



Webinar Transcript:

FHWA Safe Pedestrian Crossings at Transit Stops

April 19, 2018

RACHEL BEYERLE: Good afternoon, everyone. Today our presenters are going to discuss how people can cross to and from transit stops safely. This webinar is part of a series focusing on pedestrian safety by the Safe Transportation for Every Pedestrian (STEP) program which stands for Safe Transportation for Every Pedestrian. My name's Rachel Beyerle, and I'm communications director with the National Aging and Disability Transportation Center. We're hosting today's webinar in conjunction with the Federal Highway Administration. Now I'd like to turn it over to my colleague Ken Thompson who is a Technical Assistance Specialist with NADTC, and he'll review the housekeeping items before our webinar.

KEN THOMPSON: Hi, everyone. We have a few quick housekeeping items before we get started. This session is being recorded and will be available as an archive on the NADTC website (www.nadtc.org). Closed captioning is available to today's session, and you can access captioning by clicking on the CC icon on the top left of your ballooning board screen or the keyboard command plus F8. We'd like to thank our captioner for being with us today. If you're connecting today by phone and the webinar room, please ensure your computer speakers are muted at this time to eliminate any potential feedback. To submit questions, which can be done at the end of the session today, you can either enter your questions to the chat box if you're in the webinar room or e-mail your questions to contact@nadtc.org. As a reminder, the chat session is public. We'll address as many questions at the end of the webinar as is possible. If you're having technical difficulty connecting to the webinar or hearing, contact us at the e-mail

address contact@nadtc.org , and as I said, you may submit your questions throughout the session today. All right, and we're going to do a quick poll during this session. You're going to be clicking on the letter A, B, or C to tell us how many people are viewing at this time. So if you look at that little letter A on the left-hand side, if you click the letter A it's one to three people, the letter B four to six people and the letter C, seven or more people. We'll give you a chance to vote. So if you look at the letter -- look at it on the left side, look at the letter a again, like to get a few more votes coming in. Click on a, b, or c. A few more in. Let's look at that, there come some more votes. It looks like the highest number is the letter a, one to three. And a few more coming in. We think we're good on the poll. Letter A has the most. So one to three, so the numbers are either singles or a few other people are viewing today.

RACHEL BEYERLE: Thank you so much, Ken. And in addition to myself, also on the webinar today are Carol Kachadoorian from Toole Design Group, and we also want to recognize Becky Crowe from FHWA. Becky is here to provide the official welcome. Thank you, Becky.

BECKY CROWE: Well, thanks so much. Good afternoon, everyone, I manage the STEP program at the Federal Highway Administration and on behalf of FHWA I want to thank everyone for participating. I'd especially like to thank Ken and Rachel and the national center for partnering with us to provide information on STEP. We hope you enjoy the webinar and please don't hesitate to contact federal highway if you have any questions after the webinar's over about STEP. Thanks, Rachel.

RACHEL BEYERLE: You're welcome. And before we launch into talking about the National Aging and Disability Transportation Center, I just want to mention the purpose of today's webinar is to share information on safe crossings and we're also going to be discussing counter measures that can be used for transit access. We're going to focus on uncontrolled crossings and also the transit agency experience regarding STEP countermeasures. And we'll be sharing information about how you can find out more about the STEP program. As we mentioned, we'll have a question-and-answer session period at the end of the webinar where you'll have the opportunity to use the chat box or e-mail to post your questions to us. And with that I'm going

to go ahead and get started by providing an overview about what we do at the National Aging and Disability Transportation Center. A little bit about the NADTC.

We are a technical assistance center, and we're funded by the Federal Transit Administration, and co-administered by Easterseals and the National Association of Area Agencies on Aging. The center was established in 2015 so we've been active for three years now. We offer training, resources, and publications. We have a toll-free hotline and information and referral. Our primary audience at NADTC includes older adults, people with disabilities, caregivers, and professionals such as yourself who serve older adults and people with disabilities. Particular focus areas for us include public and private transportation, ADA accessibility, community livability, pedestrian safety, travel training, and driver transition. You can find a variety of resources on the NADTC website which is www.NADTC.org. And we have a number of pedestrian topics, if you go to the website, in the search box you can type in "pedestrian," and the type of things that will come up will be our guide on accessible pathways. We have a number of walkability audits and transit assessments, and a driver and pedestrian guide. We also have archives Twitter chats that we've done in the past, and I'll talk about that a little bit later in my presentation. We also have a guide on snow removal and wayfinding.

So when we start to discuss pedestrian accessibility at crossings and transit stops, what are the type of elements we're going to mention today? First and foremost, from an accessibility perspective, with new projects and reconstruction, if you're installing features such as sidewalks, curb ramps, detectable warning surfaces, signals and markings, these must meet ADA requirements. The type of treatments that you may use include visible and audible pedestrian signals, mid-block crossing treatments, pedestrian refuge islands, barrier removal and other means to raise driver awareness and our presenters are going to go into detail about those treatments. While the ADA itself may not require these particular features, if you do install them what you install must be ADA-accessible.

Another thing I do want to mention as we're talking about physical infrastructure is that we

want to think not only of pedestrian facilities that serve those with physical disabilities, but also those who may have cognitive disabilities or perhaps have a condition such as dementia. Using the photo in the slide is a particular example, you notice it's a distinctive glass building with some color on it and structures such as this, colors, sculptures, and fountains—those are all landmarks or wayfinding elements that can be used to help serve as prompts in the pedestrian environment for those who have cognitive disabilities. All right.

When we talk about accessibility, we also want to mention that it goes beyond just the physical infrastructure itself. Pedestrian infrastructure decisions, as we know, are local in nature and they need to include an inclusive community input from older adults, students and people with disabilities. Those who regularly use your walking routes should be at the table along with the other transportation modes during the public engagement process. Walking assessments and audits are common ways to receive feedback on plans. The photo in this particular slide shows a transit stop and a bike rack surrounded by snow. Another thing that we try to emphasize is that when you're doing assessments and audits, take weather into consideration and the conditions for your part of the country into consideration as part of your audit and assessment. It's not just a summertime activity. It's about year-round ability. So accessibility refers to the entire process that's being used to plan, design, and build physical facilities, not just the ADA features of the facilities themselves.

Accessibility decisions may be local, but the conversation is definitely national in scale. The NADTC, along with other partners such as America Walks and the Safe Route Partnership periodically host Twitter chats on walking. We hosted a #SafeWalking Twitter chat last year and there are some example graphics that we used to help market that Twitter chat shown on your screen, and we recently co-hosted the February 20th #SafeWalks Twitter chat with America Walks and other organizations. If you haven't participated in these Twitter chats, we recommend you get involved. These are online discussion and it's a great way to find out about national initiatives, meet your peers in the field, and receive downloadable references like links to publications. You can go to Twitter and search by #SafeWalks or you can visit the NADTC

website and you'll find an archive of the most recent chat. Before we move into the STEP and hear from our local organizations, I'd like to leave you with a quote. "Transit users are pedestrians either on foot or wheelchair or other assistive device on at least one end of their journey." In short, you can't get there if you can't get there and that's the reason why we're all here and why access to transit should be both safe and accessible. That's an introduction of what we do at the National Aging and Disability Transportation Center, and we're now going to jump into more detail about STEP and our local examples.

Joining us today is Carol Kachadoorian from Toole Design Group, and Carol will provide a brief overview of STEP and the five or six countermeasures that form the core of the program. Carol is going to introduce the guest speakers along with Ken Thompson. Carol, over to you.

CAROL KACHADOORIAN: Thank you very much, Rachel, I'm pleased to be here and see we have so many folks joining us. I want to start with a question about why pedestrian safety is so important. It is because pedestrians are perhaps the most vulnerable road users based on how much they weigh and the exposure that they have when they are particularly crossing the street. This vulnerability increases exponentially with vehicular speeds and that's why slowing speeds at locations where pedestrians cross is so important. As this graph shows there has been a steady climb in pedestrian fatalities for the past few years, that's why FHWA has made it a priority through the STEP program. Next slide, please.

So this says 72% of pedestrian fatalities occur at non-intersection locations. Typically, this is along transit routes and that means they're at mid-block or uncontrolled locations where there are companion bus stops that a transit user is walking to or from at one end of their trip and so the STEP program and FHWA is working specifically at non-intersection locations and along transit routes. Next slide, please.

And that's why this webinar focuses on transit service. These are some examples of bus stop placement that puts pedestrians using the bus at risk, and so let's go to the next slide and briefly talk about some of the countermeasures. These are called the fabulous five: crosswalk

visibility enhancements, raised crosswalk, pedestrian refuge island, pedestrian hybrid beacon, and road diet. And note that there is a sixth one that is a rectangular rapid flash beacon which is making reappearance. Next slide, please.

I'd like to orient you first to the graphic that you'll see here. And this is on the technical sheets available on the STEP website. These are conceptual graphics. And they are really meant to help visualize, but they're not design level so I want to make that clear. The callouts that you see for the signage are referenced in the manual of uniform traffic control devices, the MUTCD. And so when you're using these to get a sense at what you want to do at an uncontrolled crossing consult it as well as any other standards. The blue text has a percentage for crash reduction factors and that is the percent reduction that might be expected after implementing a given countermeasure at a specific site. For example, installing a center line rumble strip on a two-lane roadway can reduce crashes by 14%, and 55% crash reduction specifically for head-on crashes so that's how those crash reduction factors work. For this countermeasure, this one is on **crosswalk visibility enhancements** and this one shows the high visibility crosswalk, in other words, the striping is very visible to both pedestrians and motorists and bicyclists and it's combined with a curb extension. That curb extension brings the curb into the roadway, and it shortens the crossing distance. It also restricts parking, or if we can say it more positively, it establishes limits on curbside parking to ensure pedestrians are visible to motorists when traveling in the crosswalk. So that's the first countermeasure.

Let's go to the next slide, please. The next one is a **raised crosswalk**. And you'll see that this has a crash reduction factor of 45%, a pretty strong measure. This shows the same effective distance as a curb extension but, again, that raised crosswalk makes pedestrians more visible, the raised crosswalk has the high visibility striping. Let's go to the next slide, please.

The next countermeasure is a **refuge island**. So if you can see a theme here, we are shortening crossing distances and we're making pedestrians more visible. Another way to shorten crossing distances is to put in a refuge island, also called a center median, and what it does is it reduces

the number of lanes that a pedestrian crosses at any given time that allows the pedestrian to cross one lane in this example, go to the center and check before crossing another lane. This reduces pedestrian crashes by about 32%. Next slide, please.

This is our friend the hawk signal, formerly called the **pedestrian hybrid beacon** and the crash reduction factor here is 55%. I suspect that many of you have recommended the hawk or have used a hawk, and it does require motorists to stop when the lights are flashing. There is typically instructions for the motorist to know when -- because sometimes the light flashes red and sometimes it's a constant red so the instructions that are visible to the motorist need to be simple, clear, and easy to understand. And this countermeasure uses an advanced stop bar where the motorists need to stop behind in order to make sure pedestrians are visible and have a clear pathway to cross. Let's go to the next slide, please.

This last one is a **road diet**. And it's the change in the roadway that reduces the number of motor vehicle travel lanes, but in most cases it adds two bike lanes. Now, based on the evaluation of many road diets across the country we know that all types of crashes go down with road diets. Average travel speeds go down, particularly for motorists, but their travel time along the corridor tends to remain constant. And motorists tend to continue to travel on road diet streets not going through nearby neighborhoods. Pedestrian crashes tend to go down as well as do bicycle crashes. Now, one thing I want to point out in these examples, this has a crash reduction factor of between 19% and 47%, so they are very effective. One thing I want to point out in this example is, and it's been in the other examples, is lighting. You'll see that this light is placed before the crosswalk by about 10 feet. It is not directly over the crosswalk or after it because that tends to make pedestrians using that crosswalk during low-light times as less visible to approaching motorists. So those are the five countermeasures. Next slide, please.

I'd like to also share with you a new guide that FHWA published in January. It's a guide for improving pedestrian safety at uncontrolled locations. (Title: Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations) It's based on a six-step process that will help you

determine which of these countermeasures or elements of them can be used at a particular crossing location. It's especially useful to help you when you're working with local and state transportation staff. And one of the benefits of having presentations from these three transit agencies is you're going to hear exactly how they do that. Let's go on to the next slide, please.

So importantly, there are three things to think about when you're working with your transportation agency, is the street a locally owned road or a state-owned road so you want to make sure that you're contacting the right person, whether it's a safety engineer or pedestrian coordinator. You also want to take a look at the crash history. You want to research crash data and maps, probably try to map those crashes, and if you see that they're along a particular corridor or there are transit stops, take a look to see if they're at formal pedestrian crossings or at the ones that are uncontrolled. And then you'll want to create a plan or conduct a field review, and there are different ways to do that with walk audits and road safety audits and access to transit plans. Next slide, please.

This is one guide that FHWA has, but there are other resources. Here are four that are specifically related to pedestrian safety. And three of them are for transit service specifically. So go to the FHWA website and you can find these resources. Next slide, please.

Again, I want to give you the contact information for the folks that manage the STEP program. Becky Crowe and Peter Eun. You will have these slides if you don't have them already with links and all of the resources so please keep this in mind. Now, I want to introduce today's presenters. Next slide, please.

We're really getting to the heart of this webinar. We are fortunate to have three transit agencies represented. From Valley Metro in Phoenix we have Sarath Joshua and Jay Yenerich. They are going to be talking about the light rail system in Phoenix. From WMATA (Metro) in Washington, D.C. we have Aaron Overman, who will talk about safe pedestrian access at bus stops. And from GRTC in Richmond, Virginia, we have Ashley Mason, talking about a very

exciting project in Richmond, their new BRT service called Pulse. With that I'll turn things over to Sarath and Jay. Thank you.

SARATH JOSHUA: Thank you, Carol.

JAY YENERICH: Thank you.

SARATH JOSHUA: Good afternoon. I'd like to thank the organizers for inviting us to present on how the Phoenix metro region is addressing safe pedestrian access to transit. This is not an easy topic to present given the recent statistics in the deaths in the region and the state. Last month the Arizona governor's report reported that highest rate of deaths is double the national average. We do have a lot of challenges to overcome in making our road safe for pedestrians. We're aware of this system and are working on it. My co-presenter Jay and I will share information on what's being done to address this problem. Next slide.

We have a system that's very efficient and vehicles are very fast. I mentioned that speeding is common out here, and it goes well beyond the freeway system. We have an arterial road system with a mile square grid system with roads. Straight roads are great for speeding. We have lots of capacity for moving vehicles fast which makes unprotected street crossing quite risky. For most of the year we have perfect weather for walking or biking except for the months June through July when peak temperatures run 110 to 115 Fahrenheit. The chart at the bottom right shows the pedestrian crash totals for the five years ending in 2016. You can see the drop in the summer months mainly due to reduced walking and pedestrian exposure. The chart at the bottom left shows pedestrian crashes for this same period. The red line represents all fatal or injury crashes, 60 to 70%, higher for mid-block crashes, 70% of the crashes end up in fatal injuries. Visitors, tourists or those walking by choice and folks who have no other choice to get from point A to point B. Next slide.

The Phoenix metro region and HAWK signals. The idea of the HAWK originated here. This is a home-grown solution for pedestrian safety problem. There are about 50 HAWK signals currently installed and more are planned across the region, they provide mid-block to transit stops as shown in these pictures here. Many local communities are requesting local agencies to

install HAWKS so that their residents can have access. For many years traffic engineering practices both here in Arizona and elsewhere were mostly interested in vehicles. They say they're too costly and hinders traffic flow. HAWKS may have helped. I'd like to note that the link between pedestrian access is still not fully addressed. Next slide.

Road diets are another solution for making roads safer for pedestrians, giving the drivers a clear message on the need to accommodate other road users. These are from examples of recent cases of road diets. Many of the pictures I've included in this presentation show up in safety improvements but not all show up in transit access. The point I'd like to make is these improvements are also being made during transit stops. Next slide.

This is another example of a road diet in Phoenix, combining a four lane road with no median, two-lane road with center left turn lanes and bicycle lanes. It lowers vehicle speeds and reducing injury to pedestrians who wish to cross. Next slide.

This is an example for improving crosswalk visibility through lighting. This lighted crosswalk example comes from my hometown of Chandler, Arizona. Several lighted crosswalks with posted speed limit of 30 miles per hour. The pedestrian push button activates LED lights on the crosswalk. These start flashing along with rectangular flashing beacons alerting drivers. This is another improvement that I've seen a lot of good driver response. Next slide.

A number of local agencies have implemented rapid flashing beacons at mid-block crossings and have reported positive results regarding improved driver response. Again, many of these crosswalks are in close proximity to transit stops at pedestrian destinations. You know, allowing RRFBs will stop for a little while, but we understand, again, they are, again, allowed to use due to the rolling-back of the patent on that so pedestrians are free to use them now. Next slide.

These are some examples of a location where a pedestrian scramble has been installed at an intersection with a lot of traffic. Mainly Arizona State and university students in this area, it

allows pedestrians to cross on all lanes of the intersection at the same time rather than wait for a particular signal's face. My apologies as this feature does not properly depict the pedestrian scramble because the timing was not right for the picture. Next slide.

Since 2011, we have been performing urban road safety assessments at intersections with locations where there are high crashes. We received a request from our transit area Valley Metro to conduct an audit at our transit station. Since then, eight such locations generating a number of recommendations for safety improvement. They're passed along to transit, Valley Metro and the city. A common observation was that long pedestrian wait times at the signals, which is a recommendation to increase the walk times. Pedestrian countdown timers and audible pedestrian buttons were also some of the recommendations. The pictures on the slide were taken by team members. The sequence at the bottom shows a student skateboarding right under the gate of a crossing. Risky behavior among youth is a common observation, however, I must note that the increasing trend of pedestrian death and injuries in our region cannot be attributed to risky behavior of the general population. Next slide.

Here are two more observations of likely riders crossing at unexpected locations.

Recommending educational programs to increase awareness of such crossings. They point out the need to better design the feature for use by pedestrians. Next slide.

This map shows our wonderful mile grid network of arterial streets on which we have plotted the locations in red where the pedestrians were killed or seriously injured during the five-year period that ended in 2016. Along with bus stop locations shown as tiny green dots. We're in the midst of a study exploring the possible links between pedestrian crashes and approximate to bus stops. The study identifies candidate mid-block crossings for improvement. As a result of this investigation, we have so far identified 18 candidate sites based on the density of fatal injuries or crashes and bus stop density along transit routes. The current condition at each of these locations are either marked or unmarked crossing or a marked crossing with a pedestrian refuge. We're currently proposing a plan. That concludes my part of the presentation and my

colleague Jay Yenerich will continue from here. Thank you.

JAY YENERICH: Thank you, Dr. Joshua. Dr. Joshua showed you a couple pictures of our light rail system. Our light rail system has over 150 intersections or over 200 intersections now. We're about 26 miles long. So we've really grown since 2008, and we just continue to have unique situations where we need to have pedestrians cross our line. For the most part, our intersections is where we do the crossing so we have traditional signalized intersections and then we have pedestrian only. We do that downtown for high pedestrian areas like at ASU like Dr. Joshua was talking about. Next slide.

We also do unsignalized crossings. We try to do this in only locations where our operators can go at very low speeds. They are very aware of their surroundings, and you can see the 10 on the screen there, they are only allowed to go 10 miles an hour as they leave this platform so the danger to them is very minimal at this location. Next slide.

Also we are the transit agency, and we control the vehicle. This is probably one of the most unique features of our system. This bumpout as you see right there, is, it moves pedestrians out of the way when they are in conflict with us. We have not had that -- I don't -- actually, we haven't had any head-on fatalities with pedestrians on our light rail system. We have had it in other places on the bus system but not with the light rail because of this bumper. This bumper is also good with vehicles, motor -- regular vehicles but it also does well with pedestrians. So I would encourage any transit agency that's out there to look into that. So, of course, we always have special events in downtown Phoenix. We use police, and we try to channelize the best we can. Can you go to the next slide?

So this was Super Bowl 49. It was very crazy. So what we did there, we had to use channelization and barriers. We also used police, and we also used all the staff that we had available. I actually worked that platform one night to help control the traffic, the amount of pedestrians that we had. It was a unique experience. Next.

Next thing I want to talk about is a roundabout that we're planning. It's actually under construction right now. We've designed it and it is fairly unique in that we're going to have an unsignalized crossing. So one of the things that we did, you can look in the upper left-hand corner, our attempt was to slow the vehicles coming into the roundabout and into the area where the pedestrian would first cross. Next slide, please.

So what we're going to use is a Z crossing and you can find a standard Z crossing. One of the things you can find, though, is we're going to put in in-ground flashers for the pedestrians because when the train is coming— most people are looking down these days, they're on their iPhones, they're on their devices looking down, they're not really paying attention so our goal is to make the pedestrians aware of when a train is coming so they'll be actually flashing at them from the ground level. Additionally, we have other mitigations in place in case that we need to go to full gates there. We're putting in extra conduits and extra gates, or we have the potential to put in gates should we need that. And so we look forward to seeing what happens with this intersection once it gets activated. With that I thank you all.

KEN THOMPSON: We're going to move on to our next speaker, Aaron Overman from the Washington Metropolitan Transit Authority, and so, Aaron, go ahead.

AARON OVERMAN: Thanks so much. Good afternoon, everybody. My name is Aaron Overman. I'm the senior planner in charge of customer facilities for WMATA, it's also known as Metro here in D.C. I'm going to be presenting an overview of Metro's role in bus stop coordination throughout our region service area and presenting a case study of a project where Metro worked with one of our jurisdictional partners on some larger scale capital improvements to improve bus stop and pedestrian safety. Next slide, please. Great.

So Metro operates in a huge service area. We have about 4 million people, 1,500 square miles, nine separate political jurisdictions, two states, and the District of Columbia. Throughout this area everywhere that Metrobus serves Metro is responsible for determining where the bus stops and for coordinating with the jurisdictional right-of-way owners on bus stop amenities

and safety. We also work with jurisdictions planning major capital projects, and we leverage them as opportunities to improve the bus stops in the corridors, and we do the same with developers adjacent to our bus stops. Anytime that a developer applies for a public space permit, we work with a developer through the jurisdiction to make sure that the bus stop adjacent to their development is, you know, upgraded as much as we can make it. Next slide.

So the scope of our accessibility and safety challenge is enormous. Out of about 11,000 bus stops that we have in our service area, more than half of them do not meet ADA compliance and nearly all of them are on rights-of-way that Metro doesn't own or control. So at each one of the bus stops what we own is the pole, the flag, you can see that in the picture there with one of our jurisdictional partners, flags on alongside ours, and the information attached to the pole like a schedule or a route map. We did receive a federal grant several years ago to improve ADA access at a bunch of stops but coordinating construction on facilities that are not owned by us has been a really difficult issue, and we've had a lot of challenges with working with right-of-way owners. So we really depend on the right of owners to construct the improvements and comply with ADA in almost every case. Estimates that we've collected show that it would take nearly \$100 million to improve all of the stops in the region to our standards and make them compliant with ADA, so we've done a lot of work. Montgomery County, which is a local county that has done about \$25 million worth of work just in their county alone so we continue to work at it but the problem is still large. Next slide.

So a little bit about our guidelines. The ADA has certain requirements which many of you are probably familiar with, but we also realize that in order to serve our customers properly, that metro needed to go further than the ADA does. In 2014 we added a policy statement criteria about bus stops, and it requires that not only is there a sort of level landing pad and infrastructure at the stop, but that there's a curb cut nearby the stop with a receiving curb cut at a crossing. So in order for us to consider the stop accessible, for our own purposes, we do require that there have to be those curb cuts and crossings. The cover that you see there, the design and placement of transit stops you can Google that and pull that up. It's got a lot of good

information about not just the ADA but bus stops in general and how we want them to be designed, ideally. Next slide.

So every year we get dozens of roadway corridor plans, big sets of plans that are sent to our office that describe plans where the right-of-way -- improvements to the right-of-way where our buses operate. We've done a pretty good job of ensuring that our jurisdictional leads and our designers understand the needs of bus stops and bus operations and bus customers, but we often have to do a fair amount of hand-holding to get the plans to a workable place. So it's a combination of, you know, looking at things and reviewing but we'd like to educate people ahead of time as much as we can so that the plans that we see coming in the door are acceptable as much as we can. Several years ago we did decide as Metro that no new bus stops were going to be added to the system if they weren't compliant with ADA and our standards so that's a way for us to sort of hold the line on non-compliant and unacceptable bus stop plans and roadway construction that doesn't meet the needs of our customers and pedestrians getting on and off the bus. Particularly in D.C., the local governments have been extremely supportive of our working with developers to improve access and amenities at bus stops adjacent to new buildings and properties, so if anywhere that that's an available option I encourage everybody to take advantage of that through your jurisdiction. Developers are coming in, and they want the roadside, the curbside to look nice, they want there to be good access to their new development. So if there's a way to sort of leverage that review process, we've had a lot of success with that. Next slide.

All right. So our case study that I'd like to talk about really is an example of a lot of things you've seen already that Carol went over and the folks from Phoenix went over. The roadway corridor's called Ager Road. It's 1.28 miles long, it's a 12 million-dollar project. So this is really about finding ways to get access to these bus stops without doing major construction. It is very difficult. A lot of times the problems in the roadway are too deep, too -- too much to kind of do spot improvements. You really have to look at it from a corridor perspective. So this corridor is in suburban Washington, it's in Prince Georges County, Maryland. To the right you see there's

like a little loop that comes down from the green highway. That's our west Hyattsville green line stop, so there's a rail station as well as the bus station and the buses run along Ager Road.

The project's purpose is to essentially do two travel lanes in each direction, bicycle lanes in each direction, some parallel parking, give sidewalks where they're not existing today, some buffers, there's a lot of storm water work associated with this project. You can see there's a stream that runs right through the middle of it, so storm water management is a major part of this project. And as far as transit, giving spaces for buses to stay in the roadway, places for customers to board and get off buses, and we're working, and we have worked very closely with the county on the whole project. So if we could look at the next slide we can get into a little bit more details on it.

So one of the things that we looked at in this study or this project was stop consolidation. There were a few stops that were either not very well used or that were in locations that were hard to design them safely. So we did look at a couple stops in the corridor and just taking them out completely and focusing investments and improvements on stops that remain. You can see in the cross-section what I mentioned before about continuous sidewalks, continuous bus -- I'm sorry, bicycle lanes, travel lanes, and places for people to get on and off the buses. The crosswalks in particular, all these intersections were very, very faded. You'll see when we look at the next picture, the kind of typical conditions. And also really wide roadway. So narrowing the roadway, narrowing the lanes, narrowing the places that people need to navigate as they cross the street was a main goal of the project. Next slide.

This is just kind of one little picture of the project at Nicholson Street. You can see on the left the Google view of the project that the crossing, the pavement markings are so faded you can barely even see them, really, really difficult for a person, an able-bodied person much less a person with any sort of disability to be able to cross the street safely. They don't have any amenities at all, the ramps are pointing in the wrong direction, anybody getting on and off the bus here has to navigate a really difficult condition in order to be safe. So the picture on the right is just a little snapshot of the improvements that are coming so you can see that the

crosswalks are going to be improved, the rectangular rapid flash beacon, shorter crossings by getting rid of these slip lanes and access lanes, making high visibility crosswalks in, you know, three of the four approaches of the intersection, really changing it from a place that's, you know, almost a no man's land from a pedestrian's standpoint, nice to drive on but really hard to walk on, to a place that's easier to walk, navigate, easier to get on and off buses and use this corridor as a sort of complete street. So that's all I have today. I'll be happy to answer any questions as we move to that part later in the presentation. Thank you very much.

Approximate.

KEN THOMPSON: All right. Thank you, Aaron. That was very informative and now we're going to move to our next speaker which is Ashley Mason. And Ashley's from Richmond, at the Greater Richmond Transit Company, and we welcome Ashley.

ASHLEY MASON: Thank you so much, my name is Ashley Mason, and I'm the Marketing and PR Specialist at the RTC on behalf of RTC thank you to the organizers, I'm happy to be here to talk about GRTC Pulse. It's a high quality, high capacity bus rapid transit system which will travel to destinations in the City of Richmond and Henrico County. Our Pulse vehicle is a CNG BRT bus. The standard is a GRTC bus. The fuel is on top of the bus. Our bike rack holds three bikes and inside, of course, is the main difference between our current fleet is the fact that there's no gearbox. Next slide.

Why there's no fare box on the bus is because as a station we actually have ticket vending machines at every station location along the Pulse corridor. Another feature of the Pulse project is the frequency of service. The buses are going to arrive every two minutes on peak, that's 6:00 a.m. to 9:00 p.m. with 4:00 p.m. to 6:00 p.m. the bus will have rapid service. The Pulse route is 7.6 miles in length, and there is 3.2 miles of dedicated bus-only lanes. The bus will operate along the median and the curbside of Broad and Main streets. At 53 intersections on the Pulse corridor we have technology and that's our transit signal priority. There's technology when a bus is about to enter the intersection and it will stay green longer and then at a red light the bus will get a preemptive strike on traffic as well. With our project we have 14 station

locations. There are five median locations and nine curbside platforms. In total, we have 26 station platforms. There's one station at each terminus point and for all the stations in between there's both an eastbound and westbound platform. Next slide, please.

Before I get into more detail of this project I just want to go over some design principles of this project and this was created in collaboration with our policy advisory committee, PAC, as well as our technical advisory committee, these were our guide be principle in design. First off, safety and use for all. That includes not only pedestrians but bicyclists as well as vehicles. We wanted to make sure that that corridor was safe for everyone. North-south connectivity and access. As we'll see later on in this presentation we've closed up some areas along the corridor just to make sure that it was once again safe for all users of the corridor, we still maintain north and south connectivity as well. Finally, adequate median and lane widths. In Richmond, travel lanes are quite narrow, especially on Broad and Main streets. In designing Pulse we had to make sure that the lanes were wide enough to accommodate the buses. We made sure that in some parts of the corridor we had to shave down the median and make sure the bus had 11-foot wide lanes so the bus could operate comfortably down the corridor. Next slide.

Here are two examples of our curb running stations. The picture on the left is actually of our Government Center West station—our station in front of City Hall. Our bus is docked in front of the station platform. This was during an outreach event we had about a month ago. The picture on the right actually shows our East Riverfront East station location, and that's the home of our future Stone Brewery beer garden as well as our East Riverfront project for the City of Richmond. These are great opportunities and great locations for our stops. Next slide, please. And here we have our median running station. This is where we're actually going to get more in depth about the pedestrian safety measures we've put in place along the corridor. I want to point some features. Richmond is a historic city and we're quite proud of our history so we wanted to incorporate that into the design of our station so you can see the heavy steel truss as well as the brickwork and that can be found at our old train shed located at the current Science Museum of Virginia. If you look to the right, it blends into the background, the totem pole has

the station name on it, light double rise to indicate when the bus arrives. For pedestrians as well as users of the Pulse. Next slide, please.

All right. So this is at Allison as well as our previous slide was located but in this instance if this gentleman was crossing the street to access the station he would be accessing our Allison West station location. This picture is actually in front of a Richmond landmark, Lee's Chicken; we have a love for Lee's chicken. The pedestrian crosswalk is a transverse crosswalk and as Aaron mentioned in his presentation our crosswalk is also faded. So that's a problem. If you also noticed behind the gentleman who is crossing the street you can see that our curb ramp right there and the pedestrian crosswalk is kind of curved to meet that ramp, it's in front of that brick wall as well as that signage that indicates that that's Lee's chicken right there. That is at a signalized intersection, by the way. Next slide, please.

Now, here is a pedestrian crosswalk after we completed the station. I am happy to report that you can see we now have a ladder pedestrian crosswalk. The destination's actually centered with the station itself so as we saw in the previous slide that the curb ramp was actually located towards that brick wall right over there as well as that signage, now it is directly in front of Lee's chicken. So people have direct access to chicken if they're trying to get to and from or across Broad Street. There's a signal pole that you can see in the background of that picture as well, and they'll have pedestrian push buttons and we'll see that later on in the slide as well. This is a high visibility area of the corridor so we wanted to make sure we had that ladder pedestrian crosswalk as well. Next slide, please.

Here is our VCU and VUU station and location. So this is the heart of Virginia Commonwealth University station. In this area of the corridor there is heavy pedestrian traffic. As you can see, I took this picture, we had some people deciding to use the crosswalk and stand on the pedestrian refuge as well as people who decided to disregard the crosswalk even though they're right next to it. Right here, once again, the crosswalk, the ladder crosswalk is aligned with the curb ramp right there, and we also have the handrails to protect pedestrians from

oncoming traffic as they're boarding the station platform. We have that lady right there who is clearly watching to make sure there's no cars are crossing and, once again, this is at a signalized intersection. All of our median stations are indicated at signalized intersections because we want to make sure there's a safe pedestrian crossing where we can monitor and maintain activity throughout the area. Next slide, please.

Here's a closer look at that station platform. This is actually at the eastbound one. Here we have, you can see that it's a six-foot pedestrian refuge. That gentleman right there on the right is standing on that tactile warning strip as you've seen in our previous slide. That's to warn people that they're about to enter into ongoing traffic so just that reminder that they're about to enter traffic. Also we have those pillars right there to protect people from vehicular traffic as well as that median nose right there to protect people as well. We chose this carefully in the design of Pulse to make sure once again that we try to protect all users of the corridor including pedestrians as well as bicyclists and also in this picture you can see you have a closer look at that handrail that I talked about in the previous slide leading up to the station platform. Next slide, please.

And this picture right here I mentioned before that push button, pedestrian push button that we had at that intersection of Lee's chicken, here's a closer look. This is pretty standard at transit agencies and city routes. As you can see it has a push button, the walking figure is of a person that shows it's safe to walk, the flashing hand or the countdown warning you that their time is running out, you need to finish crossing the intersection. And finally we have that steady hand to warn you it is not time to cross. Now, these are opportunities, you would push this button when you're standing on the curbside of the road and you're waiting to cross the street to access the median station. However, what if you're actually at the station platform and you need to access the curbside, so you want to go back to Lee's chicken after you cross the street. The picture on the right actually shows that median pedestrian platform, but it shows that pillar, once again, where it it's a button and signals the traffic signal light and it would send a warning to say there's time for the rider or the pedestrian cross the street. Next slide, please.

Now, despite all the safety measures that I mentioned previously, we know, once again, that despite these measures, that people are still going to cross mid-block. Once again, we're at VCU, station locations, and we have three young ladies are crossing the street, the first young lady looks like she's about to start the party, the first lady looks like she's aware of what's going on, and the third young lady has reason for concern, looks like she's not focused or paying attention, the fact that she's about to step over the curb into ongoing traffic. So in designing the Pulse we knew that things like this, of course, would happen so we made sure that even in the landscaped area of the platform that we would have a pedestrian refuge as well to accommodate those people who disregard these big pedestrian areas that we have created along the corridor for those very reasons. Next slide, please.

Here is a part of the corridor which I am very pleased to show you. So prior to the Pulse being built, I'll take you -- let's look first at the picture on the left. If you look closely you can see some bicyclists crossing the street, that's actually Monroe. Prior to this project there was actually a gap in the median right where those bicyclists are riding. So essentially if you were traveling east on Broad Street and I can tell you from my own personal experience this happens countless time you'll be driving along listening to your radio and all of a sudden someone will slam on their brakes and make a northbound turn into the neighborhood north of Broad street. It's quite dangerous I can tell you, and I've probably avoided many accidents because of many intersections like that. Because of things like this, the project partners were very clear on making sure that the corridor was safe for all users. That's one of our guiding principles as I mentioned early in this presentation. So we closed the median. People could no longer turn here. I would also like to add that I've spoken to several businesses located on the south side of this very intersection, and there have been at least two incidents where cars that have been traveling across this intersection have actually crashed into the storefront. So adding this median has actually made this corridor a lot safer for even people who are working along the corridor as well. But the safety measure, we added this transverse pedestrian crosswalk. Despite what our previous Allison street station transverse crosswalk looked like before, these

lines are clearly lined, as you can see. Once again, you also have that pedestrian refuge with that tactile strip to warn pedestrians that they're about to enter into ongoing traffic and, once again, we're just really proud to say that, you know, we have made this corridor a lot safer for all users. Next slide.

I want to add to this picture right here, out taking pictures, these are not paid people to walk across the crosswalk, but as I have said, if you build it they will come. As I was taking pictures these two gentlemen who were at Monroe decided they wanted to cross the street and despite a crossing mid-block like we saw in the previous slides of the students, they decided to use the pedestrian crosswalk we put in place and it's our hope as we continue with the Pulse and once we launch this summer that people will continue to abide the safe pedestrian measures that we've put in place along the corridor. Next slide, please.

This is my contact information. If anyone has any questions, please feel free to contact me. Once again, I want to thank everyone for hearing me talk about the Pulse and I will turn it back over.

KEN THOMPSON: All right, thank you, Ashley, and thank you to all the speakers. We're at the time of this presentation where we're going to look at your questions so you have a chance to ask them. We want to ask our operator to provide some instructions on how can participants ask their questions and can the operator do that?

OPERATOR: Yes, my pleasure. If you'd like to ask an audio question press star one on your telephone key pad. Star one to ask an audio question. We'll stop for just a minute to compile the Q&A roster.

KEN THOMPSON: All right, and while we're waiting, we have a question in the chat box and the question says: What kind of safeguards are in place for people or drivers in a -- moving in a roundabout in an inappropriate direction. So somebody's gone in a roundabout the wrong way, what's in place or what can we do about that as far as safety? Anybody would like to handle that?

JAY YENERICH: This is Jay, I had the roundabout so I guess that question was for me. Well, I

mean, we do have some wrong-way signage. I don't believe there's much more than that that we can do. I know that we -- all of our driveways along the light rail will encourage drivers to turn right so they will -- it will be a right turn only as they come out of the driveway so they should not go the wrong way but then as they come to the intersection itself or the roundabout. There will be wrong-way signs but that's the only thing we can do right now., now, as far as -- and the pedestrians are equally vulnerable there because they're going to be assuming vehicles should be coming from the left and not from their right. So --

KEN THOMPSON: I just wanted to add, do you see that as a problem fairly often people going the wrong way in a roundabout or the way the roundabout is set up it's not much of a problem?

JAY YENERICH: It does happen. Not everyone is familiar with how to navigate a roundabout. Other than education, people getting familiar with an area and doing what they're supposed to be doing, I don't know what can be done. Just education is probably the main thing.

KEN THOMPSON: Good, all right, appreciate the answer. And we have another question in chat box from Carrie, it says: Do any agencies have standard pedestrian crossing treatments for mid-block transit stops that do not require minimum pedestrian crossing warrants?

KEN THOMPSON: Anybody? If you look there, no one wanted to take that question on.

AARON OVERMAN: I can chime in a little bit. Since Metro doesn't own the roadways we don't have warrants, we depend on our right-of-way owners to deal with those warrants so if he they provide a crossing for us it's great but we really have no role in if we get a crossing or not.

KEN THOMPSON: OK, great. And another question for Richmond, for you, Ashley, has Richmond gotten any feedback on the signal button from the community?

ASHLEY MASON: Hello, thank you, for the question. No, we have not received any feedback, but, as a matter of fact, I'll be giving a presentation to people with vision impairments this

upcoming Monday so I'll have an opportunity to talk to them about it then. I think that would be a great asset as well. I forgot to mention and forgive me during my presentation also at the signalized intersections where the median locations are located, once the pedestrian button is activated and safe to cross there's an audio box at the top that chirps for people with vision impairment so they know it's safe to cross as well. That's a neat pedestrian feature. When I first noticed I thought, oh, that's a nice little sound. It was quite charming to hear. Thank you.

KEN THOMPSON: All right. Let's go with some of the operator questions so do we have anybody wanting to ask questions assisted by our operator?

Operator: We do have a question from Matt Mesina.

MATT: This is a question about the roundabout located with the Phoenix light rail. Where is that going to be located?

JAY YENERICH: It's actually in Mesa, Arizona, so it's part of our Gilbert Road extension. It's just east of Phoenix, I mean, depends on where you -- where you're from.

MATT: So what are the cross streets?

JAY YENERICH: It's Main and Horn.

MATT: OK, thank you.

JAY YENERICH: Uh-huh.

KEN THOMPSON: All right. Any other questions for the operator?

OPERATOR: Again, if you'd like to ask an audio question, press star one. And there are no further audio questions.

KEN THOMPSON: OK. Let's go back and we're going to look in our chatroom. And we have one here where -- traffic engineering requirements looking at crossing per period enhance crosswalks on major corridors. Does anyone have advice on how to overcome such a mind-set transit access along a four-lane facility with 24,000, I don't know what that is ADT and speeds posted at 45 miles per hour? Oh, it's average daily traffic, ADT, it's pretty -- yeah, a lot of traffic. OK. Anybody?

ASHLEY MASON: Again, this is Ashley. Can you repeat the question again? I'm sorry.

KEN THOMPSON: It's in the chat box, it was requirements to look for crossings for peak period for enhanced crosswalks on major arterial corridors, does anyone have advice to overcome such a mind-set when addressing transit access along a four-lane facility with 25,000 average daily, I guess, traffic speeds posted at 45 miles per hour. Looks like a lot of traffic. And going very fast.

AARON OVERMAN: This is Aaron from Metro. If you go -- if you're able to access the presentation or just Google Metro design and placement of transit stops, the documents should come up. There's some really good pages in there that talk about treatments of bus stops and different types of facilities. One thing that I've seen done in some places is essentially bumpouts, curb bumpouts that make the curb where the pedestrians go out to the level of the street. And so that the pedestrians can sort of step out further, closer to the bus and then the bus doesn't actually leave the travel lane, the bus stays in the travel lane. That can be one effective measure. There are also some tables in the document that talk about different speeds and how you might be able to deal with different treatments at different sort of average speeds. So I would take a look at that document. You might get some ideas and some inspiration from there.

SARATH JOSHUA: This is Sarath Joshua, this is a great question because I think what this question highlights is the disconnect between those who design streets and put in the various traffic controls and those who put transit systems in place and force transit riders to cross at unsafe conditions. The transit community and whatever the warrants we have for various crossing treatment have not kept up with the changing landscape in transportation. If you are putting transit anywhere, we need to have safe access to transit riders that are pedestrians. And this -- criteria like this that are still in place are a disconnect so I think we need to address that. I think there are advances being made but we still have a long ways to go and, in my opinion, many places like this, there are many locations like this in our region that we have transit stops right across the street like this with high speeds and high volumes, and I think it's -- I think both the -- all agencies involved in here bear some liability when you're exposing

pedestrians to cross at these locations. Thank you.

KEN THOMPSON: We have more questions about that roundabout in Mesa. Will there be Z pedestrian crossings at both ends of the roundabout?

JAY YENERICH: Yes, both east and west, the north and south side will be the traditional crossing of a roundabout.

KEN THOMPSON: And what's the planned time line for that round about to be built?

JAY YENERICH: It should be open in 13 months.

KEN THOMPSON: Great. Thank you. We have another question I think for Aaron that says what is the ADT posted speed for Ager Road or were 10-foot travel lanes considered in order to make a marked buffer adjacent bike lane and travel lane in each direction?

AARON OVERMAN: So ADT, I'm not entirely sure. I think it's in the mid maybe like 15,000, something like that, I'd have to look that number up. The 10-foot lanes are a problem for us. Metro requires anywhere that we operate that we have an 11-foot lane and that's because the bus itself, when you count the mirrors, is wider than 10 feet so in order to operate that bus safely without its mirrors getting knocked off by trucks and, you know, roadside obstructions that might come up, we require an 11-foot lane. So if they would have given us a 10-foot lane we would have had to remove service from the street. So that's usually not the way things go. Usually we get an 11-foot lane, at least on the curbside lane where we're operating the bus.

KEN THOMPSON: All right. And then we have another question we have in here, are audible pedestrian signals required? Anyone?

AARON OVERMAN: We do, Metro always requires them at our crossings.

KEN THOMPSON: Others, what's your local requirement for audible pedestrian signals?

ASHLEY MASON: This is Ashley from GRTC. I know on some portions of Broad Street they are audible although I have noticed some that are not on the corridor.

KEN THOMPSON: Generally if you do include them and the ADA requirements to put them in, you should really look at different intersections in your design and look at where they make most sense for safety for people crossing so keep all that in mind. Got another question for you, Ashley, in Richmond how are bike lanes being treated at bus stops?

ASHLEY MASON: That is a great question, and unfortunately, this has been an ongoing concern for bicycle advocates throughout the city of Richmond because unfortunately we do not have many bike lanes, currently along Broad Street we share the road with bicyclists and even during the construction of the Pulse we've been noticing that our cyclists, bicyclists, have been riding down the median running lane which is really unsafe because it's still an active construction zone. So I know GRTC is working in collaboration with our bike advocates throughout the city but right now we don't have any -- I don't have a real answer for you.

KEN THOMPSON: So I'm just trying to think when I've been there are not many bike lanes, there are bike trails but not actually bike lanes on the roadway; is that correct?

ASHLEY MASON: Yes, that's correct. We just recently, in the last two years I would say, on Floyd Avenue which also travels through VCU, they made that a bicycle roadway. So the bike -- I mean, they have complete dominance over the road in that area, also incorporated roundabouts in that area to slow down the vehicular traffic and I think now when you travel down Floyd you see less vehicles on there because they're trying to avoid getting stuck behind a bicyclists and trying to navigate those roundabouts.

AARON OVERMAN: One thing we've seen in the Washington region is lots and lots of bike lanes on the curbside lane. Typically the buses will just cross over the bike lane. The drivers are trained to, you know, watch out to see if anybody's in that lane before they cross, but they're just crossing over it, and in a lot of cases they have the bus sitting in the bike lane while they're serving customers. It's not an ideal situation, but in a limited right-of-way when the bus has to get to the curb often that's the only kind of option that we have. You can see in the Ager Road project one treatment that we've done is sort of instead of providing a solid line along the bike lane, where buses are going to be crossing, they sort of did a staccato pattern to warn the bicyclists that hey, there might be somebody, there might be a vehicle or bus coming from your left and it's a way for the driver of the bus to also know that, you know, that's a place that you can cross into the bike lane so it kind of gives both of them a warning that that's a place where

there might be some crossing of different traffic and it can help somewhat with safety. The District of Columbia has used that treatment quite a bit.

KEN THOMPSON: OK, that's really interesting. Got another question, says in Kalamazoo we asked for safe crossings mid-block and are told that the requirements say they can't be installed. As a transit operation we can't put stops at corners all the time so how is this resolved mid-block especially when there can't be any receivers for curb cuts for wheelchairs. Anybody got a response, mid-block crossings.

AARON OVERMAN: Yeah, that's one of our largest sort of requests is how can I get across the street at a mid-block. It's a very, very difficult problem and one that's not easily solved. We don't like there to be -- we don't like to encourage people cross at a mid-block location either but oftentimes the only place that we can place the stop is in a mid-block location, or maybe the intersections are so far apart that in order to serve, you know, an office building or a community, that you have to put something in that's not, you know, away from an intersection, several hundred feet away, it might be a thousand feet or 1,500 feet between those stops and giving a stop in the middle at least allows some access to those -- to the developments on either side. So, yeah, it's a difficult problem. We don't require there to be a crossing at the pair of bus stops. Sometimes people are just sort of left to either cross illegally or walk up to the nearest intersection.

KEN THOMPSON: There's no real easy answer on that and it probably depends on a lot of local factors around traffic speed and flow, whatever, and the follow-up -- yes, go ahead.

SARATH JOSHUA: I'd like to comment on that. I think this idea that we shouldn't interrupt traffic flow in mid-block locations to allow pedestrians safe access I think that's an idea that we need to kind of question. Yes, it will interrupt traffic flow, but putting a stoplight in the middle to accommodate pedestrians, if you look at benefit cost ratio of the cost of putting a traffic signal in with pedestrians I think you will find that has great benefit for failing lights or the number of years, life cycle of the traffic light. So I think this idea that we shouldn't interrupt traffic -- in fact, you can put a mid-block signal, synchronize that signal and time it to work according to the signals it can be easily done and the cost of a traffic signal, mid-block signal is

\$200,000 and what's the cost of a life? So I think this notion of interrupting traffic is an old idea that we shouldn't interrupt traffic. We should interrupt traffic and provide safe access and putting a HAWK signal or a pedestrian push button signal is I think the safest way to provide that access. There are other treatments that we can -- we looked at and we've gone on today but I think the safest crossing at a high speed -- location where there's high-speed traffic is a traffic signal or a HAWK signal. Thank you.

KEN THOMPSON: Thank you, Sarath, good points for people to consider. Another question we have is a participant would like to see how to include a bus stop along dedicated bus lanes. How do we place a stop where riders would step into a bike lane and I think that's an issue we have around in the Washington area.

AARON OVERMAN: So I'm not sure if I'm following the question.

KEN THOMPSON: OK, yeah. So you've got a bus stop that's along the bike lane, you have the bike lane right where the bus stops. And so how do you want to place the stop right on that bus lane and, you know, the issue would be where riders might step into the bike lane itself.

AARON OVERMAN: Yeah, I've seen things sort of done in two ways. One is the bus would be in the travel lane and then literally cross over the bicycle lane to get to the curb. It's, you know, not the best thing for the bicyclist because they're going to have to swing around the bus if the bus is stopped there, but it's a way for sort of both of those things to mix together and that was the kind of staccato line, traffic line paint treatment that I talked about earlier, to kind of warn people. There's other ways of sort of organizing the streets so that the bike lane might be on the other side of the street or in the median. That reduces the conflicts totally, but oftentimes it's harder to implement in terms of a safe bicycle lane, to have it be in the median with the left turns and all the other things that go on in the sort of middle of the street. So most of the time the bus just goes over to the side just like they would cross a lane of travel, we would consider the bicycle lane to just be another lane of travel that we cross over to get to the curb.

KEN THOMPSON: All right, thank you, Aaron. I have a question. As a blind transit advocate, I wonder how often planners consider audio levels when designing crossings. It's for the audible signal. And so, you know, if anybody -- when you put in your audible signals that you're crossing, how do you determine what the volume of that signal should be or is the changing of the audio level dependent on ambient noise.

JAY YENERICH: That's my understanding as to how the devices that we use respond. It's based on the ambient but I would have to go research the manufacturers to be sure but that is my understanding.

KEN THOMPSON: In general some signals have a set volume but the signals you're using, and there are many signals out there that will adjust to the ambient noise, the more noise you have the louder the signal will be. Is that correct?

JAY YENERICH: That's my understanding, yes.

KEN THOMPSON: All right. So let's see. Look for another question. This one says that for those that have transit signals can you talk about their effectiveness and types of locations where you are using them. The transit signals. This would be more in the BRT situation.

JAY YENERICH: Or LRT, we have transit signals that guide our trains, horizontal bars and vertical bars. So we guide the vehicle through the intersection that the 200-ish intersections that we have, so, yeah, they work, they work very well.

KEN THOMPSON: And people seem to respond to them well.

JAY YENERICH: Well, people don't need to, no, the operators are the ones who respond to them.

KEN THOMPSON: Also sometimes there are people, there are signals for transit that interface with pedestrians to let them know, you know, trains are coming and warnings for trains, on the light rail. All right, are we getting down to the last -- I think we're done?

RACHEL BEYERLE: Yes, I think we are. And with that it looks like we're about out of time. We

want to thank all of our presenters today from Phoenix, the Washington region, and Richmond. Thank you, as well to Carol from Toole Design Group and Becky Crowe from FHWA for helping us coordinate this webinar. And we will let you know that the webinar has been recorded and we will upload it to the NADTC website early next week and you'll be able to find it. Our website address is www.nadtc.org. Please visit the website and FHWA website for additional pedestrian resources. Thanks again to everyone and enjoy the rest of your week.