3.7 DUCK CREEK TRAIL CONNECTION
SEGMENT A: 1-2

Limits:
Armleder Park to Wooster Road

Adjacent Roadway:
Armleder Road

Length:
530 ft.

Recommended Facility Type:
SU2: Shared-Use Path along Roadway

SEGMENT DESCRIPTION
This segment will continue the existing Miami Overlook Trail in Armleder Park to Wooster Road.

CONSTRAINTS AND OBSERVATIONS

General: Floodplain
The entire length of this segment is within the 100 year floodplain of Duck Creek and the Little Miami River. The trail may periodically be inaccessible when inundated by flood waters. The existing ground is approximately 1 to 3 feet below the 100 year base flood elevation 501.

A1: Armleder Sign & Property acquisition
The width from the curb to the right of way line is approximately 16 feet which provides enough space for a 10 foot trail with a 5 foot buffer to the road. The existing sign for Armleder Park is located about 6 feet from the curb and within the space where the trail would be located. The trail may need to shift slightly south to go around the sign which may require a small acquisition from the adjoining property owner.

A2: New Crosswalk & Signal modification
A new crosswalk will need to be constructed across Wooster Road at the signalized intersection with Armleder Road. The existing signal has a push button to call a green signal but does not have pedestrian signal heads for the crossing. The ADT of the roadway was 12,757 in 2013. The existing signal appears to operate as two phase. Left turn movements are unprotected. The signal will need to be modified to include a pedestrian phase with the Armleder Road green phase. Pedestrian signal heads will need to be mounted on the signal poles and a high visibility crosswalk must be painted on the roadway. A signal analysis may be needed to assess any impacts to the intersection level of service by the addition of the pedestrian phase.

12 FEMA Flood Insurance Rate Map, Hamilton County, Ohio, Panel 356 of 390, Map Number 39061C0356F, 2012
13 OKI Traffic Counts, Wooster Road at Beechmont Circle, 2013
SEGMENT DESCRIPTION

The trail will follow Wooster Road northward within existing right of way for 700 feet to a parcel of property owned by the City of Cincinnati. The trail will then turn westward and cross Duck Creek into Linwood Park.

CONSTRAINTS AND OBSERVATIONS

General: Floodplain
The entire length of this segment is within the 100 year floodplain of Duck Creek and the Little Miami River. The trail may periodically be inaccessible when inundated by flood waters. The existing ground is approximate 3 to 17 feet below the 100 year base flood elevation.

A3: Grade Change & Embankment in Floodplain
The existing grade drops by approximately 8 feet when it enters the parcel of land owned by the City of Cincinnati on the east side of Duck Creek (part of the Linwood Park property). Embankment may be required in the floodplain which will require coordination with the U.S. Army Corps of Engineers.

A4: New Bridge over Duck Creek
A new bridge over Duck Creek would be constructed near the north end of Linwood Park. The bridge would ideally span the floodway but this may not be practical since the floodway width is approximately 285 feet. The bridge should therefore span the bankfull width of Duck Creek and be designed to be occasionally inundated. The estimated bridge length is 85 feet which could likely be a single span. The estimated cost for this structure may be $200,000.

14 FEMA Flood Insurance Rate Map, Hamilton County, Ohio, Panel 243 and 356 of 390, Map Number 39061C0243E, 2010 & Map Number 39061C0356F, 2012
CONSTRAINTS AND OBSERVATIONS

General: Floodplain
Most of this trail segment is within the 100 year floodplain of Duck Creek and the Little Miami River. The trail may periodically be inaccessible when inundated by flood waters.16 The existing ground within Linwood Park is approximately 17 feet below the 100 year base flood elevation 501.

A5: Grade Change & Embankment in Floodplain
Linwood Park lies approximately 20 feet below the SORTA owned railroad tracks. The trail will traverse the slope for 400 feet to negotiate the grade change at a maximum 5% slope. Placing additional embankment on the existing slope will require a geotechnical study and may require coordination with the U.S. Army Corps of Engineers for any portion of the embankment within the floodplain.

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16 FEMA Flood Insurance Rate Map, Hamilton County, Ohio, Panel 243 and 356 of 390, Map Number 39061C0243E, 2010 & Map Number 39061C0356F, 2012
SEGMENT A: 4-5

Limits:
Linwood Park to Duck Creek

Adjacent Railroad:
SORTA owned OASIS Railroad

Length:
2,900 ft.

Recommended Facility Type:
SU3: Shared-Use Path along Railroad

SEGMENT DESCRIPTION

The trail would parallel the east side of the OASIS Railroad which is publicly owned by the Southwest Ohio Regional Transit Authority (SORTA). The segment begins at Rendcomb Junction No. 7 and proceeds northward approximately 2000 feet to Valley Junction. The trail will then continue to follow the SORTA owned eastern line, which is currently unused, and cross Duck Creek about 800 feet north of the junction on an existing railroad bridge.

CONSTRAINTS AND OBSERVATIONS

General: Proximity to Active Railroad
Genesee & Wyoming operates the Indiana and Ohio Railway (IORY) in this corridor and Norfolk Southern (NS) has trackage rights. There are currently one or two trains per day using the corridor. The rail corridor has one or two tracks within this segment. On the southern end at Rendcomb Junction there are two tracks. The western track is currently unused and the eastern track is used by the IORY. The tracks converge into one for a distance of 500 feet and then diverge back to two tracks with the IORY track now on the west side and the unused track on the east side.

On the southern end, where the active rail line is on the east side, and in the single track section, the trail would likely need to be constructed parallel to the tracks but not directly in the rail corridor. The trail should be at least 25 feet from the active rail line. This may place the trail on the slope between the railroad and Duck Creek which may be difficult to construct. See “Topography and Slope Stability” below.

Where the active rail line moves to the west side, the trail could occupy the unused SORTA track however the offset from the active rail line would only be 12 feet, less than the standard 25 feet.

Negotiations with the railroad to place the trail closer than 25 feet to the IORY may be difficult. The Genesee & Wyoming Railroad is contesting a similar arrangement proposed on this same rail corridor for the Ohio River Trail further south. Depending on the outcome of those negotiations, it may be necessary to keep the trail at least 25 feet from the I&O Track throughout the entire corridor. This would place the trail corridor on the existing slope between the railroad and Duck Creek which may be very difficult and costly to construct as noted on the following page.

18 Public Utilities Commission of Ohio, Railroad Grade Crossing Inventory, Airport Avenue Grade Crossing Record ID 13487, Last update 2010.
**General: Topography & Slope Stability**

Allowable proximity to the active IORY line may require the trail to be constructed on the slope between Duck Creek and the railroad as noted above. According to available contour data from CAGIS, the slopes are generally between 30% and 50%. The top of slope is approximately 12 to 25 feet from the nearest rail line with the larger width generally adjacent to the single track section.

Slopes steeper than 50% are generally unstable unless the soil is reinforced. Since the existing slopes are already approaching 50%, any widening of the railroad shelf to accommodate a trail may involve grading limits that would extend into Duck Creek. Steeper slopes could be constructed by reinforcing the soil with straps or tie-backs which may limit impacts to Duck Creek. However, stability of the slope may still be a major concern.

Landslides in Hamilton County are common on slopes steeper than 15%. Landslides may occur where additional load is added to existing slopes, when the slopes become saturated with water, when vegetation is removed, or when the bottom of slopes are undercut. Constructing the trail on a widened shelf will likely involve removing portions of the existing vegetation and loading the hillside with additional overburden. Flooding on Duck Creek may occasionally saturate the hillside which may trigger a landslide when the flood waters recede. And, Duck Creek’s current may undercut portions of the slope which could cause the upper slopes to lose stability. With all of these conditions possible, there may be a severe risk for landslides by constructing on the existing slope without significant structural supports. As further evidence of the landslide potential in this area, two locations on Columbia Parkway were observed that have had concrete piles constructed to stabilize the roadway slope.

The preliminary engineering assessment is that portions of this segment may not be feasible without significant structural support of the hillside and trail. This may include retaining walls, piles, reinforced soil, or spanning the unstable slopes with a trail bridge. A full geotechnical analysis will be required to more fully assess the slope stability and recommend treatments for constructing a trail in this area.

A retaining wall constructed along Duck Creek in this segment may need to be 2,000 feet long, 10 to 20 feet in height and may cost between $4 million and $7 million. If a bridge structure is used to span the hillside parallel to the railroad, the length would again be approximately 2,000 feet and the cost would likely exceed $7 million.

**General: Floodway Encroachment**

Coordination with the U.S. Army Corps of Engineers may be required if any of the work encroaches on the floodway of Duck Creek.

**A6: Existing Railroad Bridge over Duck Creek**

The existing condition of the bridge is unknown. At a minimum, a new deck and railing would need to be constructed across the bridge to accommodate the trail. The existing bridge is approximately 90 feet long. A structural inspection of the bridge should be performed to estimate any additional work that may be required.

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19 Soil Survey of Hamilton County, Ohio, US Dept. of Agriculture, Soil Conservation Service, August 1982
20 Ohio Department of Transportation, Procedure for Construction Budget Estimating, Retaining Walls, $175/sf, 2013
CONSTRAINTS AND OBSERVATIONS

General: Floodplain
The portion of this segment along the existing railroad corridor is within the 100 year floodplain of Duck Creek, Little Duck Creek and the Little Miami River. The trail may periodically be inaccessible in these areas when inundated by flood waters. The existing ground along the railroad is approximately 1 to 2 feet below the 100 year base flood elevation.

A7: At Grade Railroad Crossing
The trail would need to cross the Norfolk Southern’s N&W line east of the Wooster Road bridge. NS has one track in this location. There are two other adjacent tracks that are SORTA’s and currently unused. There are approximately six trains per day that use the NS track and the track speed is between 20 and 40 mph. There is currently not a grade crossing in this location but it is within public right of way which is presumed to be the original location of Wooster Pike before it was grade separated from the railroad.

Assuming it would take a pedestrian 5 seconds to clear the track, the sight distance required is 1,174 feet (for a speed of 40 mph). There is sufficient sight distance to the east but the curvature of the track and the location of the Wooster Road Bridge abutment may limit sight distance to the west. Active warning devices may be needed at a minimum to warn pedestrians of an approaching train.

It may be difficult to negotiate a new pedestrian at-grade crossing with NS.

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22 FEMA Flood Insurance Rate Map, Hamilton County, Ohio, Panel 244 of 390, Map Number 39061C0244E, 2010
23 Public Utilities Commission of Ohio, Railroad Grade Crossing Inventory, Estimated from Woodland Avenue Grade Crossing Record ID13473 (2008) & Airport Avenue Grade Crossing Record ID 13487 (2010)
24 Federal Railroad Administration, Highway Rail Grade Crossing Inventory for Ohio, Crossing 524850N, Woodland Road
**CONSTRAINTS AND OBSERVATIONS**

**A8: Topography**

The railroad is approximately 16 feet higher than Wooster Pike. The trail should traverse the hillside at a 5% slope which requires a length of 320 feet.

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**ALTERNATIVE A**

**Engineer’s Estimate of Cost**

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<th>Alternative</th>
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26 CAGIS Contour Data
SEGMENT B: 2-8

Limits:  
Armleder Road to South of Duck Creek

Adjacent Roadway:  
Wooster Road

Length:  
640 ft.

Recommended Facility Type:  
SU2: Shared-Use Path along Roadway

SEGMENT DESCRIPTION

This segment will proceed south along Wooster Road and cross Duck Creek utilizing the existing roadway bridge or a new trail bridge.

CONSTRAINTS AND OBSERVATIONS

General: Floodplain  
The entire length of this segment is within the 100 year floodplain of Duck Creek and the Little Miami River. The trail may periodically be inaccessible when inundated by flood waters. The existing ground is approximate 3 to 5 feet below the 100 year base flood elevation.

B1: Wooster Road Bridge over Duck Creek  
The existing bridge is approximately 36 feet wide. There is a 5 foot wide sidewalk on the west side with no buffer to the roadway. The bridge is 148 feet long with three spans. The superstructure is a steel girder with a concrete cast in place deck. It was constructed in 1961. The bridge is maintained by Hamilton County.

There are three options that could be considered to accommodate the trail through this constraint: 1) Widen the existing bridge; 2) Construct a new trail bridge on the west side; 3) Move bicycle traffic to the roadway.

Widening the existing bridge may require an additional 5 to 10 feet of width on the west side. It is unlikely this can be accomplished by cantilevering from the existing bridge. The abutments would need to be widened, new piers constructed and a new beam added to support the widened portion.

There is approximately 50 feet of right of way available on the west side of the existing bridge which is sufficient to accommodate a new trail bridge. The trail bridge length would likely be the same as the existing roadway bridge, 148 feet. The cost of a new bridge may be $500,000.

Moving bicycle traffic onto the roadway could be problematic operationally, particularly for the northbound direction. Northbound bicyclists would have to cross the southbound direction twice. The preliminary Bicycle Level of Service is estimated to be D, moderately low based on Wooster Road’s ADT of 14,264, the roadway’s functional classification as an urban collector, and truck traffic of 8% of ADT.

Recommendation:  
Construct a new trail bridge west of Wooster Road.

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27 FEMA Flood Insurance Rate Map, Hamilton County, Ohio, Panel 356 of 390, Map Number 39061C0356F, 2012  
28 Federal Highway Administration, National Bridge Inventory  
29 Ohio Department of Transportation, Procedure for Construction Budget Estimating, Multi-Span Bridges <4000 SF, $200/sf, 2013  
30 Ohio Department of Transportation, Functional Classification Map, Hamilton County, 2004  
31 Ohio Department of Transportation, Transportation Information Mapping System, Traffic Count Database System, 2013
SEGMENT B: 8-3

Limits:
South of Duck Creek to North edge of Linwood Park

Adjacent Roadway:
None

Length:
1,350 ft.

Recommended Facility Type:
SU1: Shared-Use Path on Independent Alignment

The trail would leave Wooster Road and proceed northwest along the west side of Duck Creek into Linwood Park.

CONSTRAINTS AND OBSERVATIONS

General: Floodplain
The entire length of this segment is within the 100 year floodplain of Duck Creek and the Little Miami River. The trail may periodically be inaccessible when inundated by flood waters. The existing ground is approximately 5 to 19 feet below the 100 year base flood elevation 501. The trail would also be within the floodway of Duck Creek which must be kept free of encroachments so that the 100 year flood can be carried without substantial increases in flood heights. No additional fill could be placed within the floodway.

Because the trail would be within the floodway, the trail should be constructed of concrete which is more durable and able to resist the erosive forces of a flood.

B2: Private Property
Between Wooster Road and Linwood Park the trail would be on property that is not publicly owned. The property would need to be acquired or a trail easement would need to be obtained from the owner. The land appears to currently be unused although there is a gravel driveway through the property.

ALTERNATIVE B

Engineer’s Estimate of Cost

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32 FEMA Flood Insurance Rate Map, Hamilton County, Ohio, Panel 243 and 356 of 390, Map Number 39061C0243E, 2010 & Map Number 39061C0356F, 2012
ALTERNATIVE C

SEGMENT C: 9-5

Limits:
Armleder Park to SORTA Railroad north of Duck Creek

Adjacent Roadway:
None

Length:
2,500 ft.

Recommended Facility Type:
SU1: Shared-Use Path on Independent Alignment

SEGMENT DESCRIPTION

This alternative alignment would begin at the north end of Armleder Park and connect to the SORTA Railroad north of Duck Creek. The alignment would go through property owned by Wooster Development, LTD (Prus Construction) on the east side of Wooster Road. The trail will cross Wooster Road and enter property owned by Caraustar Mill Group, Inc. which is currently greenspace but zoned for general manufacturing. The trail will then continue westward and join Alternative A north of Duck Creek on the SORTA owned rail line.

CONSTRAINTS AND OBSERVATIONS

General: Floodplain
Portions of this segment would be within the 100 year floodplain of the Little Miami River and Duck Creek. These portions of the trail may periodically be inaccessible when inundated by flood waters. Most of the Prus property and the portion of the Caraustar property adjacent to Wooster Road is above the 100 year floodplain. The eastern portion in Armleder Park is up to 23 feet below the base flood elevation of 501. The western portion near the connection to the OASIS rail line is 1 to 2 feet below the base flood elevation of 502.

General: Private Property
Acquisitions or easements would need to be obtained from Wooster Development, LTD (Prus Construction) and Caraustar Mill Group, Inc. for the trail’s alignment through these properties. The trail alignment should minimize impact to the industries’ operations. Additional right of way or a trail easement would also be needed along Wooster Road from both of these property owners.

C1: Topography
The Prus Construction Property sits approximately 24 feet above Armleder Park with slopes of approximately 30% to 50%. The trail will need approximately 480 feet to ascend the slope at a 5% grade.

C2: Impact to Industrial Operations
Some of the private trucking company’s operations may be impacted by the trail easement. Boxer Trucking stores trailers on the property. An easement may impact the storage capacity of the facility.

33 FEMA Flood Insurance Rate Map, Hamilton County, Ohio, Panel 244 of 390, Map Number 39061C0244E, 2010
34 CAGIS Contours
C3: Building Entrance & Utility Pole
The entrance to a warehouse building at 5315 Wooster Pike is a few feet higher than the curb. Approaching the door is a ramp retained by a short wall. Access to this doorway may need to be maintained perhaps by raising the trail to the level of the door. The building is approximately 18 to 20 feet from the roadway. The trail may only be three feet from the face of the building which may be a concern for people entering or exiting from the building.

An existing utility pole located in front of the building at 5315 Wooster Pike is located approximately 8 feet from the edge of roadway. It would likely need to be relocated closer to the roadway to accommodate the trail between it and the building.

C4: Driveway crossing
The trail would cross the main industrial driveway entering the Boxer Trucking Company. The AASHTO Guide for the Development of Bicycle Facilities notes that there are many concerns with shared use paths adjacent to roadways, particularly at driveways. Crashes are more likely at these locations because drivers turning to and from the driveway are not accustomed to scanning for pedestrians or bicyclists on the path. Of particular concern at this location is the driveway located near a building which blocks the view of the path. Bicyclists approaching the driveway may not be seen by truck traffic exiting the facility. Additional warning devices, stop/yield signs for driveway traffic and painting the trail green across the driveway may be needed to address the safety concerns.

C5: Mid-Block Crossing of Wooster Road
The trail would need to cross Wooster at a currently un-signalized mid-block location between the Prus Property and the Caraustar Mill Group property.

Wooster Road has an ADT of approximately 14,264. The roadway has three lanes with the center lane being a two-way left turn lane. The speed limit is 35 mph.

The crossing should have a high-visibility marked crosswalk. Where the speed limit is less than 40 mph additional measures, such as active warning devices, reduced crossing length, enhancing driver awareness, etc., may not be necessary.

Since the roadway traffic will likely be higher than the trail traffic, it would be most appropriate to require trail users to yield to the roadway traffic. Depending on the final trail alignment, sight lines may be blocked by existing buildings close to the road. A bicyclist would need to be able to see a car 360 feet away from a point 90 feet from the roadway in order to enter the roadway without slowing on the approach to the crossing. If the buildings block the sight triangle, additional measures may be required.

**Engineer’s Estimate of Cost**

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35 Ohio Department of Transportation, Transportation Information Mapping System, Traffic Count Database System, 2013
ALTERNATIVE C1

SEGMENT C: 9-5

Limits:
Armleder Park to Alternative C at Wooster Road

Adjacent Roadway:
Wooster Road (part)

Length:
3,100 ft.

Recommended Facility Type:
SU1: Shared-Use Path on Independent Alignment
SU2: Shared-Use Path along Roadway

SEGMENT DESCRIPTION
This route would provide an alternative path through the Prus Property by following the eastern and northern boundaries. It has the benefit of potentially fewer impacts to business operations and may not impact the existing utility poles along Wooster Road.

CONSTRAINTS AND OBSERVATIONS

General: Floodplain & Private Property
See General Constraints noted under Alternative C.

C1: Topography
See Constraint C1 under Alternative C.

C6: Impact to Construction Operations
Some of the private construction company’s storage operations along the northern border of the property may be impacted by the trail. Since the site is large by comparison to the trucking operation on the southern border (Alternative C), the overall business impact may be less than that caused by Alternative C.

C7: Multiple Driveway Crossings
Along Wooster Road the trail would cross four industrial driveways for the Prus Construction property. As noted in Constraint C4 for Alternative C, these locations may be safety concerns because drivers may fail to observe trail users. There are also three buildings close to the roadway which will limit the visibility of trail users from the driveway. Additional warning devices, stop/yield signs for driveway traffic and painting the trail green across the driveway entrance may be needed to address the safety concerns.

C8: Prus Construction Sign
The construction sign is located from 10 to 20 feet from the edge of Wooster Road. The sign would have to be relocated.
LIMITS:
Alternative C on Prus Property to Wooster Road

ADJACENT ROADWAY:
None

LENGTH:
850 ft.

RECOMMENDED FACILITY TYPE:
SU1: Shared-Use Path on Independent Alignment

SEGMENT DESCRIPTION
This route would provide an alternative path through the trucking company by following the eastern and northern boundaries of the operation. Although it would still have an impact on the company’s operations it has the benefit of eliminating the constraints along Wooster Road noted in Constraint C3, C4, C7 and C8 under Alternatives C and C1.

CONSTRAINTS AND OBSERVATIONS

GENERAL: PRIVATE PROPERTY
Acquisitions or easements would need to be obtained from Wooster Development, LTD (Prus Construction) and Caraustar Mill Group, Inc. for the trail’s alignment through these properties. The trail alignment should minimize impact to the industries’ operations. Additional right of way or a trail easement would also be needed along Wooster Road from both of these property owners.

C2: IMPACT TO INDUSTRIAL OPERATIONS
Some of the private trucking company’s operations may be impacted by the trail easement. Boxer Trucking stores trailers on the property. An easement may impact the storage capacity of the facility.

C8: LIMITED SIGHT DISTANCE
As the trail approaches Wooster Road from the east, sight distance to the trail from the north on Wooster Road will be blocked by an existing building located approximately 30 feet from the edge of roadway. See Constraint C5 for sight distance requirements at the mid-block crossing.
CONSTRAINTS AND OBSERVATIONS

General: Concrete Barrier
Because the speed limit on Columbia Parkway is 50 mph, trail users should be separated from the roadway traffic by a concrete barrier. The barrier should be placed 12 feet from the edge of the right travel lane. The total length of concrete barrier would be approximately 4,300 feet. The cost for this item may be $200,000.

The length of the trail along Columbia Parkway confined by the concrete barrier and the adjacent rock cut slope may make the trail feel enclosed. This could affect trail users’ sense of personal security, could block the view of trail users needing help and could impede emergency response. The concrete barrier should be no more than 42” in height and the trail width should be as wide as practical to mitigate these concerns.

37 AASHTO Guide for the Development of Bicycle Facilities, Chapter 5: Design of Shared Use Paths, Section 5.2.2 Shared Use Paths Adjacent to Roadways (Sidewalks), 2012
38 Ohio Department of Transportation Location & Design Manual, Volume 1, Section 300 Cross Section Design, Figure 301-3E Rural Shoulder Criteria, 2015
39 Ohio Department of Transportation, Estimator Software, 2014 Catalog
40 AASHTO Guide for the Development of Bicycle Facilities, Chapter 5: Design of Shared Use Paths, Section 5.2.1 Width and Clearance, 2012
General: Drainage
The trail may require relocation of the ditch drainage and catch basins along Columbia Parkway. More frequent catch basins may be needed along the concrete barrier to limit the spread of storm water onto the freeway that may be caused by the introduction of the barrier.

General: Lighting
The existing highway lighting along Columbia Parkway will likely need to be relocated to accommodate the concrete barrier. The lights could be remounted atop the barrier. Approximately nineteen light poles would be affected. The electrical conduit system would likely also be affected. The cost for relocating the lighting system may exceed $100,000.41

General: Highway Guide Signs
Two ground mounted guide signs located along the west side of Columbia Parkway for the exit at Eastern Avenue will need to be relocated. The existing signs are located approximately 20 feet from the edge of travel lane.42 Freeway signs are typically placed 30 feet from the edge of travel lane. The signs may be able to be remounted on the outside of the trail (which would be approximately 30 feet from the edge of the travel way) or the signs could be mounted on a cantilever structure overhead.

D1: At-Grade Railroad Crossing
The trail would need to cross one active track on the OASIS Rail Line. The track is used by the Indiana and Ohio Railway (IORY) operated by Genesee and Wyoming. Norfolk Southern has trackage rights.43 There are currently one or two trains per day using the corridor.44 The average train speed is 20 mph.45 There are train signals located north and south of the crossing location but these are believed to be inactive at this time. Active signals would be a concern for occasional blockages of the crossing.

A trail user would need to see 734 feet in each direction to cross the track (assuming 5 seconds for the crossing).46 There appears to be adequate sight distance to the north although the south could be partially blocked by vegetation at a slight bend in the track alignment. Active warning devices may not be needed due to the low volume of trains, low train speed and the likelihood that most users would take less than 5 seconds to cross the track (and would therefore not need as much sight distance).

D2: Mid-Block Ramp Crossing
The trail would separately cross the entrance and exit ramps to Columbia Parkway from Eastern Avenue. The length of each crossing is approximately 16 feet. In 2013 the ADT of the entrance ramp was 2,037 vehicles per day and the exit ramp was 2,362 vehicles per day.47 The speed limit of Eastern Avenue is 25 mph and the speed limit of Columbia Parkway is 50 mph. The ramp speeds would be in transition from 25 to 50 mph. Since the crossing location is nearer to Eastern Avenue, the speed may be closer to the lower range.

The intersection of the path and roadway should have a high-visibility marked crosswalk. Since the ADT is less than 12,000 vehicles per day and only one lane is being crossed, additional crossing measures may not be needed.48

41 Estimated using ODOT Estimator Software and probably quantities, 2014 Catalog
42 Ohio Department of Transportation Standard Construction Drawings, TC 42.10, Typical Guide Sign Placement, 2013
44 Public Utilities Commission of Ohio, Railroad Grade Crossing Inventory, Airport Avenue Grade Crossing Record ID 13487, Last update 2010.
45 Federal Railroad Administration, Highway Rail Crossing Inventory for Ohio, Crossing 524751R Airport Road
47 OKI Traffic Counts GIS Database
D3: Horizontal Width under Columbia Parkway Bridge

The trail will follow the path of an existing sidewalk under the Columbia Parkway Bridge. The sidewalk width is estimated to be 3.5 to 4 feet in width with a 2 to 4 foot grass buffer. The existing bridge piers are located approximately 4 to 5 feet behind the back of walk. At the eastern end, a slope begins to the abutment immediately behind the walk. On the western end the slope appears to begin behind the bridge piers. The walk is separated from the roadway by a chain link fence. The ramp has a 10 foot wide shoulder on the right side. The total minimum existing width from the ramp travel lane to the bridge piers is estimated to be 20 feet.

The trail will need to be a minimum of 8 feet wide. It should also be separated from the ramp with a barrier. The trail will also need a buffer of 1 to 2 feet from the barrier and from the existing bridge piers.

The ramp shoulder is currently wider than the required width of 6 feet. A 20" wide concrete barrier can be constructed at an offset of 6 feet from the ramp travel lane. This would leave approximately 12.3 feet of space between the back of barrier and the bridge piers which should accommodate an 8 foot trail plus 1 to 2 feet of buffer space to the barrier and piers. A small retaining wall may be needed on the eastern end to retain the slope which currently begins at the back of walk.

**Note:** These dimensions need to be verified in the field — cannot measure on aerial images since the area is obscured by the overpass.

D4: Trail Connection

The existing sidewalk under Columbia Parkway Bridge connects to sidewalks on Leonard Street and Archer Avenue via a sidewalk connection on the west side of Columbia Parkway. This sidewalk connection would provide access to the trail for residents in the Linwood and Mount Lookout neighborhoods on the west side of Columbia Parkway. It would also provide a link to Ault Park via the existing sidewalk for pedestrians and the low volume neighborhood streets for bicyclists.

D5: Grading

The hillside adjacent to this location, about 1,000 feet northeast from the Eastern Avenue exit ramp gore, does not have a rock cut. Rock cuts are generally at least 30 feet from the edge of travel lane, a distance known as the clear zone. The clear zone is a width adjacent to the roadway which should be kept clear of obstacles that may be struck by errant vehicles. Since there doesn’t appear to be a rock cut in this location, the backslope may begin closer to the roadway than 30 feet. The toe of slope may need to be excavated to accommodate the trail in this location. The excavation may encounter rock as is typical in the adjacent areas.

D6: Gateway Sign

A landscaped gateway sign at the Cincinnati municipal border may be impacted by this trail segment.

### ALTERNATIVE D

**Engineer’s Estimate of Cost**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Segment</th>
<th>Limits</th>
<th>Estimated Cost</th>
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<tbody>
<tr>
<td>D A:1-2</td>
<td>Armleder Park to Wooster Road</td>
<td>$80,000</td>
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<tr>
<td>A:2-3</td>
<td>Armleder Road to Linwood Park</td>
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<tr>
<td>A:3-4</td>
<td>Linwood Park</td>
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<td>D:10-11</td>
<td>West Side of Columbia Parkway South of Duck Creek to Wasson Way Trail West of Duck Creek</td>
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<td><strong>TOTAL</strong></td>
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</tbody>
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49 Ohio Department of Transportation Location & Design Manual, Volume 1, Section 300 Cross Section Design, Figure 303-1E Interchange Elements — Pavements, Shoulders and Medians, 2012
This project made possible by the generous support of Interact for Health. Project Management and Leadership provided by Groundwork Cincinnati-Mill Creek.
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