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FX2-Division: Shared Bicycle and Pedestrian Platform Evaluation

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Final Report

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Table of Contents

1 Introduction

To accommodate passing bicyclists and transit riders accessing the new FX2 TriMet bus rapid transit line in Portland, TriMet worked with the City of Portland and a broad group of stakeholders and partners to design and implement a new shared use bus platform that incorporates a sidewalk / platform level bike lane. The SE Division corridor was designated a high-crash corridor by PBOT, and the revamped high capacity FX2 line was implemented in coordination with associated safety improvements. Stakeholders and partners included TriMet Committee on Accessible Transit, the Portland Bureau of Transportation (PBOT) Bicycle Advisory Committee, the PBOT Pedestrian Advisory Committee, the Oregon Commission for the Blind, and the Oregon Department of Transportation. Transit service began operations in September 2022. This report seeks to assess how well the FX2 shared bus platform is working for transit riders and other platform users, including bicyclists.

1.1 Standard design

The design seeks to mitigate bicyclists moving out into traffic on the SE Division Street corridor; however, it also depends upon users understanding how to navigate the shared space, included where to wait for the bus, how to board and alight, and when and where bicyclists should yield to allows riders to access the buses. Figure 1 shows the standard FX2 platform design. The standard design includes a 4 feet boarding/alighting zone with a white truncated dome. There is a 3’ green bike lane with crosswalk markings which are aligned with the FX2 door openings. There is a 6” strip of tactile walking surface indicators (TWSI) to mark the border of the bike lane and waiting area. Also included in the design is a transit rider waiting area with amenities and a shelter. When no bus is at the platform, transit riders are intended to wait behind a marked line of tactile guide strips, and bicyclists are free to pass through the platform area. When a bus arrives, bicyclists are intended to stop at a stop bar prior to passing through the platform area, and bus riders are to board and alight.

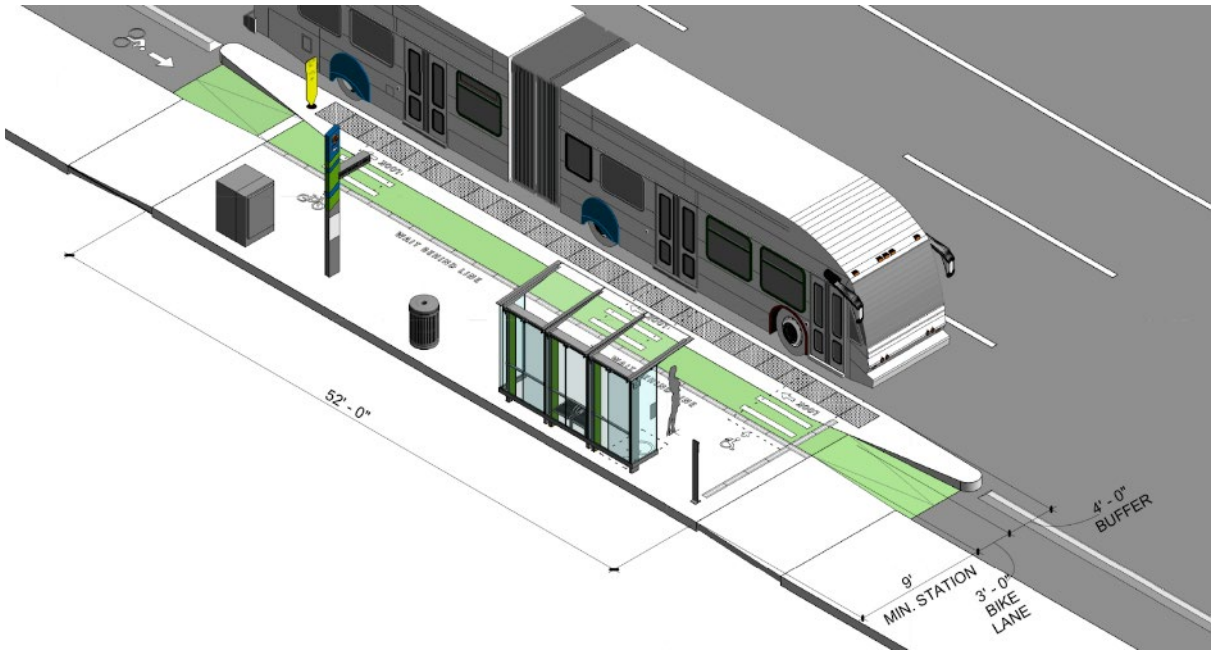


Figure 1 TriMet schematic of standard FX2 platform design (Source: TriMet)

Figure 2 Bicyclist perspective of standard FX2 platform

1.2 Design variations

Variations to the standard design were implemented at FX2 platforms located on ODOT property adjacent to I-205 and the MAX Green Line due to site constraints and variations in ODOT and PBOT guidelines and requirements. Figure 3 shows the transit stop at SE 93rd Ave. The following differences were observed compared to the standard design. At these locations:

- The bicyclist stop bar and "Stop here for peds" markings were absent.
- There is a 4' wide black bike lane, rather than 3' wide green bike lane present with the standard design.
- There is a 12" blue strip of TWSIs, rather than 6" white strip and a larger / deeper waiting area.
- On the approach to the platform, there is a "Bike Lane Ends" sign, and on the far side of the platform there is a "Bike Lane" sign to imply the resumption of the bike lane. Note that these signs were added after the photo in Figure 3 was taken.

Figure 3 FX2 westbound platform at SE 93rd Avenue, incorporating design variations

1.3 Primary objective and key research questions

The primary objective of the research is to assess conflicts between users of the shared bicycle and pedestrian stations, particularly conflicts between people on foot (or wheelchair/mobility device) who are waiting for boarding and/or alighting a bus and people on bicycles riding in the bike lane.

Key research questions include:

- How often are there conflicts between bicyclists and pedestrians, including near misses or collisions? What is the nature of the conflicts?
- How often do transit riders wait in the step-out zone or bike zone, instead of in the waiting area? How often do bicyclists stop at the stop bar (where the "stop here for pedestrians" sign is located) when a bus is at the stop? When bicyclists do not stop at the stop bar, do they still yield to transit riders getting on and off buses, do they go around buses, or behind the platform waiting area?
- How do wheelchair users and people with vision impairments navigate the platforms?

1.4 Report organization

The remainder of the report is organized in the following manner. Chapter 2 contains details of the research methodology. Chapter 3 describes the field collected video analysis, Chapter 4

describes the results from the survey and Chapter 5 presents the conclusions and recommendations.

2 Background

Transit streets sometimes also need to accommodate bicyclists, and must do so in a way that is safe and comfortable. Safety includes minimizing unsafe interactions between bicyclists and motor vehicles, including buses, as well as ensuring safety for pedestrians and transit riders.

2.1 Bus and bike conflicts

Transit platforms on busy streets, especially those with bicycle facilities and activity present the potential for interactions and possible conflict between cars, buses, cyclists, and passengers or pedestrians. With different modes and users traveling at different speeds and directions, evaluating conflicts at and near bus platforms is very important to understanding accessibility and safety.

The most common bus and bike lane design is a bike lane directly adjacent to the right side of the bus lane with no physical barrier. In this case, when a bus arrives at a stop, the bus is in the bike lane and the bike behind the bus would either stop or pass over the bus by riding into traffic. For their part, bus operators need to pay close attention to the possible presence of bicyclists as they move over to stop, and wait in traffic if bicyclists are present, which can slow operations. This process may repeat at the next stop after the bus pulls back out into traffic and passes the bicyclist(s), starting a “leapfrogging” process, which slows down bus operations and creates the potential for conflicts between bicyclists and buses as well as other motor vehicles. As vulnerable road users, these conflicts pose a potentially serious risk to bicyclists.

Several different approaches have been used to address these safety and transit service quality issues associated with this leapfrogging phenomenon. These approaches are discussed in the following sections. A common feature of each approach is that the bus does not have to change lanes to get to the stop, and bikes and buses do not have to cross one another’s path. Differences include passenger access, waiting areas, as well as if, where, and how passengers interact with passing bicyclists.

2.2 Left side bike lane

One way to completely separate the activities of bicycles and bus stops is to have them operate on different sides of the street. A left side bike lane is one way to do this. Left side bike lanes are generally only an option on one-way streets.

Complications may arise if bicyclists need to be routed from the right side of the street over to the left side of the street. An example of this approach is North Williams Street in Portland, OR (Figure 4).

Figure 4 Left-side bike lane with right side bus stop, North Williams Street in Portland, OR (Source: Google Street View)

2.3 Floating transit island

Floating transit islands are separated from the sidewalk by a bike lane, eliminating conflicts between transit vehicles and bikes. This type also let buses stop in-lane and can reduce the dwell time. Transit passengers are often funneled to a specific marked bike lane crossing area, for example using handrails that also serve to physically separate the bike lane from the transit island. Floating transit islands generally have seating, shelter and other amenities located on the "island."

A subset of floating transit islands involves a temporary or modular bus boarding islands separated from the sidewalk by a bike lane are a similar approach. A common type is the rubber modular deck type, with a relatively quick and affordable installation. In addition to installing a deck, a ramp for a bike lane and bollards or flex posts on the boundary of the deck can manage bicyclist and passenger interactions.

Floating transit islands generally occupy at least the width of a full travel lane and may not be possible at locations with constrained rights-of-way.

This design generally removes conflict between bicyclists and motor vehicles in traffic lanes. There is the potential for interactions and conflict between bicycles and transit passengers at the point passengers cross the bike lane to access the island.

Examples of permanent floating bus transit islands include those on SE Division in Portland (Figure 5) and on Roosevelt Way NE in Seattle (Figure 6). Examples of modular floating bus islands include SE Hawthorne in Portland (Figure 7) 108th Ave NE in Bellevue, WA (Figure 8)

Figure 5 Floating transit island on SE Division and 122nd Avenue in Portland, OR (Source: Google Street View)

Figure 6 Floating transit island on Roosevelt Way NE in Seattle, WA (Source: Google Street View)

Figure 7 SE Hawthorne Blvd at 12th Avenue in Portland, OR (Photo: Kyuri Kim)

Figure 8 108th Avenue NE in Bellevue, WA (Source: Google Street View)

2.4 Shared transit stops

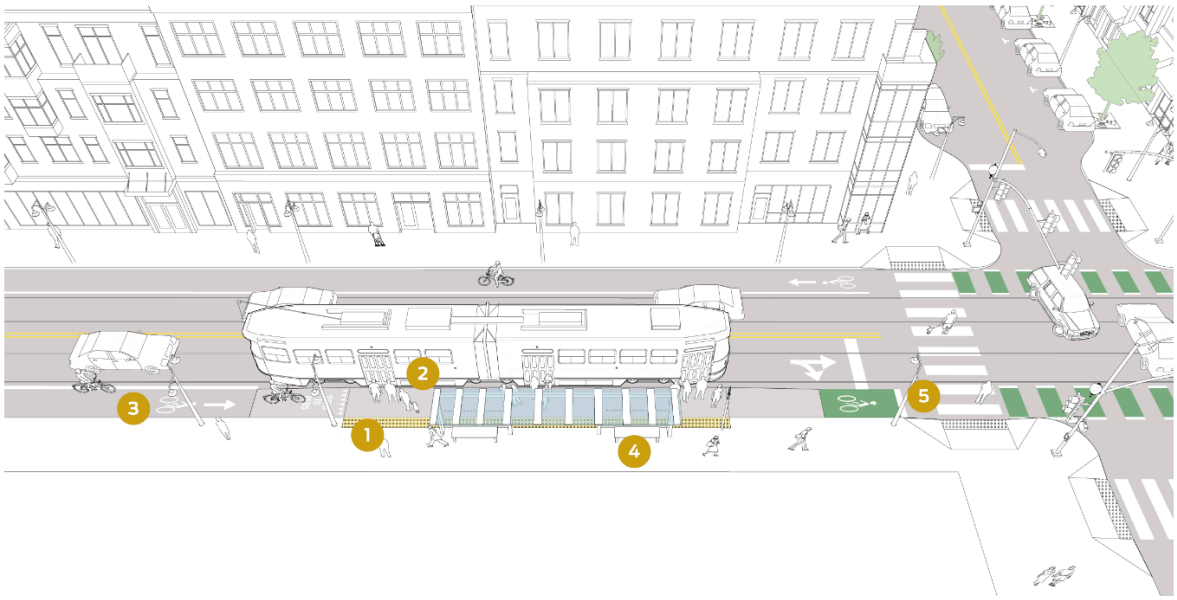
As the name implies, the bus stop and bike lane share space, generally with the bike lane being ramped up to the transit boarding level. This type of bus platform lets buses stop in-lane, without needing to cross over a bike lane. Depending on the design, passengers may board directly from the platform level bike lane area, or from a separate boarding zone on the street side of the bike lane. Bus stop infrastructure, such as signage, seating and shelter are found on the sidewalk.

The shared transit stop may achieve many of the objectives of floating transit islands in a more constrained space.

National Association of City Transportation Officials (NACTO) named this type of public transit platform as "Shared Cycle Track Stop" (see Figure 9).[1] NACTO notes that this type should have

[1] NACTO (2016). "Transit Street Design Guide," Shared Cycle Track Stop. Available at: https://nacto.org/publication/transit-street-design-guide/stations-stops/stop-configurations/shared-cycle-track-stop/

detectable warning strips along the edge of the sidewalk, and the shared cycle track area should be accessible for wheelchair lifts. Moreover, the boarding platform should be terminated at least 10 feet from the crosswalk to let cyclists to queue in front of the bus.



CRITICAL

1 Place detectable warning strips along the edge of the sidewalk where passengers step into the shared raised boarding area, and along the boarding area curb where passengers board the transit vehicle. Use shark's teeth yield markings near the top of the bicycle ramp leading to the platform.

2 The whole width of shared cycle track area can be used as the accessible boarding area for wheelchair lifts. However, wheelchair users must have a waiting area provided that is accessible to allow maneuvers to the space, and must be located outside of conflict areas.

3 Ensure cycle track is wide enough for compatibility with maintenance equipment (sweepers or plows), or enact maintenance agreements

Slope of bicycle ramp shall not exceed 1:8.

Shared boarding locations require comprehensive multi-sense information to guide visually disabled passengers. Provide audible announcements that a transit vehicle is arriving, including the route name if multiple routes are present.

Curbside activities that will conflict with bike movements and visibility (such as lay-bys or parking bays) must be prohibited at minimum 20 feet from either direction of the bike ramps.

RECOMMENDED

4 Where transit shelter is closer than 3 feet to bike lane, it should open to the building side to maintain accessible paths and to avoid pedestrian conflicts with passing bicycles.

Shelter should be transparent to allow waiting passengers and bus operators to see each other.

5 Ensure bicyclists are well positioned in view of turning traffic. Terminate the boarding platform at least 10 feet from the crosswalk to allow bicyclists to queue in front of transit vehicles.

Figure 9 NACTO Transit Street Design Guide, "Shared cycle track stop" guidance (Source: NACTO)

The Massachusetts Department of Transportation (MassDOT) includes a shared transit stop design in their Separated Bike Lane Planning & Design Guide.[2]

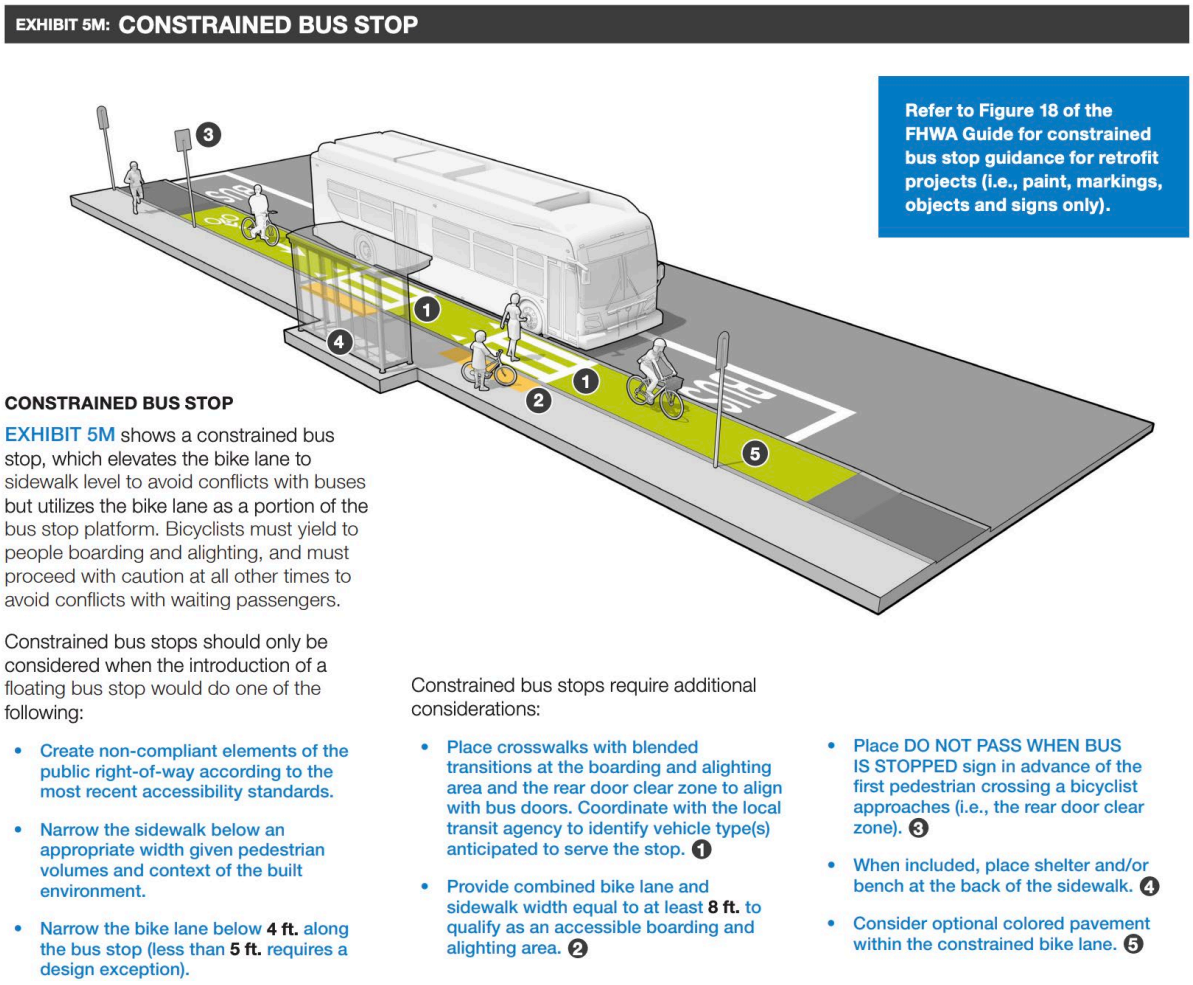


Figure 10 MassDOT Separated Bike Lane Guide: "Constrained bus stop" design guidance (Source: MassDOT)

While this design should address issues related to bicyclists moving out into traffic to go around stopped buses, they also introduce a potential conflict between bicyclists and transit passengers / pedestrians. With the floating transit island design, the bicyclist / passenger conflict is generally confined to the marked crossing area, while with the shared design the potential for conflict exists along the entire passage of the bike lane through the bus / platform area.

Examples of this type of stop are included below, including a stop on NE 65th Street in Seattle (Figure 9), and a stop on Sherbourne Street in Toronto, Ontario (Figure 10). These two designs do not feature an additional boarding zone on the street side of the bike lane. Another version of this design from West 4th Street in Charlotte, NC (Figure 11) contains a narrow, marked boarding area.

[2] MassDOT, (2015) "Separated Bike Lane Planning & Design Guide," pg. 104. Available at https://www.mass.gov/lists/separated-bike-lane-planning-design-guide

The FX2 platform design covered in this study falls into the shared transit stop design type.

Figure 11 Cycle track bus stop with no additional boarding area. Seattle, NE 65th Avenue (Source: Google Street View)

Figure 12 Cycle track bus stop with no additional boarding area. Toronto, ON, Sherbourne Street (Source: Google Street View)

Figure 13 Shared transit stop with marked boarding area. Charlotte, NC, W. 4th Street (Source: Google Street View)

2.5 Prior Research

There is very limited research on the shared transit lane design. In 2019, Seattle implemented and evaluated a shared bike lane and transit stop. NE 65th Avenue includes a corridor that experienced 4 bicycle fatalities and 5 serious injuries between 2014 to 2018. The city redesigned the corridor, which would include a flex post-separated bike lane, and shared transit stop designs at four locations.

The Seattle Department of Transportation (SDOT), conducted a video-based evaluation that looked at whether pedestrians walked in the bike lanes, if bikes remained in the bike lanes when passing the shared stop areas, and where transit passengers waited.[3] The study found very good compliance with design objectives for each user, including that pedestrians almost entirely avoided the bike lane, that bicycles remained in the bike lane, and that transit passengers waited near the bus stop shelter, and did not block the sidewalk or wait in the bike lane. The study did note that at one location, school dismissal time for a nearby high school resulted in heavy crowding at the bus stop, at which point some people tended to wait in the bike lane; however, this was limited to this one very busy period of time.

Overall, the changes along the corridor were found to be associated with reduced collisions and injuries, with no bicycle fatalities on the corridor in 2019. The study concludes that "The new shared transit stop design operated as intended with no reported operational or safety issues. This

[3] The SDOT evaluation, "NE 65th Street Redesign: Shared transit stops, protected bike lanes, and rechannelization. Before and After Study: NE Ravenna Blvd to 39th Ave NE," is available online at https://www.seattle.gov/documents/Departments/SDOT/About/DocumentLibrary/Reports/NE65thSt_Evaluation_Report_91620-1.pdf (Accessed 4/10/24).

shows that the design can be successful at locations with lower volumes of bike traffic and moderate levels of passenger activity."

2.6 Summary

The approaches to address the issue of buses and bicyclists interacting on transit streets with bike lanes will vary depending on the street context, objectives, and available space. The left side bike lane mostly removes conflicts between bicyclists, buses, and transit passengers, but is generally only possible on one-way streets. The floating transit island removes the bus-bicycle conflict and narrows the bicyclist-passenger conflict to a constrained crossing area but requires considerable roadway allocation width. The shared transit stop offers similar benefits to the floating transit island in a more constrained space, although there may be a potential for more area of interaction between bicyclists and transit passengers.

There is some design guidance for shared transit stops (from NACTO and MassDOT), but very limited existing research on the impacts of the design on user behavior, compliance and safety. SDOT' NE 65th Avenue evaluation was the primary existing research, and provides encouraging early evidence.

For both the floating transit island and shared transit stop approaches, the design intent is for bicyclists to yield to crossing pedestrians (passengers). However, it is necessary for both bicyclists and transit passengers to be aware of one another to reduce risk at crossing points. Passengers with visual impairment may not be able to recognize approaching cyclists while boarding, alighting, or waiting for the bus, and thus close attention is needed to consider how well designs work for these users.

3 Research methodology

This research followed a mixed methods approach to achieve the research objectives. Members of the research team conducted a ride-along with visually impaired users at various site locations to get their perceptions of design and any issues they faced. Video data collected at eight FX2 platform locations during fall 2022 and spring 2023 were reduced to determine bicyclist and transit rider behaviors and conflicts. Additionally, research team members conducted a survey of FX2 riders from October to November 2023 to understand the perceptions of the general transit population regarding these new transit stops. Finally, interviews conducted between October 2023 and January 2024 collected the views of riders experiencing mobility, vision, hearing, or other challenges. Further descriptions of each of these methods follow.

3.1 Ride-along with visually impaired riders

An early step in the evaluation process was to seek to understand how members of the disability community experience the FX2 platform, along with how to ensure that data collection efforts for this project would incorporate this perspective. Working with members of the Portland chapter of the American Council of the Blind, several members of the PSU research team met up with blind or visually impaired Portlanders to tour several platforms and ride the FX2. Participants met at the 113th and Division EB FX2 platform, boarded and rode the FX2 to SE 122nd Avenue. The group then transferred to a Westbound FX2 and rode back to the SE 93rd Avenue stop. The visually impaired riders shared their perceptions and opinions about the platforms, and identified design elements that they felt worked well or may pose challenges to them or other riders.

Several key themes and concerns emerged. First, the issue of the importance of consistency in design for the visually impaired community was stressed. These platforms differ from what transit riders (particularly the blind community) have become accustomed to, which would require adjustment and pose challenges to riders. Some changes are perceived as improvements but require consistent implementation to prove a lasting benefit. Second, interactions with bicyclists were deemed the most significant concerns among these riders, with fears of bicyclists failing to yield to riders and having little way to know when to expect bicyclists to pass.

Another key learning from the ride-along was that design changes may impact the various members of the visually impaired community differently. Some have some vision and can pick out colors or contrasts; others have no vision and rely on sensory or sound cues. People with guide dogs will have different needs or interactions with the design.

The ride-along process provided important feedback that informed subsequent survey and interview approaches, as well as the video review process.

Figure 14 Ride-along participants crossing the bike lane to board the FX2 at SE 93rd Avenue

3.2 Video data collection and review

3.2.1 Site selection and data collection

During site selection, team members visited potential bus stops by riding FX2 buses and along the bike lanes. Qualities such as stop placement (farside, nearside, or mid-block), bike lane separation near the stops, and whether there are driveways, bus-only lanes, or major destinations such as schools nearby, and camera feasibility at the stops informed site selection for the first round of video collection. TriMet's boarding, alighting, and lift data at each stop were also considered. The goal was to get a balanced collection of sites in both directions with diverse platform designs and high usage of transit riders and cyclists.

Eight stops selected for the first round of video collection (fall 2022) included the westbound stops at SE 85th, 93rd, 122nd, and 135th Avenue and eastbound stops at SE 93rd, 101st, 116th, and 162nd Avenue. Unfortunately, between the first day of data collection on October 27th and the second day on November 3rd, TriMet removed the FX2 articulated fleet from service and replaced it with standard-length TriMet buses, thus limiting the utility of the fall data collection to assess interactions of transit riders using the bus and platform. As a result, the research team decided to focus on the spring 2023 data collection for detailed user behavior and interaction analysis. This decision provided the additional benefits of giving users more months to adapt to the new facilities and the possibility of increased bicyclist activity on SE Division due to improved weather. The first round of video collected helped to develop the video reduction coding tool, test and refine camera placements, and assess current bicycle volumes.

During planning for the spring 2023 video collection, the project team refined camera placement objectives, including placing cameras at a higher elevation to better capture when bicyclists enter and exit the platform area. In order to observe more bicyclist and passenger activity and remove locations with poor camera mounting options, several video data collection points changed. For example, due to limited camera mounting options, the video captured of the westbound SE 135th westbound platform appeared too distant and obstructed by trees to identify users' movements, and the eastbound SE 101st location had a trivial level of cyclist activity. Stops at SE 148th Avenue westbound and SE 162nd Avenue westbound replaced the deficient stops in the second round.

Once the sites were selected, the research team contracted with a vendor to collect video data at each site on two mid-week days. Table *1* contains the list of selected stops, the dates of video data collection, and some other characteristics of the stop. Specifically, the table contains information about stop placement, either prior to the crossing of the street (nearside), in between blocks (mid-block), or on the far side of an intersection (farside). Additional columns specify if the adjacent travel lane is bus-only (as opposed to a general traffic lane), what type of barrier separates the bike lane from the right-side travel lane on the approach to the platform area, and if there are any driveways immediately before or after the platform area.

Table 1 ***Video collection platform sites and selected characteristics***

Platforms		Video collection dates		Selected characteristics			
Cross street (Avenues)	**Direction**	**Fall 2022**	**Spring 2023**	**Stop placement**	**Bus only lane?**	**Bike lane separation**	**Driveway adjacent to platform?**
SE 85th	Westbound	10/27/22; 11/3/22	6/14/23; 6/15/23	Nearside	no	painted buffer	no
SE 93rd	Eastbound	10/27/22; 11/3/22	6/14/23; 6/15/23	Mid-Block	yes	painted buffer	no
SE 93rd	Westbound	10/27/22; 11/3/22	6/14/23; 6/15/23	Mid-Block	no	painted buffer	no
SE 101st	Eastbound	10/27/22; 11/3/22	n/a	Farside	no	painted buffer	yes
SE 116th	Eastbound	10/27/22; 11/3/22	6/14/23; 6/15/23	Mid-Block	yes	concrete curb	yes
SE 122nd	Westbound	10/27/22; 11/3/22	6/14/23; 6/15/23	Mid-Block	on approach	none	yes
SE 135th	Westbound	10/27/22; 11/3/22	n/a	Farside	no	none	yes
SE 148th	Westbound	n/a	6/14/23; 6/15/23	Nearside	on approach	concrete curb	no
SE 162nd	Eastbound	10/27/22; 11/3/22	6/14/23; 6/15/23	Nearside	yes	concrete curb initially, then painted buffer near platform	no
SE 162nd	Westbound	n/a	6/14/23; 6/15/23	Nearside	yes	concrete curb but with gap for driveway right before platform	yes

3.2.2 Video data extraction

Using the first-round video, the research team developed a tool to extract relevant information from the video data. Researchers reviewed the video to study the interactions between bicyclists and transit pedestrians and established a working protocol to extract metrics. During this process, different areas of interest were defined for each location where the metrics could be extracted, e.g., waiting area, bike lane, and boarding area.

For each of the eight spring 2023 video locations, video was reviewed for all daylight hours (roughly 5 am to 10 pm) for two days, resulting in 272 hours of video reviewed and 1059 total

bicyclists' (and other micromobility users such as e-scooters, skateboards, etc.) activities captured.

For each bicyclist (or other micromobility user) that passed through the study area at each location, we noted:

- Arrival time at the top of the bike ramp (or equivalent);
- Vehicle type (e.g., bike, cargo bike, bike with trailer, recumbent bike, e-scooter, Segway, skateboard, other)
- Travel direction (with traffic or wrong way)
- A count of how many transit riders/pedestrians were in the platform area upon arrival.
- The presence of a bus (arriving, stopped, or leaving)
- The route taken on approach to the bus stop area (bike lane, sidewalk, street, etc.)
- If the bicyclist slows or stops at the bike ramp
- If the bicyclist takes action to avoid pedestrians, such as stopping, slowing, or changing course.
- If any pedestrians make avoidance maneuvers in reaction to the bicyclist

We included a comment field for team members to include additional notes regarding the bicyclist behavior observed during the video extraction process.

For the transit passenger / pedestrian review, the video was reviewed from 1 pm to 6 pm for each location for two days, resulting in 80 hours of video review and observations of 1295 transit riders. For transit riders at the stops, we noted:

- The time the transit passenger arrived at the platform.
- If they boarded or alighted from the bus
- Approximate age
- If they used any mobility aids
- If any bikes passed through while they waited. If so, did the bikes use the bike lane, waiting area, or other area
- If applicable, did the bicyclist(s) stop, slow, and/or change course.
- Did the pedestrian take action to avoid a bicyclist, such as moving from the waiting area to the bike lane, or vice versa, or another movement?
- Any conflicts with bicyclists
- For boarding transit riders, did they wait until the bus arrived to enter the bike lane, did they use the marked bike lane crossing, what door did they use to board, and did they use the lift/ramp.
- Transit riders total elapsed time at the stop and seconds they spent waiting in the bike lane.

Note: In this report, we may refer to transit passengers, riders or pedestrians to refer to the people on foot (or using wheelchairs or other assistive mobility devices) in the platform area. In most cases these were people waiting for the bus, boarding the bus, or getting off the bus.

3.3 Surveys

3.3.1 Survey development

A survey was developed and administered to transit riders to gather their attitudes and perceptions regarding the new designs and determine how these facilities are being used. The objective of the survey was to gather additional information regarding potential interactions and how people use the platform area, as the video data may not capture all interactions due to the limited amount of footage collected and reviewed. Additionally, the survey was designed specifically to reach more passengers with accessibility needs and gather their input.

The survey instrument was designed to elicit information from the general transit population and also passengers with disability needs. The survey included 21 questions, including questions on how often the respondents ride the FX2-Division line in East Portland, stops they use most often, and general perceptions of their primary stop. Short sections covered design elements such as the tactile bumps and bars and the bike lane coloring before moving into a section about the respondents' experiences interacting with bicyclists at the platform locations. Before ending with several sociodemographic questions, the survey includes a section on accessibility and whether the respondent experiences disabilities.

For people who indicated that they experience a hearing, vision, or mobility disability, an optional section asked them to describe any difficulty they experienced navigating the FX2 platform area, including navigating to the waiting area at the bus stop/platform, knowing when the bus is approaching, knowing when a bicyclist is riding through the bus stop platform area, aligning with the correct bus boarding door, getting on the bus, and getting off the bus and onto the sidewalk.

The median response time was about seven minutes to complete the survey, and the average response time was about 12 minutes.

3.3.2 Survey implementation

Survey respondents were recruited via email listservs and intercept surveys. The online version was distributed through partners with connections to the senior and disability communities; it also provided options for people to take it over the phone or on paper.

The intercept survey was conducted between October 27th, 2023, to November 22nd, 2023, and consisted of ten total site visits in three-hour increments (locations, dates, and times are shown in Table 2). To reach riders with disabilities, survey site selection was informed by lift use during boarding, along with ridership counts, derived from fall 2022 TriMet ridership boarding data.

Table 2 Survey intercept locations, dates and times

Platform	Date	Day of Week	Time
WB 122nd	10/27/23	Friday	3:00 - 6:00 pm
	11/22/23	Thursday	2:30-5:30 pm
	11/5/23	Sunday	12:00 - 3:00 pm
EB 148th **WB 148th**	11/2/23	Thursday	2:00 - 5:05 pm
	11/8/23	Wednesday	2:53 - 5:30 pm
EB 162nd **WB 162nd**	11/3/23	Friday	1:00 - 4:00 pm
	11/18/23	Saturday	1:00 - 2:45 pm
EB 174th **WB 174th**	11/11/23	Saturday	1:10 - 4:02 pm
EB 93rd MAX **WB 93rd MAX**	11/15/23	Wednesday	2:30 - 5:30 pm
WB 18000	11/16/23	Thursday	12:00 - 4:00 pm

Surveyors approached all riders waiting to board and some riders alighting the bus. Postcards were distributed with a QR code to access an online version of the survey. Team members also carried and distributed paper copies of the survey, and respondents could take the survey on-site (either with the help of the surveyor or by themselves) or bring home a paper survey with a prepaid return envelope. Phone surveys were also available for those who requested them. All survey participants were entered into a raffle for three $100 Visa gift cards and respondents with disabilities who answered additional questions were given a $10 grocery gift card of their choice.

3.4 Interviews

Participants were asked during the survey if they would be willing to participate in an interview. Those who reported in their survey responses as to either having a disability or being a caretaker to someone with a disability were contacted. Interviewees were also asked to reach out to any contacts who would be interested in sharing their experiences. However, most of the interviewees were recruited via email or during the intercept survey. Five interviewees were recruited for this study.

All interviews were conducted via phone or video meeting. However, interview participants were given the option to take the interview in person if preferred. Interviews were 45 to 60 minutes long and covered topics related to experiences and challenges boarding and alighting the bus, the overall accessibility of the FX-2 platform design, and interactions with bicyclists.

3.5 Operator Interviews and Surveys

TriMet conducted interviews and surveys with FX2 bus operators in June 2024 to gather their experience on how the shared bicycle and pedestrian platforms are working. Full details from these interviews and surveys are included in the Appendix.

4 Key Findings

Key findings are presented in this chapter. The findings are drawn from all the data sources, including video review, survey, interviews findings and ride-alongs.

4.1 Observed Volumes

Key findings:

- ***Of the 1059 bicycles and other micromobility vehicles observed, 77% were bicycles, and 74% were traveling with traffic.***
- ***Wrong-way traffic made up 24% of volume, and e-scooters and other non-bicycle devices account for 19% of traffic.***

Table 3 and Figure 15 show the travel direction by vehicle type. The bolded values represent the counts in each category. The first row of proportions are summed horizontally while the second row of proportions are summed vertically. Overall, 1059 vehicles were observed at the eight study sites, with 74% going with traffic and 26% going in the wrong way. Bicycles represent 77% of total observations, 4% were cargo bikes/bicycles with trailers/recumbent bicycles, and others including e-scooters and skateboards were 19% of the total observations. Of the vehicles traveling the wrong way, 75% were riding regular bicycles. Cargo bikes, bikes with trailers, and recumbent cyclists, which accounted for 4% of the total observations, had the highest rate of wrong-way travel at 33%.

Table 3 Travel Direction by Vehicle Type

Platform	With Traffic	Wrong Way	Total
Bicycle	602	209	811
	74% 77%	26% 75%	100% 77%
Cargo, Trailer, or Recumbent	31	15	46
	67% 4%	33% 5%	100% 4%
Other including e-scooters and skateboards	146	56	202
	72% 19%	28% 20%	100% 19%
Total	779	280	1059
	74% 100%	26% 100%	100% 100%

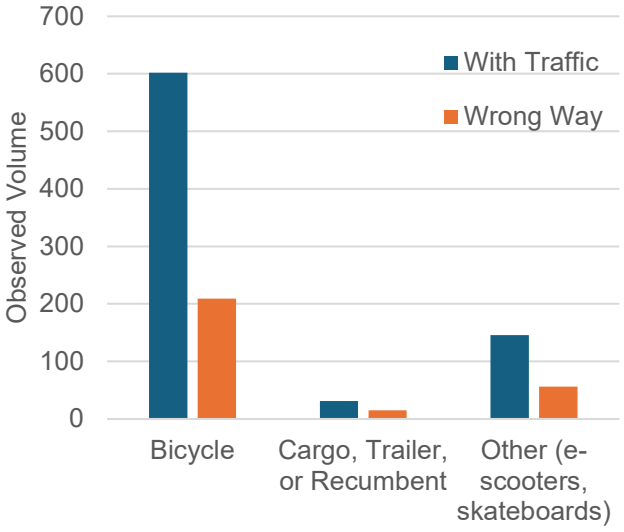


Figure 15 Observed Volumes

4.2 Bicyclist Speeds

Key Findings:

- ***Bicyclists slow when transit riders and buses are present. Average travel speeds through the platform area were 10.28 mph for standard bikes, 7.45 mph for cargo bikes, trailers, recumbent bikes, 13.10 for e-scooters, and 6.97 mph for skateboards. Among bikes, average speeds dropped 7% when transit riders were present. Average bicyclist speeds were lower when buses were present - for bikes traveling with traffic, average speeds dropped 25% when buses were present, from 10.97 mph to ~8.23 mph.***

Speeds were only collected for vehicles that entered and exited the platform area. Overall, average speed across all observed vehicle types was 10.44 mph, while the median speed was 9.89 mph. Of all the vehicles observed, e-scooters had the highest observed average speed (13.10 mph) followed by bicycles (10.28 mph).

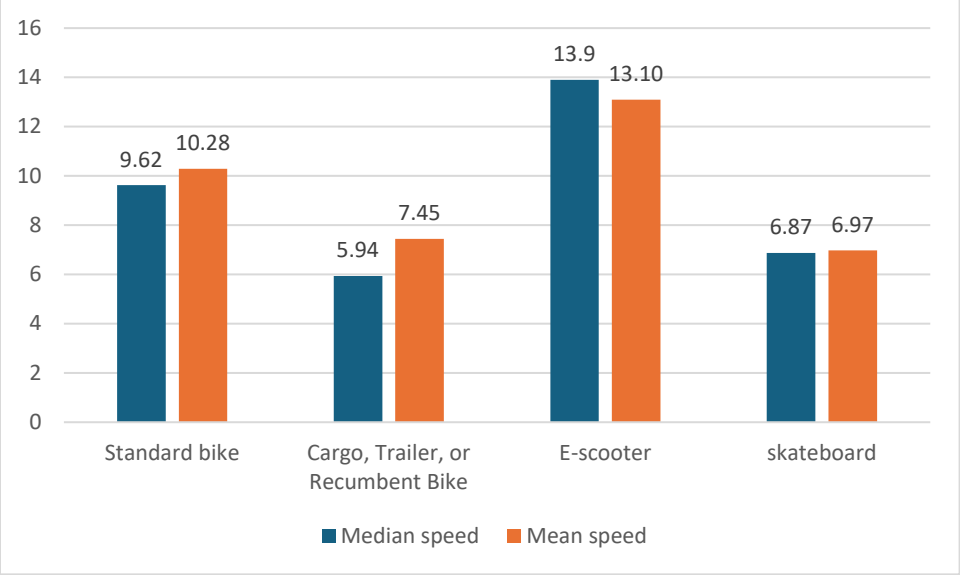


Figure 16 Observed median and mean speeds (mph)

4.3 Bicyclist path through platform area

Key Findings:

- ***Bicyclists traveling with traffic generally used the bike lane, but used other platform areas when transit riders were present.***
- ***Overall, only 2% of bicyclists moved out into the motor vehicle travel lane to move past the platform area.***

Figure 17 categorizes the path through the platform area of each bicyclist and other micromobility users. Users are broken down by those riding with traffic (versus wrong-way) and those passing through the platform area when no transit passengers or pedestrians are present compared to when they are present. Path through the platform area indicates if the bicyclist 1)

stayed in the marked bike lane area (e.g. green colored area in the standard design); 2) used multiple areas including the bike lane – for example, weaving from the bike lane, into the waiting area, and then back; 3) traveled in the transit waiting area, which roughly corresponds with the sidewalk on either side of the platform area; 4) bypassed the platform area by moving out into the street; or 5) other actions, including passing behind the bus shelter, or using the narrow boarding strip.

Most bicyclists (62%) traveling with traffic used the bike lane, while about a third used the waiting area or a combination of multiple areas including the bike lane. Only 2% of bicycle riders traveling with traffic used the street (motor vehicles lanes) to bypass the platform area. When transit riders are present, bicyclists were more likely to use multiple areas – this generally reflects bicyclists adjusting course to travel around transit passengers or pedestrians – for example starting in the bike lane but moving into the waiting area to go around a passenger.

Wrong way riders were much more likely to travel in the waiting area. Most wrong-way riders entered the platform area from the sidewalk (63%), so it is not surprising that they continued along a similar path by riding in the platform waiting area. In contrast most bicyclists riding with traffic entered the platform area riding in the bike lane (57%).

E-scooter users' patterns of bike lane usage were generally consistent with bicyclist usage, although wrong-way riders were less likely to travel through the waiting area. Skateboarders were most likely to travel through the waiting area generally, with 81% overall doing so, which is not surprising as 75% of skateboarders approached the platform from the sidewalk, rather than the bike lane.

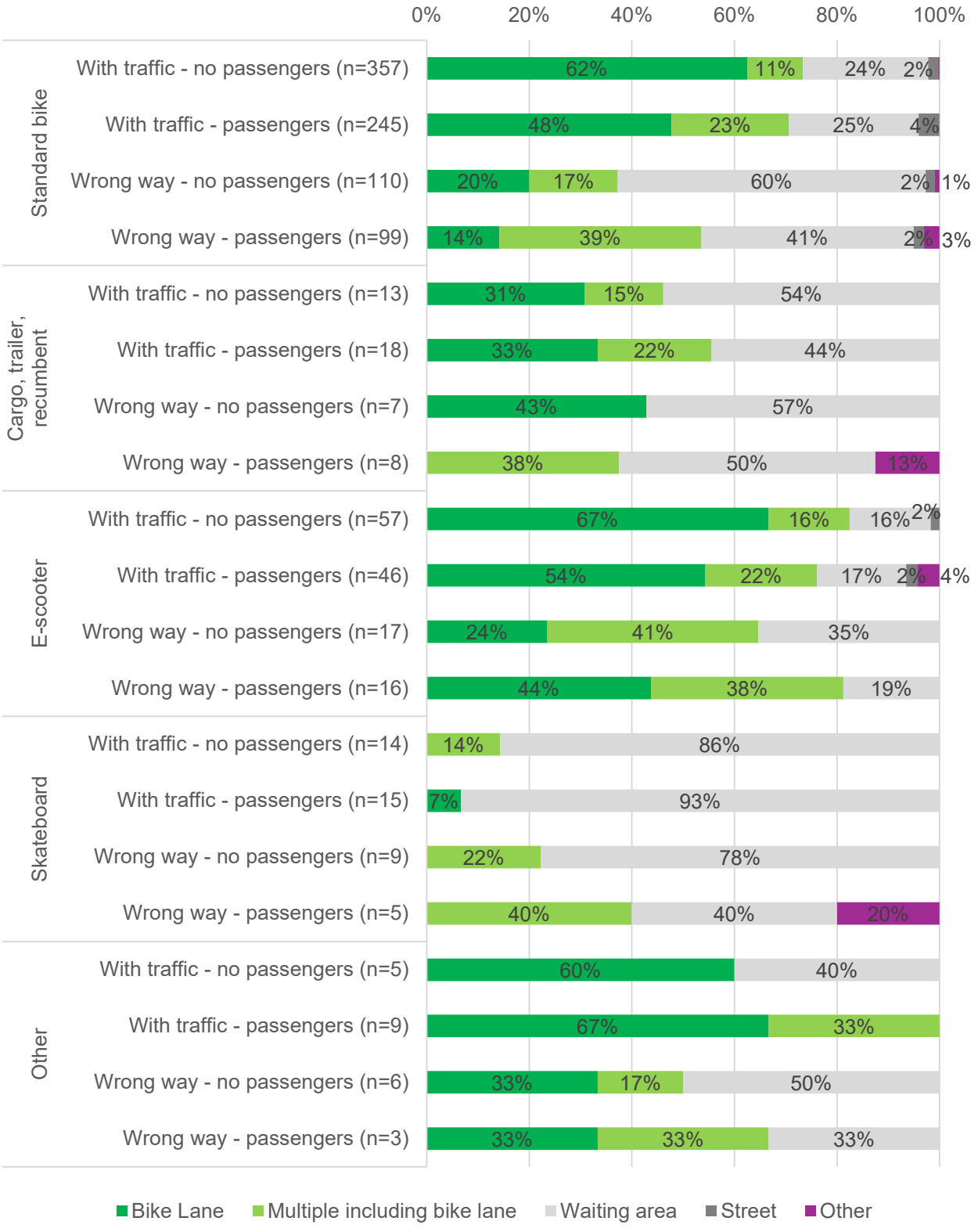


Figure 17 Path through the platform area by user type, direction of travel and presence of transit passengers

4.4 Bicyclist actions / stopping, yielding

Key findings:

- ***Bicyclists rarely stop, but more often slow or change direction to avoid passengers. Only 9% of bicyclists who arrived with a FX2 bus and passengers at the platform area stopped at the entrance ramp, while 33% slowed at the ramp. However, as noted above, bicyclists did slow.***
- ***Based on surveys of transit riders, most passengers feel bicyclists travel at safe speeds (50% agree; 22% disagree) and are careful to avoid passengers (49% agree; 22% disagree).***

Of all 1059 observed bicyclists and other micromobility users, only 69 passed through when a bus was at the platform (including arriving and departing buses), and of those only 44 arrived when a passenger was waiting in the platform area. As seen in Figure 19, bicyclist slowing and stopping at the ramp was more likely to occur when buses and passengers were present. When a bus and passengers are present, 9% of bicyclists riding with traffic stopped and 33% slowed at the bike ramp.

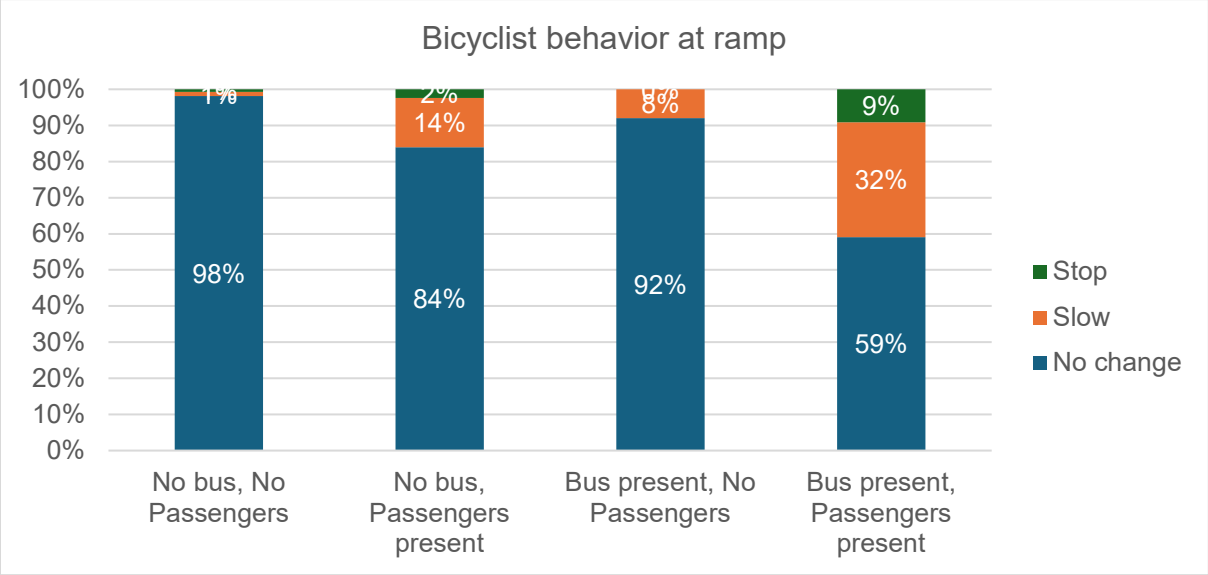


Figure 18 Bicyclist slowing and stopping at bike ramp, by presence of bus and passengers

Figure 20 looks at bicyclist behavior when encountering passengers in the platform area more broadly (i.e., not just bicyclist behavior at the ramp). Video data analysis showed that when passengers are present, very few bicyclists riding with traffic stop (3%). Thirty one percent of the bicyclists take some evasive action – slow, stop, change course or swerve to avoid conflicts with passengers. Similarly, when passengers are present and bicyclists are riding the wrong way, only 1% of the bicyclists stop and 42% of the bicyclists take some evasive actions.

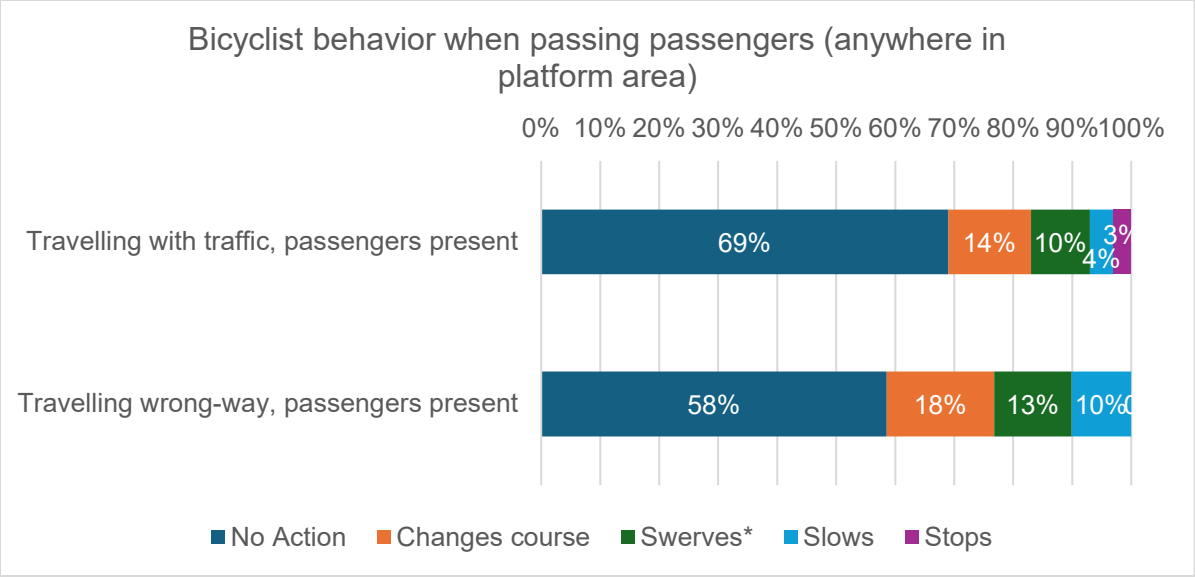


Figure 19 Bicyclist behavior when passing passengers in the platform area

* "Swerve" defined as combination of change course and slow

4.5 Passenger actions / waiting, boarding path

Key findings:

- ***Passengers generally wait in the marked waiting area until the bus is arriving. Only 8% of pedestrians waited in the bike lane or loading zone for more than 10 seconds.***
- ***Nearly three quarters of passengers (73%) wait until the bus is stopped before starting to move across the bike lane area into the boarding area.***

Of the 1295 transit passengers documented during the video review, 636 were boarding passengers. The project team documented the total wait time for each boarding passenger (from arrival at the platform area to boarding the bus), and the total duration each passenger waited in the bike lane. Ninety-two percent of passengers were in the bike lane for less than a total of 10 seconds.

We also sought to document if passengers were waiting until the bus arrived to move through the bike lane. For each boarding passenger, we noted the position of the arriving bus when the passenger stepped into the bike lane to move toward a bus door. 73% of passengers wait until the bus is fully stopped before starting to move across the bike lane area into the boarding area, while 20% start to enter the bike lane area when the bus is slowing (on the concrete area) but not yet stopped. 7% entered the bike lane prior to the bus arriving at the concrete stopping area.

For boarding passengers, when the bus arrives such that the doors are aligned with the marked bike lane crossing areas, 60% of passengers cross in the designated areas, while 40% cross the bike lane elsewhere, including at a diagonal.

4.6 Bicyclist / pedestrian conflicts

Key findings:

- ***Given the volumes observed, bicyclists and transit passengers seem to be generally managing their interactions.***
- ***Some additional warning about when bicyclists are passing would be helpful, particularly for visually impaired passengers and pedestrians.***

Video observations revealed that when bicyclists encountered riders in the platform area, 14% of those riding with traffic undertook evasive maneuvers to avoid collisions with transit passengers. Nine percent of transit passengers encountering bicyclists undertook anticipatory avoidance. Clips of interactions between bicyclists and riders were extracted from the recorded video. Forty-one clips were reviewed by the project team. The review revealed that 39 of those interactions (95%) could be defined as proactive or anticipatory negotiations for space, and they did not pose any danger to either the bicyclist or the transit rider. Two of the conflicts (5%) were tagged as minor conflicts, in which action was needed to avoid collision. No major conflicts were observed between bicyclists and transit riders.

In the survey of passengers, three people reported having a person on a bicycle "bump into or crash into" them, however, one actually was referring to an incident at a non-FX2 site (NW 18th northbound near Davis), one indicated the incident occurred at SE Division and 130th, and the third did not provide the location. None indicated that any injury had occurred. Six people indicated that they had witnessed, but not personally been involved in, such a bump or crash incident, although none mentioned any injury. Interviewees noted that they are concerned about getting hit by cyclists. For visually impaired riders, they may not know when bicyclists are approaching (particularly when loud buses are in the vicinity), and wished there was some audible way to know when bicyclists were passing.

4.7 Design elements, including differences between stations at MAX Green Line and other platform areas

Key findings:

- ***We observed few differences in bicyclist and passenger behavior between the standard FX2 shared platform design and the variations at SE 93rd Avenue.***
- ***Survey respondents and ride-along participants liked the green color for the bike lane.***
- ***Ride-along participants liked the wider blue TWSI strip separating the bike lane from the transit waiting area at the SE 93rd Avenue platform areas, noting it better conveyed a different purpose than the street adjacent white TWSI boarding area.***
- ***Consistency in design across locations should be a priority going forward.***

During the survey, respondents were asked about their preferences between the two platform areas. Green color for the bike lane (present at the TriMet stops) was generally preferred by the respondents. Respondents surveyed at the ODOT locations (93rd EB and WB) had a more

favorable view of the platform design as compared to respondents surveyed at the other locations. This could be related to differences in types of riders and respondents themselves (respondents at these locations were less frequent FX2 riders and were more likely to also be bicyclists).

Inconsistency in design is a challenge especially for vision impaired riders, who rely on knowing where the bus stop elements are located and having different stops with varying design elements and locations can make them difficult to navigate. Some passengers with limited vision stated that they navigate to stops with the help of the standard blue octagonal TriMet bus stop signs, which were not used for the FX2 platforms.

4.8 General perceptions of the FX2 platform

Key finding:

- ***The FX2 shared bicycle and pedestrian platform design is broadly popular among riders, with most feeling that the design is an improvement over other bus stops in Portland.***

A majority of survey respondents, about 62%, felt the FX-2 stops were better than other bus stops in Portland (36% said somewhat better and 26% said much better), in stark contrast to only 13% who deemed them worse (7% said somewhat worse and 6% said much worse).

Among the reasons cited for perceptions that the FX-2 stops were better than other bus stops in Portland were the presence of larger shelters that provide better coverage from the elements and were nicer overall (18%), availability of seating (5%) and better lighting (11%). A majority of respondents, 78%, felt the FX-2 stops are safe overall (35% felt they were very safe and 43% deemed them somewhat safe) compared to the 21% who felt they were unsafe (17% said not very safe and 4% said not safe at all).

5 Overall summary of findings

The primary objective of this research is to assess conflicts between users of the shared bicycle and transit stations, particularly conflicts between people on foot (or wheelchair/mobility device) who are waiting for boarding and/or alighting a bus and people on bicycles riding in the bike lane. To accomplish the research objectives, a mixed methods approach was undertaken.

First, the research team organized ride-alongs with blind or visually impaired Portlanders to tour several platforms and ride the FX2, to understand how members of the disability community experience the FX2 platform, along with how to ensure that data collection efforts for this project would incorporate this perspective. Next, eight sites were selected for video data collection. These sites were situated on both directions of the roadway and encompassed diverse platform designs with high usage by passengers and cyclists. Video was collected for two days at these selected sites in two stages; however, only video collected in spring was used in the data analysis. The collected video was reviewed, and user volumes, bicyclist and transit rider behaviors and conflicts were extracted. Next, a survey was developed and administered to transit riders to gather their attitudes and perceptions regarding the new designs and determine how these facilities are being used. The objective of the survey was to gather additional information regarding potential interactions and usage of space as the video data may not capture all interactions due to the limited amount of footage collected and reviewed. Additionally, the survey was designed specifically to reach more passengers with accessibility needs and gather their input. Finally, interviews were conducted with five participants who reported themselves as being disabled or taking care of someone with a disability.

Some key overall findings include:

- The primary conflict presented by the bicycle – bus leapfrogging problem, including the safety concerns related to bicyclists moving out into traffic, and of the impacts on bus operations, have been largely alleviated. Only 2% of bicyclists and other micromobility users (23 out of 1059 observed) used motor vehicle travel lanes.
- Bicyclists and other micromobility users rarely stop for transit passengers, but they do slow down when passengers and buses are present.
- Interactions between bicyclists and transit passengers generally occurred at slow speeds with each user aware of one another. These interactions may be categorized as negotiations for space. Two minor conflicts were observed, in which bicyclists or passengers had to stop or change course suddenly to avoid a collision.
- Some additional warning about when bicyclists are passing would be helpful, particularly for visually impaired transit passengers and pedestrians.
- Overall, surveyed FX2 passengers like the platform design. Green color was generally preferred for the bike lane.
- Inconsistency in design is a detriment for passengers with vision impairments.

Given the volumes observed, bicyclists and transit riders seem to be generally managing their interactions. However, it is important to note that observed bicycle volumes were low, and transit platforms were rarely crowded during the reviewed time periods.

Findings broken out by the data collection method are summarized below.

5.1 Video Findings

Overall, 1059 vehicles were observed at the eight study sites, with 74% going with traffic and 26% going in the wrong way. Bicycles represent 77% of total observations, 4% were cargo bikes/bicycles with trailers/recumbent bicycles, and others including e-scooters and skateboards were 19% of the total observations. Of the vehicles traveling the wrong way, 75% were riding regular bicycles. Average speed across all observed vehicle types was 10.44 mph. Of all the vehicles observed, other vehicles (e-scooters and skateboards) had the highest observed average speed (11.72 mph) followed by bicycles (10.28 mph). Cargo bicycles/ trailer and recumbent bikes were observed to have the lowest speed (7.45 mph). Bicyclists slow when transit riders and buses are present. Among bikes, average speeds dropped 7% when transit riders were present. Average bicyclist speeds were lower when buses were present - for bikes traveling with traffic, average speeds dropped 25% when buses were present, from 10.97 mph to ~8.23 mph.

Most bicyclists (62%) traveling with traffic used the bike lane, while about a third used the waiting area or a combination of multiple areas including the bike lane. Only 2% of bicycle riders traveling with traffic used the street (motor vehicles lanes) to bypass the platform area. When transit riders were present, bicyclists were more likely to use multiple areas. Wrong way riders were much more likely to travel in the waiting area as they entered the platform area from the sidewalk (63%). In contrast most bicyclists riding with traffic entered the platform area riding in the bike lane (57%).

When transit passengers were present, bicyclists were observed to rarely stop, but more often they slowed or changed direction to avoid passengers. Only 9% of bicyclists who arrived with an FX2 bus and passengers at the platform area stopped at the entrance ramp, while 33% slowed at the ramp.

Passengers generally waited in the marked waiting area until the bus arrived. Only 8% of passengers waiting for an FX2 bus waited in the bike lane or loading zone for more than 10 seconds. Seventy three percent of passengers waited until the bus was stopped before starting to move across the bike lane area into the boarding area.

When bicyclists encountered passengers in the platform area, 14% of those riding with traffic undertook evasive maneuvers to avoid collisions with passengers. Nine percent of riders encountering bicyclists undertook anticipatory avoidance. Forty-one clips of interactions between bicyclists and riders were extracted from the recorded video and reviewed by the project team. The review revealed that a majority (39) of those interactions were negotiations for space, and they did not pose any danger to either the bicyclist or the transit rider. Two of the conflicts were tagged as minor conflicts, in which action was needed to avoid collision. No major conflicts were observed between bicyclists and transit riders.

5.2 Survey Findings

Overall, 176 people responded to the survey, including 128 respondents who provided answers to the question about which platforms they used. Of these survey respondents, 106 were recruited via email (65 after removing those who indicated they do use the shared transit platforms in question) and 70 were recruited via intercept (63 after removing those who indicated they do actually use the shared transit platforms in question).

With respect to the respondents, 67% reported that they go to work or school outside the home. The majority of survey respondents were male (57%). Respondents were asked to report all modes of transportation they used; and majority (96%) reported using public transit. Overall, the respondents were positive about the FX-2 platforms. A majority of respondents, about 62%, felt the FX-2 stops were better than other bus stops in Portland due presence of larger shelters that provide better coverage from the elements and were nicer overall (18%), availability of seating (5%) and better lighting (11%). A majority of respondents, 78%, viewed the FX-2 stops preferably (35% felt they were very safe and 43% deemed them somewhat safe) compared to the 21% who felt they were unsafe (17% said not very safe and 4% said not safe at all).

A majority of respondents, 82%, said they had noticed the tactile bumps or bars in the platform area and over a quarter, 26%, said that they were helpful. Respondents felt that the bumps or bars were helpful in delineating waiting areas from other modes. Of the 28 respondents who gave open-ended feedback about the color of the bike lane, 21% specifically mentioned that they liked the green color or advocated for consistency in using green.

Twenty one percent of the respondents (14% often, 7% always) reported that they frequently saw bicyclists riding through the platform area. Fifty percent of the respondents felt that bicyclists traveled at safe speeds (only 22% disagreed). Thirty one percent of respondents were worried about being hit by bicyclists. Forty nine percent agreed that bicyclists were careful to avoid those waiting for the bus. Only 27% of the respondents agreed with the statement that the bus drivers warned them about approaching bicycles. Sixty nine percent of respondents agreed with the statement that they always made sure to check for approaching bicycles. Majority of the respondents (77%) had not experienced any crashes with bicycles.

Nineteen percent of the respondents reported having a disability. Common issues reported by the disabled passengers include having difficulties knowing when the bus was approaching, they had difficulty knowing when a bicyclist was riding through the platform, difficulties aligning themselves with the correct boarding door, difficulty getting on and off the bus.

Respondents surveyed at the ODOT stops compared to their counterparts, appeared to have a more favorable view of the FX stops, with as many as 86% reporting that there was something they liked about the platform that they wanted to see in other bus stops.

5.3 Interview Findings

Respondents were concerned with bicyclist behavior and potential collisions, and the challenge of hearing bicyclists over traffic noise and the noise of the bus itself. Interviewees emphasized the need to educate bicyclists on verbally alerting transit passengers and pedestrians when passing. There was concern among the respondents about platform accessibility for people who are blind, particularly in communicating the layout of the platform to those that don't have prior knowledge of the stop. Respondents were concerned with the inconsistency of wayfinding design elements, including the placement of braille placards and the absence of the octagonal blue pole, standard at other bus stops and were pleased with the marquee with arrival time displays. However, there was some concern about the lack of system/ route maps in the area and, in terms of accessibility, the lack of auditory or visual alerts about passing bicycles. Respondents were generally pleased with the shelter, lighting, and safety (security) at the platform. There were some suggestions to improve seating by including varying heights for different users and providing more space between seats. Equity concerns were raised about the greater distance

between stops compared to the former line or those in inner Portland. Concern was also expressed about the challenges alighting the bus using a walker, particularly when the bus pulled up too far from the curb.

5.4 Findings from Operator Interviews and Surveys

Overall operators shared positive perceptions of the FX2 line buses and platforms. However, some concerns did arise:

- One driver mentioned that they find that some users of mobility devices and walkers struggle with the tactile domes on the platforms.
- Some operators noted that passengers do not look as they exit the bus and that passing bicyclists do not look for passengers. It was noted that it is important for the driver to look for bicyclists and hold the doors and/or notify passengers of the presence of bicyclists. One mentioned a concern that an increase in the number of bicyclists could create unsafe conditions.
- Several operators mentioned that power boxes at station platforms were obscuring visibility.

Operators note that passengers are generally positive about the FX2 experience, and that most negative feedback relates to station spacing.

Several issues outside the purview of this study were noted, including that there is some confusion among drivers about which platforms are 9” vs 6” and a request for more consistency or notice about which is which. Another concern noted by a number of operators was that people do not like that the Quantum chair is rear-facing.

6 Appendix A: Detail from video data analysis

This appendix presents detailed information on the findings of the video data analysis on observed bicyclist and transit passenger behaviors at the study sites.

6.1 Observed volumes

Table 4 shows the observed vehicles and transit rider volumes. As each vehicle passed a line equivalent to the top of the bike ramp on the approach to the platform, the total number of transit passengers / pedestrians was recorded.

The bolded values represent the counts in each category. The proportions are summed horizontally. Fifty-six percent of all vehicles encountered no transit riders during their trip through the bus stop area. Thirty-five percent encountered small groups (1-2) of transit riders. Only 2% encountered large groups (6-11+) of transit riders. Of the vehicles, who encountered large groups of transit riders, majority were standard bicycles.

Table 4 Observed Vehicles and Transit Rider Volumes

Vehicle Type	Zero	1-2	3-5	6-10	11+	Total
Bicycle	**462**	**271**	**64**	**10**	**4**	**811**
	57%	33%	8%	1%	0%	100%
Cargo, Trailer, or Recumbent	**20**	**20**	**5**	**0**	**1**	**46**
	43%	43%	11%	0%	2%	100%
Other including e-scooters and skateboards	**108**	**75**	**17**	**1**	**1**	**202**
	53%	37%	8%	0%	0%	100%
Total	**590**	**366**	**86**	**11**	**6**	**1059**
	56%	35%	8%	1%	1%	100%

Table 5 shows the volumes by location. The bolded values represent the counts in each category. The proportions are summed horizontally. Highest volumes were observed at the 93EB (174 or 16%) with 72% bicycles, 3% cargo bikes and 24% other vehicles. Lowest volumes were observed at 122nd WB location, with 63% bikes, 11% cargo bikes and 27% other vehicles. 116EB location has the fourth highest observations (148 or 14% of all observations) but had the most observations of other vehicles such as e-scooters and skateboards (48). 162EB had the most observations originating from cargo bikes/bicycle with trailers/recumbent bikes (14).

Table 5 Volumes by Location

Platform	Bicycle	Cargo, Trailer, or Recumbent	Other including e-scooters and skateboards	Total
85WB	**137**	**3**	**25**	**165**
	83%	2%	15%	100%
93EB	**126**	**6**	**42**	**174**
	72%	3%	24%	100%
93WB	**127**	**2**	**26**	**155**
	82%	1%	17%	100%
116 EB	**98**	**2**	**48**	**148**
	66%	1%	32%	100%
122WB	**47**	**8**	**20**	**75**
	63%	11%	27%	100%
148WB	**100**	**5**	**19**	**124**
	81%	4%	15%	100%
162EB	**104**	**14**	**10**	**128**
	81%	11%	8%	100%
162WB	**72**	**6**	**12**	**90**
	80%	7%	13%	100%
Total	**811**	**46**	**202**	**1059**
	77%	4%	19%	100%

Table 6 shows the travel direction by location. The bolded values represent the counts in each category. The proportions are summed horizontally. Overall, the majority of vehicles at each location were compliant and traveling in the direction of traffic. Of all the vehicles that were traveling with traffic, Platform 85WB had the highest rate of travel direction compliance (85%). Of all the vehicles traveling wrong way, platform 93EB had the highest number of vehicles traveling the wrong way (56, 20%).

Table 6 Travel Direction by Location

Platform	With Traffic	Wrong Way	Grand Total
85WB	140	25	165
	85%	15%	100%
93EB	118	56	174
	68%	32%	100%
93WB	120	35	155
	77	23%	100%
116 EB	105	43	148
	71%	29%	100%
122WB	57	18	75
	76%	24%	100%
148 WB	81	43	124
	65%	35%	100%
162EB	89	39	128
	70%	30%	100%
162WB	69	21	90
	77%	23%	100%
Grand Total	779	280	1059
	74%	26%	100%

6.2 Bicyclist behavior

6.2.1 At bus stops

Table 7 shows the bicyclist route through bus stop area. The bolded values represent the counts in each category. The proportions are summed horizontally. Overall, 54% of the vehicles traveling with traffic were traveling in the bike lane, as opposed 19% in the bike lane with vehicles traveling the wrong way. Higher proportion of bicycles traveling the wrong way were traveling through the waiting area (49% vs. 27%), multiple areas including the bike lane (16% vs 21%), and multiple areas outside of the bike lane (7% vs 0%) compared to bicycles traveling with traffic. For bicyclists traveling with traffic, differences in behavior were observed when transit riders were either present or absent. Higher proportion of bicyclists used the bike lane (60% vs 47%) when transit riders were absent. Higher proportion of bicyclists used the waiting area (28% vs. 26%) and areas outside of the bike lane when transit riders were present (22% vs. 11%). Similar differences in behavior were observed between bicyclists traveling the wrong way with and without transit riders present. When transit riders were not present, a higher proportion of bicyclists traveling the wrong way used the bike lane (21% vs. 17%) and the waiting area (58% vs. 39%) compared to when transit riders were present. When transit riders were present, a higher proportion of bicyclists were observed using multiple areas including the bike lane (30% vs 14%) and multiple areas outside of the bike lane (9% vs. 5%) compared to when riders were not present.

Table 7 Route through bus stop area for Bicycles

Travel Direction, Rider Presence, & Vehicle Type	Bike lane	Waiting area	Multiple areas inc. bike lane	Street	Multiple areas outside BL	Behind bus shelter	Other	Loading area	Total
With Traffic	**423**	**209**	**124**	**19**	**1**	**2**	**1**		**779**
	54%	27%	16%	2%	0%	0%	0%	0%	100%
No transit riders present	**268**	**117**	**51**	**8**	**1**		**1**		**446**
	60%	26%	11%	2%	0%	0%	0%	0%	100%
Bicycle	**223**	**87**	**38**	**7**	**1**		**1**		**357**
	62%	24%	11%	2%	0%	0%	0%	0%	100%
Cargo, trailer, or recumbent	**4**	**7**	**2**						**13**
	31%	54%	15%	0%	0%	0%	0%	0%	100%
Other including e-scooters and skateboards	**41**	**23**	**11**	**1**					**76**
	54%	30%	14%	1%	0%	0%	0%	0%	100%
Transit riders present	**155**	**92**	**73**	**11**		**2**			**333**
	47%	28%	22%	3%	0%	1%	0%	0%	100%
Bicycle	**117**	**62**	**56**	**10**					**245**
	48%	25%	23%	4%	0%	0%	0%	0%	100%
Cargo, trailer, or recumbent	**6**	**8**	**4**						**18**
	33%	44%	22%	0%	0%	0%	0%	0%	100%
Other including e-scooters and skateboards	**32**	**22**	**13**	**1**		**2**			**70**
	46%	31%	19%	1%	0%	3%	0%	0%	100%
Wrong Way	**53**	**137**	**60**	**4**	**20**	**4**	**1**	**1**	**280**
	19%	49%	21%	1%	7%	1%	0%	0%	100%
No transit riders present	**31**	**86**	**21**	**2**	**8**		**1**		**149**
	21%	58%	14%	1%	5%	0%	1%	0%	100%
Bicycle	**22**	**66**	**14**	**2**	**5**		**1**		**110**
	20%	60%	13%	2%	5%	0%	1%	0%	100%
Cargo, trailer, or recumbent	**3**	**4**							**7**
	43%	57%	0%	0%	0%	0%	0%	0%	100%
Other including e-scooters and skateboards	**6**	**16**	**7**		**3**				**32**
	19%	50%	22%	0%	9%	0%	0%	0%	100%
Transit riders present	**22**	**51**	**39**	**2**	**12**	**4**		**1**	**131**
	17%	39%	30%	2%	9%	3%	0%	1%	100%
Bicycle	**14**	**41**	**31**	**2**	**8**	**2**		**1**	**99**
	14%	41%	31%	2%	8%	2%	0%	1%	100%
Cargo, trailer, or recumbent		**4**	**2**		**1**	**1**			**8**
	0%	50%	25%	0%	13%	13%	0%	0%	100%
Other including e-scooters and skateboards	**8**	**6**	**6**		**3**	**1**			**24**
	33%	25%	25%	0%	13%	4%	0%	0%	100%
Total	**476**	**346**	**184**	**23**	**21**	**6**	**2**	**1**	**1059**
	45%	33%	17%	2%	2%	1%	0%	0%	100%

6.3 Bicycle and Other Vehicle Behaviors

The project team coded bicyclist behavior upon reaching the bike ramp (at the beginning of the shared bus platform), and more general behavior upon encountering any transit passengers / pedestrians in the platform area.

6.3.1 Bicyclist behavior at ramp

Table 11 shows the bicyclist (and other micromobility users) behavior, including any slowing or stopping, upon arrival at the bus platform ramp, based on whether or not buses or passengers are present at the platform. As expected very few bicyclists slowed or stopped when no passengers were present in the platform area (only 2% of those arriving with no bus present, and 8% of those arriving with a bus present). With people waiting at the platform area, but no bus present, 13.6% slowed and 2.4% stopped. With people waiting at the platform and a bus present (either arriving, stopped, or departing), 32% slowed and 9% stopped.

Table 8 Bicyclist slowing and stopping at bike ramp, by presence of bus and passengers

Bicyclist behavior at ramp	No stop or slow	Slow	Stop	Total	n
No bus	92.1%	6.5%	1.4%	100.0%	985
No Passengers	98.1%	1.2%	0.7%	100.0%	567
Passengers present	84.0%	13.6%	2.4%	100.0%	418
Bus present	71.0%	23.2%	5.8%	100.0%	69
No Passengers	92.0%	8.0%	0.0%	100.0%	25
Passengers present	59.1%	31.8%	9.1%	100.0%	44
Grand Total	90.7%	7.6%	1.7%	100.0%	1054

6.3.2 Bicyclist behavior in the platform area when encountering bus passengers / pedestrians

Table 8 shows observed behaviors of bicyclists when they encounter people in the platform area. Overall, when bicyclists were riding with traffic, 57% of them did not encounter any transit riders. Of those who did encounter people in the platform area 70% undertook no action, 13% changed route, 9% swerved, 4% slowed and 4% stopped. When bicyclists were riding the wrong way, 53% of them did not encounter any transit riders. Of those who did encounter people in the platform area 58% undertook no action, 18% changed route, 13% swerved, 9% slowed and 2% stopped.

Table 9 Interactions between Pedestrians and Bicyclists

Bicyclist category	No Riders	No Action	Changes Route	Swerves	Slows	Stops	Grand Total
With Traffic	444	236	43	29	13	14	779
	57%	30%	6%	4%	2%	2%	100%
Transit riders present	n/a	234	43	29	13	14	333
		70%	13%	9%	4%	4%	100%
Bicycle		169	34	24	11	7	245
		69%	14%	10%	4%	3%	100%
Cargo, Trailer, or Recumbent		12	2	2	0	2	18
		67%	11%	11%	0%	11%	100%
Other including e-scooters and skateboards		53	7	3	2	5	70
		76%	10%	4%	3%	7%	100%
Wrong Way	149	76	24	17	12	2	280
	53%	27%	9%	6%	4%	1%	100%
Transit riders present	n/a	76	24	17	12	2	131
		58%	18%	13%	9%	2%	100%
Bicycle		57	18	13	10	1	99
		58%	18%	13%	10%	1%	100%
Cargo, Trailer, or Recumbent		1	1	4	1	1	8
		13%	13%	50%	13%	13%	100%
Other including e-scooters and skateboards		18	5	0	1	0	24
		75%	21%	0%	4%	0%	100%
Total Count of Interactions with Peds	593	310	67	46	25	16	1059
	56%	29%	6%	4%	2%	2%	100%

6.4 Transit passenger behaviors

For each boarding transit passenger, we documented the total length of time that they stood in the bike lane while waiting for the bus to arrive. Table 12 shows the proportion of passengers who waited in the bike lane for at least 10 seconds, which was deemed to be in line with the amount of time someone might take to step out and look for the bus, and then step back. On average, 8% of passengers waited in the bike lane for 10 or more seconds. Among those who waited in the bike lane, the average amount of time spent in the bike lane was 56 seconds.

Table 10 Details about transit passengers waiting in the bike lane

Platform	In BL < 10 seconds		Waits in BL (10+ seconds)		Count
	Percentage of passengers	Average duration in BL	Percentage of passengers	Average duration in BL	
116EB	77%	00:02	23%	00:59	13
122WB	93%	00:00	7%	01:22	119
148 WB	78%	00:00	22%	00:55	83
162EB	85%	00:01	15%	01:34	40
162WB	92%	00:01	8%	00:45	84
85WB	87%	00:03	13%	00:11	15
93EB	97%	00:01	3%	00:28	197
93WB	95%	00:04	5%	00:31	85
Total	92%	00:01	8%	00:56	636

For boarding passengers, we also recorded where the bus was when the passenger stepped into the bike lane (see Table 13). Seventy-three percent of passengers wait until the bus is stopped before starting to move across the bike lane area into the boarding area, while 20% start to enter the bike lane area when the bus is slowing (on the concrete area) but not yet stopped.

Table 11 When do passengers start moving toward bus / enter bike lane area

Platform	Before concrete	in motion on concrete	stopped	Grand Total
116EB	31%	38%	31%	13
122WB	3%	18%	78%	116
148 WB	12%	8%	80%	83
162EB	13%	13%	75%	40
162WB	7%	18%	75%	84
85WB	7%	47%	47%	15
93EB	5%	24%	71%	197
93WB	7%	21%	72%	85
Grand Total	7%	20%	73%	633

We also noted if boarding passengers crossed the bike lane in one of the marked crosswalks areas that align with the FX2 doors (see Table 14). For boarding passengers, when the bus arrives such that the doors are aligned with the marked bike lane crossing areas, 60% of passengers cross in the designated areas, while 40% cross the bike lane elsewhere, including at a diagonal. For the 10% of passengers for whom the bus was not aligned, many of these cases are for non-articulated buses serving the FX2 line.

Table 12 Do boarding passengers cross the BL in the marked crossing area?

Platform	In marked crossing area	Other	Subtotal	Bus not aligned	Grand Total
116EB	29%	71%	7	46%	13
122WB	74%	26%	107	10%	119
148 WB	46%	54%	72	13%	83
162EB	84%	16%	37	8%	40
162WB	46%	54%	69	18%	84
85WB	58%	42%	12	20%	15
93EB	66%	34%	188	5%	197
93WB	46%	54%	82	2%	84
Grand Total	60%	40%	574	10%	635

If a bike passed through the platform area while a transit passenger was waiting, we noted if the either party took any type of evasive action, including if the bike changes their route, swerves, slows, or stops, and if a passenger takes any anticipatory or emergency avoidance action. A crosstab of these actions is shown in Table 15. Note that we did not see any emergency avoidance action taken by transit passengers. Overall, 91% of the transit passengers took no action when encountering bicyclists, while 9% undertook anticipatory avoidance. When the bicyclists changed route, 18% of the transit passengers took anticipatory avoidance action. The highest proportion of anticipatory avoidance action was taken by the transit passengers when the bicyclists swerved (32%). Table 15 shows the transit passenger action when other micromobility vehicles are present. Overall, 93% undertook no action when encountering bicyclists, while 7% undertook anticipatory avoidance. Very few transit passengers were observed to undertake anticipatory avoidance when the vehicles changed route, slowed, and swerved.

Table 13 Transit passenger action when bicyclists are present

	Transit Passenger Action		
Bicycle Action	**No Action**	**Anticipatory Avoidance**	**Total**
No Action	233	6	239
	97% 69%	3% 18%	100% 65%
Changes Route	45	10	55
	82% 13%	18% 29%	100% 15%
Swerves	32	11	43

	74% 10%	26% 32%	100% 12%
Slows	16	6	22
	73% 5%	27% 18%	100% 6%
Stops	10	1	11
	91% 3%	9% 3%	100% 3%
Total	**336**	**34**	**370**
	91% 100%	**9% 100%**	**100% 100%**

Table 14 Transit passenger action when other vehicles are present

	Transit Passenger Action		
Other Vehicle Action	No Action	Anticipatory Avoidance	Total
No Action	69	2	71
	97% 79%	3% 29%	100% 76%
Changes Route	10	2	12
	83% 12%	17% 29%	100% 13%
Stops	5	0	5
	100% 6%	0% 0%	100% 5%
Slows	2	1	3
	67% 2%	33% 13%	100% 3%
Swerves	1	2	3
	33% 1%	67% 29%	100% 3%
Total	87	7	94
	93% 100%	7% 100%	100% 100%

6.5 Bicyclist Speeds

Speeds were only collected for vehicles that entered and exited the platform area. Table 16 shows the average speeds by vehicle type. Overall, average speed across all observed vehicle types was 10.44 mph. Of all the vehicles observed, other vehicles (e-scooters and skateboards) had the highest observed average speed (11.72 mph) followed by bicycles (10.28 mph). Cargo bicycles/ trailer and recumbent bikes were observed to have the lowest speed (7.45 mph).

Table 17 shows the vehicle speed range by location. The average speeds for the majority of vehicles observed (47%) is between 8-14 mph. Twenty one percent of vehicles had average speeds greater than 14 mph and 32% had average speeds less than 8 mph. The highest proportion of speeds greater than 14 mph were observed at 116th EB.

Table 18 shows the average cyclist speeds with and without transit riders present. When transit riders are present, average speed across all locations decreased 7% (10.42 mph w/o transit riders, 9.72 mph with pass), indicating that bicyclists are modulating their speeds when riders are present. Generally, speed decreased at the majority of locations when transit riders were present except at two locations - 116th EB and 148th WB, where it increased by 10%. Site level variations in speed were observed. Average speeds were lowest at 162nd EB, and highest at 116th EB and 85th WB.

Table 19 shows the average speed of other vehicles. Similar to bicycles, speeds of other vehicles also decreased (2%) when transit riders were present as compared to when they are not (11.61 8 mph vs 11.61 mph). Results at individual sites were mixed, 4 sites (116EB, 162EB, 93EB, 93WB) saw decrease in average speeds while 4 sites (122WB, 148WB, 162WB, 85WB) saw increases in average speeds when transit riders were present as compared to when they were not present. The highest increase in average speed was observed at the 162WB location, where average speed increased from 7.12 mph to 10.7 mph; highest decrease was observed at 162EB, where the speed decreased from 12.38 mph to 6.71 mph.

Table 15 Average speeds by vehicle type

Vehicle Type	Count	Average Speed (mph)
Bicycle	658	10.28
Cargo, Trailer, or Recumbent	36	7.45
Other including e-scooters and skateboards	163	11.72
Grand Total	857	10.44

Table 16 Vehicle speed by range category by location

	Speed			
Platform	**Less than 8 mph**	**8-14 mph**	**14+ mph**	**Total**
116 EB	**32**	**60**	**48**	**140**
	23%	43%	34%	100%
122WB	**16**	**30**	**15**	**61**
	26%	49%	25%	100%
148 WB	**41**	**62**	**14**	**117**
	35%	53%	12%	100%
162EB	**69**	**42**	**3**	**114**
	61%	37%	3%	100%
162WB	**30**	**46**	**7**	**83**
	36%	55%	8%	100%
85WB	**28**	**80**	**47**	**155**
	18%	52%	30%	100%
93EB	**30**	**48**	**34**	**112**
	27	43%	30%	100%
93WB	**28**	**36**	**11**	**75**
	37%	48	15%	100%
Total	**274**	**404**	**179**	**857**
	32%	**47%**	**21%**	**100%**

Table 17 Cyclist average speeds without and with transit riders present

	No transit riders present		**Transit riders present**		**Total**		
Platform	Count of Bicycles	Average of Speed	Count of Bicycles	Average of Speed	Total of Bicycles	Total Average of Speed	% Change Speed by Transit Rider Presence
116 EB	73	11.57	21	12.67	94	11.82	10%
122WB	15	11.29	29	9.86	44	10.35	-13%
148 WB	49	8.87	50	9.79	99	9.33	10%
162EB	67	7.83	37	6.77	104	7.45	-14%
162WB	30	9.16	43	8.93	73	9.03	-3%
85WB	118	11.99	14	10.23	132	11.80	-15%
93EB	30	11.16	60	11.06	90	11.09	-1%
93WB	28	9.83	30	9.31	58	9.56	-5%
Total	410	10.42	284	9.72	694	10.14	-7%

Table 18 Other micromobility vehicle average speeds

	No transit riders present		Transit riders present		Total		
Platform	Count of Other Vehicles	Average of Speed	Count of Other Vehicles	Average of Speed	Total Count of Other Vehicles	Total Average of Speed	% Change Speed by Transit Rider Presence
116 EB	34	12.11	12	11.90	46	12.06	-2%
122WB	4	12.82	13	12.90	17	12.88	1%
148 WB	9	10.45	9	10.65	18	10.55	2%
162EB	7	12.38	3	6.71	10	10.68	-46%
162WB	3	7.12	7	12.23	10	10.70	72%
85WB	21	12.07	2	13.71	23	12.21	14%
93EB	5	13.33	17	11.89	22	12.22	-11%
93WB	8	11.09	9	10.47	17	10.76	-6%
Grand Total	91	11.80	72	11.61	163	11.72	-2%

Average cyclist speed in the presence and absence of a bus and transit riders is shown in Table 20. Average speeds are higher when transit riders are not present (10.42 mph vs. 9.72 mph). Regardless of whether transit riders were present in the platform area, the presence of a bus (either arriving, stopped or departed) resulted in slowed speeds by bicyclists and other micromobility users.

Table 19 Cyclist speed differences with a bus present and transit passengers in the platform area

	Bicyclists only		Bicyclists and others micromobility users	
Row Labels	Count	Average Speed	Count	Average Speed
No transit riders present	410	10.42	501	10.67
No bus	388	10.55	479	10.79
Bus arriving (before concrete)	3	8.04	3	8.04
Bus in motion on concrete	2	6.32	2	6.32
Bus stopped	5	7.10	5	7.10
Bus departing	12	9.04	12	9.04
Transit riders present	284	9.72	356	10.11
No bus	263	9.86	328	10.23
Bus arriving (before concrete)	4	8.35	4	8.35
Bus in motion on concrete	1	5.44	1	5.44
Bus stopped	13	7.83	19	8.79
Bus departing	3	9.32	4	9.17
Total	694	10.14	857	10.44

7 Appendix B: Detail from passenger survey

This appendix presents detailed information on the findings from the survey of FX2 passengers.

7.1 Responses

Overall, 176 people responded to the survey, including 128 respondents who provided answers to the question about which platforms they used. Forty-eight people started the survey, but either did not ride the FX2, or did not visit any of the share transit platform locations. Of all respondents 106 were recruited via email (65 after removing those who indicated they do actually use the shared transit platforms in question) and 70 were recruited via intercept (63 after removing those who indicated they do actually use the shared transit platforms in question).

Of the 128 respondents who provided answers to the question about which platforms they used, 104 respondents indicated that they used a location with a standard FX2 platform design (e.g. with green bike lane), while 24 indicated they used one of the 93rd Avenue platforms featuring some design variations (e.g., wider black bike lane and wider blue TWSI strip). Of the 108 participants who responded to the disability question, 21 indicated that they had a disability and 87 indicated that they did not.

All respondents were asked to answer additional demographic and mode choice questions. Two-thirds (67%) said they go to work or school outside the home, in contrast to 33% who did not. Respondents were asked to report all modes of transportation they used; of 104 responding to the question, 96% reporting using public transit, 38% walking or using personal mobility devices, 37% selected a bicycle, 35% driving a car, 29% getting rides from friends or family, 29% getting rides from Taxi, Uber or Lyft, and 7% use paratransit. The majority of survey respondents were male about 57%, followed by female at 32%, non-binary at 6%, and 5% said they preferred not to say.

7.2 Overall perceptions of platforms

An initial question asked respondents to consider the FX2-Division stop they use most often: “in your experience, how does this FX platform/stop compare to other bus stops you use in Portland,” with response options of *much worse*, *somewhat worse*, *about the same*, *somewhat better*, and *much better*.

Overall, the respondents expressed positive perceptions of the FX-2 platforms (see Figure 21). A majority of respondents, about 62%, felt the FX-2 stops were better than other bus stops in Portland (36% said somewhat better and 26% said much better), in stark contrast to only 13% who deemed them worse (7% said somewhat worse and 6% said much worse). A remaining quarter of respondents felt they were about the same compared to other stops.

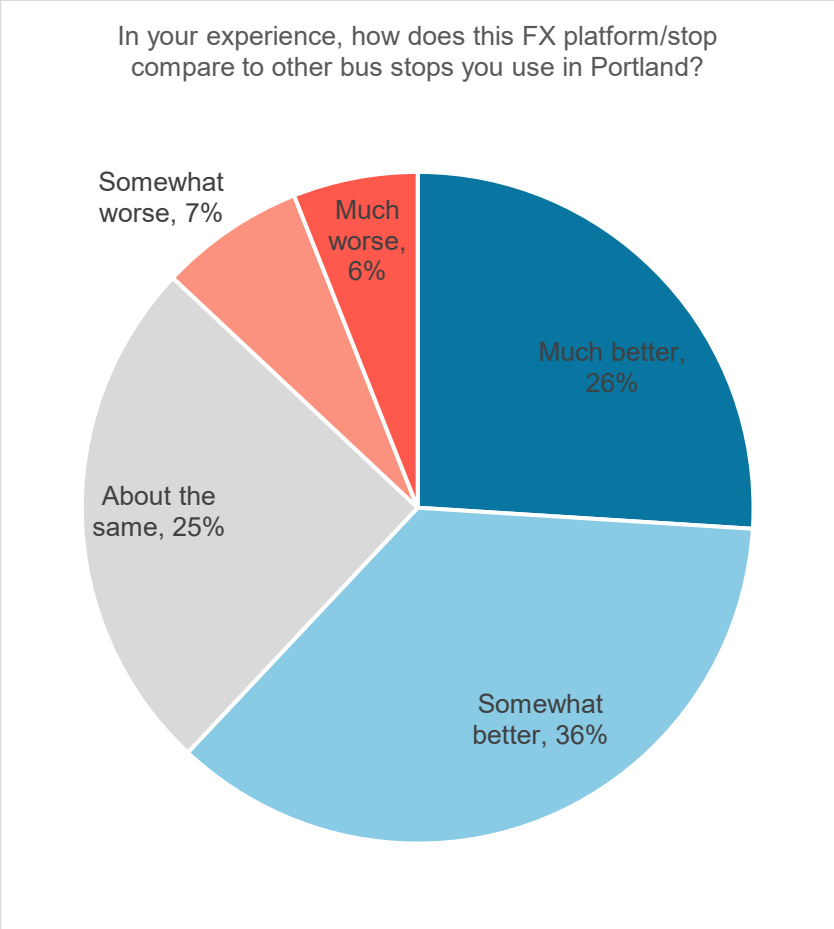


Figure 20 FX2 platform compared to other Portland bus stops

A follow up question asked respondent to briefly explain why they felt the FX2 stop was worse, about the same or better than other stops in Portland. Ninety-three survey respondents gave open ended answers.

Of these respondents, 14% mentioned that the FX platforms were cleaner, while 2% of respondents found them less clean. Eighteen percent of respondents mentioned that the FX2 stops had shelters or that the shelters were larger, provided better coverage from the elements, or were nicer overall. One respondent commented, "I can stand away from traffic and in a shelter. Everything is visible and in front of me." Five percent of respondents mentioned that the FX2 had seating and 11% noted the better lighting.

The topic of safety and the bike lanes was raised by some respondents in relation to their overall perception of the platforms (a separate question, described in the next section, specifically asked about safety). Ten percent of respondents mentioned feeling safer at FX stops than other stops, for reasons such as separation from traffic and pedestrian-oriented design. Six percent reported feeling less safe because of the bike lane, heavy traffic, or other reasons. Eight percent of respondents had a positive impression of the bike lanes and/or FX2 integration with bikes, while 9% had a negative impression of the bike lane and/or cyclists. Their concerns included cyclists not staying in their lane, potential issues with increased use of the bike lanes in the future, the

need for constant vigilance, and the risks posed to visually impaired riders. One respondent, who mentioned they had experience working with people who are blind, commented that, "visually impaired pedestrians have no idea when a bicycle is coming and where it's safe to wait. It's dangerous, and it's not an accommodation."

7.3 Perceived safety of FX2 platforms.

Considering the FX2-Division stop they use most often, respondents were asked to indicate how safe they feel using this type of platform, with a response scale of *very safe*, *somewhat safe*, *not very safe*, *not at all safe*, and *I don't know*.

The majority of respondents, 78%, viewed the FX-2 stops preferably (35% felt they were very safe and 43% deemed them somewhat safe) compared to the 21% who felt they were unsafe (17% said not very safe and 4% said not safe at all). The remaining 1% said they did not know. Responses are shown in Figure 22.

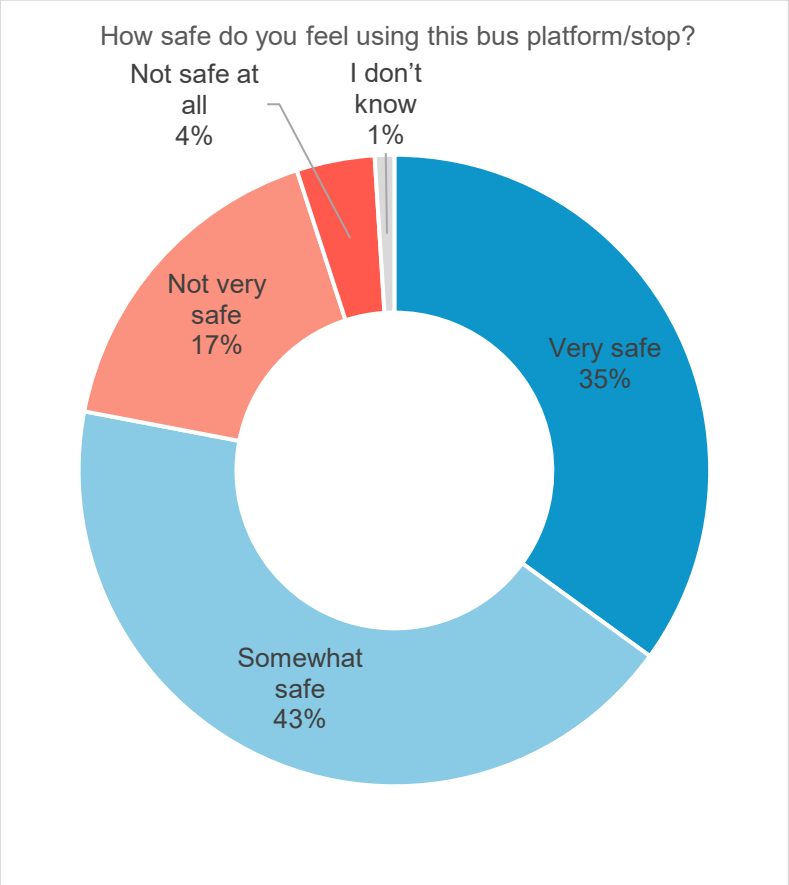


Figure 21 Perceived safety using FX2 platform stop

Respondents were also asked to select one or more from a list of any safety concerns that applied to them. Out of all respondents who took the survey 7% were concerned with getting to and from the waiting area; 5% were concerned with boarding and exiting the bus; 5% were concerned with bike, scooter, or other mobility device collisions; and 10% were concerned with other people's actions or behaviors.

Only six respondents gave open ended responses about other safety concerns they had about the FX2 stop. Concerns included drug use at the bus stop, houseless camps, and sexual harassment—these concerns were related to the other people's actions or behaviors category.

7.4 Things people like and don't like about the FX2 platform

Participants were asked "Is there anything about this platform / stop **that you like** and want to see at other bus stop locations in Portland?" If yes, they were asked to explain. A subsequent question asked "Is there anything about this platform / stop **that you don't like** and want to see changed or improved?" Again, they were asked to explain if the answer was yes.

In terms of overall design, a majority of participants, about 63%, liked something about the FX-2 platforms that they wanted to see at other bus stop locations, while only 37% felt otherwise. This aligned with responses to the question about wanting to see changes or improvements—37% wanted to see improvements to the FX-2 stops while 63% did not think improvements were necessary.

Of the 66 respondents who provided open-ended feedback to the question about what they liked and wanted to see in other bus stops, 32% said they liked the shelters and 18% respondents were pleased with the seating. The reader board displaying arrival times was favorably mentioned by 20% of respondents. One respondent wrote, "I think ALL the bus stops should have some kind of electronic notification for arrival times…. People will say 'Oh, just use the TriMet app to check times.' I have the android smartphone from hell and I can't use it for much outside of calls and texting." 17% of respondents made comments generally related to improved safety, including surveillance and separation from traffic. 14% appreciated the lighting and 12% remarked on the spaciousness of the platforms or shelters, with one saying, "I really like how open everything is. I see that bikes are protected but I am not shoved into a restrictive area while waiting." Another 12% mentioned the protected bike lane, either expressing a specific liking for it or commenting on how each mode had their own space.

Among the 40 respondents who offered open-ended feedback about changes or improvements they would like to see, 33% of respondents voiced concerns about the bike lanes. One respondent said they had had "close calls with bikers" when boarding the bus, others were concerned with future interactions between riders and bicyclists if bike ridership were to increase. For example, a mobility device user said that they didn't oppose mixed modal spaces but called for ongoing dialogue and more data, noting the current low bike ridership. Another respondent wrote, "Way too much emphasis was placed on creating these wide bike paths that hardly anybody uses. I've lived here for 11 years. Very few people ride bikes to get around out here, and I don't see that changing anytime soon." Notably, safety concerns were brought up by 23% respondents, particularly regarding the bike lane but also concerning speeding cars, drug use, sexual harassment, and security more generally. Another 15% wanted to see improvements with road design, mentioning traffic noise and speeding, or suggesting solutions such as traffic calming measures, enforcement against illegal parking in the bike lane, or dedicated bus lanes.

7.5 Design features and the bike lane

The survey then asked respondents about two specific design features of the platforms – the tactile walking surveys indicators (TWSIs), described in the survey as "raised bumps and bars are to help riders with visual impairments to know where to wait and board the bus. The bumps

and bars also let riders know where the bike lane, curb, and roadway are"; and the bike lane passing through the platform area, including asking about the color of the bike lane.

7.5.1.1 Tactile bumps and bars

The vast majority of respondents, 82%, said they had noticed the bumps or bars in the platform area. Respondents were asked to select one or more answers that applied to them regarding whether they found the bars or bumps helpful, a hindrance, or neither. Around a quarter (26%) said that they were helpful, and only 5% of respondents had had problems with the bars and bumps, while a majority of respondents, 68%, said they were neither helpful nor a problem.

Nineteen respondents gave open-ended answers to the question about how the raised bumps and bars impacted their experience while waiting for, boarding, or getting off the bus. Of these respondents, 37% people mentioned that these design features were helpful in delineating waiting areas from other modes. For example, one respondent wrote, "It helps to know where TriMet believes the safest place to wait for a bus is." Around a quarter (26%) of respondents described how the bumps and bars helped them or others with disabilities navigate on the platform. One respondent said, "I'm disabled and sometimes my vision goes a bit foggy so the bumps help me indicate how close I can [be] to the bus so I know when to get on." Another shared, "When I go backwards to navigate, I know where the bumps are. I am in a wheelchair and have to go backwards to up hills and grades."

7.5.1.2 Bike lane and color

Regarding the bike lane, most respondents, 68%, reported observing only the green bike lanes, while 16% had noticed both the green and the black lanes. Only 12%, said they'd observed the bike lane but not the color, and an even smaller proportion, 4%, said that they had not noticed the bike lanes at all. The color was an important signifier for most respondents. A vast majority, 77%, said that the color helped them know where to expect bicyclists, compared to 13% who said it did not help and 10% who said they did not know (see Figure 23).

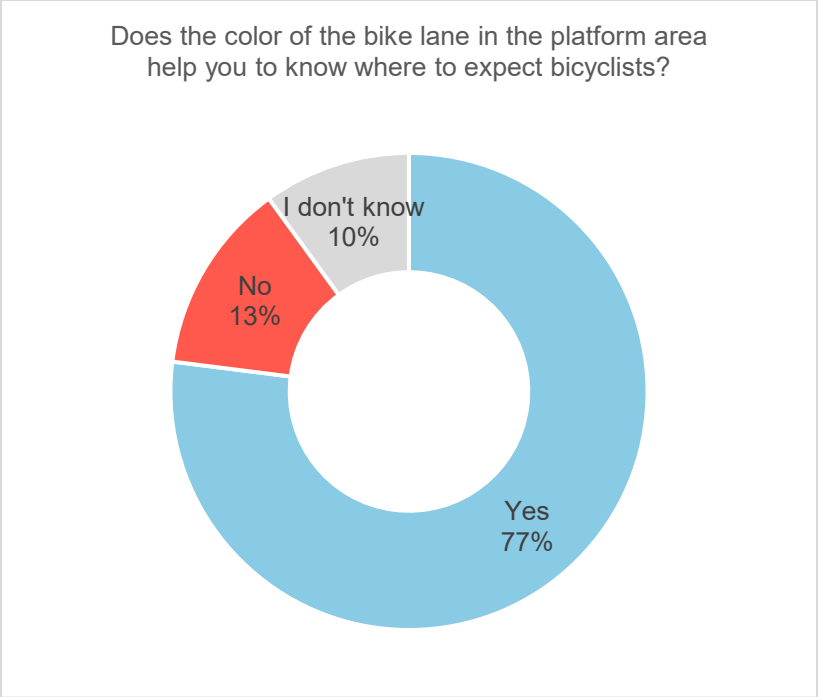


Figure 22 Bike lane color and expectation of seeing bicyclists

Of the 28 respondents who gave open-ended feedback about the color of the bike lane, 21% specifically mentioned that they liked the green color or advocated for consistency in using green. Notably, one respondent, who disclosed that their neurodivergence affected their visual system, emphasized the importance of uniformly green bike lanes for neurodivergent riders. They further mentioned that people with disabilities were more likely to be targets of violence and unclear waiting areas could potentially invite conflict. Another 21%, mentioned that they liked the color of the bike lane but did not specify which color. Twenty nine percent respondents reported problems with the bike lane not related to the color, such as cyclists riding through the platform, the overall design being unclear, or disliking the placement of the bike lane. For example, one respondent wrote, "The color can be helpful for bike lanes, but it being at the same level as the platform doesn't make it as clear that it's a traffic lane, versus having it physically separated from the platform by lowering it or putting a barrier." Another respondent reported, "I had no idea the lanes were for bikes."

Although not in response to the bike lane question, one cyclist gave their opinion about the design of the bike lane elsewhere in the survey, saying, "I tend to travel at times when there are few cyclists around (and few passengers). When I *am* as a cyclist I find the raised bus platforms an annoying barrier that put me in potential conflict with pedestrians and at greater risk of falling off a curb and into road traffic."

7.6 Bicyclist interactions and behavior.

Participants were also asked about the frequency with which they observed bicyclists riding through the platform area—14% said never, 31% said rarely, 34% said sometimes, 14% said often, and only 7% said always (see Figure 24).

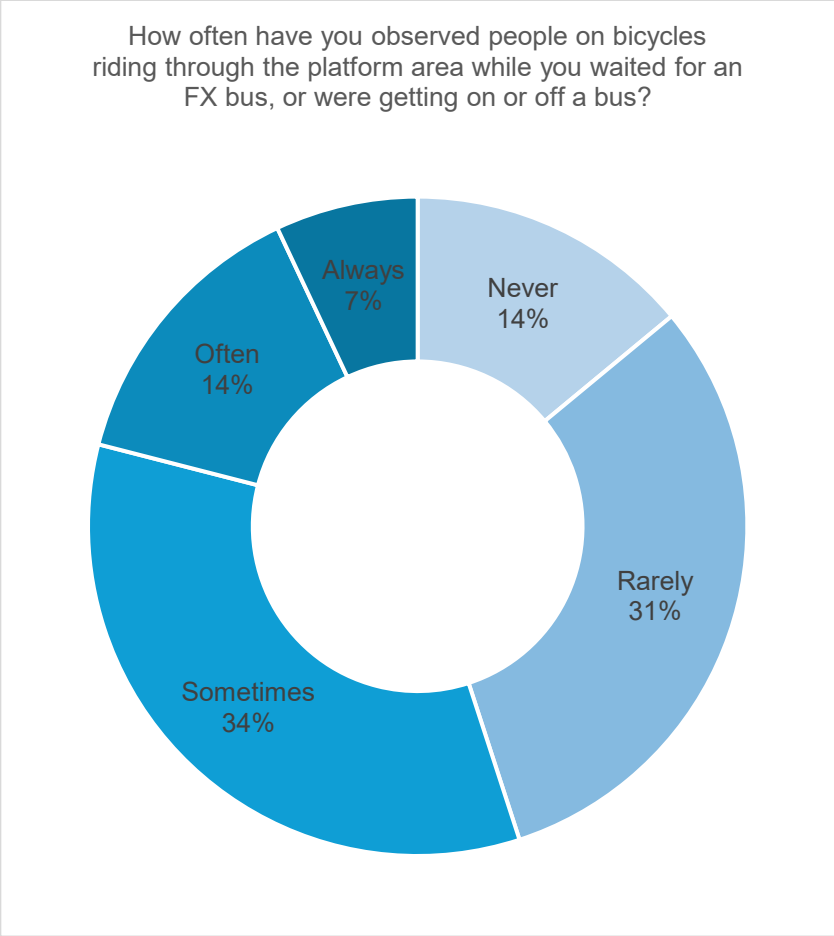


Figure 23 How often passengers observe bicyclists

Participants were asked to express their level of agreement or disagreement with statements regarding the behavior of bicyclists (see Table 22). When asked if they felt bicyclists traveled at a safe speed through the platform area, more respondents agreed than disagreed, with half, 50%, who agreed compared to 22% who disagreed (this breaks down to about 25% who strongly agreed and 25% who somewhat agreed, compared to 15% who somewhat disagreed and 7% who strongly disagreed). Over a quarter, 28%, neither agreed nor disagreed with the statement.

Overall, fewer participants were worried about being hit by a bicyclist. When asked if they regularly worried about such incidents, a total of 49% disagreed (32% strongly and 17% somewhat), compared to 31% who agreed (13% strongly and 19% somewhat). 20% neither agreed nor disagreed with the statement. More participants agreed than disagreed when asked whether they felt bicyclists were careful to avoid those waiting for the bus, with a total of 49% who agreed (23% strongly and 26% somewhat) compared to 22% who disagreed (6% strongly and 16% somewhat). 28% of respondents neither agreed nor disagreed. When asked whether bus drivers warned them about approaching bicycles, more respondents disagreed, 43%, than agreed, 27% (27% strongly disagreed, 16% somewhat disagreed, 11% strongly agreed, and 16% somewhat agreed), while 30% neither agreed nor disagreed. As many as 69% of respondents agreed with the statement that they always made sure to check for approaching bicycles (40% strongly, 29% somewhat). In contrast, 23% disagreed (7% strongly, 16% somewhat), and 8% neither agreed nor disagreed.

Table 20 Passenger perceptions of bicyclists at FX2 platforms

Statement	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Total
People riding bicycles through the FX bus platform area usually travel at a safe speed.	7%	15%	28%	25%	25%	110
At FX stops, I regularly worry about being hit by a person on a bicycle.	32%	17%	20%	19%	13%	110
People riding bicycles through the FX bus platform area are careful to avoid people waiting for the bus.	6%	16%	28%	26%	23%	110
When I'm getting off the FX bus, the bus driver warns me about approaching bicycles.	27%	16%	30%	16%	11%	110
When I get off the bus, I always make sure to check for approaching bicyclists.	7%	16%	8%	29%	40%	110

Due to rounding, does not add to 100%.

7.6.1.1 Bike collisions.

When asked whether they had ever experienced a person on a bicycle bump into or crash into them at an FX-2 stop, a majority of participants, 77%, said they had not experienced such incidents, while only 3% said they had. However, as many as 20% reported experiencing a near crash. Participants were also asked whether they had ever witnessed such incidents involving someone else, to which the majority, 78%, said they had not witnessed any crashes, 8% said they had, and 14% said they had witnessed a near crash.

Thinking specifically about the FX2 bus platforms that share space with the bike lane:

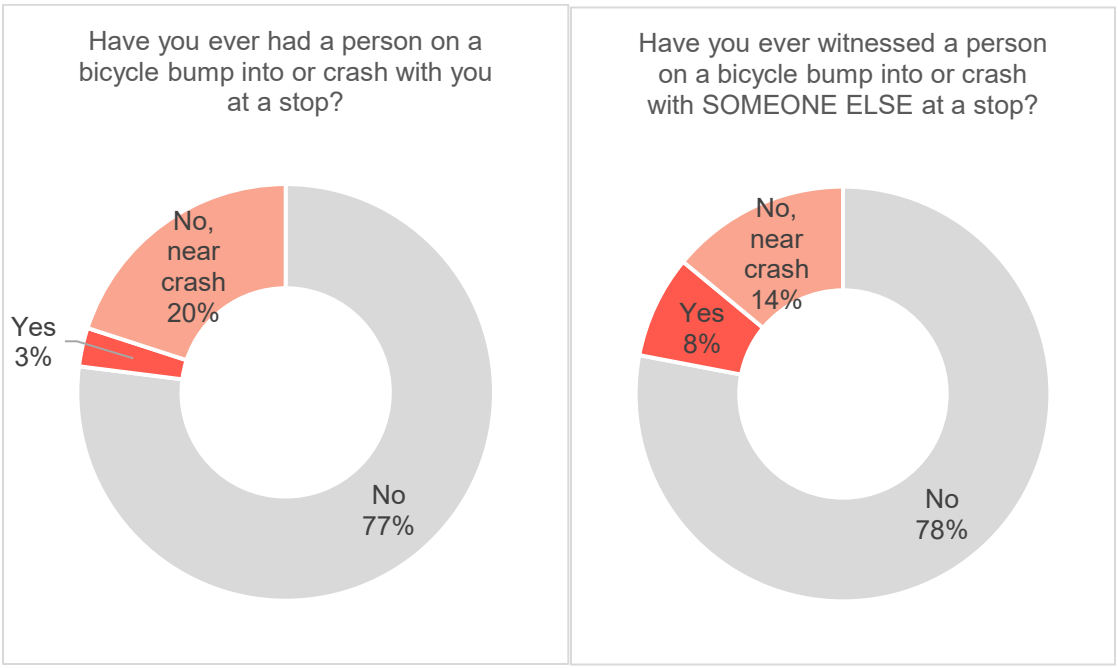


Figure 24 Experiences of bumps or crashes by bicyclists at FX2 platforms

Of the eight respondents who gave open ended feedback describing incidents between riders and cyclists, 20% described incidents where cyclists crashed or nearly crashed into them, while 60% described witnessing such incidents. Respondents specified various reasons: two mentioned cyclists not using the bike lane, three cited cyclists' speed or inability to stop in time, and three pointed out the lack of visibility between cyclists and riders. For example, one respondent said, “Person was riding around platform not in bike lane and another person trying to get off bus didn’t see them right away. Bike managed to swerve but both were very close in proximity to each other.” Another respondent reported a similar incident, “Passenger getting off bus was hit when a bike was using it's lane that's right next to where people step off the bus. Blindspot for passenger and bicycle. Poor design.”

7.7 Intercepted respondents vs. email recruitment

FX2 Division ridership and overall travel patterns between participants recruited through the intercept surveys (70 respondents) and those recruited via email (106 respondents) were statistically different. Respondents recruited via intercept surveys were more likely to be frequent FX2 riders (see Figure 26). Whereas 49% of intercept respondents reported that they used the line four or more days per week, only 9% of those recruited via email indicated such frequent usage. Furthermore, only 4% of intercept respondents, compared to as many as 32% of email respondents, reported using the FX2 line less than monthly, and only 3% of intercept respondents, against 11% of email respondents, said they never used the line at all.

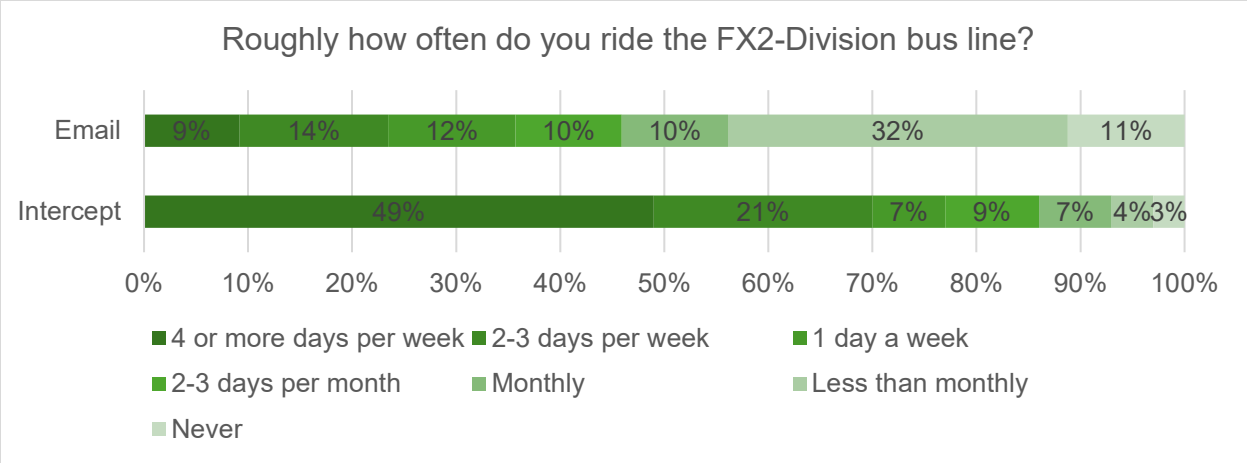


Figure 25 FX2 ridership frequency by survey recruitment method

Additionally, participants recruited via intercept were more likely to report frequent travel to stops East of 82nd Avenue (see Figure 27). As many as 47% of intercept respondents, in contrast to only 25% of email respondents, said that more than 75% of their trips included stops east of 82nd. Meanwhile, just 6% of intercept respondents, compared to 27% of email respondents, said that none of their trips included these stops.

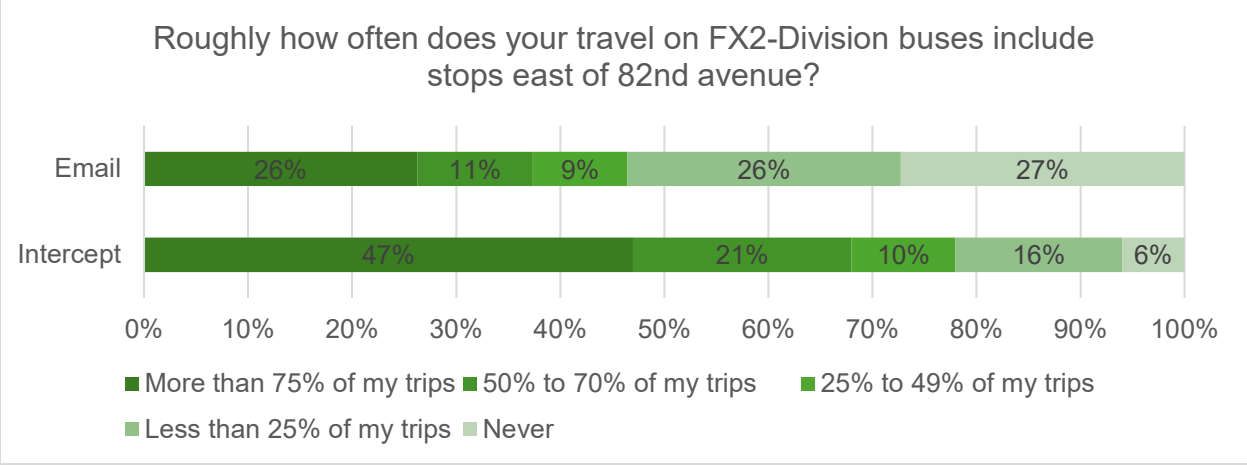


Figure 26 Proportion of passenger trips east of 82nd Avenue

When asked which FX2 stops east of 82nd they reported using most, some differences were found between the two recruitment groups. While most of these differences could be accounted for by the sampling method, results for the 93rd Max station stops (which was an intercept location) were notable—22% of the email-recruits compared to 8% of intercept-recruits selected the Westbound stop, and 8% of email recruits compared to 0% of intercept recruits selected the Eastbound stop.

Participants from each group answered differently to some questions regarding mode choice. Only 25% of intercept respondents, compared to 51% of email respondents, selected walking or use of a personal mobility device as a mode choice. In addition, just 25% of intercept respondents, against 47% of email respondents, selected bicycles. Notably, only 20% of intercept respondents selected automobiles, in stark contrast to 49% of email respondents. However,

differences in public transit use or other modes (paratransit, rideshare, or riding with friends and family) were not statistically significant.

These findings are consistent with the initial hypothesis that participants recruited via intercept were a different demographic, who, overall, used the FX2 line more frequently, were more likely to travel to stops East of 82nd, and were less likely to report using other modes of transportation. Despite these differences in travel patterns, however, responses to other questions in the survey, particularly related to perception of the bike lane and overall platform design, did not differ significantly.

7.8 Riders experiencing a disability

Among the respondents, 19% reported having a disability and 81% indicated that they did not. Figure 28 shows the proportion of respondents who reported have hearing, vision, or mobility disabilities. Four percent of respondents said they were deaf or had serious difficulty hearing and 6% said they were a caregiver to someone who was. Similarly, 4% of participants reported that they were blind or had serious difficulty seeing, and 2% said they were a caretaker to someone who was. Mobility related disabilities were the most commonly reported at 14%, and 4% of respondents said they were a caretaker to someone who had serious difficulty walking or climbing stairs.

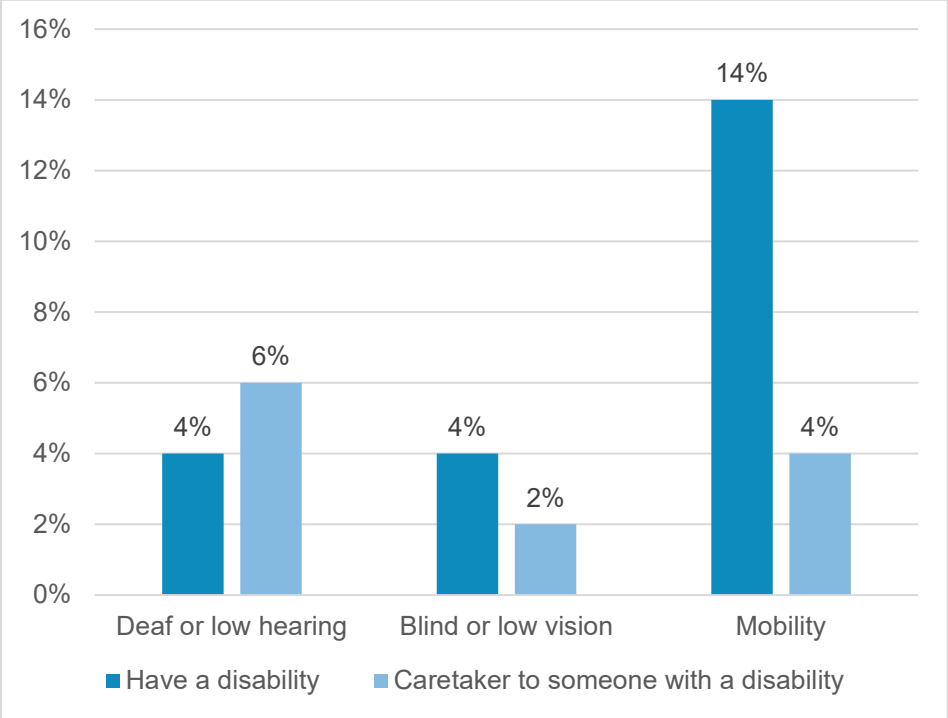


Figure 27 Type of disability

12% of respondents agreed to answer additional disability related questions. Among these respondents the following mobility aids were reported: 38% said they used a cane or walking stick, 38% used a wheelchair, 33% said they needed someone's assistance, 29% used a walker or zimmer frame, 19% said they had a service animal, 10% used crutches, and no one reported

having an artificial limb. Respondents also wrote in responses, such as hearing aid, motorized wheelchairs, walker/wheelchair combo, a bike for neuropathy in feet, and scooter.

Figure 29 shows the proportion of respondents with self-reported disabilities who have difficulty with various aspects of using the FX2 platform. Of the respondents who volunteered to answer additional questions a majority, 81%, said that they didn't have difficulty navigating to the platform and a remaining 19% chose "Don't know" or "Don't want to answer." About a quarter (24%) reported having difficulties knowing when the bus was approaching and 76% said they did not. Twenty-four percent said they had difficulty knowing when a bicyclist was riding through the platform compared to 52% who said no and 24% who selected "Don't know." Only 5% of respondents reported having difficulties aligning themselves with the correct boarding door compared to 90% who said they didn't and 5% who said they didn't know. Twenty nine percent of respondents said they had difficulty getting on the bus compared to 71% who said they didn't have problems. Thirty eight percent of respondents said they had difficulty getting off the bus and onto the sidewalk compared to 62% who did not.

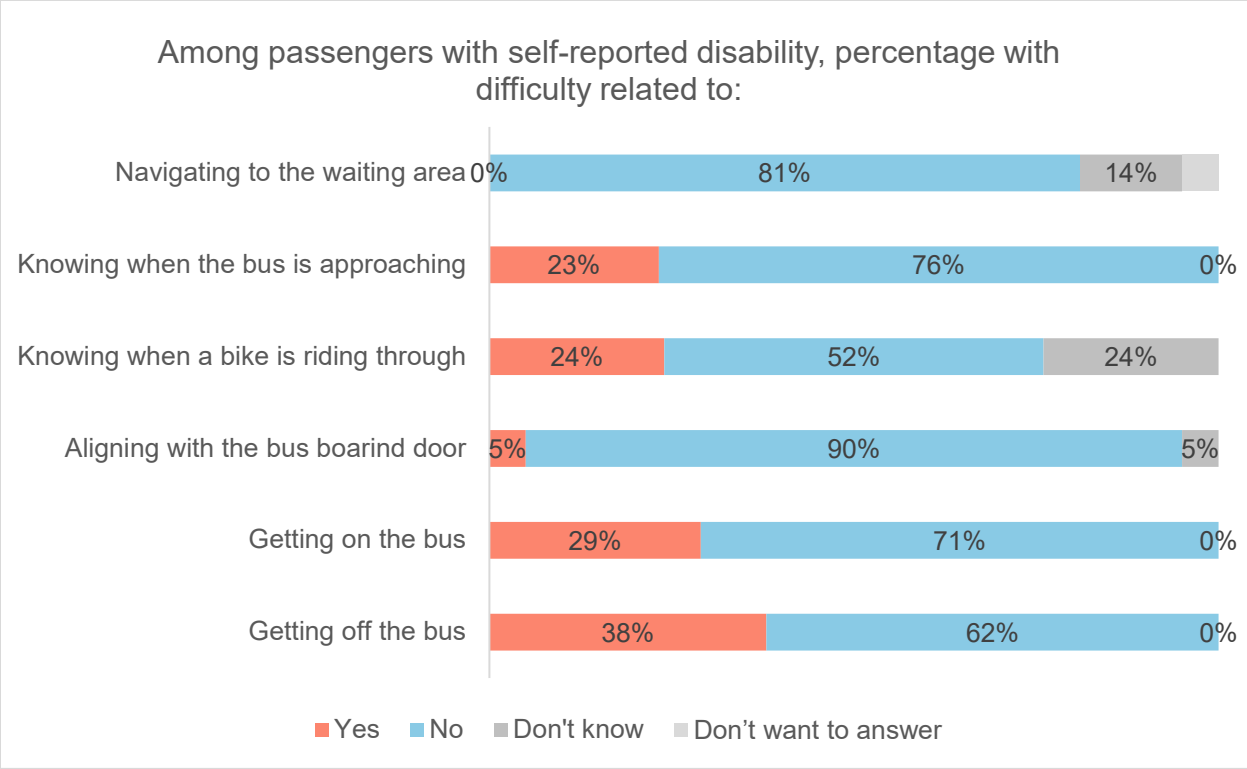


Figure 28 Do you have difficult with … (n=21)

Eleven respondents gave open ended feedback to the disability related questions, with nine identifying as having a disability and two as caretakers of individuals with disabilities. Six respondents gave open-ended feedback about the bike lane or cyclists, with half saying they never or rarely saw cyclists and the other half describing difficulties with knowing when cyclists rode through the platform area. For example, one respondent wrote, "[A]s some bike riders approach some divert and some continue through. They decide at the last second so passengers have no way to know what they will do. Five respondents gave open-ended responses about the

accessibility of the platform, particularly regarding getting on or off the bus. One respondent said it was much better in comparison to stops on other lines, however four described some difficulties with boarding or alighting the bus.

7.8.1 Disability riders survey responses compared to other riders

The survey results revealed some differences in responses between participants with and without disabilities. For example, some responses to the bicycle related questions differed between the two groups (Table 23). However, mostly the equivocal responses such as "neither agree nor disagree" or "does not apply" were found to be statistically significant. In particular, respondents with disabilities were more likely to select "does not apply" to many of these questions compared to those without disabilities. Meanwhile there was no significant difference in affirmative or negative responses between the two groups with one exception. Notably, only 6% of respondents with disabilities, compared to as many as 31% of their counterparts, somewhat agreed with the statement that bicyclists riding through the FX platform were careful to avoid people waiting for the bus. Overall agreement with this statement remained ambiguous, however. As many as 44% of those with disabilities strongly agreed with the same statement in contrast to only 20% of those without disabilities. Overall, for the bicycle related questions differences between the two groups were fairly ambiguous.

Table 21. Level of agreement regarding the behavior of bicyclists, disability vs other passengers

Statement	Disability	n	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Does not apply
People riding bicycles through the FX bus platform area usually travel at a safe speed.	Yes	15	5%	14%	19%	9%	24%	29%*
	No	85	7%	14%	25%	24%	22%	8%*
At FX stops, I regularly worry about being hit by a person on a bicycle.	Yes	17	29%	24%	0%*	9%	19%	19%*
	No	83	31%	14%	21%*	19%	10%	5%*
People riding bicycles through the FX bus platform area are careful to avoid people waiting for the bus.	Yes	16	5%	14%	19%	5%*	33%	24%*
	No	81	5%	14%	28%	29%*	18%	7%*
When I'm getting off the FX bus, the bus driver warns me about approaching bicycles.	Yes	15	19%	5%	24%	14%	9%	29%*
	No	78	24%	16%	28%	13%	9%	10%*
When I get off the bus, I always make sure to check for approaching bicyclists.	Yes	19	10%	10%	5%	24%	43%	10%*
	No	86	6%	17%	9%	29%	38%	1%*

**Column proportions differ significantly from each other at the .05 level.*

Results revealed some demographic differences between riders with disabilities and those without. For participants with disabilities results were split between 43% who said they worked or went to school outside the home and 57% who did not. In contrast, 73% of respondents said they worked or went to school outside the home, while a remaining 27% did not. Additionally, participants with disabilities skew older, with more participants over the age of 70 than their counterparts.

Statistically significant but less notable findings. There were some significant differences in how the two groups selected more neutral positions to bicycle related questions. For example, 29% of participants with disabilities, compared to 8% of their counterparts, selected "does not apply" to the question about whether they felt bicyclists riding through the FX platforms traveled at a safe speed. Similarly, 19% of respondents with disabilities, compared to 5% of those without, selected "does not apply" to the question about whether they regularly worry about being hit by a person on a bicycle. For the same question, 0% of respondents with disabilities selected "neither agree nor disagree," compared to 21% of their counterparts. Twenty four percent of respondents with disabilities, compared to 7% of their counterparts, selected "does not apply" to the question about whether bicyclists riding through the platform are careful to avoid passengers. Twenty nine percent of respondents with disabilities, against 10% of those without, selected does not apply to the question about whether bus drivers warn them about approaching bicyclists. Finally, 10% of respondents with disabilities selected "does not apply" to the question about checking for approaching bicyclists, compared to only 1% of their counterparts who selected the same option.

7.9 Respondents at ODOT location vs other locations

Responses were aggregated based on whether participants selected as their primary platform a location with a standard FX2 platform design or one of the 93rd Avenue platforms featuring some design variations requested by ODOT (referred to here at "ODOT locations").

Of the group that selected an ODOT location, only 21% were recruited via intercept against the 79% recruited via email survey. In contrast, users of the non-ODOT locations were more evenly split between 56% of intercept recruits and 44% of email recruits.

Significant differences in frequency and ridership patterns also emerged (see Figure 30). Only 13% of the ODOT group, compared to 35% of their counterparts, reported using the FX2 four or more days per week, and as many as 42% of the ODOT group, against 12% of the other group, said that they used the FX less than monthly. In addition, 46% of the ODOT location participants, against only 19% of their counterparts, said that less than 25% of their travel included stops East of 82nd.

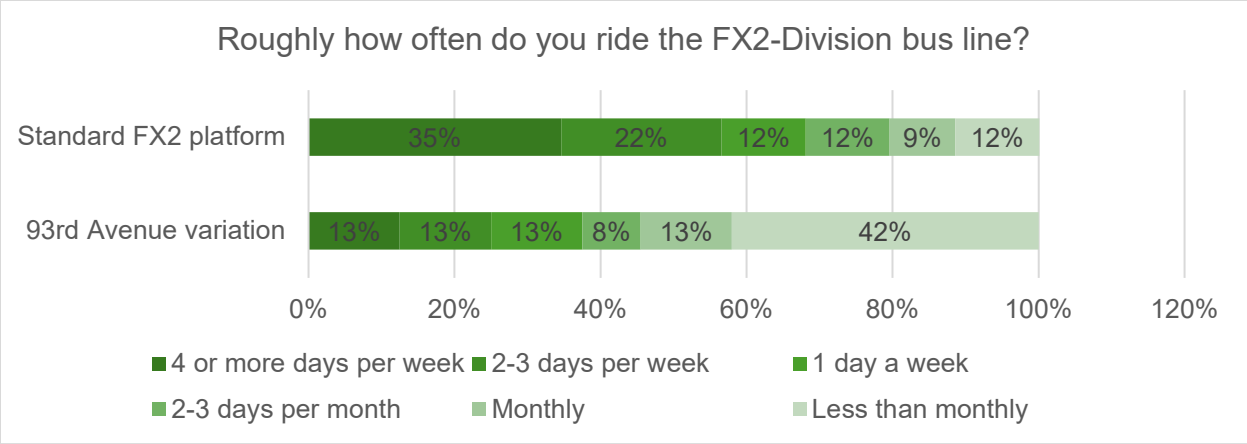


Figure 29 FX2 ridership frequency by platform type

In addition, none of the ODOT location respondents reported mobility related disabilities compared to 17% of the other group.

The ODOT location respondents, compared to their counterparts, appeared to have a more favorable view of the FX stops, with as many as 86% reporting that there was something they liked about the platform that they wanted to see in other bus stops. This is in contrast to 58% of non-ODOT location riders. This may be partly explained by differences in the proportion of bicycle riders between the two groups. Riders who used the ODOT locations were also more likely to ride bicycles—63% of whom selected bicycling as a mode choice compared only 29% for other respondents.

These results reflect significant differences in the demographic makeup of respondents who used the ODOT locations compared to other locations. As a transfer location with connection to the Max, the 93rd Max station platforms may draw a different population than the other stops.

8 Appendix C: Detail from ride-alongs and interviews

This appendix documents the findings from interviews and ride-alongs.

8.1 Ride-along feedback

While the ride-alongs were intended to primarily inform subsequent data collection processes, we also received some useful feedback on how the design works for vision-impaired riders.

First, the participants felt there should be better guidance for vision-impaired riders on where they should waiting, noting the "wait behind line" pavement marking was not helpful to them if they didn't already know where to wait. They also felt that the start and end of the platform area should be marked with some tactile surface, noting that at some locations people might wander into a drive-way without realizing they were no longer in the platform area.

It was noted that SE Division Street can be very loud, which would have implications for any attempt to provide auditory cues to passengers, for example to identify approaches bicycles or buses.

Regarding the bike lane, participants felt the green color was preferred as it stood out as a bike space for users with limited vision. The black color looked more like the street, and could be misinterpreted as such. They also felt some additional unique textural element would help to further clarify the unique purpose of the bike lane.

Ride-along participants noted that the TWSI strip separating the bike lane from the transit waiting area at the SE 93 locations (12", blue tactile bars, 4 wide) is preferred to the standard separator (6", white tactile bars, 2 wide), noting that the blue color suggests it serves a different purpose from the white strip abutting the street, and the greater width makes it stand out more.

8.2 Interview feedback

The following sections provide feedback received from the five interview participants, drawn from FX2 survey participants who self-identified as having a hearing, vision and / or mobility disability, and opted into an interview.

8.2.1 Bicyclist observations

During the interviews, several participants voiced concerns about the placement of the bike lane through the platform. Most reported low bike ridership in the area and had not experienced any collisions or near misses at the FX-2 platform. However, participants were worried about the behavior of bicyclists, saying that they had observed bicyclists fail to stop for pedestrians or speed through the platform. They emphasized the need a concerted effort to educate bicycle riders, including through signage, to verbally alert pedestrians before passing. One participant, however, had a contrasting view of Portland bike riders, describing them as a generally conscientious group and a second participant did not mention any issues with bicyclist behavior.

8.2.2 Concerns about the bike lane

Two participants voiced concerns about the placement of the bike lane between the boarding area and the platform. One participant stated that they were initially optimistic about the integration of the bike lane, but felt that the actual experience of navigating the bike-bus platform as a blind

person with gradual hearing loss required a lot of courage. Without prior knowledge of the platform layout, arriving at a bus-bike platform (both boarding and alighting) could be a confusing experience for someone who is blind. When boarding the bus, the distance from the platform area to boarding could be disconcerting—it takes a minute for them to realize that it's probably a bike lane. When disembarking, traffic noise and the noise of the bus itself make it difficult to hear any approaching bicycles. Because they rely on their hearing, they usually step to the right to let the bus pass before they can be sure that they can safely cross the bike lane, however, the bike lane gives them very little space to stand and wait. The interviewee described the experience of alighting the bus and the importance of having prior knowledge about the presence of a bike lane in order to know how to proceed:

> ***"The bus is making a lot of noise. So, I mean, when I get off a bus, I step to the right. Once I'm off the bus to let it go by… there isn't much space to stand there… while the bus is pulling out [because] the pedestrian platform isn't very deep…. When I typically get off the bus, I, you know, I just walk off the bus. But you can't do that at that bus stop and you don't know that it's that kind of bus stop [with a bike lane] when you get there. I [use another bus stop that] has the bike lane on the Eastbound side. And that's another place where I have to, you know, just stop and wait for the bus to go away before I walk across… the bike lane."***

The same interviewee felt that the bike lane was not marked well enough because it is at grade with the sidewalk. Navigating using the raised strip of guidance bars was challenging because it was difficult to know which side was safe. Another interviewee, who was disabled but not part of the low vision community, felt that the bike lanes were better marked at the FX stops than at other stops in Portland and said that other stops should be marked more clearly in green.

8.2.3 Inconsistency of design

Consistency and simplicity were frequently mentioned throughout the interviews. Participants had many concerns with the accessibility of the platform, in this regard, particularly the inconsistency in wayfinding design. One interviewee explained their concerns with the placement of the braille placards:

> ***"You know they put those nice little braille placards? They're not in the same location on any two stops… Some of them are inside the shelter, some of them are on a wall, some of them are on a little pillar. And if you can't see to be able to find it, how the heck are you gonna know this is where the front of the bus will stop?"***

Interviewees advocated for the reintroduction of the blue octagonal style poles which were once a standard and actively being used by the low vision community to know where to wait and board the bus. One interviewee explained some of the challenges of navigating to the bus stop as a person who is blind with some peripheral vision, describing their reliance on crucial visual cues, such as the blue bus pole:

> ***"I look for the difference in the color of the sidewalks, sometimes I can see it and sometimes I can't. Um, but I'm scanning looking for the [blue octagonal] pole. And I just find, I find myself getting really resentful that I have to work so hard to find it…. Consistency, you know, is really important and that's, that's***

kind of my mantra…. And… I really can't tell you, I can't remember if there is a bus stop sign out there. But if there is, I would like it to, to be the poll that I'm used to."

8.2.4 Shelter design

People were generally pleased with other design elements of the platform, such as the shelter design, seating, and lighting. Interviewees felt that the stops were safer (in terms of security), newer, and well kept. However, there were some negative impressions about the shelter and seating design. One participant felt that the shelters were modern and sleek but lacked proper coverage in adverse weather, particularly from the sun and rain. This posed a significant challenge for them as a motorized chair user given that holding an umbrella while operating the chair was impractical. Two interviewees had suggestions for improving the seating. One interviewee suggested seats of varying heights to accommodate seniors who need higher seats to help with getting up, as well as shorter seats for shorter people and children. Another interviewee felt that the seats were too close together, forcing them to sit next to strangers, despite there being enough space in the shelter to spread them out.

8.2.5 Information at the bus stop

Participants were pleased with the accurate information displayed on the marquee. One participant, however, mentioned that the marquee was hard to find:

"They're pretty high up there though… I mean you have to look up but it took me more than one time to figure out where they were but I did finally figure it out… So it takes a minute. They're not like the ones that are in the shelter that are sort of right near your face."

In addition, there was some concern about the lack of route information at the bus stop. In particular, information about transfer stops, connecting routes, and the system as a whole was difficult to access without a phone or internet. One interviewee described the challenges of accessing route information and suggested displaying a map for the whole system at each stop:

"I would like to see a map showing the other routes. Though I am pretty sure, you know, if I go down to Pioneer Square I could get a map. Or I could get one by calling or I could go to the library and get on the internet and get some or whatever. But I think it would help, you know, people… I hear people asking directions all the time and if they could see the routes, I think that would… help a lot of people."

Concerns were raised about alerting the low vision and hearing community about passing bicycles. One interviewee suggested including audible or visual notifications or both to alert people of oncoming bicycles.

8.2.6 Distance between stops

The distance between stops was a major concern for most interviewees. Interviewees were concerned with the equity implications particularly for other members of the community. One interviewee first thought that the FX-2 would be an addition to the already existing bus line and was dismayed to learn that wasn't the case. While they appreciated how quickly they could go from one end of Division to the other, the difference in stop density in their neighborhood and the SE Clinton neighborhood, for example, was a stark reminder of privilege:

"The only thing is, I don't know if you've noticed, but in my neighborhood they're way too far apart. I mean, especially… So especially, when you get on the East side of 205. There's a stop at 101st, the next freakin' stop is at 113th. That's thirteen blocks with no bus stops! And I just, you know, I think that that doesn't give any consideration to people with disabilities…. I get it. Like, I know that they're trying to get more people to use the bus and I know the biggest complaint about getting on the bus is that it takes so long to get where you're going. And I think that they've done a good job of it, you know, alleviating that issue on the FX2 but it sort of leaves elderly people and people with disabilities, the people who really rely on public transportation. They don't have cars sitting at home in their garage, you know. So yeah, that's my big pet peeve. That makes me really angry."

One interviewee who used a walker for carrying groceries, mentioned that their main concern was the walk to and from the bus stop to their residence or grocery store. Another interviewee described the challenges of using a powerchair to get to the stop:

"Being a power chair user doesn't mean you can go all day. You can't go a long ways. For me with this particular chair I've got probably an absolute maximum of 5 miles round trip before I have to get hooked up to a charger. Think about that with how far bus stops are apart. The distance needed to travel to get to the bus stop."

8.2.7 Boarding and alighting

One interviewee noted challenges with alighting the bus using a walker. While they generally managed to board the bus with ease, even when carrying groceries, they described difficulties with alighting when the bus stopped too far from the curb, causing their walker to veer off into the gutter. They also found the tactical bumps somewhat troublesome when using their walker but not a serious hindrance. Overall, they found that bus drivers were very accommodating, saying that they readily deployed the ramp and often warned riders to look out for bicycles.

8.2.8 Key themes from interviews

Some key themes that emerged through the interviews were:

- **Bicyclist behavior:** People were concerned with bicyclist behavior and potential collisions, and the challenge of hearing bicyclists over traffic noise and the noise of the bus itself. Interviewees emphasized the need to educate bicyclists on verbally alerting pedestrians when passing.
- **Bike lane accessibility:** There was concern about platform accessibility for people who are blind, particularly in communicating the layout of the platform to those that don't have prior knowledge of the stop.
- **Inconsistency of design:** People were concerned with the inconsistency of wayfinding design elements, including the placement of braille placards and the absence of the octagonal blue pole, standard at other bus stops.
- **Information at the bus stop:** People were pleased with the marquee with arrival time displays. However, there was some concern about the lack of system/ route maps in the

area and, in terms of accessibility, the lack of auditory or visual alerts about passing bicycles.

- **Shelter design:** People were generally pleased with the shelter, lighting, and safety (security) at the platform. There were some suggestions to improve seating by including varying heights for different users and providing more space between seats.
- **Distance between stops:** Equity concerns were raised about the greater distance between stops compared to the former line or those in inner Portland.
- **Boarding and alighting:** One interviewee described challenges with alighting the bus using a walker, particularly when the bus pulled up too far from the curb.

9 Appendix D: Research questions key takeaways and supporting data

This Appendix document breaks out the questions that the research sought to address, either one by one or grouped by related subtopics.

9.1 General

How often are there conflicts between bicyclists and pedestrians, including near misses or collisions? What is the nature of conflicts that take place?

Key Takeaways:

- Many interactions occur between bicyclists and pedestrians at the platform locations; generally, interactions happen at slower speeds and as negotiations for space. Those performing video data collection observed no collisions and two minor conflicts during the study period. Those performing survey data collection noted a few reported collisions, although no injuries were reported.
- Given the volumes observed, bicyclists and transit riders seem to be generally managing their interactions.
- An auditory warning signal when bicyclists are passing would be helpful, particularly for visually impaired pedestrians.

Data:

- Ped Video Review: 17% (219) of 1291 passengers experienced a bike passing by. In 39% of those 219 cases, the bicyclist slowed, stopped, or changed course. 14% of pedestrians took some evasive action (almost always in combination with the bicyclist doing the same), the most common was moving to the bike lane (due to a bike on the sidewalk), followed by those moving to the waiting area or some other action. In most cases the bicyclist passed by without either party taking any action. The project team conducted additional review of 23 interactions when pedestrians took evasive action, and none were determined to be conflicts.
- Bike Video review: Among bicyclists who encountered pedestrians in the platform area, 14% of those riding with traffic, and 20% of wrong-way cyclists took some maneuver to go around pedestrians. In both the case of bicyclists riding with traffic and wrong way cyclists that encountered pedestrians, those pedestrians took some type of evasive maneuver about 9% of the time. 34 pedestrians were noted as taking "anticipatory" evasive action in these interactions, - in 28 of these interactions the bicyclists also took an evasive maneuver - such as to slow, stop, swerve, or change course. Clips of all 41 interactions were reviewed by the project team - 39 were deemed to be "negotiations" for space, but not conflicts posing a safety danger. 2 were deemed to be minor conflicts, in which action was needed to avoid collision.

- Survey: 3 out of 113 reported having a person on a bicycle bump into or crash into them, however, one was referring to an incident at a non-FX2 site (NW 18th northbound near Davis), one indicated the incident occurred at SE Division and 130th, and the third did not provide the location. None indicated that any injury had occurred. 6 people indicated that had witnessed such an incident, although none mentioned any injury. When asked if they felt bicyclists traveled at a safe speed through the platform area, 22% disagreed. When asked if they regularly worried about a collision with a bicyclist at FX2 stops, 31% agreed (13% strongly and 19% somewhat). Asked if they felt bicyclists were careful to avoid those waiting for the bus, 22% disagreed.
- Most respondents, 78%, viewed the FX-2 stops preferably (35% felt they were very safe and 43% deemed them somewhat safe) compared to the 21% who felt they were unsafe. Among those who indicated unsafe, 5% selected concern with bike, scooter, or other mobility device collisions (from a drop-down list).
- Among those giving open-ended comments to how they liked the platforms compared to other TriMet bus stops, 9% had a negative impression of the bike lane and/or cyclists. Their concerns included cyclists not staying in their lane, potential issues with increased use of the bike lanes in the future, the need for constant vigilance, and the risks posed to visually impaired riders. One respondent, who mentioned they had experience working with people who are blind, commented that, "visually impaired pedestrians have no idea when a bicycle is coming and where it's safe to wait. It's dangerous, and it's not an accommodation."
- Interviews: Interviewees noted that they are concerned about getting hit by cyclists. For visually impaired riders, they may not know when bicyclists are approaching (particularly when loud buses are in the vicinity) and wish there were some audible way to know when bicyclists were passing.

Are there conflicts between pedestrians and other platform area users, such as people on scooters or other mobility devices?

Key Takeaways: No conflicts were observed during video data collection, and none were mentioned by survey respondents.

Data:

- Bike Video review: When encountering other platform users (scooters, etc.) 92% of passengers take no action, while 8% make a courtesy action to avoid the user. Conversely, 74% of other platform users travelling with traffic take no action, 10% change route, 3% slow, 9% stop, and 4% swerve to avoid passengers in the study area. When the other platform users are travelling the wrong way 75% take no action, 21% change route, and 4% slow to avoid passengers.
- Survey: None of the survey respondents specifically mentioned scooters or other mobility devices.

Do the stations at ODOT locations (no green bike lane, wider setback) produce different behaviors?

Key Takeaways:

- Most survey respondents indicated that they preferred the green coloring for the bike lanes. However, survey respondents who ride at ODOT locations were more likely to state that they liked the platform design (this may be due to differences in who responded to the survey – people who responded to the general email request for feedback were more likely to be less frequent FX2 riders, and to primarily use the SE 93rd Avenue stop which connects to the Green MAX line.)
- The inconsistency in design was noted as a detriment, both within the FX2 platforms and between FX2 and other TriMet stops, for riders with vision impairment who rely on familiarity to navigate.

Data:

- Survey: 77% of survey respondents indicated that the bike lane color lets them know where to expect bicyclists. Among those who provided comments, we heard that they liked the green color and felt it important that it be consistently used to mark bicycle space. The ODOT group, compared to their counterparts, appeared to have a more favorable view of the FX2 stops, with as many as 86% reporting that there was something they liked about the platform that they wanted to see in other bus stops. This is in stark contrast to only 58% of non-ODOT location riders. This may be explained by differences in the proportion of bicycle riders between the two groups. Riders who used the ODOT locations were also more likely to ride bicycles—63% of whom selected bicycling as a mode choice compared only 29% for other respondents. These results reflect significant differences in the demographic makeup of respondents who used the ODOT locations compared to other locations. As a transfer location with connection to the Max, the ODOT owned 93rd Max station platforms may draw a different population than the other stops.
- Interviews: Interviewees expressed a concern about inconsistency of design. Vision impaired riders relay the importance of knowing where bus stop elements are located and noted that the braille placards are not in a consistent location at all stops. They also noted that they are accustomed to identifying other TriMet stops by the blue octagonal signs, which the FX2 stops lack. A theme in the interviews was that the green color helps make it clear that this is a bike space, although for those with no vision this was not helpful.

9.2 Questions Specific to Bicyclists (including other micromobility users)

Are bicyclists complying with the signage to slow and stop?

How often do bicyclists fail to stop at the stop bar (where the "stop here for pedestrians" sign is located) when a bus is at the stop?

When transit passengers are present, do bicyclists yield (or slow, stop, change direction) to transit riders at the platform? Or those getting on and off buses?

Key Takeaways:

- Very few bicyclists stopped (4% among those riding in the direction of traffic), while a total of 30% made some evasive action - slow, stop, change course, or swerve. Slightly higher rates of those who arrived when a bus *and* pedestrians were present stopped at the bike ramp- 9% stopped and 33% slowed at the bike ramp.
- Most surveyed passengers felt bicyclists travel at safe speeds (50% agree; 22% disagree) and are careful to avoid passengers (49% agree; 22% disagree).

Data:

- Ped Video Review: 219 pedestrians experienced bikes passing through - in only 4 cases (2%) did the bike come to a stop at the stop bar, while in 10% of cases the bicyclist slowed.
- Bike Video review: Behavior when encountered pedestrians: Of all 1059 bicyclists observed (779 with traffic and 280 wrong way), 464 passed through the platform area when there was a passenger present (331 with traffic and 131 wrong way). Among those travelling with traffic, 70% take no action, i.e., they continue their route, when encountering pedestrians. 13% changed course/route when encountering pedestrians, 4% stopped, 4% slowed, and 9% swerved. Wrong way cyclists were a bit more likely to change course (18%) or slow (9%) and were less likely to continue without making any changes (58%). Behavior at bike ramp: 45 bikes arrived at the platform when a bus was present (arriving or stopped) AND pedestrians were in the platform area. Of those, 4 (9%) stopped; 15 (33%) slowed at the bike ramp.
- Survey: Survey data does not directly address if bicyclists stop (although we know from the video that few do). However, the majority feel bicyclists are travelling at safe speeds and are careful to avoid pedestrians: When asked if they felt bicyclists traveled at a safe speed through the platform area, more respondents agreed than disagreed, with half, 50%, who agreed compared to 22% who disagreed (this breaks down to about 25% who strongly agreed and 25% who somewhat agreed, compared to 15% who somewhat disagreed and 7% who strongly disagreed). Over a quarter, 28%, neither agreed nor disagreed with the statement. Overall, fewer participants were worried about being hit by a bicyclist. When asked if they regularly worried about such incidents, a total of 49% disagreed (32% strongly and 17% somewhat), compared to 31% who agreed (13% strongly and 19%

somewhat). 20% neither agreed nor disagreed with the statement. More participants agreed than disagreed when asked whether they felt bicyclists were careful to avoid those waiting for the bus, with a total of 49% who agreed (23% strongly and 26% somewhat) compared to 22% who disagreed (6% strongly and 16% somewhat). 28% of respondents neither agreed nor disagreed.

Questions related to bicyclists' route through platform area:

How many stay in bike lane?

How many travel through the waiting area? Or the boarding area?

Do any of the bicyclists move into the bus or general travel lane to bypass the shared platform? Or go behind the platform?

Do any bicyclists use the pedestrian curb ramp (at the crosswalk) to go around the bike zone?

How do bicycles negotiate around pedestrians standing in the boarding and bike zone? Do bicyclists cross over the TWSI?

Key Takeaways:

- Bike travelling with traffic generally used the bike lane, but some shifted to other platform areas when transit riders were present, likely to give room to get around them.
- Riders are not moving out into the streets to pass the platform area, which should largely eliminate the conflict between bikes and bus and other motor vehicles. Overall, only 2% of bicyclists moved out into the motor vehicle travel lane to move past the platform area.
- Wrong way riders use more of the platform area, and preferred the waiting area. Note that most (63%) wrong way riders entered the platform area from the sidewalk, compared to most bicyclists riding with traffic riding in the bike lane (57%).
- The TWSI does not appear to be a barrier to bicyclists in moving between the bike lane and waiting area to navigate around pedestrians.

Data:

- Ped Video Review: 32% of the 219 passengers who experienced a bike passing through the platform area, had the bike travel through the platform waiting area (as opposed to staying in the bike lane)
- Bike Video Review: Bicyclists riding with traffic and no transit passenger present usually rode in the bike lane (60%), while 26% rode through the waiting area, and 11% used the bike lane but then moved into another area, such as the waiting area. When transit passengers were present in the platform area, more bicyclists shifted from the bike lane to other areas - 47% rode in the bike lane still, 28% in the waiting area, while 22% used the bike lane plus another area (up from 11% without passengers present). Wrong way riders

generally rode through the waiting area (58% or 39% depending on if transit passengers are present), and few used the bike lane (21% and 17%). Only 2% of all bike or micromobility riders were observed riding in the street through the platform area when riding with traffic and 1% riding wrong way, and only 1% rode behind the shelter (not possible at many stops). Bicyclists were not observed using crosswalks to go around the platforms, however, at a few locations (most notably 93rd Ave where the I-205 trail crosses), some bicyclists entered or exited the Division corridor bike lanes via the crosswalk).

Does a queue of bicyclists form where bikes stop at the waiting area? (Does it extend to block the crosswalk?)

Do bicyclists stop, then go – or stop and remain stopped?

How long do bicyclists remain stopped?

Key Takeaways: With hardly any bicyclists stopping, there was little to document for these questions.

Data:

- Bike Video review: No queue of bicyclists was observed.
- Bike Video review: In the few cases where bicyclists or other bike lane users stopped at the bike ramp, they waited for pedestrian traffic to clear and then proceeded.

9.3 Questions Specific to Wheelchair Users

How do wheelchair users align with the bus lifts in the bike zone or behind the TWSI guide strips?

When do wheelchair users align with the bus lifts in the bike zone or behind the TWSI guide strips?

Key Takeaways: Wheelchair users appear to abide by the suggested waiting location.

Data:

- Ped Video Review: We observed seven wheelchair users boarding the FX2. All waited until the bus had come to a complete stop before moving through the bike lane.
- Survey: one respondent wrote, “It helps to know where TriMet believes the safest place to wait for a bus is.” 26% of respondents described how the bumps and bars helped them or

others with disabilities navigate on the platform. One respondent said, "I'm disabled and sometimes my vision goes a bit foggy so the bumps help me indicate how close I can [be] to the bus, so I know when to get on." Another shared, "When I go backwards to navigate, I know where the bumps are. I am in a wheelchair and must go backwards up hills and grades."

9.4 Questions Specific to Pedestrians / Transit Riders

Do pedestrians stand in the loading and bike zone when a transit vehicle is not present? (Do pedestrians wait behind the TWSI line or the DWS line?)

Key Takeaways:

- Most passengers wait in the waiting area, or only venture into the bike lane and boarding area for short periods of time.
- 75% of passengers wait until the bus is stopped to move from the waiting area toward the bus.

Data:

- Ped Video Review: 633 boarding passengers were observed. Only 8% of pedestrians waited in the bike lane or loading zone for more than 10 seconds. Of those they spent an average of 56 seconds waiting in the bike lane or loading zone. Three quarters of passengers wait until the bus is stopped before starting to move across the bike lane area into the boarding area, while 20% start to enter the bike lane area when the bus is slowing (on the concrete area) but not yet stopped.

Do pedestrians in the boarding zone move over when bicyclists ride through?

Key Takeaways: When a bicyclist passes in the boarding zone, passengers tend to move over.

Data:

- Ped Video Review: When passengers encounter bicyclists riding through the boarding zone (5 instances, 8 passengers) they took some action to move out of the bicyclist's path. In one encounter, a group of four passengers with a stroller swings the stroller around and into the bike lane. The bicyclist moves from the bike lane to the boarding zone to avoid it. The passenger with the stroller also moves the stroller to avoid the bicyclist.
- Bike Video review: No interactions between passengers in the boarding zone and bicyclists riding through that area were observed. However, when a bicyclist's route through the study area included the boarding zone, 75% of bicyclists made some move to avoid passengers while 17% of passengers made a courtesy move to avoid a cyclist.

- Survey: One respondent said they had had "close calls with bikers" when boarding the bus though no mention was made about the bicyclist's route at that time.

Are there indications that show pedestrian caution (whether they look for conflicting bike traffic) before crossing the bike zone (when exiting the bus, when waiting for a bus)?

Key Takeaways: While video review did not indicate that passengers were cautious about crossing the bike zone, one vision impaired interviewee stated that they wait in the loading area for the bus to leave so that they can listen for bicycle traffic before crossing. This interviewee stated that the loading area has very little space for waiting.

Data:

- Ped Video Review: Most exiting passengers do not seem noticeably pause and look in the direction of approaching bike traffic. For mobility devices, wheelchair users, the bus ramp generally extends into the bike lane, so they are not exposed when crossing the bike lane.
- Interviews: One vision impaired respondent noted that they tend to step off the bus and then wait for the bus to leave before starting to walk, so that they can listen for any approaching bicyclists (which they can't hear over bus sounds). They felt there was little space to wait after stepping off the bus.

Do pedestrians walk down either of the bike ramps?

Key Takeaways: A small portion of disembarking passengers (7%) walked down the bike ramps. Most of these were using the bike ramp to access the crosswalk at the 93rd Ave stop.

Data:

- Ped Video Review: 7% of 643 disembarking passengers walked down the bike ramp. The vast majority of these were at the 93rd Ave stop, and passengers were walking down the bike ramp to access the crosswalk.

Do transit users use all the marked crosswalk areas exclusively, or cross at other locations?

Key Takeaways: While most passengers (60%) use the crossings, a sizable portion (40%) cross elsewhere including at a diagonal.

Data:

- Ped Video Review: For boarding passengers, when the bus arrives and the doors are aligned with the marked bike lane crossing areas, 60% of passengers cross in the designated areas, while 40% cross the bike lane elsewhere, including at a diagonal. For the 10% of passengers for whom the bus was not aligned, some of these cases are for non-articulated buses serving the FX2 line.

9.5 Questions about the Tactile Walking Surface Indicators (TWSIs)

Do people step over the TWSI without stepping on/contacting them?

Does anyone trip on the TWSI surface?

Key Takeaways: We did not observe anyone tripping, stumbling, or getting devices wheels stuck on TWSIs. Most surveyed respondents didn't have any opinion about them, but among those who did, 26% said they were helpful and 5% indicated they had encountered some problem. Among those reporting issues, one reported tripping and another said it was difficult to maneuver their walker over the TWSIs.

Data:

- Ped video review: No issues observed.
- Survey: Over a quarter, 26%, said that they were helpful, and only 5% of respondents had had problems with the bars and bumps, while most respondents, 68%, said they were neither helpful nor a problem. One respondent said they had tripped on the TWSI bumps, and one other said they had trouble pushing their walker device over the bumps.
- Interviews: One interviewee said their walker gets caught on the bumps but sometimes they are helpful because they provide some friction when trying to lift the walker onto the bus.

Do bicyclists cross over the TWSI?

Key Takeaways: Bicyclists did cross over he TWSIs regularly, which seemed to be more common when they were navigating around waiting transit passengers

Data:

- Bike video review: Bicyclists cross over the TWSI without any issue, often to navigate around pedestrians.

Do vision-impaired pedestrians straddle the TWSI or walk to one side? (Which side? Is it helpful for general pedestrians align for boarding (i.e., organize themselves in a waiting line)?

Key Takeaways: The limited sample of observations do not provide enough data to identify if vision-impaired pedestrians will straddle or walk to one side of the TWSIs.

Data:

- Ped Video Review: We observed 2 transit riders who were noted as being visually impaired and using canes. Both were exiting buses, and both crossed the TWSIs, but did not walk along them.
- Interviews: One vision impaired respondent noted that it is hard to know which side of the TWSIs the bike lane is on, especially for people new to the platforms.

Does the TWSI appear to have enough contrast adjacent other traffic control, during day, night, and inclement weather?

Key Takeaways: We did not receive any feedback on the TWSI contrast from the survey or interviews. Ride-along participants felt the wider 12" blue TWSI strip adjacent to the waiting area at the SE 93rd platform set its function aside from the white strip adjacent to the street, which they liked.

Data:

- Ride-along: Ride-along participants noted that the TWSI strip separating the bike lane from the transit waiting area at the SE 93 locations (12", blue tactile bars, 4 wide) is preferred to the standard separator (6", white tactile bars, 2 wide), noting that the blue color suggests it serves a different purpose from the white strip abutting the street, and the greater width makes it stand out more.

10 Appendix E: FX2 Operator Interviews and Surveys

TriMet conducted a set of interviews and surveys with TriMet bus operators in June 2024. Results from these efforts were shared with the research team, and are included below.

10.1 FX2 Operator Interviews

Four FX 2 operators were interviewed at the Cleveland Park & Ride on June 13th, 2024.

Summary of responses by interview question:

1. **What are your impressions/feedback on shared bicycle and pedestrian platforms?**

   Operator 1 – These are working very well. I've found that wind displacement from buses can impact riders. The separation of bikes from adjacent travel lane reduces this impact for bicyclists.

   Operator 2 - No issues. Works well.

   Operator 3 - These platforms are doing a good job. 95% riders/bicyclists appear to follow rules and platforms operate well.

   Operator 4 - I've personally not have seen any conflicts, but they do require awareness and have the potential to be dangerous

2. **General operational concerns, challenges or considerations associated with FX2?**

   Operator 1 – I haven't heard any concerns with stop-spacing. I think most passengers appreciate the efficiency that comes with consolidated stops.

   Operator 3 – Stop spacing seems to be working well for riders – I've heard no concerns.

   Operator 4 - Farside stops are preferred and make considerable difference in improving travel times/reliability

   Operator 4 – A station platform should have been placed at the Social Security Office at 179th. Lots of folks get on/off at this location. Especially those who are elderly and/or live with a disability.

3. **General impressions, thoughts, and concerns associated with station platforms**

   Operator 1 – I've seen ridership noticeably increase since we've first opened.

Operator 1 – Platforms sometime jut out and should sit behind fog line to prevent impacts.

Operator 2 – Some mobility devices and walkers cannot easily maneuver over the tactile domes of the curbside tactile domes on 9" platforms.

Operator 3 – the large comms/power cabinets block important sightlines. Remove or reduce the size!

Operator 4 – Every six blocks feels like the right distance between stations. Contributes to faster/reliable service while still providing access to riders

4. **Common rider feedback, suggestions, criticisms and/or praises specific to FX2-Division (buses, service, operations, station environments, etc.)**

   Operator 2 – Stop spacing seems to work for riders. Though the stop spacing distance around Angeline I've hard is to far and is especially difficult as there is a considerable hill here. 6 blocks spacing seems to be the maximum we'd want to consider in a service like this.

5. **Any general feedback, thoughts or considerations as we look to implement similar type service on 82nd avenue and beyond**
6. **How is the bus/station interface working with 9" platforms? Any issues with approach, boarding/alighting, etc. at these platform types?**

   Operator 1 – There is variance in the articulated buses (kneeling, floor height, etc.) that can sometimes impact interface between station platform and vehicles. I also have difficulties at times know which platforms are 9" versus 6"

   Operator 2 – The 9" platforms perform measurable better. Boarding and alighting is much faster and efficient!

   Operator 3 – I have a hard time keeping track of where we have near-level vs. standard platform heights. Can these be more consistent?

7. **How is the priority seating area working from an accessibility point of view? Any concerns or feedback on mobility device securement areas.**

   Operator 1 – There is often not enough available seating space in the priority area. Often we see people with lots of recycling/trash come on board and use up considerable space.

   Operator 2 – Consider individual flip-up stadium chairs as opposed to the three-seat configuration that has to entirely be flipped up to accommodate a mobility device. This

would allow for flexibility for additional seating while space is also allow for carts, strollers, etc.

8. **How is the rear-facing Quantum chair working for riders and operators?**

   Operator 1 – Most people choose not to use this chair. It can be figidty and some struggle with getting in position to self-secure. Most prefer to face forward.

   Operator 2 – For some these seem to work well. But other riders have complained that they can't see because it blocks sight lines.

   Operator 3 – Most I've interacted with who use a mobility device hate the rear-facing Quantum chairs.

   Operator 4 – Many who use chair do not like facing backwards – people can't see. The high profile of the chair impacts sightlines.

9. **Any other general thoughts or suggestions?**

   Operator 1 – Having bikes on the bus is much quicker and efficient. Space on the bus can accommodate a 3rd bike when necessary. Overall works well.

   Operator 1 – Road conditions have a real impact on our riders. They comment often that parts of Division are really rough and impact comfort. Operators at times have to swerve out of lane to miss potholes.

   Operator 1 – I've been a TriMet operator for 35 years. Driving FX2 is the best line I've been on and for the rest of my career only intend to be an FX2 operator!

   Operator 2 – The articulated buses break down all the time. They also don't do well on hills. Consider use of articulated buses on hills in the future – it could be a considerable problem.

   Operator 2 – The TSP on the buses at times needs to be rebooted and can take significant time to reset. This can make us 10-12 mins late

   Operator 2 – Overall, FX service and operations are working well.

   Operator 2 – Contact "On-The Move" https://onthemovepdx.org/. They are on 42nd/Division and work with a population that lives with disabilities who frequently ride FX. They will be an invaluable resource when considering how to improve FX service for those living with disabilities.

10.2 FX2 Operator Survey

Twenty FX2 operators were surveyed in June 2024. Compiled responses to survey questions are included below.

1. Please give your Impressions/feedback on the **shared bicycle and pedestrian platforms** (station design that has bike path "up and over" the platform – SE 85th to SE 175th)
    a. *I like the "up and over" platforms as cyclists still have a safer path past the bus than passing on the left in traffic. However operators still need to be mindful when opening the doors when a cyclist is near because very few of the stops as suggested at the nearside of the platform; I've had near misses with bikes vs alighting passenger one or two times. I truly prefer the stops where the bike lane goes around the back of the platform.*
    b. *Passenger safety exiting the bus – Looking for bicyclists. As an operator, it took awhile to make it standard practice prior to opening doors.*
    c. *Work well but better when they are behind at the stop*
    d. *Farside of platform for passenger safety.*
    e. *No real issue. Since implemented, rarely see any interaction.*
    f. *I like the shared platforms*
    g. *Excellent design with one small but a safety issue. Passengers do not pay attention as they exit the bus and there is a potential for alighting passenger with bicycle crashes.*
    h. *Odd design – no designated right of way. Bikes don't yield and passengers are confused. It works but not great.*
    i. *I believe having bikes travel on the back side of the platform is safer. (82, 52E, 26E, 20E)*
    j. *Great! No complaints. Bicyclists take responsibility so no one gets hurt.*
    k. *NA*
    l. *I'd rather have them there than share the road.*
    m. *If bike traffic ever increases, it'll be a bad thing. I have had two very close calls.*
    n. *Bikes do not look out for pedestrians getting off the bus.*
    o. *Passengers don't look when deboarding and often times there are near misses with ebikes and fast bikes.*
    p. *I see no issues. Looks like a safe set-up. Maybe something to slow down the bikes through platform.*
    q. *Works well*
    r. *NA*
    s. *Bicyclists speed on the platform and don't pay attention to the exiting passengers who don't look either.*
    t. *It works. The only problem is we do not know if they want the bus or not as there are a lot of street people in the shelters.*

2. Do you have any **general operational concerns, challenges or considerations** associated with FX2
    a. *Not enough articulated buses. Several times 40' buses are used on trippers during the PM peak and ridership is starting to really need the bigger bus.*
    b. *Standard routine – service stops only – no courtesy stops. Helps to stay on time.*

c. *Works well except when cars get in the way – use the lane to beat traffic/cut me off then get stopped turning right.*
d. *All stops should be farside. Line 9 at 39th Ave is good example of it having it correct.*
e. *The lane design where it angles (back into traffic) before or after platforms, primarily 130th Ave and nearside 101st Ave (?) westbound. Eastbound nearside 130th Ave and 122nd Ave platforms.*
f. *The doors are slow to open and close. A lot of people get on without paying through the rear two doors.*
g. *The huge issue that all operators bring to light is the crossing of rail tracks at 8th Ave. The re-routes because of train blockage take a lot of time and cause buses to run late and lose TSP. The signals are problematic and cause safety issues with FX2 buses stopping on the tracks. Max trains can cause buses waiting to cross to lose 2-3 light cycles and putting them behind schedule. In addition, the one lane on inner division frequently is blocked with delivery and garbage trucks. An express route should never travel a route with less than two lanes in both directions. Having enough and reliable, trouble free buses is a big issue too. We have had a lot of mechanical issues with the artics and almost every day they need to run some 40' buses to fill in for lack of 60' buses. It looks way better to stay branded and run consistent artics.*
h. *The design itself is odd. They could have made a straighter path – lots of curves and turns.*
i. *Why did we design all platforms with visual barriers? Power boxes and garbage cans between the view of riders and drivers on platforms. Bad idea.*
j. *5th Ave traffic vs Max trains – Let FX2 resume first.*
k. *The FX2 should do the re-route as part of the regular route to avoid the heavy rail and limit passenger and operator*
l. *Give the operator more leg room and change the seat for getting in and out.*
m. *It's tough seeing what people bring in the back doors. I have caught people bringing in car batteries.*
n. *In general, the bus is comfortable and rides smooth. Only complaint is the seat leg room is cramped. Buses do break down a lot. I love the ADA securement and the bike racks.*
o. *The RR crossing at 8th Ave can be difficult at best. If caught during rush hour on an outbound, expect 15 min delay at minimum.*
p. *When I drive the FX on holidays I have had no issues.*
q. *Don't put FX72 down Alberta*
r. *The back two doors stay open too long after passengers enter or exit.*
s. *The gas pedal is stiff and hard to press smoothly. We are unable to see passengers which is unsafe for those innocent people not doing anything. Lots of passengers we can't see but are having mental episodes is dangerous.*
t. *North Terminal (5th & Hoyt) should not be a stop. 90% of the time there are tents there and all you can smell is meth and fentanyl and sometimes they get on the bus and smoke it in the back of the bus.*

3. General impressions, thoughts, and concerns associated with **station platforms**
    a. *I prefer the platforms over the standard stops – it makes it clear to passengers where to catch the bus.*

b. *Platform Eastbound at New Seasons – at light – series of signals 2-3 times. Would be better to have well before light signal.*
c. *Better cover for people waiting*
d. *NA*
e. *Lane design needs to be considered.*
f. *The "white bricks" are hard for people to roll over with mobility devices like walkers and buggies. The large electrical boxes block operator view from intending passengers when they thought they couls bypass the station platform.*
g. *I feel farside stations are a better design allowing buses to leave again as soon as they load/unload. In a perfect world all stations should match in design, curb height and bicycle path through – consistency would save on equipment damage and promote safer, faster trips.*
h. *Great design for access with articulated vehicles, bump outs, jump lights and traffic controls.*
i. *Speed bumps/humps should be installed before platforms to slow bike speed prior to platform. "Have drop off only" on inside reader board.*
j. *Fog lines vs plate edges. More consistent.*
k. *NA*
l. *NA*
m. *It would be nice if the height was the same.*
n. *They are good. Some are too big. People sit back and it's hard to see them at times.*
o. *Eliminate blindspots*
p. *Seems ok*
q. *Needs consistent curb height.*
r. *NA*
s. *NA*
t. *5th & Hoyt – take stop away.*

4. Common **rider feedback**, suggestions, criticisms and/or praises specific to FX2-Division (buses, service, operations, station environments, etc.)
    a. *Any feedback that I've received is either they love the service because of the speed or they hate it due to the stop spacing.*
    b. *Main feedback is positive. People like it. Priority seating fills up at peak times is negative feedback.*
    c. *NA*
    d. *Well lit. No confusion where they need to be.*
    e. *Most passengers like the space especially those not purchasing fares using rear doors.*
    f. *Passengers don't like the extra distance between stops.*
    g. *My bus is late (due to re-route at 8th Ave crossing).*
    h. *Love the frequent services and volume of available seats.*
    i. *Remove sides of platforms so drivers and passengers can see each other. And it reduces drug use in shelter if there is no wind break.*
    j. *Need traffic restrictions (No truck traffic 5ooa-800p). Police dangerous, illegal activities on platforms. No loitering, transiency. Buses are faster than Max – let buses through first on Tilikum.*
    k. *NA*

l. *Too many free loaders going in the back door and we can't know if they are carrying gas cans or batteries.*
m. *They want courtesy stops – but we can't – because of the farther spacing of stops.*
n. *Road surface on Division causes a rough ride. Too easy for people not to pay with the three doors, they usually cause problems.*
o. *Inability to monitor fare evaders on the FX bus.*
p. *ADA people hate riding backwards. Switch it to forward facing.*
q. *Cramped operator space.*
r. *NA*
s. *ADA Passengers are still upset they have so far to walk between stations.*
t. *We pick up way too many homeless and fare evaders.*

5. Any **general feedback**, thoughts or considerations as we look to implement similar FX type service on 82nd avenue and beyond
    a. *I can't think of any feedback from passengers specifically – I think 82nd Ave is a good spot for an FX service.*
    b. *Ergonomics (bus controls/seating) not good. Especially for 6' or taller. Controls, Kneel ramp more difficult to deploy than standard buses.*
    c. *After farside of light stops are best*
    d. *Very positive for ADA for height of platform. Needs to be farside stops only. For FX72, move Glisan stop farther North.*
    e. *Lane design needs to improve.*
    f. *The TSP not always working.*
    g. *TSP is super important. Limit the amount of stops – weed out the lesser used/closely spaced stops to keep it as an express. Run it on 2 lane/both direction roads only. Source better performing, more reliable artic buses.*
    h. *Keep it as straight as possible, avoid creating pinch points. Jumps lights are great.*
    i. *At main intersections add stop line 10-15 ft back on right auto lane so crosswalk is visible to bus driver for safety. Clean weeds and grass and sand and rock from platforms and bridge. Upkeep our property better than the city. (slip – trip – fall).*
    j. *NA*
    k. *NA*
    l. *NA*
    m. *I've had problems at Cleveland P&R with people high on drugs milling about not knowing where they were. There needs to be more ways to keep them out as it is dangerous. North Terminal does a pretty good job keeping them out.*
    n. *How would that work with the tight turns onto Alberta? It would be great on 82nd.*
    o. *Implement the ability to monitor fare evaders. More room for bikes. Fully enclosed driver compartment. Driver space adjustable A/C system. Video on side mirrors to eliminate mirror strikes.*
    p. *NA*
    q. *Bicycles on back of bus are a good thing. No sense making a 60' bus longer with bikes on the front.*
    r. *I don't kneel the bus ever since it causes mechanical tie up needing a complete bus reset. I use the ramp instead.*
    s. *NA*

t. *NA*

Specific FX Questions

1. How is the bus/station interface working with 9" **platforms**? Any issues with approach, boarding/alighting, etc. at these platform types?
    a. *In my experience the platforms are the best for operators and passengers – no need to kneel, easy to pull up and depart from.*
    b. *Works well for me. Don't have to kneel as often – which is great.*
    c. *NA*
    d. *Operators need to be careful not to hit them.*
    e. *Seems good. Rarely needs to kneel bus for passengers.*
    f. *Works good.*
    g. *It'd sure be nice if all curb heights could be consistent (I realize the downtown mall stops are shared with 40' and even 30' uses though). The higher curbs allow for not kneeling the bus, which saves time!*
    h. *Great design. Works for ease of access for passengers.*
    i. *OK*
    j. *You can see evidence of the varied height by the damage to the concrete edges of each platform. Also platforms need to be set back from the fog line. Bus must travel over the fog line, then veer back into traffic. Platforms, curbs, islands need to be consistently set back from the far side of the fog line. TSP trigger reset when going on a re-route. General road asphalt surfaces on Division are terrible.*
    k. *NA*
    l. *NA*
    m. *Bumpers would be nice so we don't scrape.*
    n. *Not all are 9" and some cause scraping.*
    o. *Not all platforms are 9". Create consistence in platform height.*
    p. *NA*
    q. *Needs to be consistent. Surprises for new operators with some being taller is not a good thing for equipment damage.*
    r. *NA*
    s. *122nd Ave East station after pulling out there is a curve to which back right rear tire catches the curb slightly.*
    t. *148th and 162nd signals take way too long to turn green.*

2. How is the **priority seating** area working from an accessibility point of view? Any concerns or feedback on mobility device securement areas. How is the rear-facing Quantum chair working for riders and operators?
    a. *Accessibility in and out of the ADA are is very easy for passengers. As for the Quantum restraint system, I can't say I've seen anyone use it. The only complaint/request I've received from passengers is that those who choose standard restraints or just don't want to use the Quantum ones – their view is blocked to see out the front of the bus. If possible passengers want the Quantum restraint on the driver's side of the bus.*

b. *Priority seating often taken and full. Quantum chair never used during my sign-up.*
c. *NA*
d. *NA*
e. *Multiple mobilities sometimes with the angle can cause hang ups especially 3 wheeled ADA chairs.*
f. *Quantum makes it hard for passengers to see out the window. Rear facing is hard for people.*
g. *Passengers generally do not want to ride backwards (myself included) for numerous reasons (nausea, can't see their stop coming up, do not want to stare in the face of other passengers). I feel the Quantum securement is somewhat intimidating to learn.*
h. *Quantum is not great – rear facing not preferred by mobility users and blocks view of all passengers.*
i. *Seating is just as any bus. Few people use Quantum. Takes more time. Customers cannot see where they are going.*
j. *Q-restraint system rarely used. People don't like to sit backwards. It would be more used if it wasn't so sensitive to perfect alignment of chair and people could see where they were going. Also there needs to be a ban on carts full of recyclables, garbage and tons of people's belongings that occupy priority seating. Oversize cargo must go in back doors and into bicycle space, not into accessible seating area. People with mobility devices cannot choose to board in the back when space up front is full of carts with garbage.*
k. *NA*
l. *Haven't really used the Quantum – they prefer to face the driver/front.*
m. *People don't like to ride backwards and rarely use it.*
n. *It's big and awesome.*
o. *Not all mobility users want securement and very few want to use Quantum.*
p. *The wheel chair system blocks our vision. Wheelchair people do not like to use it.*
q. *People don't want to sit backwards so it doesn't get used much.*
r. *I've only had the Quantum used 2 or 3 times. I didn't have any problems or issues.*
s. *I've never seen it used yet.*
t. *It's pretty good but a lot of riders complain that they wish the Quantum chair was turned the other way.*