

STATION SQUARE
STATION AREA PLAN

PORT AUTHORITY OF ALLEGHENY COUNTY
PLANNING AND EVALUATION DEPARTMENT

A.

APPENDICES

A.1 TRANSPORTATION PLANNING

PEDESTRIAN AND BICYCLE SAFETY EVALUATION

Similar to FHWA's formal Road Safety Audit (RSA) program, the TOD team performed a safety assessment within the Station Square Station's half mile walkshed. The team reviewed crash data for all intersections within the past five years of available data (2011 – 2015) to determine if there were instances of crash clusters, defined as five crashes within a 12 month period with similar causation factors. Additionally, the team performed a field visit of these intersections in March of 2017 to observe pedestrian safety hazards throughout the walkshed. Pedestrians that feel safer walking to transit stations are more likely to use them, so this report identifies opportunities to improve pedestrian safety. Recommendations for improvements within Port Authority-owned property have been incorporated into the station's redesign in this report. Recommendations beyond the station area itself are not intended to be implemented for the station improvement project, but are offered for consideration for incorporation when other projects are planned within the station's walkshed (by city and state agencies, private developers, utilities, etc.).

PennDOT performed a formal Road Safety Audit along East Carson Street starting at Smithfield Street and extending east into the South Side and is developing safety improvements based on the findings. These safety improvements are scheduled to be completed in 2019. The project team has coordinated with PennDOT through the project and supports most of the findings, though may offer additional improvements for consideration.

Crash Data Review

The project team requested reportable and available non-reportable crash records from the Pennsylvania Department of Transportation for the last five years of available crash data, from 2011 through 2015 (inclusive). Reportable crashes are defined as crashes involving injury (an ambulance) and/or towing. Minor crashes, such as low speed rear-ends and broken mirrors, or pedestrian crashes in which pedestrians refused treatment, are not reportable crashes and are not reflected by the crash data analysis. Crash data was requested along Carson Street, Smithfield Street, and Arlington Avenue, which included at the following intersections:

Carson Street

- Commerce Drive
- Wabash Tunnel
- Smithfield Street
- Arlington Avenue and Station Square Drive
- South First Street
- South Second Street
- South Third Street
- Terminal Way
- South Fifth Street

Smithfield Street

- Carson Street
- Fort Pitt Boulevard

Arlington Avenue

- Carson Street
- Sycamore Street
- P. J. McArdle Roadway

All roads within the study area experienced reportable crashes.

During the study period, there were a total of 146 crashes within the study area, 14 of which (10 percent) involved pedestrians. Almost a third (35 percent) of crashes were angle crashes and a third (32 percent) were rear-end crashes. Driver actions that contributed to the crashes were 16 percent turning improperly or carelessly, 14 percent driving distractedly, 6 percent affected by a physical condition, 4 percent driving too fast for conditions, 4 percent tailgating, 3 percent speeding, 3 percent proceeding without clearance, 3 percent red light running, 1 percent failing to respond to traffic control devices, and the remainder other improper driving or unknown actions. There were two fatalities. Once occurred in which the driver was impacted by a physical condition and struck a pedestrian and the other occurred when the driver struck a fixed object.

[Figure 1.1] Summary of Intersection Crash Data provides a summary of crash data by intersection or roadway segment, ranked by crash frequency and then severity. The table describes the most common contributing driver action and the most common collision type. Note that some crashes have multiple contributing driver actions and some actions, collision types, and severity levels are unknown.

Intersection	Number of Crashes Veh (Ped)	Most Common Driver Action (%)	Most Common Collision Type (%)	Fatality, Moderate or Major Injury (%)
E/W Carson St & Smithfield St	23 (3)	Improper/Careless Turn (33%)	Angle (52%)	1 (4%)
E Carson St & Arlington Ave / Station Square Dr	16 (3)	Improper/Careless Turn (22%)	Angle (50%)	1 (6%)
Smithfield St & Ft Pitt Blvd	10 (2)	Other Improper Driving (33%)	Angle (50%)	0 (0%)
W Carson St & Commerce Dr	10 (1)	Distracted Driver (18%)	Rear-end (60%)	0 (0%)
Arlington Ave & McArdle Rdwy	10 (0)	Affected by a Physical Condition, Other Improper Driving (tie) (20%)	Angle (40%)	0 (0%)
W Carson St & Wabash Tunnel	9 (0)	Improper/Careless Turn, Other Improper Driving (tie) (33%)	Rear-end (56%)	0 (0%)
Smithfield St from Carson St to Ft Pitt Blvd	9 (0)	Other Improper Driving (40%)	Rear-end (78%)	0 (0%)
Arlington Ave & Sycamore St	8 (0)	Proceeding without Clearance (25%)	Angle (63%)	1 (13%)
E Carson St & S 2nd St	8 (0)	Other Improper Driving (38%)	Angle (63%)	1 (13%)
E Carson St from Smithfield St to Arlington Ave	7 (4)	No Contributing Action (50%)	Pedestrian (57%)	0 (0%)
E Carson from Terminal Way to S 5th St	7 (1)	No Contributing Action (29%)	Rear-end (50%)	0 (0%)
E Carson St & 1st St	6 (0)	Distracted Driver (43%)	Rear-end (67%)	0 (0%)
E Carson St from 1st St to 2nd St	5 (0)	Other Improper Driving, No Contributing Action (tie) (20%)	Hit Fixed Object, Same Direction Sideswipe (tie) (40%)	0 (0%)
E Carson St from Arlington Ave to S 1st St	4 (0)	Other Improper Driving (50%)	Rear-end (75%)	0 (0%)
E Carson St from S 3rd St to Terminal Way	4 (0)	Distracted Driver (50%)	Angle, Head-on, Rear-end, Same Direction Sideswipe (tie) (25%)	1 (25%)
E Carson St & S 3rd St	3 (0)	Improper/Careless Turn (50%)	Angle (67%)	0 (0%)
E Carson St & Terminal Way	3 (0)	Distracted Driver, Tailgating, Other Improper Driving (tie) (33%)	Rear-end (100%)	0 (0%)
E Carson St & S 5th St	3 (0)	Distracted Driver (67%)	Rear-end (100%)	0 (0%)
E Carson St from S 2nd St to S 3rd St	1 (0)	Other Improper Driving (100%)	Angle (100%)	0 (0%)

[Figure 1.1] Summary of Intersection Crash Data

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Refer to **[Figure 1.2] Intersection Crash Occurrences (2011 – 2015)** for graphical summary of crashes at each location.

The crash data determined one potential crash cluster. At the intersection of Carson Street and Smithfield Street, there were 12 month periods with five angle crashes caused by improper or careless turns. This intersection operates at a failing level of service in the afternoon peak period, with much congestion. The eastbound Carson Street left lane has a shared left/through movement. The speed limit on Carson Street is 35 mph.

Over 70 percent (10 of 14) pedestrian crashes occurred in the one-block area along Carson Street from the intersections of Smithfield Street and Arlington Avenue / Station Square Drive (inclusive), on average two per year. The remaining crashes occurred on East Carson Street near Terminal Way where there happens to be an in-street bus stop, on West Carson Street at Commerce Drive which has a missing crosswalk and discontinuous pedestrian connection to Station Square, and on Smithfield Street at Fort Pitt Boulevard where there is a long, pre-timed signal phase, high traffic volumes, and sidewalk furniture that blocks visibility.

Reviewing crash data based on crash occurrences alone can be misleading, since busier roads generally experience more crashes. Adjusting for traffic volume, intersection crash rates were calculated using the following formula to give an intersection crash rate (R(i)) per million entering vehicles (MEV):

R(i) = (Number of Crashes x 1,000,000) / (365 days x 5 years x ADT)

PennDOT conducts average daily traffic volume (ADT) counts for state-owned highways and higher volume municipal roads.

East Carson Street (SR 0837) has the highest traffic volume with an average daily traffic (ADT) of 17,141 vehicles per day. Smithfield Street (SR 3027) has the second highest ADT of 12,816. West Carson Street's ADT is 11,418, Fort Pitt Boulevard's ADT is 9,283, McArdle Roadway's ADT is 8,854, Arlington Avenue's ADT is 8,146, and Sycamore Street's ADT is 3,508. The **[Figure 1.3] Available Intersection Crash Rate** table that follows summarizes the crash rate for intersections with available traffic data.

The intersection of Carson Street and Smithfield Street had the highest crash rate of 0.61 MEV. All Monongahela Incline riders and almost all Station Square LRT Station riders must walk through this intersection. The intersection of Arlington Avenue and McArdle Roadway had the second highest crash rate of 0.51 MEV, though fewer pedestrians use it. This shows that the roadway area around the Station Square station area has the highest number of intersection crashes in the walkshed.

In addition to crashes at intersections, crashes along roadway segments were studied. Using PennDOT's traffic volume data, the following roadway segment crash rates were calculated using the following formula to give a roadway segment crash rate (R) per million vehicle miles traveled:

R = (Number of Crashes x 1,000,000) / (365 days x 5 years x ADT x Length of Segment in Miles)

The **[Figure 1.4] Available Roadway Segment Crash Rate** table that follows summarizes the crash rate for roadway segments with available traffic data, inclusive of crashes occurring intersections at the end of each segment.

Intersection	ADT	Number of Crashes	Crash Rate (MEV)
Carson St & Smithfield St	20,506	23	0.61
Carson St & Arlington Ave	25,288	16	0.35
Arlington Ave & McArdle Rdwy	17,000	10	0.51
Smithfield St & Ft Pitt Blvd	22,099	10	0.32
Arlington Ave & Sycamore St	10,707	8	0.20

[Figure 1.3] Available Intersection Crash Rates

Roadway Segment	ADT	Length (mi)	Number of Crashes	Crash Rate (MEV)
E Carson St from S 5th St to Arlington Ave (Inclusive)	17,142	0.39	60	4.96
E Carson St from Arlington Ave to Smithfield St (Inclusive)	17,142	0.17	46	8.77
W Carson St from Smithfield St to Commerce Dr (Inclusive)	11,418	0.21	42	9.50
Smithfield St from Carson St to Ft Pitt Blvd (Inclusive)	12,816	0.37	42	4.86
Arlington Ave from E Carson St to McArdle Rdwy (Inclusive)	8,146	0.25	34	9.29

[Figure 1.4] Available Roadway Crash Rates

INTERSECTION CRASH OCCURRENCES



[Figure 1.2] Reportable Crashes from 2011 to 2015

TRANSPORTATION PLANNING

The Available Roadway Segment Crash Rate table shows that stretch of Arlington Avenue to Carson Street at Station Square Drive and then continuing along Carson Street through Smithfield Street to Commerce Drive has approximately double the crash rate of the other roadway segments. The Station Square station area is along these segments, and all pedestrians using transit must cross streets to reach the station. This shows the importance of safety improvements in this area.

Unlike computing vehicular crash rates per location, pedestrian crashes typically occur too infrequently to calculate statistically-significant rates; in the past five years, the variation between the highest and lowest intersection or roadway crash occurrences was four. Pedestrian crashes may also occur when pedestrians are third parties to vehicular crashes. Therefore, this assessment focuses recommending improvements to make intersections as safe as possible for all users to prevent situations that may lead to future crashes, regardless of past pedestrian crash occurrences. Vehicular safety improvements, especially ones that slow traffic volumes or reduce aggressive driving, will also help to lower pedestrian crash risks.

Since signalized intersections typically experience higher traffic volumes, they typically experience the greatest number of both pedestrian and vehicular crashes. Three ways of reducing aggressive driving at signalized intersections include installing exclusive turn lanes, adding advance exclusive turn arrows, and actuating the signals for vehicles. At uncontrolled locations, improving sight distance, signage, and crosswalk markings may reduce the risk of pedestrian crashes.

Considering crash rates and occurrences, crash data shows that the most critical area to improve is East Carson Street from Arlington Avenue to Smithfield Street.

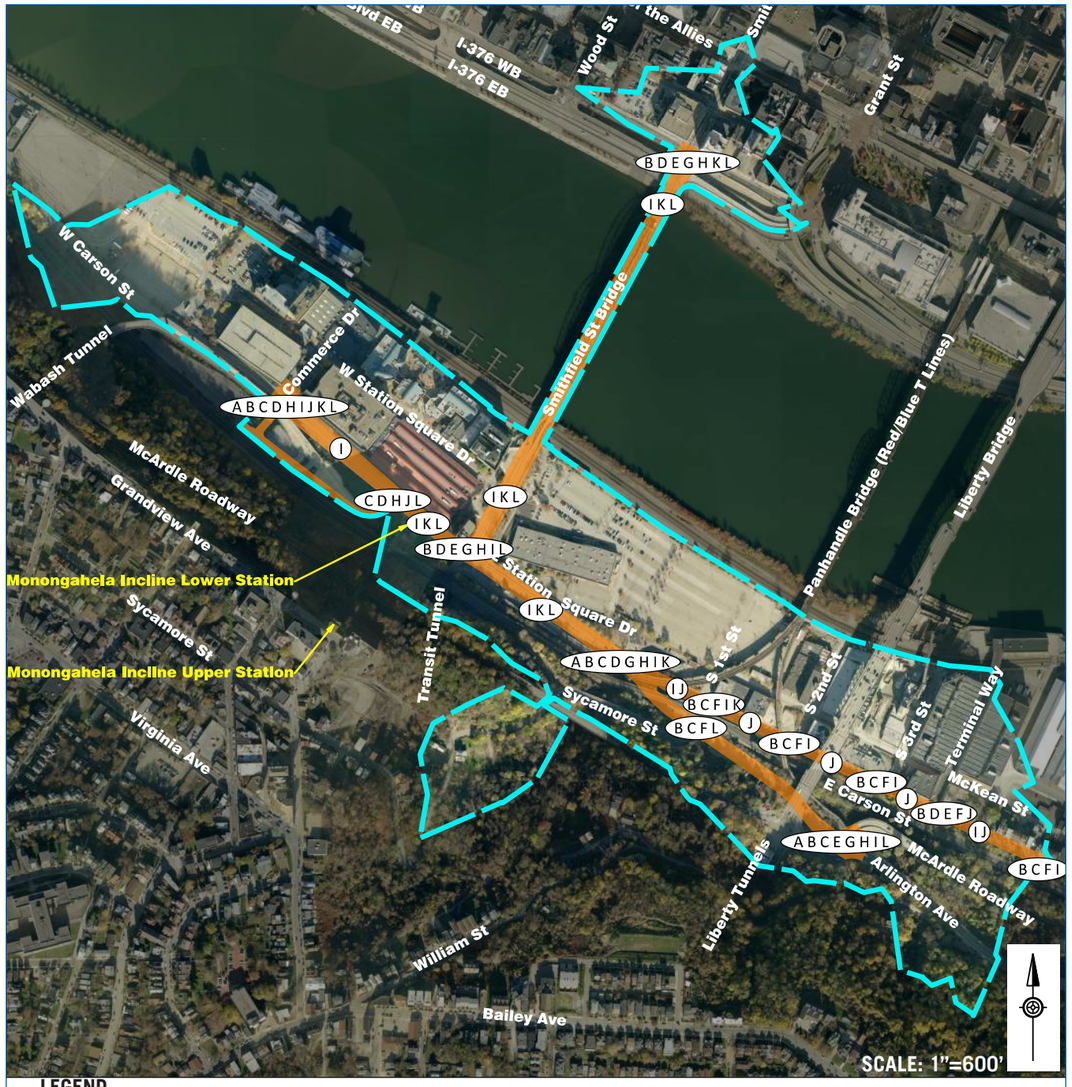
This report provides recommendations for making improvements along these roadways to improve pedestrian safety within the Station Square Station's walkshed.

Intersection Observations

The GAI/CSG team performed field observations of all roadways in the highlighted pedestrian walkshed area to observe safety deficiencies. The field observations were conducted on March 21, 2017, prior to the PennDOT-planned safety improvement project scheduled for 2018-2019. The most significant issues observed were related to safe pedestrian access to the Station Square LRT Station and to the Monongahela Incline Lower Station, which included confusing signal phasing, frequent jaywalking, and narrow or discontinuous sidewalks that lacked buffers from travel lanes. Other common issues observed included missing and non-ADA compliant curb ramps, missing or faded crosswalk markings, misaligned crosswalks, missing stop signs, lack of bicycle connectivity, confusing lane arrangements, and a lack of ADA compliant pedestrian signals.

The following section describes general safety improvement recommendations along with specific examples of why such improvements are needed. These suggested safety improvements are summarized in **[Figure 1.5] Safety Assessment Observations**. The letters denoting each type of safety observation in the figure corresponds with the following report recommendations below. Since these are not formal audits they are not intended to be a complete and exhaustive list at all intersections. Many of these recommendations are also being proposed as part of the planned PennDOT safety project.

SAFETY ASSESSMENT OBSERVATIONS



LEGEND

- (A) - Install Curb Ramp(s)
- (B) - Upgrade Curb Ramp(s)
- (C) - Install Crosswalk Marking(s)
- (D) - Upgrade Crosswalk Marking(s)
- (E) - Realign Crosswalk(s)
- (F) - Add/Reposition Stop Sign or Stop Bar(s)
- (G) - Upgrade Signalized Intersection
- (H) - Add or Improve Pedestrian Signals
- (I) - Improve or Reconfigure Sidewalk
- (J) - Add Sidewalk
- (K) - Adjust Road Operations and/or Replace Signage
- (L) - Improve Bicycle Accommodations

[Figure 1.5] Safety Assessment Observations

TRANSPORTATION PLANNING

RECOMMENDATION A - INSTALL CURB RAMP(S)

Intersection observations revealed missing curb ramps at some of the intersections, particularly the intersection of Arlington Avenue and McArdle Roadway and Carson Street and Arlington Avenue. Where sidewalks line up at signalized intersections, approaches should have straight, marked crosswalks with ADA-compliant curb ramps.

RECOMMENDATION A



Guidance:

Add curb ramps at missing crosswalk locations.

Example:

Carson Street at Station Square Drive and Arlington Avenue

RECOMMENDATION A



Guidance:

Add curb ramps at missing crosswalk locations.

Example:

Arlington Avenue at McArdle Roadway

RECOMMENDATION B – UPGRADE CURB RAMP(S)

Many of the curb ramps in the study area were installed prior to current ADA-standards, so they lack detectable warning surfaces and may have excessive slopes. Corners were observed to often have one shared ramp for two crossing directions, though the ramps may not be angled properly or the radius may not be large enough to permit on-street wheelchair turning movements outside of vehicular wheel paths. Shared ramps should only be used for larger radii. The project team suggests upgrading all remaining curb ramps to be ADA-compliant.

RECOMMENDATION B



Guidance:

Upgrade curb ramps to be ADA compliant and to point in the direction of pedestrian travel. Limit slopes to ADA maximums where possible.

Example:

East Carson Street and Arlington Avenue

RECOMMENDATION B



Guidance:

Avoid the use of combined curb ramps when possible. If used, ensure pedestrians have adequate space for turning movements within crosswalks, per ADA standards.

Example:

Arlington Avenue and Sycamore Street

RECOMMENDATION B



Guidance:

Some intersections have curb ramps that are too narrow and are more like sidewalk to pavement grade transitions. Use ADA-compliant ramps that meet width requirements.

Example:

Arlington Avenue and McArdle Roadway

TRANSPORTATION PLANNING

RECOMMENDATION B



Guidance:

Replace all deteriorated ramps.

Example:

Intersection of East Carson Street and South First Street

RECOMMENDATION C – INSTALL CROSSWALK MARKING(S)

Smaller intersections were observed to lack crosswalk markings. While crosswalk markings are not required at all intersections, especially for low volume roads, they should be painted for all crossings that might be confusing to either drivers or pedestrians, such as at intersections with angled approaches or crossing T-tracks. Any location in which drivers may not expect pedestrians should have marked crosswalks with a corresponding stop bar.

At signalized intersections, where feasible, crosswalks should be located for each crossing movement. Missing crosswalks include across Carson Street at the west side of the Arlington Avenue intersection, at the east side of the Wabash Tunnel intersection, and at the east side of the Commerce Drive intersection. Appropriate curb ramps and sidewalk connections must be made to connect new crosswalks. The intersection of Commerce Drive has a west-side crosswalk to nowhere and is missing an east side crosswalk that is used by pedestrians heading to and from Station Square.

Discretion should be used when marking crosswalks at uncontrolled locations, since marked crosswalks have been shown to give pedestrians a false sense of security. Marked midblock crosswalks were observed across East Carson Street at Terminal Way and formerly across Arlington Avenue at Sycamore Street (the markings were worn). When uncontrolled crossings are used at these locations, intersections, they should line up with the most convenient pedestrian path and have painted crosswalks across both sides of the uncontrolled roadway with as corresponding stop bars (or yield triangles) and advance warning signage. New markings at midblock and uncontrolled crosswalks should not be installed unless recommended by a specific safety study.

While standard parallel-style markings are acceptable for lower volume crosswalks, crosswalks at midblock or high traffic locations (most locations within the station's walkshed) should have high visibility piano key-style markings.

RECOMMENDATION C



Guidance:

Install crosswalks markings across all signalized intersection approaches where feasible, especially where they line up with sidewalks.

Example:

West Carson Street and Commerce Drive

RECOMMENDATION C



Guidance:

Install crosswalks at stop-controlled locations that have sidewalks to discourage vehicles from stopping in pedestrian paths without watching for pedestrians first.

Example:

East Carson Street and South Third Street

RECOMMENDATION C



Guidance:

At existing uncontrolled locations, upgrade crosswalk markings with high-visibility piano key markings. At uncontrolled intersections, mark crosswalks across all approaches and add stop bars or yield triangles to supplement the advance signage. Install crosswalk to align with pedestrian path, such as the bus stop at Terminal Way.

Example:

East Carson Street and Terminal Way

RECOMMENDATION C



Guidance:

Mark crosswalks along higher volume streets, especially where drivers may not look for pedestrians.

Example:

Arlington Avenue and McArdle Roadway

TRANSPORTATION PLANNING

RECOMMENDATION D – UPGRADE CROSSWALK MARKING(S)

Signalized intersections were generally observed to all have parallel-style crosswalk markings (when used), and smaller intersections and curb cuts with larger driveways often had no markings. Many of the crosswalk markings were observed to be faded. The project team suggests regular inspection intervals for crosswalk markings. Piano key-style crosswalk markings have been shown to be more visible and require less maintenance. The project team recommends upgrading parallel markings to piano key-style markings, especially at high-volume and midblock locations, such as along Carson Street and Smithfield Street.

RECOMMENDATION D



Guidance:

Upgrade parallel-style markings to piano-key style markings at high-volume intersections.

Example:

Intersection of Smithfield Street and Carson Street

RECOMMENDATION D



Guidance:

Maintain and repaint faded crosswalk markings.

Example:

Intersection of Carson Street and the Wabash Tunnel Ramp

RECOMMENDATION E – REALIGN CROSSWALK(S)

Crosswalks and curb ramps at various intersections were observed to be misaligned. While this is typically due to utility conflicts and roadway obstructions, misaligned crosswalks increase pedestrian walking time and exposure to vehicles within the intersection. They also lead to pedestrian non-compliance and low driver visibility. However, crosswalks should also be placed at feasible locations for ADA-compliant curb ramps. For busy sidewalks, such as along Smithfield Street and along Carson Street between the LRT and incline stations, crosswalks and curb ramps should be positioned so pedestrians waiting to cross the street do not block pedestrians walking past the crossing.

At the intersection of Arlington Avenue and McArdle Roadway, the LRT tracks do not experience regular service, and the LRT has its own signal phase. Realigning the inbound crosswalk to be parallel to Arlington Avenue may improve pedestrian safety and convenience and should be studied further. At intersections like Smithfield Street and Fort Pitt Boulevard, crosswalks are located back from curb radii, behind obstructive street furniture such as a traffic signal cabinet and a pedestrian map.

RECOMMENDATION E



Guidance:

Realign crosswalks to shorten pedestrian paths.

Example:

Intersection of Carson Street and Smithfield Street

RECOMMENDATION E



Guidance:

Provide straight crossing paths in visible locations optimized for pedestrian use.

Example:

Intersection of Arlington Avenue and McArdle Roadway

RECOMMENDATION E



Guidance:

Place crosswalks in visible locations close to intersection corners.

Example:

Intersection of Smithfield Street and Fort Pitt Boulevard

TRANSPORTATION PLANNING

RECOMMENDATION F – ADD OR REPOSITION STOP SIGN OR STOP BAR(S)

Place stop signs at all applicable locations in which traffic should stop, such as South First Street, South Second Street and Terminal Way approaching East Carson Street. Where stopping traffic crosses a pedestrian marked or unmarked crosswalk, paint a stop bar a minimum of four feet in advance of the crosswalk, aligned with a stop sign.

RECOMMENDATION F



Guidance:

Mount stop signs at all intersection approaches where traffic must stop.

Example:

Intersection of East Carson Street and South First Street

RECOMMENDATION F



Guidance:

Stripe stop bar a minimum of four feet in front of all marked and unmarked pedestrian crosswalks.

Example:

Intersection of East Carson Street and South Second Street

RECOMMENDATION G – UPGRADE SIGNALIZED INTERSECTIONS

Some of the traffic signals run in a pre-timed pattern and do not use the latest technology. Actuated signals are programmed to reduce the chance of changing in the "dilemma zone" (when the driver experiences the dilemma of either going through the yellow indication or stopping quickly). Pre-timed signals only change based on specific timing patterns, pre-programmed for traffic flows.

Some of the signalized intersections in the study area have protected-permissive phasing in which a phase starts with a green arrow and a green ball and then the green arrow goes dark when the opposing movement gets a green ball indication. Without an exclusive turning lane, such as along Carson Street, turning traffic blocks through movements. Reallocating lane configurations to give all left turns their own lane could improve safety and reduce congestion. Eastbound Carson Street could have an exclusive left turn lane and a through lane at Smithfield Street and a short exclusive left turn lane, through lane, and right turn lane at the Station Square Drive and Arlington Avenue intersection. This configuration would require the northbound Arlington Avenue approach to be reconfigured to an exclusive left lane (to westbound Carson Street) and a right lane (to Station Square Drive and eastbound Carson Street). As part of the project, the team performed an informal evaluation that concluded these traffic patterns could operate at similar levels of service, though a formal traffic study is needed for more conclusive results. The current entrance to the Wabash Tunnel lacks a turn lane, though there is a left turn lane at Commerce Drive which also provides Wabash Tunnel access.

For movements that retain protected-permissive operations, a flashing yellow arrow may be a safer and more flexible indication, since it can be safely used for both leading and lagging turn phases.

When the current signals were installed, signal phasing only gave the option of pedestrians walking concurrently with traffic flows or separately in their own exclusive phase. While an exclusive pedestrian phase theoretically should prevent pedestrian crashes, it extends the cycle length so pedestrians may be less likely to wait for a walk signal. Pedestrians are accustomed to cross during green indications, so they may think they do not need to wait for the walk indication when it is separate. Meanwhile, the intersection of Smithfield Street and Carson Street runs inefficiently in which pedestrians on the west side cross concurrently with turning traffic (resulting in traffic congestion during the afternoon peak period) and pedestrians on the east side essentially have an exclusive movement, since their push button-actuated phase lines up with the Transit Tunnel exit, a phase no longer called by vehicles. Therefore, Smithfield Street pedestrians cross Carson Street at different times in the cycle, resulting in confusion and a long cycle length.

Many signals both locally and nationally are now being programmed with leading pedestrian intervals (LPIs) that give pedestrians a head start of three to five sections of exclusive crossing time prior to concurrent vehicular green indications with lagging turn arrows. The project team suggests studying using LPIs at high-pedestrian crossing intersections such as along Smithfield Street both at Carson Street and at Fort Pitt Blvd.

RECOMMENDATION G



Guidance:

Consider installing LPIs at signalized intersections with high pedestrian volumes.

Example:

Intersection of Carson Street and Smithfield Street

TRANSPORTATION PLANNING

RECOMMENDATION H – ADD OR IMPROVE PEDESTRIAN SIGNALS

Many of the signalized intersections lack modern or accessible pedestrian signal heads and push buttons. Reconfigure all deficient intersections to have ADA-compliant pedestrian signals (such as pushbuttons with vibrotactile arrows, audible pedestrian indications, etc.) and countdown timers. Some have faded or obstructed signs.

The signalized intersection of Arlington Avenue and McArdle Roadway lacks pedestrian signal heads. Due to the at-grade LRT crossing, the intersection has louvered signals, optimized for drivers, but potentially obstructed for pedestrians. McArdle Roadway curves into and out of the intersection, so pedestrians and vehicles may not be able to see each other. Add fully ADA-compliant pedestrian signals to the intersection. Additionally, current “Push Button for Green Light” signage is not at accessible locations.

RECOMMENDATION G



Guidance:

Review lane allocation to determine if left turn lanes can be provided.

Example:

Intersection of East Carson Street, Arlington Avenue, and Station Square Drive

RECOMMENDATION G



Guidance:

Install actuation to improve pre-timed signals.

Example:

Intersection of Smithfield Street and Fort Pitt Boulevard

RECOMMENDATION H



Guidance:

Add ADA-compliant pedestrian signals with countdown timers.

Example:

Intersection of Smithfield Street and Fort Pitt Boulevard

RECOMMENDATION H



Guidance:

Place all pedestrian push buttons at accessible locations.

Example:

Intersection of Arlington Avenue and McArdle Roadway

RECOMMENDATION H



Guidance:

Replace faded or obstructed pedestrian signs.

Example:

Intersection of Carson Street and Smithfield Street

RECOMMENDATION H



Guidance:

Ensure pedestrians can see vehicular traffic signals, especially in locations without pedestrian signals.

Example:

Intersection of Arlington Avenue and McArdle Roadway

TRANSPORTATION PLANNING

RECOMMENDATION I – IMPROVE OR RECONFIGURE SIDEWALK

Deterioration and improper sidewalk maintenance results in tripping and drop-off hazards. Sidewalks along Carson Street has several observed hazards, including deteriorated slabs and missing railings to adequately protect pedestrians along hillsides. Landscaping alongside sidewalks was observed to slide into the sidewalk creating tripping hazards. Expansion joint covers on the Smithfield Street Bridge were observed to create tripping hazards.

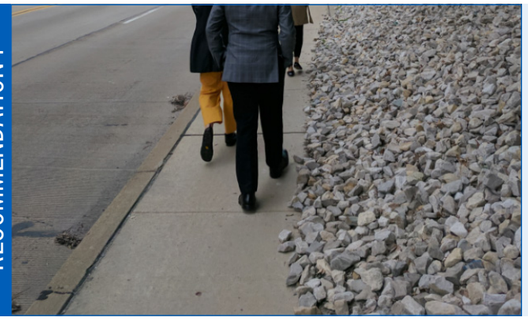
Sidewalks without street buffers do not adequately protect against pedestrian and vehicle interactions. Along Carson Street between Arlington Avenue and Smithfield Street, pedestrians are observed to cross midblock. There was a fatality reported in this area due to a vehicle whose driver had a medical emergency and encroached onto the sidewalk.

Pedestrian fences are effective, but they do not create a welcoming environment. They create barriers to effective transit stops, since the spot buses pickup and discharge passengers may vary due to conditions caused by traffic and other buses. Gates at driveway locations, such as adjacent to the Monongahela Incline, may block sidewalk use. Avoid obstructions that can block sidewalks.

At intersections with sight distance obstructions from pedestrians or parked cars, drivers were observed to encroach into areas where pedestrians may be crossing. Installing curb extensions (bump-outs) can shift pedestrian crossings away from sight distance conflicts from side streets, thus improving pedestrian visibility. They can also prevent parked cars from obstructing sight distance. Relocate street furniture and pedestrian amenities if they are placed along sidewalks in front of curb ramps, since they can block sight distances. This was observed from the Smithfield Street Pedestrian Map at Fort Pitt Boulevard.

Some sidewalks were observed to be too narrow for pedestrians. The sidewalk was measured to be less than four feet wide along Arlington Avenue, which is less than permitted by ADA standards, though there are geometric challenges in this area. The sidewalk in front of the Monongahela Incline was observed narrow and crowded when the incline's queue spills outside of the station. The only sidewalk from Smithfield Street and the Monongahela Incline to the Station Square LRT Station was measured to be four feet wide. While ADA-compliant, pedestrians were observed to walk into Carson Street to avoid overcrowding. Update sidewalks were possible to ensure ADA-complaint widths in all places. Provide wider sidewalks that experience high pedestrian flows, especially at primary access routes to transit stations.

RECOMMENDATION I



Guidance:

Properly maintain sidewalks and landscaping to avoid tripping hazards.

Example:

West Carson Street at Commerce Drive

RECOMMENDATION I



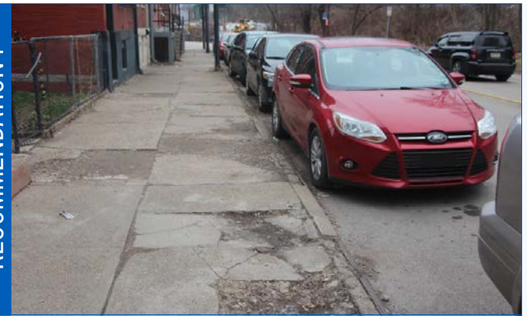
Guidance:

Install protective fencing at drop-off locations.

Example:

East Carson Street at the 4th Street Stairs

RECOMMENDATION I



Guidance:

Replace damaged sidewalks to eliminate tripping hazards.

Example:

East Carson Street by South Fifth Street

RECOMMENDATION I



Guidance:

Add sidewalk buffer to protect pedestrians from travel lanes where possible.

Example:

East Carson Street by Station Square LRT Station

RECOMMENDATION I



Guidance:

Add sidewalk buffer to reduce jaywalking.

Example:

East Carson Street by Station Square LRT Station

RECOMMENDATION I



Guidance:

Remove obstructive pedestrian fences and gates.

Example:

West Carson Street by Monongahela Incline

TRANSPORTATION PLANNING

RECOMMENDATION I



Guidance:

Install bump-outs at intersections with limited sight distance

Example:

East Carson Street at South 3rd Street

RECOMMENDATION I



Guidance:

Provide ADA compliant width. If width cannot be achieved due to obstruction, provide adequate width on the opposite side of the street.

Example:

Sidewalk to Station Square LRT Station

RECOMMENDATION I



Guidance:

Widen sidewalks in areas with high pedestrian flows, especially at primary routes to transit stations.

Example:

Intersection of Carson Street and Smithfield Street

RECOMMENDATION I



Guidance:

Remove sidewalk obstructions that are placed between curbs and crosswalks.

Example:

Smithfield Street and Fort Pitt Boulevard

RECOMMENDATION J – ADD SIDEWALK

The project team noted several gaps in sidewalk connectivity in the area around the Station Square Station, and some routes used by pedestrians had “No Pedestrians” signs. Despite the South Side being a densely-developed neighborhood with a parking shortage, there is only a sidewalk connection to the Station Square Station and Incline on Carson Street’s north side. Therefore, pedestrians may have to cross Carson Street twice to reach the transit stations. Within the stretch without a sidewalk, there is an unprotected bus stop at Terminal Way in which pedestrians must stand on the roadway shoulder. Since there is an unused paved shoulder between the existing bicycle lane and the ashlar wall, install the missing sidewalk.

Sidewalk infrastructure along Carson Street behind the Station Square development has several gaps. There is a missing sidewalk across Carson Street from the Monongahela Incline. Despite the “No Pedestrian” signs, pedestrians were observed to disregard the sign. There are no sidewalks at the Commerce Drive entrance to Station Square (“No Pedestrian” signs are posted), yet Commerce Drive is the main pedestrian route from the Wabash parking lot to Station Square.

RECOMMENDATION J



Guidance:

Add sidewalks at locations used by pedestrians.

Example:

West Carson Street west of Smithfield Street

RECOMMENDATION J



Guidance:

Connect gaps in sidewalk infrastructure.

Example:

Commerce Drive entering Station Square

RECOMMENDATION J



Guidance:

Add sidewalks at transit stops.

Example:

Intersection of East Carson Street and Terminal Way

TRANSPORTATION PLANNING

RECOMMENDATION K –ADJUST ROAD OPERATIONS AND/OR REPLACE SIGNAGE

Safe roadway design and operations benefits both drivers and pedestrians. Ideally, complete streets surrounding transit stations should have wide sidewalks, buffers from travel lanes, slow vehicular speed limits, tight radii to slow turning vehicles, turning lanes for vehicles to safely queue, and more. In a congested urban environment, such as the area surrounding the Station Square and Monongahela Incline stations, there is insufficient room for all of these operations. However, only certain vehicular movements experience congestion, so there may be unneeded capacity that could be reallocated for improved safety for all users.

Due to the narrowness of the sidewalk and location of the Monongahela Incline Lower Station, roadway reconfiguration to reallocate space from the eastbound curb lane to increase the sidewalk area in front of the incline station could help station operations and improve safety and accessibility. Potential ways to mitigate vehicular delay could include closing the eastern entrance to the Wabash Tunnel, requiring drivers to turn at Commerce Drive where there is an existing left turn lane.

Due to the limited width of the south side Carson Street sidewalk between Smithfield Street and the Station Square LRT Station, as well as the frequent bus stops in front of the LRT station, study single-lane eastbound Carson Street operations that would allow for a wider sidewalk and a safe place for buses to stop without blocking through traffic.

Large turning radii increases turning vehicle speeds that conflict with concurrent pedestrian crossings. The radius at the westbound right turn from Carson Street to the inbound Smithfield Street Bridge has an atypically wide radius from the streetcar era, resulting in high vehicular turning speeds, long pedestrian crossing distances, and a bus stop away from the corner. Improve the radii to allow safer operations at the intersection.

The Smithfield Street southbound approach to Carson Street is flared and has concrete median curbs, resulting in a 90 foot crossing distance for a four-lane approach. Consider removing the concrete curbs and using 11-foot lanes to minimize pedestrian crossing distances.

Vehicles travel along Carson Street at a high rate of speed, being one of only a few roads in the City of Pittsburgh posted at 35 mph (west of the Station Square LRT Station). Consider reducing speed limits on roads with high pedestrian use to 25 mph.

Carson Street experiences typical westbound queuing approaching Arlington Avenue, so vehicles making a left turn onto roads such as first street block through traffic. Either provide turning lanes or prohibit problematic left turns.

RECOMMENDATION K



Guidance:

Narrow curb radii to slow vehicular speeds for right turning vehicles.

Example:

Intersection of Smithfield Street and Carson Street

RECOMMENDATION K



Guidance:

Study adjusting roadway operations to install turn lanes, bus pull-offs, and wider sidewalks in roadway lanes with excess capacity.

Example:

Eastbound Carson Street from the Monongahela Incline to the Station Square LRT Station

RECOMMENDATION K



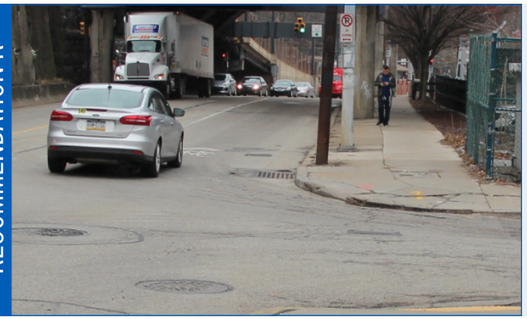
Guidance:

Post speed limits of 25 mph along roadways with a lot of pedestrian activity, such as Carson Street between the Wabash Tunnel and Arlington Avenue.

Example:

Carson Street

RECOMMENDATION K



Guidance:

Prohibit left turns in areas where high conflicting volumes and lack of available space for turn lanes could create congestion and angle or rear-end collision issues, especially immediately downstream of signalized intersections.

Example:

Carson Street and 1st Street

RECOMMENDATION K



Guidance:

Narrow intersection approaches that have excess width to reduce pedestrian crossing distances.

Example:

Smithfield Street southbound approach to Carson Street

TRANSPORTATION PLANNING

RECOMMENDATION L – IMPROVE BICYCLE ACCOMMODATIONS

The area around the Station Square LRT Station and the Monongahela Incline Lower Station has a lot of bicycle activity, especially since there are riverfront trails on both sides of the Monongahela River and bike trail ramps being added to the Smithfield Street Bridge in 2017-2018. Smithfield Street is emerging as an important bicycle connection between the Station Square Station, Carson Street, bike trails, and downtown. There is a bicycle lane along Carson Street eastbound from Arlington Avenue into the South Side and the bridge's eastern sidewalk is designated a bicycle and pedestrian shared sidewalk. Therefore, the largest gap in the bicycle network is in the Carson and Smithfield Street area immediately surrounding the stations. Examine areas to improve bicycle connectivity, such as additional bicycle lanes or shared lane markings. Infrastructure such as the Wabash Tunnel and inbound Smithfield Street Bridge may have unused roadway width that could accommodate bicycle lanes.

The project team suggests replacing all inlets with bicycle-safe grates. The team also suggests installing bike racks (or working with private property owners to install bike racks) at locations with bicycle use, such as businesses and apartment buildings. Additional bicycle infrastructure is recommended at the Station Square Station as part of the station design process.

RECOMMENDATION L



Guidance:

Use bicycle safe grate designs.

Example:

Intersection of Carson Street and Smithfield Street

RECOMMENDATION L



Guidance:

Study whether or not unused paved areas can accommodate bicycle lanes.

Example:

Smithfield Street Bridge

RECOMMENDATION L



Guidance:

Examine gaps in the bicycle network and study how links can be appropriately improved

Example:

Smithfield Street

TRANSPORTATION PLANNING

INTERSECTION OBSERVATIONS SUMMARY

Refer to **[Figure 1.5] Safety Assessment Observations** figure for the locations of the safety improvement recommendations. A summary is as follows:

East Carson Street from South Fifth Street to Arlington Avenue

Upgrade most of the intersections along this stretch with curb extensions to improve sight distance concerns. Add ADA-compliant curb ramps. Add stop signs to the side streets where they are missing, paint corresponding stop bars, and mark crosswalks using high visibility markings. Add a sidewalk along Carson Street's eastbound side between the bicycle lane and the retaining wall to connect the Station Square LRT Station and South Side neighborhood and to give pedestrians at the bus stops along this stretch a safe place to stand. Use high-visibility crosswalk markings with corresponding pedestrian fluorescent warning signs and stop bars (or yield triangles) for convenient midblock crossings to bus stops. Repair deteriorated portions of existing sidewalks and add protective fencing where needed, such as near the South Fourth Street stairs where there is a drop-off from the back of the sidewalk. Provide better connectivity to the existing bicycle infrastructure and repair drainage structures to be safe for bicycles and pedestrians. Install no left turn signage for corners that may have sight distance problems or queuing issues.

Intersection of East Carson Street and Arlington Avenue

Add the missing crosswalk on the intersection's west side and upgrade crosswalk markings with high-visibility, perpendicular "piano key" style markings. Use ADA-compliant curb ramps for all crossings. Study upgrading intersection phasing and lane assignments to provide left turn lanes for all approaches. Use flashing yellow arrows for permitted left arrows. Upgrade pedestrian signals and use LPIs. Improve deteriorated sidewalks and improve their lighting and attractiveness beneath the LRT and railroad structure.

East Carson Street from Arlington Avenue to Smithfield Street

Replace deteriorated sidewalks. Widen the narrow four-foot strip of sidewalk connecting to the LRT station since pedestrians were observed to walk into Carson Street due its narrow width. Consider moving the inbound bus stop closer to the corner of Smithfield Street and adding planted buffers where applicable to encourage pedestrians to cross at the signalized intersection of Smithfield Street. Upgrade bicycle infrastructure to add connectivity to the station and the eastbound Carson Street bicycle lane beyond Arlington Avenue. Optimize roadway configuration to include a dedicated area for buses to stop and study exclusive left and right turn lanes at adjacent intersections.

Intersection of East and West Carson Street and Smithfield Street

Upgrade the intersection to focus on pedestrian safety, since it is the critical link to the Port Authority's bus, light rail, and transit facilities. Add accessible pedestrian curb ramps and signals, and use high-visibility crosswalk markings. Shorten pedestrian crossing distances as much as possible and reduce the maximum cycle length to reduce wait times. Since pedestrians crossing Carson Street conflict with turning vehicles from the Smithfield Street Bridge, use appropriately-timed LPIs and lagging left turns to minimize conflicts. Convert the eastbound shared left and through lane to be an exclusive left turn lane to the Smithfield Street Bridge to simplify operations. However, this should be balanced by widening the sidewalk on the intersection's east side to provide a buffer between increased right lane through traffic and the station. Use bicycle-safe grates and consider ways to better connect bicycle use from the Smithfield Street Bridge to the station area.

West Carson Street from Smithfield Street through Commerce Drive

Improve the pedestrian connection to the Monongahela Incline by widening the sidewalk and adding a sidewalk buffer from the travel lanes. Improve pedestrian connectivity between Station Square and the Monongahela Incline by adding a sidewalk and missing crosswalks from Smithfield Street to Wabash Street on the north side of Carson Street and along Commerce Drive crossing the east side of Carson Street to Station Square's Freight House Shops entrance. Upgrade crosswalk markings and pedestrian signals, and keep the sidewalk free from tripping hazards, especially from landscaping beneath the Wabash Tunnel's ramp. Connect the isolated curb ramp at the Commerce Drive intersection. Add LPIs to signals and adjust roadway operations to reduce or eliminate turns without exclusive left turn lanes. Install bicycle-safe grates.

Smithfield Street from Carson Street though Fort Pitt Boulevard

Upgrade curb ramps and traffic signals to be ADA-compliant and use high-visibility crosswalk markings. Improve bicycle infrastructure and connections. Remove sidewalk obstructions and locate crosswalks close to curb radii to improve visibility for pedestrians from turning vehicles. Use actuation to reduce pedestrian wait times and LPIs to allow for safer pedestrian crossings.

Arlington Avenue from East Carson Street to McArdle Roadway

Improve sidewalk connectivity and widen sidewalks at pinch points to maintain minimum four-foot wide sidewalks. Since marked uncontrolled midblock crosswalks can be unsafe and should be avoided if possible, improve sidewalk conditions along Arlington Avenue and maintain the Arlington Avenue crossing at sycamore Street as unmarked. Install ADA-compliant curb ramps and use high-visibility piano-key crosswalk markings. Place stop signs four feet back from crosswalks and paint stop bars.

Intersection of Arlington Avenue and McArdle Roadway

Install missing curb ramps and upgrade all of the curb ramps so they are ADA-complaint. Place push buttons in accessible locations and install pedestrian signals. Realign crosswalks to provide straight crossing paths, or provide pedestrian refuge islands if crosswalks cannot be made straight. Use push-button actuated LPIs, which are especially important due to sight distance limitations at the intersection. Use bicycle-safe grates.

TRANSPORTATION PLANNING

STATION SQUARE STATION SURVEY ANALYSIS

In the fall of 2016, the Port Authority conducted a user survey at Station Square LRT and bus station. Riders had the opportunity to describe what they would like to see to make the station better as well as to specify their barriers and obstacles to using the station. Responding to what they would like to see to make the Station Square station better, 18 percent responded safety and 11 percent responded pathways. Both of these responses are related; to reach the station pedestrians must cross busy Carson Street and walk along the narrow sidewalk pathway to reach the station.

Responding to the question about barriers and obstacles to station use, 17 percent felt unsafe from traffic, 7 percent reported sidewalks, and 2 percent reported crosswalks. User comments indicated concerns with the length of the traffic signal cycle crossing Carson Street, the high traffic volumes along Carson Street, the perceived unsafe crosswalks across Carson Street, and the difficulty of crossing Carson Street midblock from the bus stop to the LRT station (jaywalking). Comments included, “The crosswalks surrounding [the station] are unsafe and do not prioritize pedestrian traffic,” and “Add a bike rack and a slightly wider sidewalk when heading to the Smithfield Street Bridge.”

Therefore, about a third of station users feel that the Station Square station area needs to be improved to promote pedestrian safety and accessibility.

SAFETY EVALUATION SUMMARY

The safety evaluation analyzed high-crash locations, field viewed the station’s walkshed, and reviewed station user safety results. The results of these analyses will serve to improve the safety and security of Station Square station area users, as well as the traveling public in general. While most of these improvements are outside of the Port Authority’s control, they can be applicable to future City/State, utility, and private development projects near the station, examples of which are all underway. The most critical area to improve is along Carson Street from Arlington Avenue to the Monongahela Incline Lower Station.

OPERATIONS ANALYSIS

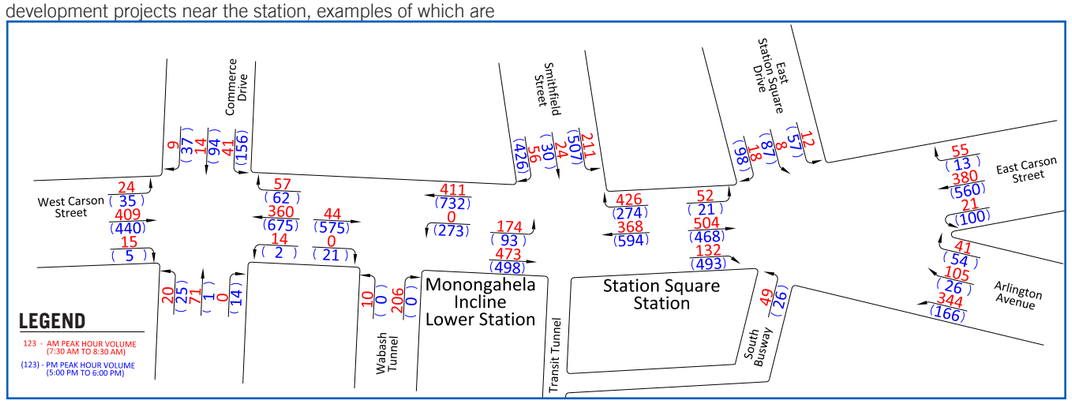
Appropriate station redesign should analyze how a station is currently being used in order to maximize its utility for future use. This study incorporated pedestrian and vehicular data collection observations to create recommendations for station redesign.

SUMMARY OF DATA COLLECTION IN THE STATION SQUARE STATION AREA

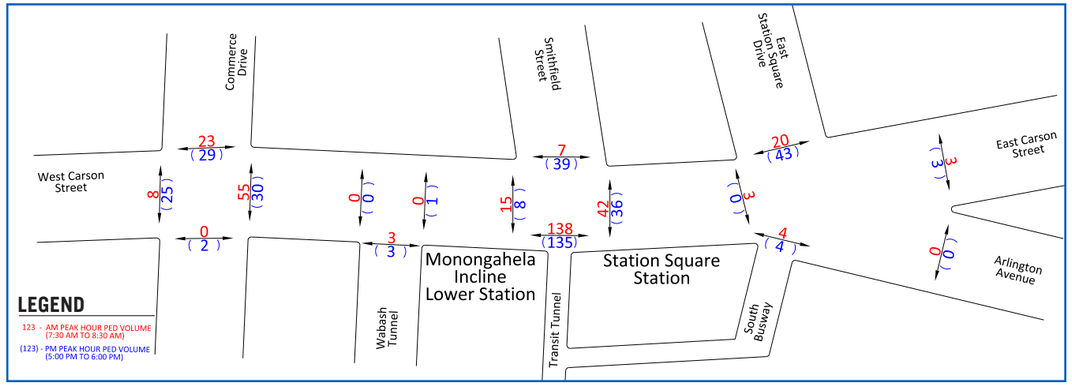
The project team performed data collection capturing pedestrian, bicycle, and vehicular movements in and around the Station Square station area. The project team contracted with Miovision Traffic Data Online to perform video counts on Thursday, March 23rd from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM at the following intersections along Carson Street:

- Commerce Drive
- Wabash Tunnel
- Smithfield Street
- Arlington Avenue and Station Square Drive

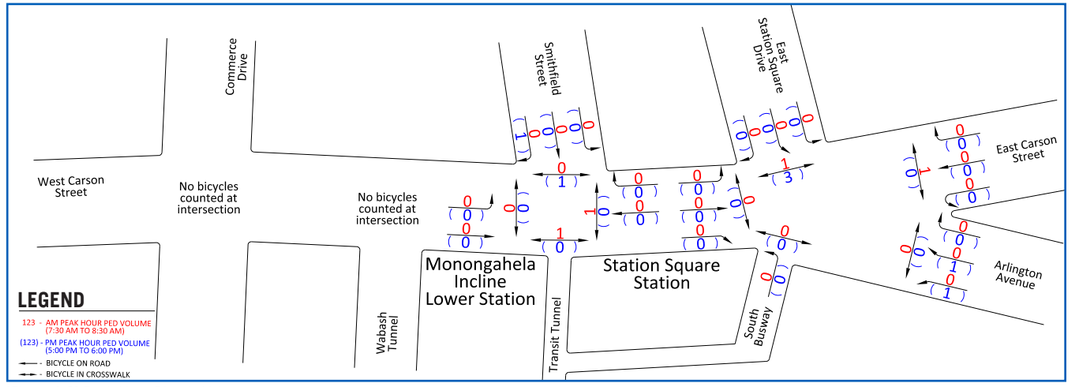
During those hours, the morning peak hour capturing the highest vehicular volume was from 7:30 AM to 8:30 AM and the afternoon peak hour was from 5:00 PM to 6:00 PM. Refer to the **[Figure 1.6] Carson Street Peak Hour Volumes** for a summary of morning and afternoon peak hour vehicular volumes. Pedestrian counts are provided in the **[Figure 1.7] Carson Street Peak Hour Pedestrian Volumes** and bicycle counts are provided in **[Figure 1.8] Carson Street Peak Hour Bicycle Volumes**.



[Figure 1.6] Peak Hour Vehicular Volumes



[Figure 1.7] Peak Hour Pedestrian Volumes



[Figure 1.8] Peak Hour Bicycle Volumes

Vehicular data collection summary shows that the heaviest movements are along Carson Street westbound (outbound) and the Smithfield Street Bridge southbound (outbound) during the afternoon peak hour. The maximum number of vehicles observed in a single-lane movement was between 500 and 600 vehicles per hour, suggesting the upper limit of capacity of a single lane at an intersection, dependent on signal timing and phasing. Data collection did not assess the impact unmet demand, where volume is greater than capacity. Data collection revealed relatively few left turns from eastbound Carson Street to the Smithfield Street Bridge, with an average demand of fewer than 3 vehicles per minute. This shows the impact of the Fort Pitt Bridge ramps from Carson Street to the west.

Pedestrian data shows the highest pedestrian volumes were near transit stations along Smithfield Street and Carson Street. The intersection of Smithfield Street and Carson Street experienced between 200 and 220 pedestrian crossings (across all intersection approaches) in the peak hours. More pedestrians walk along the south side of Carson Street (crossing the Transit Tunnel approach) than were counted to cross Carson Street, which suggests a lot of incline to bus or LRT transfers or a lot of jaywalking. Nearly 140 pedestrians crossed the Transit Tunnel approach to Carson Street during both peak hours, yet only 60 pedestrians in the morning and 45 pedestrians in the evening crossed Carson Street in the same area. Therefore, this operational analysis recommends a wider pedestrian sidewalk with a buffer to prevent jaywalking along Carson Street’s south side.

At the intersection of Smithfield Street and Carson Street, between 75 percent and 85 percent of pedestrians crossed Carson Street on the intersection’s east side. The Smithfield Street Bridge’s west sidewalk is known to be busier. While the east crosswalk may be more convenient for bus to LRT transit connections, the east crosswalk’s walk indication is tied to the Transit Tunnel phase, a prohibited vehicular movement with no vehicle calls. Therefore, these pedestrians can cross Carson Street in an exclusive movement, while pedestrians crossing on the intersection’s west side do so concurrently with turning traffic. The pedestrian volume shows that pedestrians prefer to cross separate from turning traffic.

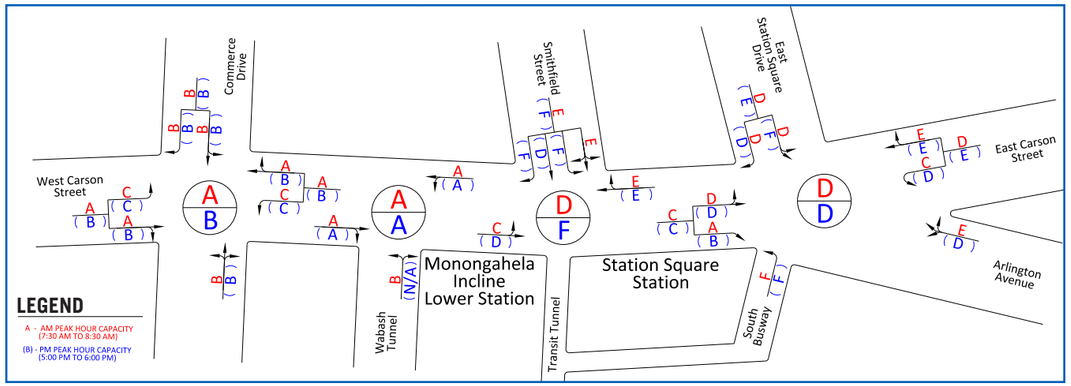
TRANSPORTATION PLANNING

Pedestrian counts revealed that pedestrians are crossing illegally where no pedestrian signs are posted. At the northeast corner of the Commerce Drive intersection, “No Pedestrian” signs are mounted facing both crossings. During the morning peak hour, 55 pedestrians crossed Carson Street and 23 pedestrians crossed Commerce Drive to reach this corner. During the afternoon peak hour, 30 pedestrians crossed Carson Street and 29 pedestrians crossed Commerce Drive. This crossing is the link between the Port Authority’s lot beneath the Wabash Tunnel and Station Square. These counts demonstrate the need for marked crosswalks at this location. Additionally one pedestrian was counted crossing Carson Street at the east side of the Wabash Tunnel approach and three pedestrians on the west side of the Arlington Avenue approach. Pedestrians will take the most convenient path when possible, regardless of signage or signal operations.

Bicycle data collection analysis reviewed very few bicycles within the station area, suggesting limited bicycle throughput. No bicycles were observed along West Carson Street at the Wabash Tunnel and Commerce Drive intersection. Despite Smithfield Street being an important bicycle link and having a shared sidewalk and East Carson Street having a bicycle lane eastbound beyond Arlington Avenue, data collection may suggest that bicycles are using Station Square internal roadways for connectivity and are not using transit. Therefore, no further operation recommendations are offered for improving bicycle operations along Carson Street. It is important to note that data collection was performed in March; bicycle usage may be higher in other months.

EXISTING ROADWAY CAPACITY

The project team used Trafficware’s Synchro software to assess current roadway conditions to determine which vehicular approaches are congested during the peak hours. Delay is measured as an average per vehicle per intersection and assessed a letter grade, A through F, to correspond with the length of the delay. An F level of service indicates there is more volume than available capacity. Urban roadways are designed to operate at a level of service (LOS) of D or better. Refer to **[Figure 1.9] Carson Street Existing (2017) Levels of Service** for a summary of existing delay in the vicinity of the station.



[Figure 1.9] Existing (2017) Levels of Service

The capacity revealed that during the morning peak hour, while all intersections operate at an acceptable level of service of D or better overall, several movements operate at a level of service E. These include westbound East Carson Street and northeast bound Arlington Avenue approaching the intersection with Station Square Drive. Westbound Carson Street’s right turn to the Smithfield Street Bridge and the southbound Smithfield Street Bridge approach also operates at LOS E.

During the PM peak hour, all intersections operate at an acceptable level of service of D or better overall, except for the intersection of Smithfield Street and Carson Street which operates at a failing level of service F. Both the southbound Smithfield Street left and right turns operate at an F level of service during this time. Eastbound Carson Street operates at an E level of service approaching both Station Square Drive and Smithfield Street. The southbound Station Square Drive left turn also operates at an F level of service.

During both peak hours, the South Busway ramp to Carson Street operates at an F level of service, though this is due to a long cycle length and low volume instead of a congestion issue.

The results of the capacity analysis show the need for operational improvements for southbound Smithfield Street and westbound Arlington Avenue and Carson Street. Eastbound Carson Street operates at or below capacity. The Monongahela Incline Lower Station and Station Square LRT and bus station are located along the eastbound (south) side of Carson Street, the side that has the highest pedestrian volume. A future traffic study could determine if space along Carson Street could be reallocated to better serve the needs of pedestrians while maintaining existing levels of service.

TUNNEL CONNECTOR ROAD

Based on discussions with Port Authority staff, the Monongahela Incline is replaced by shuttle service during maintenance periods and is supplemented with shuttle service during peak events, such as Light up Night or Fourth of July. Shuttle service can be confusing to potential riders, since it may not be obvious where to go to catch the shuttle at the temporary stop locations. During peak event periods, Carson Street becomes congested, impeding the ability of efficient shuttle service.

The employee parking lot and maintenance area for the Monongahela Incline is immediately to the east of the lower station. To discourage jaywalking, there is a pedestrian railing with gates separating Carson Street and the south sidewalk; employees opening the gates for parking lot access blocks the sidewalk, which is the only accessible route to the station. Carson Street has a posted speed limit of 35 mph and the employee parking lot is between two signalized intersections. It is it difficult for vehicles to enter and exit the lot. In order for riders to think of the incline, T, busway, and bus stops as one transit hub, this operational analysis recommends relocating the employee lot to a better location and developing the area between the LRT and incline as one continuous station.

To address all of these operational concerns, the project team recommends installing a two-lane connector road between the Wabash Tunnel and the Transit Tunnel. The road would pass beneath the Monongahela Incline and add a shuttle stop. One lane of the road could be used for shuttles and maintenance vehicles and the other lane could be used for parallel parking for employees. Such a road would improve station operations in the following way:

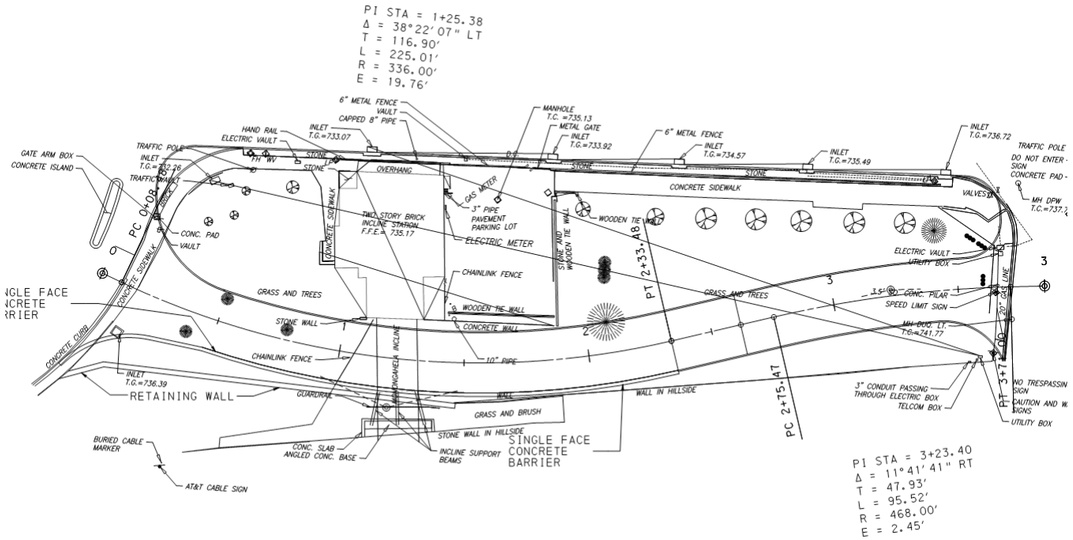
- Provide a permanent shuttle stop to eliminate rider confusion during incline maintenance or overcrowding.
- Improve the reliability and efficiency of shuttle service.
- Connect the entire Station Square transit area.
- Eliminate sidewalk conflicts from the employee lot gates.
- Improve maintenance vehicle access for incline maintenance.
- Provide a bus loop if needed for operations.
- Allow space for tourist-oriented uses, such as interpretive signage to give the history of historical transportation structures, such as the Incline, Transit Tunnel, Wabash Tunnel, Panhandle Bridge, and Smithfield Street Bridge, all of which are (or were) used by the Port Authority.

The project team performed conceptual design of the proposed tunnel connector road to determine if there is sufficient horizontal and vertical space. Refer to **[Figure 1.10] Connector Road Conceptual Plan and [Figure 1.11] Connector Road Conceptual Profile**.

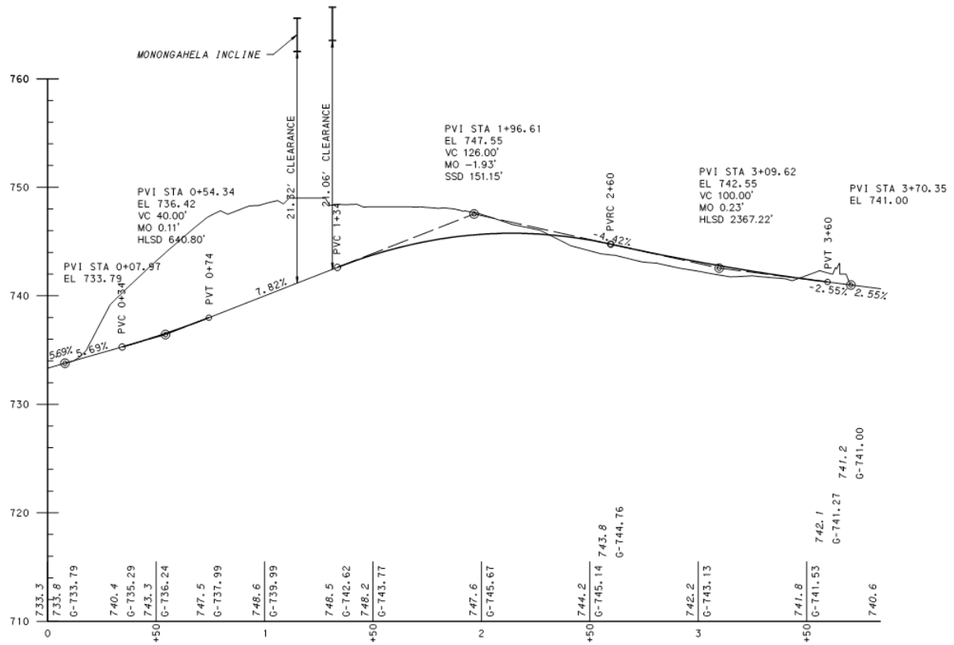
The conceptual plan shows there is sufficient space to build a connector road behind the Monongahela Incline Lower Station without impacting the station itself or the existing incline support. It would require modification of the existing retaining wall on the south side of the Wabash Tunnel approach. The gated entry to the Wabash Tunnel would need to be relocated. On the Station Square LRT and bus station side, the connector road would require relocating the traffic signal cabinet and overhead trolley electric lines support.

The conceptual profile shows that there would be sufficient clearance to operate vehicles below the Monongahela Incline, with approximately 21 feet of vertical clearance. The connector road would have an approximate 8 percent grade eastbound from the Wabash Tunnel ramp and would transition to around a four and a half percent grade approaching the Transit Tunnel. These slopes meet low-volume roadway standards.

TRANSPORTATION PLANNING



[Figure 1.10] Connector Road Conceptual Plan



[Figure 1.11] Connector Road Conceptual Profile

By separating the pedestrian realm from the employee and maintenance vehicle realm and improving the reliability of supplemental shuttles, the proposed connector road will improve the functionality and operations of the entire station area.

OPERATIONS ANALYSIS RECOMMENDATIONS

Based on the operational analysis, both the roadways and sidewalks surrounding the Station Square station area are well used by pedestrians and vehicles. Finding the right balance to optimize roadway operations and to increase pedestrian safety and flow will improve the station area experience for all users. Traffic is generally congested in the westbound direction on Carson Street on the (opposite side of the Port Authority's stations) during both the morning and evening peak periods. Eastbound Carson Street volumes approaching Smithfield Street are lower than westbound volumes from Smithfield Street, likely due to the directional Fort Pitt Bridge ramps that provide an alternate route into downtown. Relatively few vehicles turn left onto the Smithfield Street Bridge. The Smithfield Street Bridge is typically congested during the afternoon peak period, but the signal at Carson Street meters traffic. Therefore, eastbound Carson Street runs well operationally, except for the lack of the left turn into Station Square Drive. This volume and capacity analysis shows that any future complete street studies and projects should focus on vehicular capacity for westbound Carson Street and pedestrian capacity and safety for eastbound Carson Street.

There is an employee parking lot on the Monongahela Incline's east side that creates operational problems and serves as a barrier to one integrated station area. Supplemental incline shuttles are limited by traffic congestion along Carson Street during peak events and a lack of rider familiarity since they have no permanent stop. Creating a connector road from the Wabash Tunnel to the Transit Tunnel with one traffic lane and one parking lane would greatly improve operations for pedestrians and employees while better connecting the various separate stations into a larger Station Square transit hub. Therefore, the recommendations presented in this operation analysis will help improve the operational efficiency and usability of the Station Square station area for years to come.

A.2 COMMUNITY ENGAGEMENT

STAKEHOLDER & PUBLIC ENGAGEMENT OVERVIEW

At the outset of the planning process, on April 6, 2017, Port Authority staff and members of the consultant team held a start-up meeting and project area tour. In preparation for the start-up, the consultant team assembled a database of key stakeholders to ensure focused involvement of residents, agency representatives, and other key stakeholders. The database included the following categories:

- Advocacy organizations
- Planning and regional agencies
- Neighborhood organizations
- Key property owners
- Public officials
- Citizens

Two rounds of stakeholder meetings were convened to gather input from key stakeholders. The first round of stakeholder meetings was held on June 7, 2017. Individual stakeholders and organizations identified in the database received invitations. In addition, stakeholder organizations distributed information to their constituents. Follow-up calls were made to stakeholders to encourage attendance and answer any questions about the process. To accommodate stakeholders available in the daytime and those available in the evening, interactive workshops were offered at two times on June 7th, 9:00 to10:30 AM and 6:30 to 8:30 PM. The meetings were convened at the Sheraton Station Square. At each session, following a brief presentation, participants were invited to visit three stations, focused on these topics:

- Internal connections
- External connections
- Economic development



Community members working together during the first of two public meetings determining the challenges and opportunities of Station Square. The meetings were held at the Sheraton Station Square on June 7, 2017.

The second round of stakeholder meetings was convened on October 10, 2017 at Highmark Stadium. Two sessions were offered, from 1:00 to 2:30 PM and 6:30 to 8:00 PM.

Building on input that was gathered at the first round of stakeholder meetings, the consultant team presented concepts for improvements to station access and design, public space, and transit-oriented development. The presentation was followed by a facilitated group discussion.

Supporting Materials

- Stakeholder Database
- Round 1
  - Stakeholder Meeting Flier
  - Meeting Agenda
  - Stakeholder Workshop Meeting Minutes
- Round 2
  - Stakeholder Meeting Flier
  - Meeting Agenda
  - Stakeholder Workshop Meeting Minutes



Flyers for Round 1 of the stakeholder meetings were posted on station bulletin boards, and the Port Authority's website. Local community groups, property owners, and public leaders were also contacted with meeting information.



Flyers for Round 2 of the stakeholder meetings were posted on station bulletin boards, and the Port Authority's website. Local community groups, property owners, and public leaders were also contacted with meeting information.

COMMUNITY ENGAGEMENT

STATION SQUARE STAKEHOLDER SESSIONS

As part of the station area planning process for Station Square, a stakeholder meeting was held on June 7th and again on October 10th with groups that represent property owners as well as key constituencies that use the system at Station Square. Following is a summary of comments received during the stakeholder discussions.

JUNE 7TH: MORNING SESSION

Other long-term projects

- One Grandview
  - Site has been expensive to develop but plans may be moving again with new owners
  - Participant suggested adding the site to Emerald View Park
- South Hills Junction TRID Study (2010)
  - Mount Washington CDC is working with Hilltop Alliance on South Hills Junction winery project
- Shiloh Street becoming more of a destination
- PennDOT Carson Street TDM project (Smithfield to 33rd)
- Smithfield St Bridge will need rehab soon
  - Current weight limit excludes articulated buses, which would be useful on the PAAC's 51 route (one of the most used)
  - Would be great to have protected bike lanes across bridge
- Future of old Health Dept. building downtown
- Terminal conversion from urban industrial to office space (many more users in the future)
  - Will start in August 2017
  - First phase will be infrastructure
  - A "high line" will be built where there is now parking
- Boggs/Bailey commercial area development
- New trail connection from Crafton/Crafton Heights to bring commuters from Robinson
  - City planning recently approved an easement/ riverfront overlay to allow continued access

Trammell Crow Development

- Space currently houses about 1600 spaces, 700-800 of which are used by daily commuters
- No stormwater infiltration on site because of brownfield status

Waterfront as economic development opportunity

- Current conditions
  - Access issues crossing train tracks
  - Port of Pittsburgh recently built dock at Heinz Field. What opportunities are there?
  - Fox Chapel Yacht Club runs leasing in summer
- One participant from Gateway Clipper Fleet shared that during the last bridge rebuild they ran a free shuttle. They had difficulty getting people to use it.
- Opportunities
  - The river cruise market is currently south of the Mississippi
  - Kayaks from venture outdoors
  - Connection to public launch at 18th St

Station Square

- According to Forest City representatives, Station Square is currently 100% leased with some vacancy in the Landmark building.
- Retail has waned in popularity in the past 20 years
- A plan is in progress (not ready to be shared) for the Freight House shops. The vision is inspired by Ponce City Market in Atlanta
- Bradford School is planning to expand
- Not interested in making through street more pedestrian oriented
- Restaurants are doing well despite upcoming turnover

Highmark Stadium

- Around 3000 seat expansion is planned because the Riverhounds moved up in leagues
- Expansion may wrap around existing seats to preserve city view
- There is concern over parking with the expansion
- Youth development academy will be moving to Coraopolis. This will free up time/space for more concerts and events.

Sheraton

- Need better signage to get guests to transit station
- Hotel business has gotten harder in recent years – supply up, demand the same
- Most of the Sheraton's guests are groups (military, business, conferences, social groups)
- 50% of guests who use parking do not need in/out privileges – they use shuttle or walk because the transit system is not intuitive

Ideas

- Could free fare system be expanded to serve Station Square and Highmark Stadium? Who would sponsor?
- Think of the station beginning further out – for example, it would be good to know how to access Emerald Park trails from Station Square
- Signage from the West End to the incline would be helpful
- Access to Healthy Ride from station
- Better connections would encourage economic growth and new residents to move to West End neighborhoods
- Hold more (free or low cost) public events at Station Square to establish it as a destination. One participant noted that she often looks on Facebook for events around the city and rarely sees events in or around Station Square. She cited the examples of Jam on Walnut and yoga outside in Mount Washington. Events like these would bring more young people.

JUNE 7TH: EVENING SESSION

Safety

- It would be useful to have data on pedestrian conflicts around Station Square
- Cycling conditions are unsafe on Smithfield Street Bridge – Many cyclists use the west sidewalk along with a majority of pedestrians. Could cyclists use east sidewalk?
- Sidewalk on south side of Carson at the station is too narrow. The proposed railing would be helpful.
- A raised pedestrian bridge from the Monongahela Incline to the Freight House Shops would take away a lot of pedestrian issues, especially in summer
- Would a refuge island in Carson be useful instead of striping that is currently proposed?

Maintenance

- Brady St railing is in poor condition

Circulation

- There is currently no left turn proposed into the development from Carson. Could that turn be allowed during non-peak hours?
- The current transfer experience between the LRT and buses is not intuitive, discouraging tourists and people from other neighborhoods
- There is an ongoing conversation at the City about reversing the flow of Smithfield and Wood downtown.
- Suggestion – shrink the distance between transfers between modes OR make them read as a single hub
- Suggestion – provide supplementary shuttle service for incline, especially during the busy season
- Proposed access road
  - Could it be a dropoff?
  - Could it be used to loop buses coming off the bridge?
- The primary problem with the station is that the transit is in the wrong place. A more European model would have the station in the middle of development, not on the side.
- Current signal times are based on the time it takes for pedestrians to cross the street. A narrower street will reduce cycle length. Long cycle length is a major complaint about the intersection.

Trammell Crow Development

- How will the development activate Carson?
- What is PAAC's financial commitment to rebuilding the Carson/Smithfield intersection?
- The primary users of Station Square are regional tourists. Focus safety efforts on them.
- Push PennDOT to address the block of Carson to the west of Smithfield instead of stopping at Smithfield. Can the City make safety investments if PennDOT approves?
- The area needs consistent visual language in the street and the station. Design and circulation should be legible, with an eye towards safety especially at night.

COMMUNITY ENGAGEMENT

OCTOBER 10TH: MORNING SESSION

- Is the transition from the Smithfield Street Bridge part of this project or part of the new development? The sidewalk on one side of the bridge is technically part of the trail system, so there are a lot of bicycle-pedestrian conflicts. Bike Pittsburgh would like more work on the bridge-to-trail transition. The current angle is not ideal.
- The radius of the right turn from Carson Street to the bridge is difficult for pedestrian visibility. The proposed 3-second lead time for pedestrians could put them in a dangerous location in the crosswalk by the time cars start turning. Could that radius be tightened?
- Why not expand the sidewalk into the painted hatch section shown in front of the LRT station?
- Could there be a crosswalk connecting the incline and the Belgian block walkway on the northern side of Carson? Could that Belgian block area be widened?
- Will the inbound bus stop on Smithfield Street impede traffic?
- The protected left turn and lane reductions are both great proposals. Could there be a protected right lane onto the bridge?

OCTOBER 10TH: EVENING SESSION

- I use the incline and LRT connection regularly. I'm concerned about the bus-pedestrian conflicts coming off of the bridge to the incline and crossing from the incline to the T.
- There should be better service between the Duquesne and Monongahela inclines.
- I am a reverse commuter between the Terminal Building and Downtown. Bus service can be slow during rush hour. I'm concerned about the additional time it will take to walk between the bus stop and LRT station with the bus stop moved further up the bridge.
- I'd like to see more of a connection for the Mount Washington community in addition to the incline.
- There is often a line for the incline. That sidewalk should be wider.
- There should be seating at the Smithfield Street bus stop.
- Can there be a staircase from the Smithfield Street bus stop to Station Square shops?
- The new trail connection on the other side of the bridge is well under construction, so it would be nice for the display materials to show that.
- The incline house door swings out, which seems unsafe.
- City Planning Commission had a hearing today on the City's Climate Action Plan. I would like to see more greening consistent with the City's plan.
- There should be more public art in the discussion here. There are some good opportunities to use light or other media (ex – TBD under Ft Duquesne Bridge since 2015).
- Bus shelters should have phone charging stations or other 21st century amenities.

Port Authority Transit Oriented Development: Invited Stakeholders - Station Square	
Advocacy Organizations	Committee for Accessible Transportation (CAT)
	Disabilities Law Project
	Three Rivers Center for Independent Living
	Healthy Ride
	Green Building Alliance
	Bike Pittsburgh
	Pittsburghers for Public Transit
	Visit Pittsburgh
	Tree Pittsburgh
	Riverlife
	Pittsburgh Community Reinvestment Group
Planning and Regional Agencies	Allegheny County Economic Development
	Pittsburgh Department of City Planning
	Pittsburgh Department of Mobility and Infrastructure
	Allegheny Conference on Community Development
	Pittsburgh Water and Sewer Authority
	Urban Redevelopment Authority of Pittsburgh
	Pittsburgh Department of Mobility and Infrastructure
	DPW, Bureau of Transportation and Engineering
	Office of the County Executive
	Southwestern Pennsylvania Commission
Citizens	Beechview Area Concerned Citizens
Community Organizations	South Side Chamber of Commerce
	South Side Community Council
	Brashear Association (convenes South Side Planning Forum)
	Pittsburgh Downtown Partnership
	Mount Washington CDC
	South West Pittsburgh CDC
	Pittsburgh Downtown Community Development Corporation
Key Property Owners	Forest City Enterprises
	Trammell Crow Company
	Pittsburgh History and Landmarks Foundation
	Sheraton Hotel at Station Square
	Gateway Clipper Fleet
	McKnight Realty Partners (Terminal Way/High Line)
	Pittsburgh Riverhounds/Highmark Stadium
Public Officials	City of Pittsburgh District 3
	City of Pittsburgh District 2
	City of Pittsburgh District 6
	Allegheny County Council District 12
	Allegheny County Council District 13
	Office of Mayor
	Office of County Executive

Listed are the identified stakeholders for the Station Square General Planning Services meetings.

PortAuthority