the area between North Territorial and the M-14 triple ramp. A second example of this problem occurs at the M-14 WB and US-23 NB ramp. At that location, first responders have to drive to North Territorial, exit the highway, and then reenter in order to reach the crash site. To clarify the second example, the other FCP member stated, *“coming from Nixon to US-23, where the two roads overlap far from the Flex, makes it hard to turnaround from west to north.”* Additionally, if first responders are coming from a Plymouth crash and switch from traveling on the north to southbound US-23, their response time is longer due to the lack of turnarounds. The EMS dispatcher and the other FCP member agreed. A police officer explained, with two others agreeing, that the turnarounds were removed because the salt trucks could not use them. The same officer said that a different result of not being able to turn around is that, in order to reach a crash site, police officers are forced to jump over the walls separating the two directions of traffic. Though this action is clearly dangerous, there is no other option that allows officers to quickly reach the crash site. All agreed that first responders such as police officers need turnarounds. At the end of the discussion, some agreed with a police officer that *“things such as the 60 mph speed limit and the no turnarounds prevent the Flex from doing what it is supposed to do.”*

5. Communication

A FCP member, with some agreement, noted that the top priority for dispatchers is to clear the Flex lane. Watching the video feed of the Flex via cameras, a dispatcher determines when it is

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safe for people to drive it. Next, a FCP member must physically drive the Flex and “clear” it. However, there is a significant lag time between when the FCP member informs dispatch that the Flex is clear and when dispatch actually opens the Flex lane. Additionally, FCP drivers must focus on clearing the Flex; even if there were a crash, they would be unable to stop and determine if people are okay. Clearing the Flex is their top priority.

Further highlighting communication issues among agencies. Some attendees agreed that at the WB I-96 and US-23 NB triple ramp there is always traffic that makes access difficult for first responders. If a crash is on the border of their zone, they will not respond, thinking someone else will.

6. *Induced Demand*

Though not much was said about induced demand by the attendees, some agreed that once people get onto the Flex, and traffic begins to flow well, it has led over time to more and more people driving on it.

7. *Advisory Speed*

There was agreement among attendees that drivers do not understand that the advisory speed is only a recommendation. The actual speed limit on the Flex is 70 mph, though due to recommendations from the Federal Highway Association, the “recommended” speed is 60 mph. *“The Flex brings together people not familiar who go 60 with those who are educated and think it is not enforceable and drive fast. These behaviors create congestion.”* Most first responders then agreed with a FCP member that the speed limit is hard to enforce during high traffic times because it is more imperative for them to respond to crashes and the Flex is very dangerous without a shoulder. First responders do not want to be on the Flex during those times. Some further agreed that by making the advisory speeds enforceable, traffic would flow better than without them. A police officer revealed that he receives calls from people asking if they will get a ticket for traveling over 60 mph. The same police officer believed that if everyone went that speed, the Flex would work and there would not be a bottleneck.

Most agreed that the speed does not help anyone, and it negates the purpose of the Flex. A FCP member explained that the people opening the Flex are too far away to see how the Flex actually works. A police officer agreed.

There was some agreement on several solutions. One was to educate people about the advisory speed. Another attendee recommended that if the speed is not enforceable, then do not post it. A police officer said that people should travel at 60 mph because then there would not be any backups. The dispatcher for EMS said to make 60 mph the speed limit to slow traffic down.

First Responders Reaction to Other Focus Group Concerns

Next, the first responders were prompted to comment on the themes developed during the two non-first responders focus groups in Whitmore Lake and Brighton. They were asked about the

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following Whitmore Lake Concerns: pinch points, presence of a police car at the end of the Flex, confusion on the advisory speed of 60 mph, and the presence of “X” on the Flex gantries. First responders were also asked about the following Brighton concerns: the bottleneck at the US-23 and I-96 intersection, the Oak Village Place and Lee Road backup, Freeway Courtesy Patrol activating the salt used in the winter, and lane discipline on the Flex. In general, there was at least some agreement from the first responders on each issue.

Responses to Whitmore Lake Concerns

One main issue brought up at other focus groups were specific points of congestion. First responders all agreed that pinch points cause significant congestion. One suggestion from the Whitmore Lake focus group was to place a police car at the end of the Flex. Two first responders agreed, though they found the suggestion amusing, noting that the presence of a police officer may make the area even more complicated. One police officer also mentioned people will slow down and not pass a police car going 60 mph in the Flex. Another concern arose that there is no crash investigation site at the end of the Flex, thus enforcement is difficult and dangerous at the Whitmore Lake pinch point.

A FCP member said they see people drive as fast as they want in the Flex. Most agreed that drivers are confused about the advisory speed of 60 mph. The first responders suggested removing the 60 mph signage and putting up nothing or displaying a green arrow. They said these actions would clarify that the speed limit is only advisory.

A FCP member and the dispatcher for EMS agreed the “X” is confusing to people when they are displayed on the gantries. Two other attendees explained that the “X” meant the Flex was shut down. A FCP member stated that the Flex might have already been cleared. The signs on the gantries are run all over Michigan by only a few MDOT employees. They are not only responsible for Grand Rapids and Detroit but also the Upper Peninsula. They control bridges, signs, and message boards. There was some agreement that the team of four cannot respond to everything at once, causing a delay between when the first responders clear a crash and when the message board indicates the Flex is cleared. Another first responder agreed. The dispatcher for EMS supported him when he said the people controlling the signs do not respond quickly. Their response time depends on the weather and everything else going on in Michigan. Two possible solutions some agreed on were to educate drivers and to add a second sign saying, “crash ahead.”

We then asked the first responders whether there were more or less crashes on the Flex. The dispatcher for EMS agreed with the FCP member that there are fewer crashes in the morning because the lane is open. There were also some who agreed that there are more crashes in the evening because of the visibility at the I-96 and US-23 bridge. The number of crashes is also impacted by the end of the Flex. Once traffic gets to I-96, it starts flowing and people can make up for lost time. At the hill which leads to Silver Lake Rd, there is another bottleneck. Some agreed there are more crashes and a backup at the I-96 entrance ramp towards Lansing because people are merging left, more people drive in that area going north and people compensate for lost time by driving faster. There is also congestion around 8 and 9 Mile roads, as explained by the dispatcher for EMS.

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Finally, the first responders agreed with Whitmore Lake residents that another important issue was the length of time it takes to clear the Flex lane and reopen it after a crash. Some also noted that the Flex has to be physically cleared by a FCP member driving down the Flex instead of it just being cleared through cameras. The dispatcher for EMS agreed that it takes time to open the Flex after FCP clears it.

It was once more mentioned that FCP's priority is to open the Flex on time, even if one of their members has to be pulled from a crash site. A FCP member explained that he does not care if it takes a while for people to get to work when someone is injured. There was some agreement with that same FCP member that it is "*terrible to skip over hurt people.*" According to the attendees, there is either miscommunication or no communication in these situations.

Next, the first responders mentioned a few other topics that were not brought up by participants from Whitmore Lake, specifically communication issues. Some agreed with a FCP member stating, "*one of the most frustrating things about the Flex is having to tell dispatchers to look at what is happening near the cameras in Washtenaw on the CLARIS system.*" The Claris Mobile vehicle-mounted camera provides information to transportation agencies on accidents/incidents or weather that may not be caught by fixed cameras. The dispatcher for EMS agreed. He further explained that the system is complicated. There are individual usernames and passwords for each dispatcher. Because of this complication, dispatchers do not know what is happening in Washtenaw County towards Livingston County. The system is worse, not better, than before it was 'fixed'. A FCP member admitted that rather than use the CLARIS system, he uses WAZE, a navigation app from Google. WAZE is GPS based; commuters input information about crashes and road conditions to alert other drivers.

The same member of FCP said there are also issues with WAZE. Police officers do not know to call FCP on the radio. Instead, the FCP members use WAZE and Washtenaw dispatch. Some agreed with a FCP member that WAZE has helped tremendously. He further explained that they should not have to use an app to find out there is a crash on the Flex.

Another issue some attendees agreed with was a problem with the medians on US-23. A FCP member mentioned a crash where a truck smashed through the median into the opposite lane of traffic. People injured in the incident had to be airlifted to a hospital since there was not enough space for ambulances to avoid continuous traffic. An attendee noted that "*the two guard rails mean everything to somebody.*" The dispatcher from EMS agreed.

The EMS dispatcher inquired whether guard rails are supposed to be safer than wire since wire is supposed to stop traffic. Another first responder answered affirmatively. Another first responder was concerned that they may not be an improvement. There was also some discussion that guard rails are better than wire. A FCP member explained how "*The guard rail prevents the most serious crashes and slows down traffic.*" There was some agreement that wire barriers cut into everything, and another attendee noted that wires could easily slice through someone. A FCP member gave the example where a first responder saw a wire had cut through a truck's engine and driver's seat.

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A police officer asked whether there is a difference between concrete walls and guard rails. They explained people do not usually get through a wall. Another exclaimed they hate the concrete. One FCP member “*saw a regular trailer get hit and then ran into the barrier into oncoming traffic. It does not happen with guard rail or wire.*”

Responses to Brighton Concerns

Some first responders agreed that the SB bottleneck at I-96 and US-23 is an issue and all agreed that the bottleneck impacts further roads. There was some agreement when a police officer remarked that “*I have experienced this for 27 years and it never used to back up onto I-96, unless there was an accident when US-23 was a two-lane road. Now it backs up for three miles.*” Two first responders agreed with the police officer when he stated that southbound US-23, north of I-96, backs up because of traffic. The same police officer further explained that commuters from Ann Arbor used to avoid the area by traveling on secondary roads. Since the Flex, more people have started using the highway, creating more congestion. The amount of traffic depends on the day of the week. The dispatcher for EMS laughed when the police officer said that the worst day for traffic is Monday. There was some agreement that the backup leads people to use secondary roads such as Whitmore Lake and Fieldcrest. Some agreed with the other FCP member that people in Michigan like driving themselves and will not participate in public transportation. A police officer and the dispatcher for Emergency Medical Services agreed.

Most attendees agreed that the Friday backups on Lee Road Next to Green Oak Village Place was a problem. A FCP member described how shoppers use secondary roads to avoid the congestion on I-96; they drive to an on-ramp past the congested points. A police officer noted that they mostly see residents going faster on the side roads because they are familiar with the area. Additionally, a FCP member and the dispatcher for EMS agreed that many drivers are trying to get to Brighton, but there are no good exits off I-96. Instead, drivers use secondary roads such as Whitmore Lake Rd and Fieldcrest Dr. People then usually drive fast and get into crashes. A FCP member bluntly said, “*as a commuter it is terrible.*”

As far as activating road salt goes, both FCP members agreed they cannot ‘activate’ the salt to make it safer for commuters. They are up before the salt trucks and therefore cannot drive on the Flex first. An issue most agreed on is that the Flex will always ice over if it is shut down. A police officer and one FCP member agreed with the other FCP member that drivers have to activate the salt themselves. In order to relieve the issue, a FCP member proposed that lower speeds be considered.

All attendees agreed that people need to be educated about the zipper method. One possible solution is to require it to pass a driver’s test. Some agreed that in the morning trucks use the center lane until US-23 SB, merging at the last minute, which then causes a traffic backup. They also explained that people get angry when people aggressively pass them, especially when they are passed by someone on the shoulder. Most agreed with a police officer that there are very aggressive drivers in Michigan; they are destination focused and ride on people’s bumpers.

Some agreed that they have seen trucks pass people going slower in the left lane so they could keep going 70 mph. A FCP member noted that such a thing happens to him often. One first

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responder saw someone get pulled over for it, which caused some laughter. The attendee from Corrigan Oil suggested putting public “stress” out there to enforce the purpose of the Flex lane through marketing techniques (so trucks don’t use it). This education may solve the problems of speeding and aggressive passing. A FCP member revealed that state police officers will park in front of FCPs emergency services vehicles to write civil infractions for people not changing lanes, he noted *“I am very thankful for it.”* Additionally, the Corrigan Oil member noted that they left the airport (DTW) Monday morning around 8:30 am and people were going 60 mph in both the middle and left lanes while the right lane was vacant.

There was also a small discussion on what slows people down. A FCP member mentioned how the color of certain emergency lights innately slows some drivers down. However, he explained that FCP vehicles cannot have red and white lights, even when it would help them stay safe. The member of Corrigan Oil suggested that any *“blinky-flashy lights slow people down, like tow trucks.”*

What Works on the Flex Route?

We then asked the first responders about what works on the Flex. There was some agreement that the Flex works great 8 and/or 9-mile on US-23 NB. The number of crashes has decreased, and the entrance ramps have improved. A FCP member explained that once one gets five miles south of I-96, traffic goes a lot faster since people are eager to *“press the pedal on the gas.”* A police officer noted that they thought it was great from Silver Lake Road going south.

A couple of attendees agreed with a FCP member that the intelligent freeway signs work great. For example, it lets people know about, and react more effectively, to a crash. The Freeway Courtesy Patrol member then said, *“he can call dispatch and have people start merging over two miles before the scene of the accident.”*

Most agreed with the police officer that the Flex works great on a clear sunny day. He then suggested that there is only a traffic problem on game days and rush hour, so there is no need to spend the money building an additional permanent lane. Some agreed, such as the dispatcher for EMS, that the extended ramps helped with the backup.

First responders mostly agreed with the police officer, and laughed, when they noted that people can express their frustration by going faster, such as 90 mph, in the left lane. A FCP member further explained that people will do 80 mph at the green arrow, and then as soon as they merge into the Flex lane, they slow down to 60 mph. A police officer agreed. Another police officer mentioned that *“what demonstrates the Flex works is that the biggest complaint is that it was not extended to I-96.”*

Most agreed with a police officer when he noted that the electronic message boards help educate drivers on future operations and gives them something to pay attention to other than the advisory speed. They familiarize people with traffic investigation lanes and signage. Most attendees also agreed when a FCP member noted that people are also confused about the three red X’s. *“Sometimes a red X in the right lane might mean there is an accident in that lane. The X*

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demonstrates that people should be driving in the Flex. In another situation, there might only be a red X in the Flex, making that kind of education important.”

After providing reasons why the Flex works, the first responders discussed the future Flex route on I-96 and its implications. A police officer was concerned with where the Flex begins and ends. The new Flex route starts at the intersection of I-275 and I-96 and will terminate at Kent Lake Road.

The officer noted that budget was a likely factor in where the US-23 Flex ended, he would have preferred it be extended to I-96. He further noted that instead of fixing the first Flex, they will end up creating another pinch point, increasing traffic and forcing people to use secondary roads. A FCP member and the dispatcher of EMS agreed. Additionally, the police officer also predicted that Novi will start having the same issues as Brighton since the city is already “*packed*,” and that I-275 may be affected. Most attendees agreed that MDOT should invest in the Flex they started, which caused some laughter. A FCP member said that if “*investors*” see how well the Flex works at full capacity, they would fund more of them. The dispatcher for EMS and a police officer agreed. By extending the current Flex, the first police officer explained that it would also solve the first responders’ and community’s complaints.

Most attendees then agreed with a FCP member when he noted that extending the Flex would also lead to more traffic because people enjoy driving it. Some agreed that fixing the secondary roads and bridges is the biggest conflict between MDOT and the local municipality. There was some agreement that neither wants to pay to fix the secondary roads unless there is a federal grant for emergency traffic needs.

Conclusion

We conclude that the most important issues with the Flex lane are the pinch point at Whitmore Lake, the number of incidents, and the absence of turnarounds for emergency vehicles.

Specifically, the following is recommended for the current Flex as well as any planned and future Flex routes:

1. **Find natural merging and exit points:** avoid any pinch points by connecting one highway with the other to avoid any lane reduction.
2. **No concrete barrier to mark the end of Flex lane:** to give drivers space to maneuver at the merge, leave some distance between the end of the Flex lane and the concrete barrier.
3. **Design an emergency stop next to the ends of the Flex lanes:** the merging point from three to two lanes when the Flex ends is perceived to be a hot spot for crashes.
4. **A clear explanation of speed advisories on Flex:** commuters are confused about the difference between speed limit and speed advisory.
5. **Frequent turnarounds:** to decrease response time to crashes and incidents, please add turnarounds.

Another suggestion the first responders made was to finish and fix the US-23 Flex rather than add a new one on I-96 between I-275 and Kent Lake Road. They explained it would solve their own and communities’ complaints and would prevent another pinch point.

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If these suggestions are followed, participants believe the safety and the performance of the Flex can be improved.

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Summary of Whitmore Lake focus group

Michigan State University's (MSU) Department of Urban and Regional Planning convened a focus group on behalf of the Michigan Department of Transportation (MDOT) to explore the performance and safety of the first Flex route in Michigan, located on US-23 from north of Ann Arbor to Whitmore Lake. MDOT's goal is to evaluate the challenges and successes of the Flex and come up with solutions based on public input. These potential solutions will be considered on US-23 and in the design and operation of future Flex routes.

Background

In November 2017, MDOT opened the first Flex lane in Michigan on an 8.5-mile section of US-23 between M-14 and where M-36 meets 9 Mile Road (MDOT, 2017). The Flex is a dynamic lane, meaning it uses variable speed controls and queue warning systems. Other states and European countries have successfully implemented Flexible travel lanes. The lane is an attempt to clear congestion during peak commute times in the mornings and afternoon, as well as during incidents. Before the Flex's introduction, people often experienced delays and were frustrated about traffic congestion during peak commute times. Since the introduction, there have been mixed perceptions regarding its efficacy. In order to learn what commuters thought about the Flex, one focus group in Whitmore Lake was conducted.

Methods

Dr. Kassens-Noor, the lead investigator on the project, sent an open invitation to attend focus groups via a flyer to everyone who had emailed MDOT with comments or complaints regarding the Flex as well as additional contacts provided by MDOT and personal connections. As a condition of their acceptance, respondents were asked to describe their driving habits. Those who emailed back were given the location of the focus group. One person responded with several helpful comments but did not want to attend the meeting.

We recorded each participants' driving habits and visually estimated some demographic traits. Seven people attended the focus group. The attendees included: a senior man, a former commuter who still uses US-23 for trips up north and managing a rental property in Whitmore Lake. A senior woman who drives US-23 daily. A middle-aged man who drives US-23 from Brighton to his work every day in Ann Arbor. Another senior man who drives to and from work in Detroit every day, and on weekends. A second woman who uses it to drive from Ann Arbor to Flint; she also occasionally uses it to go to Lapeer and Mt. Morris to visit her family. Finally, another senior man and a middle-aged woman who also drive the Flex. The meeting was at Captain Joe's Grill in Whitmore Lake. Two recording devices were used to collect audio from the focus group.

The focus group lasted an hour and a half, and covered three main questions:

1. What does not work on US-23?
2. How can we fix it?
3. What works for you on US-23?

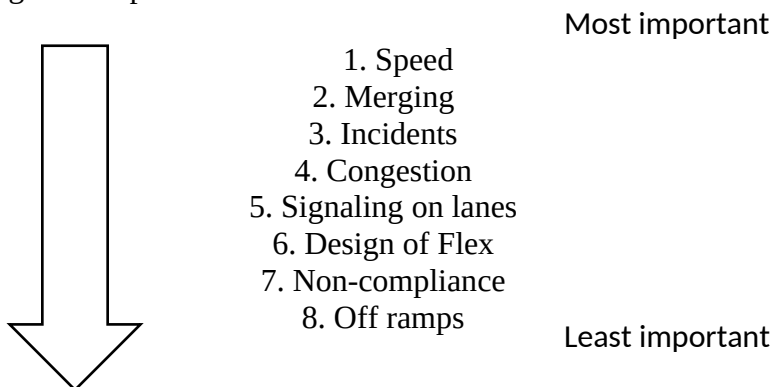
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Methods for note-taking and data analysis were retrieved from Onwuegbuzie et al (2009). It was recorded whether one, some, or most of the participants agreed with whomever was speaking at the time. The word “some” meant two-three participants agreed. The word “most” meant four to five participants agreed. An agreement was indicated by a nod of the head or a verbal “yes.” Constant comparison analysis was used to group the data into eight categories of problems addressed with their potential solutions (Onwuegbuzie et al, 2009).

To determine the relative importance of each of the categories discussed, it was examined how long the participants spent on each topic and how many attendees were in agreement. Next, topics ordered by importance from most to least. The discussion was further analyzed to turn it into a structured narrative mixing concerns with potential solutions. The problems discussed and any solutions suggested were listed in order of importance.

Concerns with US-23

We found nine categories of problems and solutions.



Participants were asked what does not work about the Flex first and then they gave solutions after each issue they discussed.

1. *Speed*

Most attendees agreed that drivers of the Flex do not understand that the speeds listed on the gantries are advisory, and not the actual speed limit. However, they go as fast as they want, especially in the Flex lane, because the legal speed limit is not stated anywhere, and enforcement is almost impossible when the Flex is in use. Most of the participants agreed that the digital signs actually distract them more than they help them. One explained that “*drivers see it as an invitation to drive as fast as they like with one green arrow over the Flex and the other two having a 60 mile per hour speed limit.*” Another person thought the gantries were a waste of money and that the recommended speed limit seemed very official.

As a solution to this problem, the participants mostly agreed that the gantry should be used for information only, such as when a crash occurs. For example, there could be an X in the left lane and a billboard indicating there is a crash ahead, which would push people to the right. Another

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participant asked for the gantry to be removed completely since they viewed it as just a distraction.

Participants also mostly agreed that people either go too fast or too slow on the Flex. Instead, it would be best if all were going the same speed. They explained drivers get confused with the signs, which leads to crashes. One participant said that some drivers are worried about being stopped while others just do not care.

To resolve this issue, the participants suggested that the 60 miles per hour speed limit should be removed and replaced with green arrows and red X's or the gantries should be left blank. The suggested speed limit of 60 mph should be posted instead on yellow signs next to the Flex. Some agreed that speeds should only be listed to slow traffic down. One attendee expressed concern that people do not look at the speed limits anyway, while another suggested that the advisory speed should be 70 mph.

2. Merging

Most of the participants agreed that people do not know when to merge because signs do not notify people early enough. They ask, "*is it the first time it shows up? Is it the second time? Is it at the end?*" One person explained that depending on the time of day, people are more willing to move over from the Flex earlier while others try to go as far as they can in the Flex before merging back into regular lanes. People who speed in the Flex lane sometimes end up crashing into the barrier at the pinch point because there is no shoulder.

Four main solutions were formulated, of which most of the attendees agreed with. First, they suggested to start merge indicators a quarter of a mile earlier in order to make sure drivers finish the merge well before the concrete wall/pinch point at exit 52 and leave the shoulder open for emergencies. Second, some people suggested that installing rumble strips may encourage people to merge earlier. However, one attendee argued that putting down rumble strips may lead to a novice driver getting into a crash. The third solution was to create longer exits on southbound US-23; For example, one attendee explained "*it would be nice for the Barker entrance ramp to go all the way to the 6 mile entrance and then again to N. Territorial, just for those high traffic times to allow more time for people to merge on the highway or merge off.*" Fourth and last, some attendees agreed that arrows on the overhead signs should flash faster as people get closer and closer to the merge. These four solutions would allow people to merge while avoiding crashes and confusion.

3. Incidents & opening/closing times the Flex lane

Most participants agreed that the Flex lane is not opened fast enough when a crash has occurred. They expressed their desire for it to be opened immediately, since "*all it is, is making a quick assessment with the cameras that are already functioning.*"

Participants perceived the Flex lane to be opened by a timer in the morning for southbound and in the evening for northbound. One attendee said that they plan their route when it is open to avoid congestion. To solve this problem, they mostly agreed there should be someone with

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experience, such as a police officer, to evaluate the situation and open the Flex lane. One person suggested that there should be a hotline for people to learn where incidents are located and then avoid them.

The participants mostly agreed law enforcement should have control of the lane since they monitor the area already. For example, “*law enforcement should say there is a crash on the right lane of US-23, turn the Flex lane on.*” However, some mentioned that the city, county, and state governments should have some input.

Throughout the conversation, the participants mentioned crashes that they have witnessed. One participant said that there was a crash where people slowed down and kept driving in lanes with red X’s over them. During a third crash on eastbound 96, the Flex lane did not open, leading to US-23 becoming congested.

Others thought a possible solution would be to have the shoulder open 24/7, but one person argued that it needs to be clear for emergency vehicles and for when cars break down. Another participant noted that they would like it to open longer, but not 24/7. Some suggested that the Flex needs to be open 24/7 during the Ann Arbor art fair and on game days.

4. Congestion

Most people agreed that there is still a problem with congestion despite the Flex lane. It seems to them that the northbound bottleneck just moved. They also said it is congested to the point that they “*can’t use the highway.*” One attendee stated that they are often forced to get off US-23 and take back roads home.

Some attendees agreed that in order to solve the problem of congestion, the bottleneck should be moved further north. They explained the Flex should have been extended all the way to I-96 when they built the bridge over the Huron River. They also mentioned that there should be longer exit lanes to encourage people to exit earlier.

5. Signaling on Lanes

Most attendees agreed that there should not be a solid yellow line between the main highway and the opened left shoulder or Flex lane. It leads to confusion when they need to switch lanes, especially because it is against the law to cross a solid yellow line elsewhere in the state.

The solution the participants mostly agreed on was to replace the solid yellow line with a dashed white or yellow line because it is the national norm.

6. Design of Flex

Participants questioned whether the Flex was durable enough to handle more traffic. They agreed that heavy vehicles like tractor trailers should not use the Flex. One participant said that the merge point on the southbound side (past the rest stop going towards Ann Arbor) has a concrete barrier that coincides with the merge point. They explained this was not a good design because it

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could cause a crash. Another participant mentioned that when they merge on at Barker Road, the Flex does not take them to N. Territorial. Finally, what worried another participant was that if MDOT fixes anything, there would be inconsistency in terms of their mix of concrete.

Participants agreed that there should be a concrete barrier throughout the Flex between opposing lanes of traffic. One of the participants talked about when a semi-truck crossed over into oncoming traffic, because of the absence of a concrete barrier, which resulted in fatalities. Most agreed that the concrete barrier was not extended far enough. They believe it will continue to cause crashes.

But the final merge point should not end in a concrete barrier. Instead, there should be some space after the final merge point as a shoulder. Another attendee would like to see the concrete barrier extend as far north as possible. While another would like four lanes from US-23 to I-696, and yet another wanted the road widened and taken to Clyde Road.

7. *Non-compliance*

Most attendees agreed that people ignore speed limits when the Flex shoulder is open. A couple noted having seen trucks drive in the Flex, despite that being prohibited. Most participants, however, agreed that people usually do not drive on the Flex when a red “X” is displayed above the lane.

As a solution, most participants agreed that people should get ticketed for improper lane usage.

8. *Off-ramps*

One person explained that the visibility on some of the off ramps is terrible. They believe it was the difference in elevation and the road design that caused this. As a solution to the visibility problem, an attendee mentioned the possibility of having a mile-long exit ramp so people getting off could do so earlier. The same person said it needs to be the same at North Territorial.

What Works on the Flex route?

Most attendees agreed that the Flex lane is phenomenal during rush hour. One person explained that southbound works the best because the increased number of lanes has eliminated all bottlenecks. Another person explained there is less congestion near the airport in the evening. Another attendee said that traffic is now flowing to I-96, when in the past it had been slow-moving. Additionally, someone mentioned a sign northbound, near Whitmore Lake, that warns people ahead of possible crashes; the signs then display a slowly decreasing speed limit as drivers approach the crash site. Overall, the participants shared a similar view on what works on the US-23 Flex lane.

Conclusion

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We concluded that the most important issues with the Flex lane are the uncertainty over advisory speeds on the gantries, how fast people drive the Flex, and the merging issues. Specifically, it is recommended:

1. Moving the end of the Flex lane away from the concrete barrier: leave some room on the shoulder for late mergers and to encourage early merging through “mumble-to-rumble” strips.
2. Remove the green arrow above the Flex: either post “60 mph” or keep gantries blank.
3. Enforce speed limits especially on the Flex lane.
4. Extend concrete barriers along medians of the Flex.
5. Change solid yellow lane marking to white dashes on stretches where switching lanes is allowed.
6. Post the 60 mph speed advisory as yellow permanent signs next to the Flex instead showing it on the overhead gantries.

If these suggestions are followed, the participants believe the safety and the performance of the US-23 Flex can be improved.

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Summary of Brighton focus group

Michigan State University's (MSU) Department of Urban and Regional Planning convened a focus group on behalf of the Michigan Department of Transportation (MDOT) to explore the performance and safety of the first Flex route in Michigan, located on US-23 from north of Ann Arbor to Whitmore Lake. MDOT's goal is to evaluate the challenges and successes of the Flex lane and come up with solutions for said challenges based on public input. These potential solutions will be considered for US-23 and in the design and operation of future Flex routes.

Background

In November 2017, MDOT opened the first Flex lane in Michigan on an 8.5-mile section of US-23 between M-14 and where M-36 meets 9 Mile Road (MDOT, 2017). The Flex is a dynamic lane, meaning it uses variable speed controls and queue warning systems. Other states and European countries have successfully implemented Flexible travel lanes. The lane is an attempt to clear congestion during peak commute times in the mornings and afternoon, as well as during crashes. Before the Flex's introduction, people often experienced delays and were frustrated about traffic congestion during peak commute times. Since the introduction, there have been mixed perceptions regarding its efficacy. In order to learn what commuters thought about the Flex, one focus group was conducted in Brighton.

Methods

Dr. Kassens-Noor, the lead investigator on the project, sent an open invitation via a flyer to everyone who had emailed MDOT with comments regarding the Flex. In addition, an email was sent out to those in the city government along with those connected to the Brighton Chamber of Commerce. As a condition of their acceptance, respondents were asked to describe their driving habits. Those who responded were given the location of the focus group. Five people responded with several helpful comments but did not want to attend the meeting. Their driving habits were as follows. One woman lives in Brighton off Lee Road and US-23. She has been commuting to Ann Arbor and back on Mondays through Fridays, for over 5 years. Another woman drives daily from Howell to either Ann Arbor or Ypsilanti. A man who lives in Brighton and takes Whitmore Lake Road up to M-36 and merges onto the highway and then the Flex. The last two were a married couple and commonly drive the Flex.

We recorded each participants' driving habits and generalized age. Thirteen people attended the focus group, their descriptions and driving habits are as follows. One was a senior man who is the supervisor of the Charter Township of Brighton. He drives US-23 SB from Brighton to Ann Arbor in the mornings and back home on NB three to five days per week. A middle-aged woman who did not give her affiliation, though she lives in Brighton and works in Ann Arbor, she drives US-23 every morning and evening, Monday through Friday. A middle-aged man who also did not give his affiliation, he lives in Hartland and works in Ann Arbor, driving US-23 from M-59 to M-14 five days per week. Another middle-aged man who did not give his affiliation, he drives US-23 daily from Brighton to Ann Arbor and back. A third middle-aged man, living in Brighton, who drives US-23 from the Lee Road entrance ramp to M-14 West in Ann Arbor on his commute to and from Brighton to Chelsea, on weekdays. Another middle-aged man who drives the route daily at 6 am and 3 pm and various other times throughout the week. A middle-aged woman who did not give her affiliation nor describe her driving habits. Another middle-aged

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woman, who is a Brighton City Council Member, drives the Flex four or more times a week. A third middle-aged woman who drives the Flex toward Ann Arbor twice a week. A middle-aged man associated with the MI-SBDC, who lives in Whitmore Lake and uses the route every morning headed towards Ann Arbor, and back in the evening. Another middle-aged woman drives the US-23 Route from Brighton to Ann Arbor three days per week, during non-peak times. A middle-aged man who is associated with the University of Michigan, he drives from Brighton to Ann Arbor and back, every day, and has done so for over 6 years. Lastly, a middle-aged woman has been driving the Flex forth and back to Ann Arbor for medical purposes.

The meeting was at the Brighton Coffee House and Theater in Brighton. The focus group was audiotaped with two recording devices positioned at either end of the table.

We asked the participants three main questions during the course of the hour and a half long discussion.

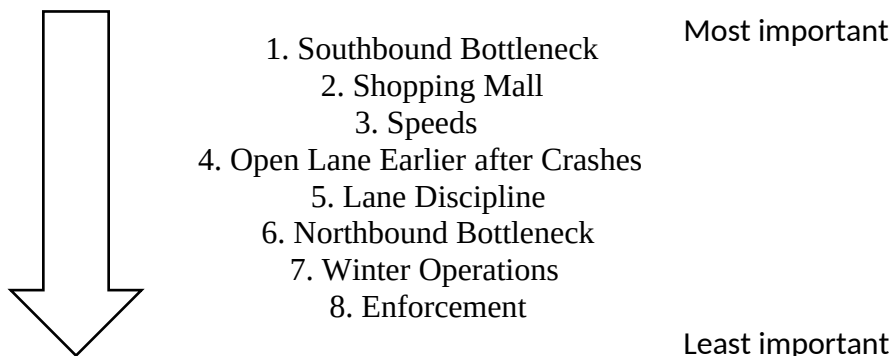
1. What does not work on US-23?
2. How can we fix it?
3. What works for you on US-23?

Methods for note-taking and data analysis were retrieved from Onwuegbuzie et al (2009). It was recorded whether one, some, or most of the participants agreed with whomever was speaking at the time. The word “some” meant two-three participants agreed. The word “most” meant four to five participants agreed. An agreement was indicated by a nod of the head or a verbal “yes.” Constant comparison analysis was used to group the data into eight categories of problems addressed with their potential solutions (Onwuegbuzie et al, 2009).

To determine the relative importance of each of the categories discussed, it was examined how long the participants spent on each topic and how many attendees were in agreement. Next, topics were ordered by importance from most to least. The discussion was further analyzed to turn it into a structured narrative mixing concerns with potential solutions. Problems discussed and any solutions suggested were listed in order of importance.

Concerns with US-23

We found seven categories of problems and solutions and ordered them in a table based on how long participants spent on each topic.



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Participants were asked what does not work about the Flex first and then they offered solutions after each issue was discussed.

1. Southbound Bottleneck

Regarding the merge from I-96 EB to US-23 SB, some attendees agreed that the collector lane on I-96 EB is a dangerous area. One person explained that when the Flex first opened there were numerous crashes. However, another attendee argued that the area has actually become safer because people now drive at 5-10 mph instead of 60 mph (Figure 1). A couple of participants further noted that the backup extends to even Spencer Road. One person noted that another reason the area is dangerous is that the right lane of I-96 EB backs up as people wait to exit onto US-23 SB (Figure 2). A participant agreed saying “*I have seen vehicles **stop** in the middle lane of 96 trying to merge into the waiting lane and almost be rear-ended by drive-through traffic.*” One possible solution would be an extra “acceleration lane” plus an additional lane to give people a mile to accelerate off from I-96 EB to US-23 SB. Another person agreed saying there should be three lanes from EB-96 to US-23 SB.



Figure 1. This picture shows the collector lane from I-96 EB to US-23 SB.

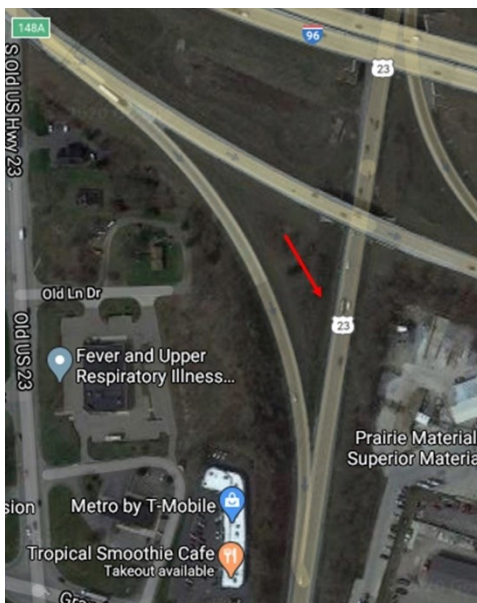


Figure 2. This picture shows where the right lane of I-96 EB backs up to allow people to merge on to US-23 SB.

There was some agreement about congestion at M-59 and I-96 near Howell. Participants also noted that traffic stops at the M-59 bridge (where M-59 WB turns into I-96 EB) on Fridays until 7 or 8 pm. The attendees agreed that traffic clears from M-59, as one approaches I-96. This may be because as drivers come over the hill (M-59 Bridge) they can then see where people are merging in from I-96. Because of congestion, drivers must quickly accelerate from a dead stop within a quarter of a mile (Figure 3).

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Figure 3. This picture shows M-59 bridge over I-96 and the entrance ramp onto EB 96, where one goes from 0 to 70 mph.

Some attendees agreed that the entrance onto Old US-23 from Spencer Road needs to be fixed. One person explained that Old US-23 needs to be wider at the merge (Figure 4). Some attendees agreed there is not a problem with the oncoming traffic from Spencer Road going east to I-96 EB. If people see the congestion, they will not merge onto US-23 (Figure 5). Another attendee noted that the area “*helps me decide which way to go to Detroit because that area is very dangerous.*” Because of backups affecting I-96, drivers must reduce their speed from 70 mph to 0 mph, right before the entrance lane.



Figure 4. This picture shows the entrance onto old US-23 south from Spencer Rd WB.

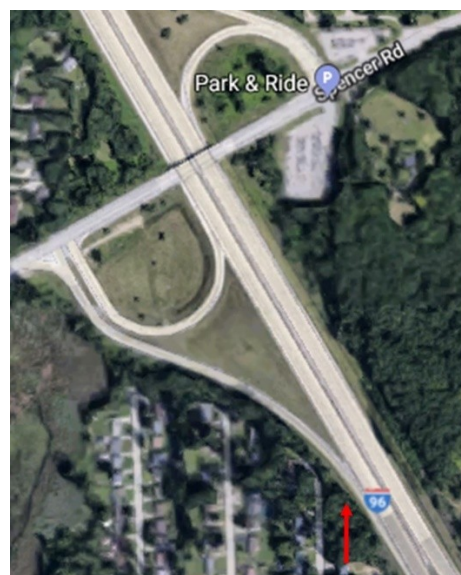


Figure 5. This picture shows the entrance onto I-96 EB from Spencer Rd, which continues east and is where Spencer comes to a dead stop from 70 down to 0.

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Attendees presented two solutions. One mentioned that there should only be one lane when merging onto US-23 NB from Spencer Rd; it should be the same lane as those going SB on US-23. Another participant suggested that there should be an extra acceleration lane and to widen the road.

A couple participants agreed that the issue arises when one exits at Spencer Road. One participant explained that it was impossible to get on NB-23, then get on at I-96 WB, and finally exit at Spencer Road WB (Figure 6). The heavy traffic in the area where I-96 EB merges on to US-23 SB affects I-96 up until Spencer Road. The same attendee's solution was to exit earlier at Lee Road. A second person countered that the additional lane at the exit ramp allows the driver enough time before merging. It is located where US-23 NB turns into WB-96 and exits onto Spencer Road WB (Figure 7).

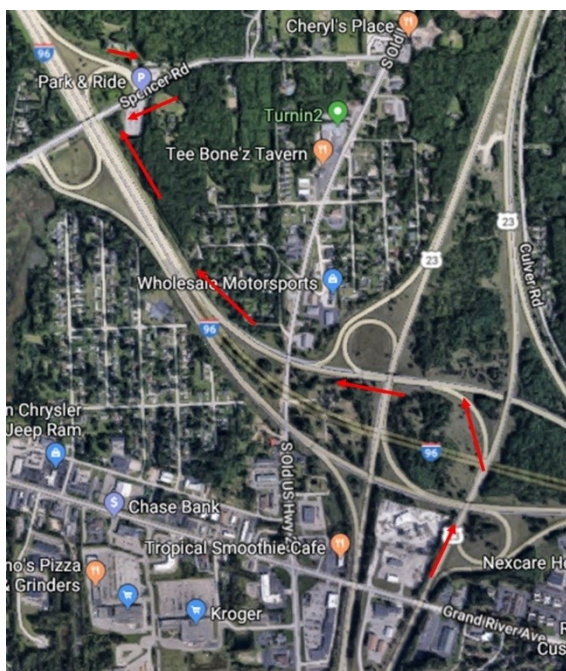


Figure 6. NB US-23 to I-96 WB to Spencer Rd WB.



Figure 7. This photo shows the merge onto Spencer Rd east off I-96 WB.

2. Shopping Mall: Traffic Conditions at Lee Road and Green Oak Village Place

Most attendees agreed that traffic is extremely heavy where Lee Road merges onto US-23 SB. *“There are people coming from the left and right, because of all the doubling to the left side and people merging in”* (Figure 8). One person noted that as the afternoon progresses, the traffic gets worse, especially because drivers cannot merge. Another person experienced this traffic until 9 Mile. A third attendee stated that the side streets, Fieldcrest and Whitmore Lake Road, are also affected.

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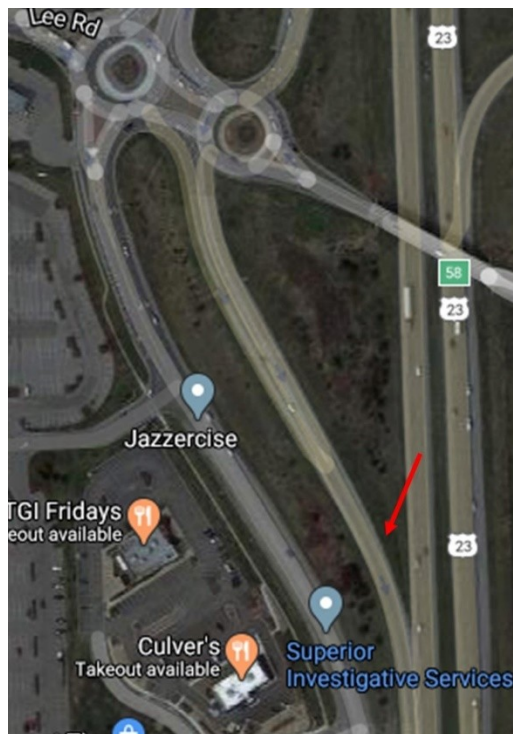


Figure 8. Entrance ramp onto US-23 SB from Lee Rd roundabouts.

There was some consensus that instead of extending the Flex lane to I-96 past the M36 bridge there could be a left lane exit ramp, opening up into a third lane at Lee Road in order to give a person a mile to merge. Reconfigure the Lee Road exit ramp by building a northbound US-23 exit ramp south of the Lee Road and removing the spiral ramp. This would reduce conflicting US-23 lane changes from the far-left Flex lane to the exit ramp in the area where the Flex lane is dropped (Figure 9). One attendee was concerned that there would still be an issue because people would still only have a short distance to accelerate.

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Figure 9. This picture shows the Lee Rd Bridge, and the merge onto Lee from US-23 NB. where participants agreed to drop a ramp instead of a ramp that comes from the north and crosses over traffic.

Another issue some participants agreed with was that people from out of town, or shoppers, are not used to dealing with the traffic and the three roundabouts at Lee Road across from the Green Oak Village Place. *“Shoppers go the wrong way, stop in the middle of traffic and go different speeds because they do not know how the Flex, and the roundabouts work.”* A proposed solution was to have signage explaining how to use the roundabouts and Flex lane.

3.Speeds

Most participants agreed that there is confusion about the advisory speed limit of 60 mph on the Flex. They noted that the signage on the gantries is confusing. Specifically, most attendees agreed that people are confused about what the numbers represent. Dr. Kassens-Noor then asked all the participants directly what they thought the speed limit of 60 mph meant. Seven attendees thought it meant 60 mph and seven thought it meant 70 mph. She then asked what the speed limit was when a green arrow was above the lane. Three people said 60 mph and 10 people said 70 mph.

A suggested possible solution to this problem was to change the signage on the gantries to more clearly indicate the speed limit. A solution to the advisory speed problem that most people agreed on was to have a green arrow instead of the “60.” They also mostly agreed that it would be good to have the signs read “slow down ahead” during a crash or if traffic ahead has stalled. Some attendees presented the idea that “advisory speed” be displayed on the gantries, which would help clear up any possible confusion. One participant suggested putting up a solid green arrow above lanes which had clear traffic. A different attendee would like to have green arrows when all three lanes are free of traffic. That same person suggested putting a yellow arrow over the blocked lane. Though, another attendee countered that by saying one should not do that unless all three are slowed down. The other lanes would just get backed up.

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Most attendees also agreed that there is an increased speed differential which causes problems. One person explained a situation where *“there was no traffic, it was flowing nicely and the speed after the rest stop said 40 mph, and next it said 30 mph,”* as seen in Figure 10. Some people agreed with him that that was a common occurrence, which caused traffic to slow. But frequently, drivers did not see a need to reduce their speed to what was displayed.

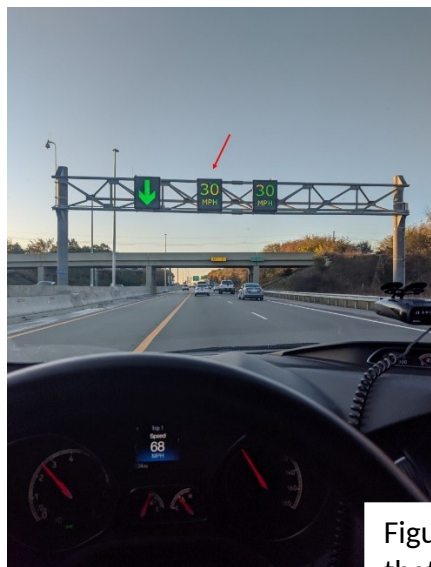


Figure 10. Gantries after the rest stop that changed to 30 mph from 40.

A suggested solution was to put up a message on the gantries and change the speed limit to 50 mph before decreasing the speed further so that the change is less sudden.

Another issue some attendees agreed upon was the merge on northbound. One participant explained that *“as one approaches the left lane, there will sometimes be a slow car in what is becoming the middle lane. This person gets over as soon as they can but prevents the people behind them from getting into the lane and passing, since the person is driving too slow.”*

4. Open Flex lane earlier after crashes occur

Some attendees agreed that it takes at least 40 minutes for the Flex lane to open when there is a problem, if it is opened at all. They also agreed there is a lag in the summer, implying that the lanes should be open sooner due to the increased traffic volume. Attendees also noted that the Flex does not always open when there is traffic. A couple participants explained that *“it’s frustrating to see an open lane that you cannot use.”* Some people agreed that this happens fairly often.

Some participants agreed that there should be design changes on US-23. A couple of participants asked for the Flex to be extended further north, or to convert US-23 NB into a three-lane highway full time, so that they would not have to worry about whether or not the Flex is open. Another participant just wanted the Flex to be open 24/7.

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Some attendees noted that Fridays are often an issue when driving on US-23. Attendees noted that they were unsure when the Flex opens on Fridays, and some avoided it altogether. Some attendees agreed that a possible solution would be to extend the hours of operation northbound, especially on Friday evenings.

It is problematic that the Flex lane does not open until after 9 Mile where M-36 ends.

5. Lane Discipline

Most attendees agreed that people merging too early results in parts of the highways being unused. However, one attendee noted that by merging earlier, it makes them less nervous. Going on M-36 southbound, a participant explained *“there is almost a mile for people to accelerate if they do not panic.”* As a result of these behaviors, the same participant explained, with most attendees agreeing, they have their own *“private lane”* from M-36 to 8 Mile Road. Most also agreed that people move to the middle lane immediately even if they have a whole mile. This leads to the right lane being frequently vacant.

Some attendees agreed that exiting US-23 NB Flex lane is very dangerous at the merge point, frequently resulting in crashes. People often wait until the last minute, creating massive backups. Additionally, attendees noted that drivers will drive on the shoulder to the Silver Lake Road exit since they do not want to merge.

Another issue most people agreed on was that drivers do not understand the zipper method. One person noted that the zipper method has to be used by law in construction zones. Some agreed that for zipper merges to work, both lanes, the exit/entrance ramp, and the main lane have to be moving at the same speed. One mentioned that the method is not taught in driver’s education classes. Some participants agreed that one solution would be to teach people more about the method, especially when and where it should be used. Another solution would be a sign on the gantries explaining the zipper method, and perhaps a web address to an informational page.

A third issue is non-compliance by trucks. Some participants agreed there needs to be clarification on the “no truck” rule. There have been semi-trucks, large motor homes, busses, and construction vehicles with trailers.

6. Northbound Bottleneck

Most attendees agreed that traffic is slower and there are more crashes as a result of increased traffic between I-96 EB and the M-59 exit. There are significantly more slow-downs and crashes because there is more traffic NB and it is narrowing to two lanes. There are no exits for six miles on this stretch of highway, making it impossible for drivers to exit.

Another issue that some attendees agreed on was the existence of a bottleneck on US-23 NB. An attendee explained that drivers are stopped after M-14 until North Territorial Road or 6 Mile Road as well as on US-23 SB from Lee Road. Another attendee noted that *“NB is a complete mess since traffic is a nightmare. For example, every day there is a crash between 8 and 9 mile and even to Silver Lake Road. The traffic congestion causes fender benders.”* The attendee

US-23

continued the discussion by explaining more about the area between Silver Lake Road and 9 Mile Road going south. On that section of road, the traffic will come to a complete stop at 9 Mile Road, even though it was flowing well before then despite the extra lane. Some attendees agreed that this was caused by the merge. One participant mentioned it was a result of drivers anticipating the start of the Flex.

Some attendees agreed that the Flex lane should continue up to I-96. Another attendee mentioned that there is now actually more traffic on northbound US-23 even though that area only has two lanes.

All suggested to extend the Flex lane to I-96 if funding allows. Extending it may prevent crashes. The Flex lane would continue through the ramp once extended to I-96. Additionally, participants suggested adding another exit between M-14 and N. Territorial or 6 Mile to relieve congestion.

7. Winter Operations

Most attendees agreed that US-23 and the Flex suffer from dangerous snow and ice conditions during the winter months. Attendees noted that the Flex lane is often not cleared of ice and snow on winter mornings. For example, most participants agreed that *“if there is a light snow overnight, then at 6 am, even at 8:30 am, it is treacherous to drive on.”* One person explained they had gotten onto the Flex, noticed how poor the road conditions were, and then immediately merged back into a regular lane. Another person mentioned that there needs to be better drainage during rainy or snowy conditions. A solution proposed was to have the Freeway Courtesy Patrol clear the Flex by driving on the shoulder first and activating the salt.

8. Enforcement

Some attendees agreed that there needs to be better enforcement of traffic laws in the Flex lane since *“80% of people travel in it.”* One participant said it should be used only for passing. Instead, people often drive in it all the way to Ann Arbor. The lane also suffers from aggressive drivers. Another person explained that there is an ongoing campaign to create awareness for what the left lane is supposed to be used for. Some attendees mentioned that they heard about it on the news, that one should *“move over or get pulled over.”* However, participants also agreed the Flex is really hard to enforce because it is difficult to know how long a person has been in the left lane. Additionally, it may be easier for police officers to focus on enforcing the speed limit. One attendee recalled a time when they saw a lone motorcycle hogging the left lane, backing up traffic, and causing other drivers to drive recklessly.

Another participant said that people slowing down in all three lanes to speeds of about 60 mph cause other drivers to gradually slow down behind them in a ripple effect. Thus, most agreed that having law enforcement present during peak congestion times is unproductive; it just causes people to drive even slower. A solution some agreed on was to have a police car pass through the area instead of stopping at one side or another.

What Works on the Flex Route?

US-23

Next, attendees explained what they think works about the Flex. Most agreed that it is helpful since the congestion has been reduced significantly. Some agreed that US-23 SB has been greatly improved in the morning, including fewer crashes. A few attendees agreed that the “*emergency pull-outs are great.*” Another said the merge from US-23 NB to I-96 WB to Spencer Road WB is a lot better. It offers more cruise time. One person mentioned after the introduction of the Flex, their travel time had been cut in half where it took him 45 minutes to Ann Arbor. Another mentioned that the signs are useful, especially when they warn of road conditions ahead.

Conclusion

We concluded that the most important issues with the Flex lane are the southbound bottleneck congestion, traffic conditions around Lee Road and Green Oak Village Place, and recommended gantry speeds.

Specifically, participants recommended to:

1. **Add an extra acceleration lane and widen the road:** to accelerate onto US-23 NB from I-96 EB.
2. **Reconfigure the Lee Road exit ramp:** by building a northbound US-23 exit ramp south of the Lee Road and removing the spiral ramp.
3. **Put a green arrow and “slow down ahead” on gantries:** these indicators would replace the advisory speeds of 60 mph and the stacked 10 mph decreases when an incidents happened on the Flex.
4. **Set up automatic lane opening thresholds:** should be set to alleviate congestion before it forms.
5. **Extend the Flex lane to I-96 if funding allows.**
6. **Install an informational sign on gantries explaining the zipper merge method:** educating drivers would help them understand it better.
7. **Have the Freeway Courtesy Patrol drive on the Flex lane after salt trucks in winter:** by driving on the Flex lane first, the salt is activated and will create safer driving conditions.

Another important suggestion that most participants agreed on was to educate drivers through their township hall, newsletters, social media, printed literature, and signs on the road. Most participants also suggested there should be enforcement in the left lane to control its use. For example, if a pace keeper was to travel in the Flex lane traffic flow would be consistent across the three lanes.

If these suggestions are followed, the participants believe the safety and the performance of the Flex can be improved.