NORFOLK SOUTHERN
PITTSBURGH VERTICAL CLEARANCE PROJECTS
ALTERNATIVES ANALYSIS REPORT

City of Pittsburgh
Allegheny County, PA

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1.0 Introduction

Norfolk Southern Railway Company (NSR), in cooperation with and funding through the Pennsylvania Department of Transportation (PennDOT), is proposing a group of five projects collectively referred to as the Pittsburgh Vertical Clearance Projects in the City of Pittsburgh, Allegheny County, Pennsylvania. The projects would remove the final remaining vertical clearance restrictions that result in chokepoints and other hindrances to the efficient flow of intermodal rail traffic on the Pittsburgh and Fort Wayne Rail Lines. The Pittsburgh Vertical Clearance Projects are necessary to meet future freight rail transportation demand, to promote the efficient transportation of goods between Chicago and the New York/New Jersey commercial markets, and to improve mobility and safety for freight traffic through the Pittsburgh region. In addition, these railway improvement projects would support truck-rail intermodal facilities by allowing for reliable double-stack intermodal traffic between Chicago and the New York/New Jersey commercial markets (a PennDOT goal under Pennsylvania's 2015 State Rail Plan[1], developed in compliance with Federal Railroad Administration requirements and with the Rail Freight Preservation and Improvement Act of 1984, as amended, Public Law 587-119.) The Purpose and Need Statement for these projects can be found in **Appendix A**.

The Pittsburgh and Fort Wayne lines are two of three existing NSR mainlines through Pittsburgh. The Pittsburgh and Fort Wayne lines were completed in 1852 and include the approximately 50-foot-wide right-of-way and two mainline tracks serving the Chicago to New York/New Jersey corridor. Only single-stack trains currently can utilize these lines because of height elevation limitations due to clearance restrictions at several bridge locations in the Pittsburgh area. In 2019, the Pittsburgh Line through Pittsburgh's Central Business District, East End neighborhoods, and eastern suburbs averaged 21 trains per day, while the Fort Wayne Line averaged 34 trains per day through Pittsburgh's North Side neighborhoods. By 2045, according to the high-growth scenario presented in the 2015 Pennsylvania State Rail Plan[1], traffic is forecasted to increase to 50 trains per day on the Pittsburgh Line and 62 trains per day on the Fort Wayne Line if no clearance improvements are made to the bridges. The third mainline, on the south side of the city, is referred to as the Monongahela (Mon) Line. The Mon Line averaged 34 freight trains per day in 2019 and is expected to remain at 34 trains per day in 2045 because the line is currently operating at capacity. By 2045, according to the low-growth scenario presented in the 2020 Pennsylvania State Rail Plan[2], traffic is forecasted to increase to 42 trains per day on the Pittsburgh Line and 56 trains per day on the Fort Wayne Line if no clearance improvements are made to the bridges. With implementation of the projects, the predicted number of trains per day on the Pittsburgh Line drops to 49 under the high-growth scenario and 32 under the low-growth scenario. On the Fort Wayne Line, the predicted number of trains per day drops to 58 under the high-growth scenario and 45 under the low-growth scenario with implementation of the projects.

[1] Pennsylvania Department of Transportation 2015 Rail Plan. https://www.penndot.gov/Doing-Business/Transit/InformationandReports/Documents/2015%20Pennsylvania%20State%20Rail%20Plan%20(low).pdf.
[2] Pennsylvania Department of Transportation 2020 Rail Plan. https://www.penndot.pa.gov/Doing-Business/RailFreightAndPorts/Planning/Documents/2020%20Pennsylvania%20State%20Rail%20Plan/2020%20Pennsylvania%20State%20Rail%20Plan.pdf.

This alternatives analysis is being prepared in compliance with Pennsylvania Act 120 and the Pennsylvania History Code. When there is state funding but no federal funding, such as for this project, PennDOT follows Section 2002 of the Pennsylvania Administrative Code of 1929, which defines the powers and duties held by PennDOT under Commonwealth of Pennsylvania Act 120 of P.L. 356 (Act 120), amended Section 2002, as codified at Title 71 of the Pennsylvania Code, 71 Pa.C.S. § 512 (Section 2002 of Act 120). Act 120 of P.L. 356 amended Section 2002 in 1970 to add requirements to consider the effects of transportation routes or facilities on environmental and other resources. Section 2002 requires that the Department consider impacts to 23 natural, social, and cultural resources for any planned transportation project. This alternatives analysis will only evaluate resources that could influence the selection of a preferred alternative for each project location. The Act 120 Environmental Document will analyze impacts of the preferred alternative on all 23 resources for each project location in accordance with PennDOT guidance.

Section 2002 of Act 120 created a state counterpart to Section 4(f) of the U.S. Department of Transportation (USDOT) Act of 1966. Section 4(f) of the U.S. Department of Transportation Act of 1966 stipulates that the Federal Highway Administration and other Department of Transportation agencies cannot approve the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites unless there are no prudent and feasible alternatives to using those resources, and the proposed project plans include all possible planning to minimize harm to the property or the project has a de minimis impact on the property. (See PennDOT Publication No. 349 [Jan. 25, 2018] for additional information.) Section 2002 also requires PennDOT to evaluate alternatives and minimize harm to resources whenever a transportation corridor or facility is built or expanded in such a way as to use any land from recreation areas, wildlife and waterfowl refuges, historic sites, forest, wilderness, game lands, or public parks. Section 2002 of Act 120 requires that the analysis include reasonable and prudent alternatives to the use of any such lands and requires that such corridor or facility is planned and constructed so as to minimize harm to these resources.

2.0 Corridor Alternatives

This section describes the preliminary corridor-level alternatives considered to meet the projects' purpose and need. NSR, in consultation with PennDOT, considered a reasonable range of alternatives under Section 2002 of Act 120 and associated PennDOT guidance.[3] The range of alternatives was developed based on input from community representatives, governmental agencies and officials, elected leaders, and the general public. Each alternative corridor was assessed as to whether it would meet the purpose and needs of the project, whether it could be constructed in accordance with sound engineering judgment, whether it would result in impacts of an extraordinary magnitude, and its potential to avoid and minimize impacts to Section 2002 resources.

[3] PennDOT guidance applicable to Section 2002 of Act 120 incorporates or considers a number of other agency guidance including the U.S. Department of Transportation (Federal Highway Administration, Federal Railroad Administration), U.S. Environmental Protection Agency, Department of Conservation and Natural Resources, Pennsylvania Historical and Museum Commission, and others.

2.1 No Build Alternative

The No Build Alternative represents future conditions without any project to promote the efficient transportation of goods between Chicago and the New York/New Jersey commercial markets or to improve mobility and safety for freight traffic through the Pittsburgh region. The No Build Alternative assumes that NSR will continue to use the existing rail line infrastructure without changes to the vertical clearance along the line. The No Build Alternative provides a baseline against which the impacts of implementing the build alternatives are measured. NSR's assessments of the No Build Alternative as a baseline demonstrates that under the No Build Alternative, the Pittsburgh Line would experience increases in train movements to accommodate forecasted freight rail demand, and the increased train movements would be exacerbated due to the restriction on double-stack trains because of the clearance limitations on the Pittsburgh and Fort Wayne lines. Associated secondary and cumulative effects under the Pennsylvania History Code include the consideration of air, noise, and vibration impacts that would be experienced under the No Build Alternative due to the larger number of train movements as opposed to alternatives that accommodate double-stack trains. The latter have greater freight capacity that allows for a reduced number of trains to move the same amount of freight. Under the No Build Alternative, more trains would be required through the Fort Wayne Line in Pittsburgh's North Side neighborhoods and Pittsburgh Line in the City of Pittsburgh to meet future rail freight demand. The No Build Alternative was carried into detailed study.

2.2 Bypass Line (New Line) Alternative

The Bypass Line Alternative would be a newly built rail line located along a new right-of-way. The Bypass Alternative would require new routing and would be required to have an appropriate connection to the existing interstate rail system. Two tracks traversing through the Pittsburgh region would be required to fulfill the capacity needs of the project. Rail safety and operational requirements would require a right-of-way width of at least 50 feet. Cut, fill, and blasting would be required to meet rail engineering specifications for rail slope and safety due to topographic variation. Rail/automobile crossings would be required to permit freight rail traffic and reduce rail/automobile conflict. Rail/automobile crossings would involve clearances to accommodate double-stack trains as well as potential signaling, grade separation, bridge, tunnel, and other engineered routing. The potential for crossing waterbodies and sensitive or protected areas is significant under the Bypass Line Alternative. As compared to use of existing right-of-way, the Bypass Line Alternative would have greater impacts to socioeconomic, cultural (historic and archaeological), and environmental resources in light of the new right-of-way required. Impacts would include effects to any neighborhood through which the new right-of-way would pass and would require land acquisition/condemnation and new transportation/pass through impacts. In addition, the exponential cost of a bypass route, including significant property acquisitions that would be required, further discounts this option as a viable alternative, as it would be significantly more than the standard required to meet the project's purpose and need. The Bypass Line Alternative would not be a reasonable and prudent alternative and was dismissed from further consideration.

2.3 Mon Line Alternative

The Mon Line Alternative assumes use of the existing Mon Line to accommodate future freight rail demand identified in the Purpose and Need Statement. The Mon Line has a 3-mile single-tracked segment that includes a tunnel and an adjacent bridge over the Monongahela River. Although the Mon Line is cleared for double-stack freight movement, it has substantial capacity constraints due to a single-track line through a tunnel and a major river crossing, thus causing further delay and capacity issues for freight transit between Chicago and the East Coast. In order to increase the Mon Line's capacity to accommodate its current traffic along with the projected traffic demand, the existing tunnel and the major river crossing would both need to be widened to accommodate at least a double-track alignment. As such, cut, fill, and blasting would be required through the tunnel to meet rail engineering specifications, and bridge work would entail crossing a major waterbody, and may impact sensitive or protected areas. The Mon Line Alternative would have greater impacts to environmental resources in light of the additional width of right-of-way required. This alternative also may require land acquisition/condemnation. In addition, the properties adjacent to the Mon Line are prone to unpredictable landslides and are not owned by NSR. These incidents can cause and have caused hazardous conditions, impacts on public safety, and substantial transportation interruption and reliability concerns for freight movement. The threats cannot be addressed by NSR, PennDOT, or any reasonable and prudent alternative to meet the purpose and need as a result of third-party ownership and the substantial engineering feasibility considerations. The Mon Line cannot accommodate future freight rail demand to meet the purpose and need without significant modification, which is not reasonable and prudent due to physical restraints and topography. Additionally, the Mon Line Alternative does not meet operational safety and reliability requirements to meet future freight rail demand and the purpose and need.

Due to the major physical constraints and engineering factors, along with the cost of major tunnel and bridge expansions and required safety measures that would need to be addressed by third-party landowners, the Mon Line was dismissed from further consideration.

2.4 Conemaugh Line Alternative

The Conemaugh Line Alternative assumes use of NSR's existing Conemaugh Line between Conpitt Junction (east of Bolivar, Pennsylvania) and Federal Street on Pittsburgh's North Side to accommodate future freight rail demand identified in the Purpose and Need Statement. In order to accommodate future freight rail demand to meet the purpose and need, the Conemaugh Line would require the reconstruction of sections of double track that have been removed. The line has 10 vertical obstructions that also would need to be addressed to achieve the required vertical clearance to accommodate double stack trains. The Conemaugh Line runs through less densely populated areas than the Pittsburgh Line; however, the Conemaugh Line contains a greater number of at-grade crossings in small towns, which makes the route less desirable from a safety perspective. From an operational perspective, the Conemaugh Line is a longer and less efficient route than the Pittsburgh Line. Much of the Conemaugh Line follows the Kiskiminetas River, and the route has an excessive number of curves that limit train speed.

This alternative would not avoid impacts along the Fort Wayne Line in Pittsburgh's North Side neighborhoods but would not require modifications to the Pittsburgh Line in the City of Pittsburgh and its eastern suburbs. The Conemaugh Line would require the reconstruction of sections of double track within the rail right-of-way that have been previously removed.

Improvement of the Conemaugh Line to meet the project's purpose and need is not considered reasonable and prudent. The Conemaugh Line Alternative has a reduced ability to meet forecasted traffic demands due to its configuration, curves, and slower track speed. The Conemaugh Line Alternative has facility deficiencies including 10 vertical clearance constraints that present potential impact issues such that the alternative would not represent a reduction in impacts. In addition, the alternative would involve substantial costs to complete double tracking of the line and address vertical clearance issues at 10 crossings. Therefore, the Conemaugh Line Alternative was dismissed from further consideration.

2.5 Pittsburgh/Fort Wayne Line Alternative

The Pittsburgh/Fort Wayne lines serve rail freight traffic in interstate commerce and operate as a primary link through Pittsburgh between Chicago and the New York/New Jersey commercial markets. The Pittsburgh/Fort Wayne lines are the preferred route for time-sensitive intermodal freight, in large part because they avoid the hazardous conditions and delays experienced on the Mon Line discussed in Section 2.3. Furthermore, the Pittsburgh/Fort Wayne lines are the shortest route between Chicago and the East Coast and the use of that route increases network fluidity while reducing transit time. However, the current configuration of the Pittsburgh/Fort Wayne lines does not meet the need for projected freight rail demand with its current clearance limitations for double-stack trains. Only single stack trains currently can traverse these lines due to vertical clearance restrictions at several bridge locations.

To meet the project purpose and need, the Pittsburgh/Fort Wayne lines were assessed for locations with substandard vertical clearance that were not already considered for replacement. Six locations with vertical obstructions preventing efficient movement of freight, especially time-sensitive intermodal freight, by rail between Chicago and New York/New Jersey, were identified: Washington Avenue Bridge, Swissvale (PT-344.91); Amtrak Station Canopy, Pittsburgh (PT-353.20), W. North Avenue Bridge, Pittsburgh (PC-1.60); Pennsylvania Avenue Bridge, Pittsburgh (PC-1.82); Columbus Avenue Bridge, Pittsburgh (PC-2.17); and Ohio Connecting (OC) Bridge Flyover, Pittsburgh (PC-3.38). However, the OC Bridge Flyover has been removed from the overall Pittsburgh Vertical Clearance Projects. See **Figure 2-1** for a location map. Addressing the vertical obstructions along the Pittsburgh and Fort Wayne lines meets the purpose and need of the project and it would not result in impacts of an extraordinary magnitude since improvements would occur along an existing rail line and the work at each bridge or structure would be confined to an area immediately surrounding the bridge or structure. The Pittsburgh/Fort Wayne Alternative was carried into detailed study.

2.6 Alternatives Studied in Detail

An assessment of the alternatives carried forward into detailed study, including the No Build Alternative and the four project locations identified for the Pittsburgh/Fort Wayne Alternative corridor, is included in the subsequent chapters. The assessment includes the consideration of both the beneficial and the

adverse impacts of project alternatives under consideration. For purposes of this analysis, low potential was assigned when the alternative is considered to have no or beneficial impacts to a resource; moderate potential was assigned when the alternative is considered to have minimal potential impacts to a resource; and high potential was assigned when the alternative is considered to have the potential to adversely impact a resource prior to mitigation. However, it is important to note that high potential to impact a resource does not equate to the projects as a whole having significant impacts.

3.0 Amtrak Station

The Amtrak Station is located in the City of Pittsburgh, Allegheny County, Pennsylvania, and carries traffic on the Pennsylvania Rail Line. See **Figure 3-1** for a location map.

Alternatives have been identified to address the purpose and need for the Pittsburgh Vertical Clearance Projects and to meet NS and Amtrak requirements. The alternatives will be discussed in further detail later in this report. Below is a brief description of each alternative:

- Alternative 1 - No Build Alternative
- Alternative 2 - Remove portion of trainshed
- Alternative 3 - Adjust trainshed roof beams to achieve 21’-0” vertical clearance

Conceptual plans and details for each Build alternative as well as sections can be found in **Appendix B.** Conceptual cost estimates for each Build alternative can be found in **Appendix C**. An Alternatives Comparison Matrix is included in **Appendix D**.

3.1 Environmental Considerations

As noted in Chapter 1, this section discusses those resources that could influence the selection of a preferred alternative for this project location. The Act 120 document will analyze impacts of the preferred alternative on these and the remaining of the 23 resource categories.

3.1.1 Hazardous or Residual Wastes

Potential hazardous materials identified during the Hazardous Materials Survey (WSP Global, Inc. 2018) conducted for the Amtrak Station Project are as follows:

- It has been confirmed through previous testing performed by WSP Global that lead-containing paint (LCP) is present on structural steel girders, steel beams, steel columns, electrical conduits, and roof drainpipes.
- Shallow soil under the Amtrak Station canopies may have been impacted by flaking lead-based paint.
- Asbestos-containing materials (ACM) have been identified in many areas of the trainshed and on the brick wall along Liberty Avenue. ACM cement (transite) panels are located throughout the trainshed on the exhaust areas. Wire insulation is located on the inside pendant light fixtures at track level and in the entire trainshed west and east sections.
- Historic fill (e.g., slag, cinders, and fly ash) may be present beneath the railroad ballast since these materials have been commonly used as fill in Allegheny County. These materials sometimes contain elevated concentrations of metals and/or polycyclic aromatic hydrocarbons.

- HID light fixtures in the west and east sections of the trainshed will be managed under the presumption that mercury vapor may be present.
- WSP Global's 2018 analysis indicated no presence of polychlorinated biphenyl (PCBs) containing equipment or caulk, and no equipment containing chlorofluorocarbons (CFCs). As it is possible that additional hazardous materials, including ACM, LCP, and PCB containing materials, may exist behind walls and other concealed spaces that were not accessible during WSP Global's sampling survey, if such materials are encountered during construction they will be managed in accordance with state, local, and federal requirements as applicable. Areas below the platform and track surface, as well as pipe trenches at the north side of the station along Liberty Avenue, will not be disturbed and were not included into the scope of work for this survey.

3.1.2 Historic Properties

The area of potential effects (APE) for the proposed undertaking contains three historic properties, the Pennsylvania Railroad Station, which was listed in the NRHP on April 22, 1976; the Pennsylvania Railroad Station Rotunda, which was listed in the NRHP on April 11, 1973; and the Pennsylvania Railroad: Main Line (Harrisburg to Pittsburgh) Railroad Corridor Historic District, which was determined eligible for the NRHP on September 14, 1993. As part of the current study, contributing elements of the railroad corridor historic district were identified within the 1,800-foot segment of the corridor contained within the APE. Project historians identified two contributing elements of the railroad corridor historic district as functional components that were constructed during the corridor's period of significance and that retain historic integrity. These include the NRHP-listed 1898-1903 Daniel H. Burnham Pennsylvania Railroad Station (which includes the attached 1953-1958 McKim, Mead, and White trainshed and the undergrade bridge at Liberty Avenue, which partly supports two passenger platforms) and the NRHP-listed Pennsylvania Railroad Station Rotunda.

3.1.3 Section 2002 Resources

There are three Section 2002 resources located in the project vicinity, the NRHP-listed Pennsylvania Railroad Station; the NRHP-listed Pennsylvania Railroad Station Rotunda; and the NRHP-eligible Pennsylvania Railroad: Main Line (Harrisburg to Pittsburgh) Railroad Corridor Historic District. The trainshed is a contributing element of both the NRHP-listed Pennsylvania Railroad Station and the NRHP-eligible Pennsylvania Railroad: Main Line (Harrisburg to Pittsburgh) Railroad Corridor Historic District.

3.1.4 Air Quality

The current National Ambient Air Quality Standard designations for the Pittsburgh area pollutants are:

- Marginal nonattainment for the 2008 Ozone standard
- Maintenance for the 1971 Carbon Monoxide standard
- Maintenance for the 2006 PM2.5 standard
- Moderate nonattainment for the 2012 PM2.5 standard
- Nonattainment for the 2010 SO2 standard
- Attainment for Lead
- Attainment for NO2

The proposed project will not have a direct effect on air quality with the exception of minor construction related emissions for Alternatives 2 and 3, which would consist of construction equipment regulated under United States Environmental Protection Agency (EPA) emission standards. NSR has conducted a project-level air quality analysis for the Pittsburgh Vertical Clearance Projects corridor to evaluate secondary or indirect effects on air quality (see **Appendix E**). A general conformity determination is not required since there is no federal action or federal money being used for the project. The No Build Alternative would not result in any impacts to air quality. However, due to the inability to utilize more efficient double-stack containers and the need for additional train trips to accommodate future forecasted freight needs, with a commensurate increase in locomotive emissions for single-stack trains, future emissions would increase slightly under the No Build Alternative as compared to Alternatives 2 and 3 where the more efficient double-stack trains would allow for fewer trains and lower locomotive emissions for the same freight needs. It is anticipated that Alternatives 2 and 3 would have similar impacts on emissions levels. Therefore, from an emissions perspective, any of the approaches to achieving the needed vertical clearance at these locations are considered the same. With the Build alternatives, there would be a slight net reduction in annual regional locomotive operational emissions in comparison to both existing and future 2045 No Build emissions levels, and therefore no significant adverse impacts would result with implementation of the project.

3.1.5 Noise

Direct noise effects will be limited to construction related impacts. The No Build Alternative would have no noise effects. Noise effects of the Build alternatives would be temporary and the difference between Build alternatives would not be significant.

Regarding indirect or secondary effects, NSR conducted a noise impact assessment to evaluate the potential impacts associated with the Pittsburgh Vertical Clearance Projects corridor (see **Appendix F**). Noise levels would be slightly higher under the No Build Alternative than Alternatives 2 and 3 due to the greater number of single-stack trains that would be required to accommodate future rail traffic demand as compared to the fewer double-stack trains capable of carrying the same amount of rail freight. There were no sensitive land use sites above the Surface Transportation Board noise impact threshold identified near the Amtrak Station under the No Build Alternative or either of the Build alternatives for both the low-growth and high-growth scenarios. In addition, any impacted land uses under the future Build alternatives also would be impacted under the future No Build Alternative. It is anticipated that Alternatives 2 and 3 would have similar impact on noise levels. The dominant consideration for noise in these circumstances is the number of trains per day, and that would not be different for either of the Build alternatives for these projects. Therefore, from a noise perspective, any of the approaches to achieving the needed vertical clearance at these locations are considered the same.

3.1.6 Vibration

NSR conducted a vibration analysis for the Pittsburgh Vertical Clearance Projects corridor in consideration of guidance provided by the Pennsylvania History Code (see **Appendix F**). It is anticipated that there will be no impacts as a result of any alternative. Currently, the study corridor is defined as “heavily used” (i.e., more than 12 freight trains per day). Under future conditions there is no change to the train speeds or track locations, other than small reductions in vertical alignment in areas that would result in a negligible change in vibration. Therefore, both the No Build Alternative and Alternatives 2 and 3 would only result

in an increase in the number of trains per day. However, because the number of trains is not predicted to result in an increase of 3 VdB or greater at any vibration-sensitive land uses, there would be no vibration impacts under any of the alternatives.

3.2 Engineering Considerations

3.2.1 Roadway

A detour will be required for Alternative 2 to remove a portion of the trainshed along Liberty Avenue. Alternative 3 will not require a detour as the structure will be modified without any roadway impact.

3.2.2 Structure

The purpose of this project is to increase the vertical clearance over existing Tracks 1 and 2 traveling through the Pittsburgh Amtrak Station. The existing vertical clearance varies with an 18'-8" minimum clearance. A minimum vertical clearance of 21'-0" is required. The existing structure will need to be modified at designated areas to increase the elevation of the bottom of the canopy structure. The limiting members in the station are the girders that span transversely across the railroad tracks.

3.2.3 Right-Of-Way

Temporary easements for construction are anticipated for Alternatives 2 and 3 for locations for cranes to operate and a construction compound/contractor laydown area.

3.2.4 Utilities

Abandoned utilities in the demolition area will be removed and capped off as needed. Inlet filter bags will be used to prevent debris from entering the inlet during a runoff event. Existing utilities in the project area include a Penn Power Company Electric Line, a PA American Water Line, and a Verizon telephone line. Telecom cables exist above ground and below ground.

3.3 Alternatives Description and Evaluation

3.3.1 Alternative 1—No Build Alternative

This alternative would consist of doing nothing to the existing structure at the Amtrak Station. While this alternative would not meet the purpose and need of the project, it is carried into the alternatives analysis as a basis of comparison with the Build alternatives.

3.3.2 Alternative 2—Remove portion of trainshed

Under Alternative 2, the trainshed would be removed between column lines A and B from column lines g (west end of the station) through 5 (column lines g to a and 1 to 5 are radial) to column line 14 (column line 14 is at the west side of I-579) and from column line 25 to 47. (See Appendix B, Alternative 2, pages S-11 through S-15.) This would provide clearances for Track 2. The trainshed would be removed between column lines C and D from column lines g (west end of the station) through 5 (column lines g to a and 1 to 5 are radial) to column line 14 (column line 14 is at the west side of I-579) and from column line 22 to 47. This will provide clearances for Track 1. All material would be removed back to the column line (see **Appendix B**). A waterproof cover would be placed over the stairways that are exposed by the removal of the trainshed. The curtain wall along Liberty Avenue would be removed down to the top of the windowsill.

The remaining wall would be 3'-6" high. The work would be similar to the portion of the wall that was previously removed under I-579. The wall would be removed from column lines 4 through 14 and 25 through 46. A higher portion of the wall between column lines 46 and 47 would be retained to allow the Pennsylvania Railroad symbol to remain. A butterfly type canopy would be installed in the center of platform 3 (between column lines C and D) to protect Amtrak passengers. The canopy would be similar to the canopy under I-579.

The skylight glass panels and connection plates at the apex of the sloped skylight frame would be removed. The bolts that connect the panels to steel framing would be sheared and the panels would be removed intact. The removal of the existing masonry wall down to parapet height would then follow. Concrete parapet toppings would be added to match the height of the existing parapets between grids 15 and 25. Roof drains would be moved as needed.

Alternative 2 calls for the partial demolition of the structural wall along Liberty Avenue leading to a temporary traffic disturbance. A lane shift and detour plan are in order. Trees and seeding along the wall would be removed and later replanted. The existing road curb and water meters would be protected. Access to driveways and side roads would be maintained at all times.

Alternative 2 would not require any existing utility adjustments. Abandoned utilities that may be encountered will be removed and capped off as necessary.

Alternative 2 is anticipated to have a relatively higher potential for encountering contaminated materials compared to Alternative 3 due to proposed demolition activities. Special provisions will have to be developed to properly manage any ACM and/or LCP disturbance during repairs, removal, and/or repainting in accordance with applicable federal, state, and local requirements for protection of human health and the environment. Additionally, provisions will have to be developed to identify and manage any historic fill (e.g., slag, cinders, and fly ash) that may be present beneath the railroad ballast in the affected areas.

Alternative 2 would require extensive modifications to the trainshed including the removal of its roof over Tracks 1 and 2 and the removal of the northwest façade wall along Liberty Avenue. As noted above, the 1953-1958 McKim, Mead, and White trainshed is a contributing element of the NRHP-listed Pennsylvania Railroad Station and the NRHP-eligible Pennsylvania Railroad: Main Line (Harrisburg to Pittsburgh) Railroad Corridor Historic District. The Alternative 2 modifications would result in the partial demolition of a contributing element of both historic properties and are not in keeping with the Secretary of the Interior's Standards and Guidelines Rehabilitation**.** Therefore, Alternative 2 is anticipated to have a high potential to impact historic properties.

Since Alternative 2 would result in impacts to the Pennsylvania Railroad Station and Pennsylvania Railroad: Main Line (Harrisburg to Pittsburgh) Railroad Corridor Historic District, it would also have a high potential to impact Section 2002 resources.

3.3.3 Alternative 3—Adjust trainshed roof beams to achieve 21'-0" vertical clearance

Under Alternative 3, the existing structure would be modified and built up on the bottom portion of the girders at designated areas to increase the elevation of the bottom of the canopy structure (see **Appendix B**). The limiting members in the station are the girders that span transversely across the railroad tracks.

The bottom flange and a portion of the web of the existing girder would be removed over the Tracks 1 and 2. To maintain the structural capacity, angles and plates would be added to the bottom of the existing girder to create a built-up shape. The stiffness of the proposed built-up shape would exceed the stiffness of the existing girder. With the addition of the new structural members on bottom and top of the existing, modifications to the exhaust chutes would be required. The existing asbestos exhaust chutes would be modified to ensure that the exhaust from the diesel engines does not adversely affect the passengers waiting for Amtrak trains.

This work would be performed over Track 1 and Track 2 and would involve the removal of the exhaust chute sections designated along with the steel members that carry it. Required work would include the removal of concrete from the designated beams over both tracks and roof sections as indicated on the drawings; trimming the identified girders over both tracks per the plans to obtain a minimum clearance of 21'-0"; the reinstallation of the exhaust chute framing and panels per the drawings and specifications; and the application of protective coatings to the girders and exposed steel over both tracks. This work would also involve the installation of foundations and new columns for two locations along both tracks.

Alternative 3 would not require any existing utility adjustments. Abandoned utilities that may be encountered will be removed and capped off as necessary.

Alternative 3 is anticipated to have a relatively lower potential for encountering hazardous materials compared to Alternative 2 due to proposed renovation activities. Special provisions will have to be developed to properly manage any ACM and/or LCP disturbance during repairs, removal, and/or repainting in accordance with applicable federal, state, and local requirements for protection of human health and the environment.

Alternative 3 would require the modification of alteration of girders over Tracks 1 and 2, including the removal of a bottom flange, the removal of a portion of the web, and the addition of angles and plates to the bottom of the existing girder. These minor alterations will not be visible on the exterior of the trainshed and will be only minimally visible from the building's interior. Therefore, Alternative 3 is anticipated to have a low to moderate potential to impact historic properties.

Since Alternative 3 results in only minor modifications of the trainshed, it is anticipated to have a low potential to impact Section 2002 resources.

3.3.4 Alternatives Comparison Summary

Alternative 1 would not meet the needs of the project and therefore can be eliminated from consideration. Alternative 2 would meet the project needs, is estimated to have the highest construction cost, would have minor roadway impacts during construction, and would have a high potential to impact historic properties and Section 2002 resources within the project limits. Alternative 3 would meet the project need, would avoid a roadway detour during construction, has the lowest construction cost, would have a low to moderate potential to impact historic properties, and a low potential to impact Section 2002 resources. Both Build alternatives would have a high potential for encountering contaminated materials, particularly asbestos. Alternative 2 would require more special provisions than Alternative 3 to properly manage the contaminated materials (ACM, LCP, and historic fill, etc.) due to the more extensive

demolition activities. When accounting for impacts to the surrounding neighborhood, project complexity, and potential historic property and Section 2002 impacts, Alternative 3 is recommended to be advanced for further consideration. A comparison matrix of the identified alternatives is included in **Appendix D.**

3.4 Selection of Preferred Alternative

Based on these considerations, Alternative 3—Adjust trainshed roof beams to achieve 21'-0" vertical clearance is the preferred alternative for the Amtrak Station Project.

4.0 W. North Avenue Bridge

The W. North Avenue Bridge is located in the City of Pittsburgh, Allegheny County, Pennsylvania, and carries W. North Avenue and Brighton Road over four NSR tracks. See **Figure 4-1** for a location map.

Alternatives have been identified to address the purpose and need for the Pittsburgh Vertical Clearance Projects and to meet PUC requirements. Several bridge rehabilitation options were evaluated in the Historic Bridge Rehabilitation Analysis (Michael Baker International, Inc. 2020) prepared for the project and were determined not to comply with the Secretary of the Interior's Standards for the Treatment of Historic Properties. Therefore, the rehabilitation alternatives were dismissed from further consideration. Below is a brief description of the alternatives that will be discussed in further detail later in this chapter:

- Alternative 1 - No Build Alternative
- Alternative 2 - Replace and raise bridge to achieve 22' vertical clearance
- Alternative 3 - Replace bridge and lower railroad tracks to achieve 22'vertical clearance
- Alternative 4 - Combination replace and raise bridge and lower railroad tracks to achieve 22' vertical clearance

In addition to the four alternatives listed above, a design modification to minimize impacts of the preferred alternative was analyzed and is discussed in Section 5.3.6.

Conceptual plans and profiles for each Build alternative as well as typical sections can be found in **Appendix B.** Conceptual cost estimates for each Build alternative can be found in **Appendix C**. An Alternatives Comparison Matrix is included in **Appendix D**.

4.1 Environmental Considerations

As noted in Chapter 1, this section discusses those resources that could influence the selection of a preferred alternative for this project location. The Act 120 document will analyze impacts of the preferred alternative on these and the remaining of the 23 resource categories.

4.1.1 Hazardous or Residual Waste Sites

The potential for contaminated materials was identified during the Phase I ESA conducted for the W. North Avenue Bridge Project and are as follows:

- It is anticipated that the bridge paint contains lead because of the age of the bridge. All work will comply with applicable lead material handling, safety, and disposal requirements.
- Shallow soil under the W. North Avenue Bridge may have been impacted by flaking lead-based paint.

- At some locations, black surface staining is present on the railroad ties and ballast.
- Historic fill (e.g., slag, cinders and foundry sand) may be present beneath the railroad ballast and roadway, since these materials have been commonly used as fill in Allegheny County. These materials sometimes contain elevated concentrations of metals and/or polynuclear aromatic hydrocarbons (PAHs).
- A former gasoline filling station (Spur Distributing Company Gasoline & Oil Service/Scott's Oil Company gasoline station) was located at 1119 Brighton Road, near the proposed retaining walls on the west side of Brighton Road and north of W. North Avenue.
- It should be noted that groundwater contamination sources may be present upgradient of the site. Most of the planned Build alternatives are not expected to encounter the uppermost aquifer. However, alternatives that require deep foundations and dewatering may encounter contamination within the uppermost aquifer. Furthermore, isolated lenses of contaminated perched groundwater may be present within the railroad ballast that could impact construction costs related to track-lowering alternatives.

4.1.2 Historic Properties

The APE for the proposed undertaking contains five NRHP-listed or -eligible historic districts: the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District, the Allegheny West Historic District, the Mexican War Streets Historic District, the Allegheny Commons Historic District, and the Allegheny Second Ward Industrial Historic District, and two individually NRHP-listed or -eligible properties: the International Harvester Company of America: Pittsburgh Branch House (International Harvester Building) and the Allegheny City Stables Building.

As part of the current study, contributing elements of the railroad corridor historic district were identified within the approximately 566' segment of the corridor contained within the APE. Project historians identified the W. North Avenue Bridge[4] as well as the concrete retaining walls with stone coping along the northeast and southwest edges of the rail corridor, decorative wrought-iron fencing, standard three-rail railroad safety fencing, and an elevated out-of-service siding, all of which are attributable to the early-twentieth-century grade separation project as contributing elements of the railroad corridor historic district. The project APE contains four contributing buildings within the Allegheny Second Ward Industrial Historic District (the Hipwell Manufacturing Company Buildings, the International Harvester Building, the Katsafanas Coffee Company Building, and the Allegheny City Stables Building) and two contributing buildings within the Allegheny West Historic District: 907 Brighton Road and 913 Brighton Road.

4.1.3 Section 2002 Resources

There are seven historic property Section 2002 resources located in the project vicinity as discussed in the previous section. Allegheny Commons Park is both a historic district and a public park. Since the W. North Avenue Bridge is a contributing element of the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State

[4] The W. North Avenue Bridge was determined to be not individually eligible for the NRHP for its engineering significance on March 5, 2007, as part of the Pennsylvania Historic Bridge Inventory and Evaluation, which stated "the bridge is an example of a very common bridge type in widespread use for railroad and highway applications since the late 19th century…the bridge has no noteworthy features or details" (A.G. Lichtenstein & Associates, Inc. 1997). However, the same study found the bridge to be a contributing element of the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) railroad corridor historic district.

Line) Railroad Corridor Historic District, there will be a Section 2002 impact to this resource regardless of which Build alternative is selected.

4.1.4 Air Quality

The current National Ambient Air Quality Standard designations for the Pittsburgh area pollutants are:

- Marginal nonattainment for the 2008 ozone standard
- Maintenance for the 1971 carbon monoxide standard
- Maintenance for the 2006 PM2.5 standard
- Moderate nonattainment for the 2012 PM2.5 standard
- Nonattainment for the 2010 SO2 standard
- Attainment for lead
- Attainment for NO2

The proposed project will not have a direct effect on air quality with the exception of minor construction related emissions for Alternatives 2, 3, and 4, which would consist of construction equipment regulated under EPA emission standards. NSR has conducted a project-level air quality analysis for the Pittsburgh Vertical Clearance Projects corridor to evaluate secondary or indirect effects on air quality (see **Appendix E**). A general conformity determination is not required since there is no federal action or federal money being used for the project. The No Build Alternative would not result in any impacts to air quality. However, due to the inability to utilize more efficient double-stack containers and the need for additional train trips to accommodate future forecasted freight needs, with a commensurate increase in locomotive emissions for single-stack trains, future emissions would increase slightly under the No Build Alternative as compared to Alternatives 2, 3, and 4 where the more efficient double-stack trains would allow for fewer trains and lower locomotive emissions for the same freight needs. It is anticipated that Alternatives 2, 3, and 4 would have similar impacts on emissions levels. Therefore, from an emissions perspective, any of the approaches to achieving the needed vertical clearance at these locations are considered the same. With the Build alternatives, there would be a slight net reduction in annual regional locomotive operational emissions in comparison to both existing and future 2045 No Build emission levels, and therefore no significant adverse impacts would result with implementation of the project.

4.1.5 Noise

Direct noise effects will be limited to temporary construction-related impacts. The No Build Alternative would have no noise effects. Any noise effects of the Build alternatives would be temporary and the difference between Build alternatives would not be significant.

Regarding indirect or secondary effects, NSR has conducted a noise impact assessment to evaluate the potential impacts associated with the Pittsburgh Vertical Clearance Projects corridor (see **Appendix F**). Noise levels would be slightly higher under the No Build Alternative than Alternatives 2, 3, and 4 due to the greater number of single-stack trains that would be required to accommodate future rail traffic demand as compared to the fewer double-stack trains capable of carrying the same amount of rail freight. Existing noise levels were measured at three sites near the W. North Avenue Bridge Project location: the Iron Deer Playground at Allegheny Commons Park West, 710 W. North Avenue, and 401 W. Commons. All three of these locations contain both Category 2 (where people sleep) and Category 3 (institutional) land use categories. There were no Category 2 or Category 3 sensitive land use sites predicted to be above

the Surface Transportation Board noise impact threshold identified near the W. North Avenue Bridge project location under both the No Build and all of the Build alternatives for both low-growth and high-growth scenarios. It is anticipated that Alternatives 2, 3, and 4 would have a similar impact on noise levels. The variation in vertical alignments of the Build alternatives is small, anticipated to be less than five feet. Changes in the vertical bridge alignment associated with the Build alternatives would result in generally imperceptible differences in noise levels that are within tenths of a decibel of one another. The dominant consideration for noise in these circumstances is the number of trains per day, and that would not be different for any of the Build alternatives for these projects. Therefore, from a noise perspective, any of the approaches to achieving the needed vertical clearance at these locations are considered the same.

4.1.6 Vibration

NSR conducted a vibration analysis for the Pittsburgh Vertical Clearance Projects corridor in consideration of guidance provided by the Pennsylvania History Code (see **Appendix F**). It is anticipated that there will be no impacts as a result of any alternative. Currently, the study corridor is defined as "heavily used" (i.e., more than 12 freight trains per day). Under future conditions there is no change to the train speeds or track locations, other than small reductions in vertical alignment in areas that would result in a negligible change in vibration. Therefore, both the No Build Alternative and Alternatives 2, 3, and 4 would only result in an increase in the number of trains per day. However, because the number of trains is not predicted to result in an increase of 3 VdB or greater at any vibration-sensitive land uses, there would be no vibration impacts under any of the alternatives.

4.2 Engineering Considerations

4.2.1 Roadway

W. North Avenue and Brighton Road intersect at a signalized 90 degree at-grade intersection. W. North Avenue is classified as a Neighborhood Collector with a design speed of 25 mph. Brighton Road is classified as a Community Collector with a design speed of 30 mph. W. North Avenue is currently a curbed roadway with one lane in each direction and an additional left turn lane provided on each side of the intersection. There are parking lanes adjacent to the eastbound lane on the west side of the intersection, prior to Rope Way, as well as adjacent to both lanes on the east side of the intersection. Brighton Road is also a curbed section with pavement markings that were recently replaced in 2021 with bike lanes in both directions, one 10' travel lane in both directions, and one additional 10' turn lane in each direction approaching the intersection. There are also 8' parking lanes in the northbound direction between Beech Avenue and West Ohio Street/Western Avenue and in the northbound direction just north of Eloise Street. Sidewalks are located on both sides of both roadways. Allegheny Commons Park, West Park Court apartments, and other businesses and residences are adjacent to the project area and border the existing sidewalk.

The existing vertical grades on all approaches to the intersection vary to a maximum 5% with a crest curve over the railroad. Both roadways are generally flat with grades of less than 5% farther away from the intersection.

4.2.2 Structure

The W. North Avenue/Brighton Road superstructure consists of two main, splayed through girders along the exterior and riveted steel, built-up floor beams along the interior that either frame into the through girders or span from abutment to abutment. The through girders are built-up, riveted steel members encased in concrete. The steel floor beams and diaphragms are also encased in concrete. The bridge is 88' in length with a curb-to-curb roadway width of 36' plus 11'-wide sidewalks on each side of the bridge. The bridge's substructure consists of reinforced concrete abutments and wingwalls. Adjacent sections of concrete retaining walls in the depressed railroad corridor have rock-faced, cut sandstone capstones. The structure carries four lanes of traffic on Brighton Road and three lanes of traffic on W. North Avenue.

The existing vertical clearance is 18'-2" above the tracks and does not meet minimum design requirements. The bridge is in fair to poor condition based on the most recent Bridge Inspection Report dated June 2023 and is currently posted for a 10-ton single vehicle and 19-ton combination vehicle weight restriction (Mackin Engineering Company 2023). The W. North Avenue Bridge superstructure is rated 4 or "poor condition" as the result of overall steel corrosion and collision damage to the bottom flange and web; the diaphragm at the location of the collision damage is bent as well. The bridge substructure is rated 5 or "fair condition"; all primary structural elements are sound but may have minor section loss, cracking, and spalling. The fascia girders are through girders, which are fracture critical and may result in a collapse or partial collapse of the bridge if they were to fail. The areas where cracking is likely to develop is underneath the gunite coating, which cannot be visually inspected. This structure does not have a drainage system but drains along the curbs to the end of structure.

The substructure consists of reinforced concrete abutments on spread footings for the south and north abutments. The substructure is fair, and all primary structural elements are sound but may have minor section loss, cracking, and spalling. At both abutments, the reinforced concrete backwall exhibits vertical cracking, some of which are 1/8" to 1/16" in width. On the bridge seats, one pedestal is spalled and there is undermining of some of the masonry plates. The concrete stem is in satisfactory condition with scaling and map cracking throughout.

4.2.3 Right-Of-Way

Minor right-of-way impacts, such as temporary easements for construction and sliver takes, are anticipated for Alternatives 2 and 4 for work along the sidewalks in the northwest, northeast, and southeast quadrants of the intersection, including impacts to the Allegheny Commons Park for fill slopes as described below. A larger permanent take is anticipated from the vacant parcel in the southwest quadrant due to the widening of W. North Avenue and an embankment slope. Temporary easements are also anticipated along the rail line for the construction of the wall buttressing in Alternative 3, including temporary impacts to Allegheny Commons Park.

4.2.4 Utilities

Utilities near the intersection of W. North Avenue and Brighton Road include 30" and 48" Pittsburgh Water and Sewer Authority (PWSA) brick combination sewers along W. North Avenue and Brighton Road that combine into a 72" combination sewer that then flows southeast along the railroad retaining wall

through the park. PWSA 16" and 24" waterlines are present along both approaches of W. North Avenue, the north approach of Brighton Road, and under the right-turn bypass from W. North Avenue to Brighton Road. A fire hydrant is located in the sidewalk on the northwest quadrant. Peoples Gas Company maintains a 6" gas line along Brighton Road and an 18" gas line along W. North Avenue that cross under the existing bridge deck. A Verizon duct bank runs along the north side of W. North Avenue and crosses under the existing bridge deck. Duquesne Light maintains an underground electric line along W. North Avenue and Brighton Road that crosses under the existing bridge deck. There are existing utility poles that carry aerial electric lines along W. North Avenue west of the intersection and along Brighton Road north of the intersection. A PWSA 30" lead-caulked cast iron water main and a Duquesne Light primary electric line (345kV/138kV) in two 8-5/8" oil-cooled steel conduits that cross under the railroad tracks and continue under Beech Avenue are located approximately 300' southeast of the W. North Avenue Bridge.

4.3 Alternatives Description and Evaluation

4.3.1 Alternative 1—No Build Alternative

This alternative would consist of doing nothing to the existing W. North Avenue Bridge. However, this alternative would not meet the project purpose and need. While the No Build Alternative would not meet the purpose and need of the project, it is carried into the alternatives analysis as a basis of comparison with the Build alternatives.

4.3.2 Alternative 2—Replace and raise bridge to achieve 22' vertical clearance

Alternative 2 would raise the bridge to achieve 22' of vertical clearance over the railroad corridor. Roadway approach work along W. North Avenue would extend approximately 180' to the west and 240' to the east of the bridge. Roadway approach work along Brighton Road would extend approximately 210' to the south and 355' to the north of the bridge. Approach work would include roadway pavement and sidewalk reconstruction, including the construction of retaining walls and toe walls with pedestrian railings. Due to the profile change, side street adjustments would be required along Rope Way, Beech Avenue, Eloise Street, and the Buncher Company property driveway at 1201 Brighton Road.

The existing lane configuration, including the Brighton Road bike and parking lanes, will be maintained in Alternative 2. A right turn bypass from eastbound W. North Avenue to southbound Brighton Road will be eliminated to exclude free flow traffic due to limited sight distance. "No Turn on Red" signs will be installed to increase safety. (Note: existing sight distance requirements are not met at this location either.)

The proposed vertical alignment would increase the profile grade to a maximum of 8% on W. North Avenue and 7% on Brighton Road to meet American Association of State Highway and Transportation Officials (AASHTO) standards for urban collectors. Sidewalk grades would follow the roadway profile with the exception of the sidewalk in the northwest quadrant, which is proposed to have a sidewalk length of approximately 90' consisting of a maximum of 30' lengths at 8.3% with three 5' long level landings for ease of pedestrian and wheeled assistance and consistent with applicable design, safety, and Americans with Disabilities Act (ADA) guidelines. The ramp runs would be separated from the roadway with a proposed landscape area in order to maintain access to the existing entry door at 810-822 W. North Avenue.

During the alternative development process, a more gradual profile grade adjustment was explored for W. North Ave utilizing a 7.25% grade from Rope Way to Brighton Road and 5% grade from Brighton Road to Buena Vista Street. This profile alternative extended the impacts 250' west of Rope Way, resulted in a bifurcated sidewalk, and further impacting garage and other entrances along the roadway. After coordination with the City, this alternative was removed from consideration due to impacts to historic properties and maintenance concerns.

The profile change would result in approximately 375' of toe wall with a bicycle-height fence along the exterior edge of the reconstructed sidewalk along both sides of Brighton Road on portions of each approach to the raised bridge. A 27' retaining wall with a protective fence would be needed in the northwest quadrant along W. North Avenue between the bridge and the proposed stairs to the existing walkway along the eastern exterior of the 810-822 W. North Avenue building due to the elevation difference between the sidewalk and the ground adjacent to the railroad corridor. Proposed fencing would be set along the exterior edge of the sidewalk in the southwest and northeast quadrants.

Both W. North Avenue and Brighton Road would be temporarily closed to traffic during bridge reconstruction. Brighton Road traffic would have a 2.5-mile detour across the Pennsylvania Avenue and West Ohio Street bridges. W. North Avenue traffic would have a 1.5-mile detour across the West Ohio Street Bridge.

Property impacts under Alternative 2 would include temporary construction impacts due to sidewalk replacement, driveway adjustments, and retaining wall and toe wall construction along several of the adjacent properties, along with permanent property acquisitions for embankment slopes in all four quadrants. Fill slopes in Allegheny Commons Park due to the bridge raising and bridge construction would require both permanent property takes consisting of sliver takes for fill slopes and temporary construction easements. The permanent property impact in the park would be approximately 0.09 acre consisting of sliver takes for fill slopes in the southeast quadrant of the project. The temporary impact in the park would be approximately 0.04 acre.

Utilities that would be impacted under Alternative 2 include utility poles along W. North Avenue west of the intersection and along Brighton Road north of the intersection. Verizon, Level 3, and Duquesne Light duct banks, as well as the Peoples Natural Gas 18" gas line that cross along the existing bridge, would be replaced and installed on the new bridge structure. The existing fire hydrant would need to be removed and reset. Existing water and gas valves would need to be grade adjusted at their existing locations.

Alternative 2 would require the entire existing superstructure to be removed and the existing abutments to be increased in height and modified to facilitate the new superstructure. The proposed span length is 65'-9" measured from the centerline of bearings at Abutment 1 to the centerline of bearings at Abutment 2. This represents an increase of approximately 5.75' over the existing span length (2.875' at each abutment) to improve abutment stability considering the increased heights and increased superstructure reactions.

The proposed superstructure is a single-span prestressed concrete spread box beam bridge. The reinforced concrete deck would be 8" thick and is supported by 33 concrete box beams. The box beams would be flared, ranging in spacing from 6'-0" center to center at Abutment 2 to 7'-9 7/8" (-) center to

center at Abutment 1, with three beams along the centerline of the bridge at 7'-9 7/8" (-), as required by the configuration of roadway lanes on the bridge. The box beams would be 48" wide and 30" deep.

The existing abutments would be increased in height to facilitate the increased vertical clearance. In addition, Abutment 2 would be lengthened to correspond with the new superstructure plan-view configuration. Backwalls would not be required for the revised abutments. Approach slabs would be provided at each abutment with sleeper slabs and pavement relief joints. The possibility of replacing backfill with lightweight material to reduce lateral loading would be considered with this alternative.

Alternative 2 is anticipated to have a low potential for waste management impacts. Management of contaminated groundwater is not expected for Alternative 2. Special provisions may be required for the management of painted steel in accordance with applicable Federal, state, and local requirements. In the event that historic fill containing potential non-hazardous waste (i.e., slag, cinders, and fly ash) is encountered during construction, special provisions will be developed to address the management and disposal of these materials.

Alternative 2 activities that could affect historic properties include the replacement of the W. North Avenue Bridge superstructure; repairs to the substructure necessary to raise the bridge; increasing the vertical grade of the bridge approaches and sidewalks; side street adjustments to accommodate the roadway profile change; temporary construction impacts due to sidewalk replacement, driveway adjustments and retaining wall and toe wall construction along several of the adjacent properties; permanent property acquisitions for embankment slopes in all four quadrants; and permanent property takes and temporary construction easements required for fill slopes in Allegheny Commons Park due to the bridge raising and construction.

Alternative 2 has a high potential to affect the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District. The alternative would require replacement of the W. North Avenue Bridge superstructure and repairs to the substructure necessary to raise the bridge. The W. North Avenue Bridge is a contributing element of the NRHP-eligible railroad corridor historic district, and its removal would affect the characteristics of the historic district that qualify it for NRHP eligibility. The existing through-girder superstructure would be replaced with a single-span prestressed concrete spread box beam bridge and would result in a substantial visual change within the railroad corridor historic district. The expanded footprint of the bridge to the southeast and northwest would alter and obscure the concrete retaining walls with stone coping, remove portions of the standard railroad safety railings north of the bridge, and remove portions of the decorative wrought-iron fencing south of the bridge in this grade-depressed section of the corridor. All of these elements contribute to the railroad corridor historic district and their removal would affect the characteristics that contribute to the historic significance of the district.

Alternative 2 has a low potential to affect the NRHP-listed Allegheny West Historic District. No project activities would occur within the boundary of the historic district. The proposed vertical alignment adjustment in the 800 block of Beech Avenue would terminate approximately 225' east of the historic district's eastern boundary and its nearest contributing property at 824 Beech Avenue. The vertical alignment adjustment in the 900 block of Brighton Road would terminate approximately 90' north of the historic district's northeast boundary and its nearest contributing property at 913 Brighton Road.

Alternative 2 has a low potential to affect the NRHP-listed Mexican War Streets Historic District. No project activities would occur within the boundary of the historic district. The proposed vertical alignment adjustment in the 700 block of W. North Avenue would terminate approximately 35' west of the historic district's southeast boundary at the corner of W. North Avenue and Buena Vista Street and approximately 185' south of its nearest contributing property at 1201 Buena Vista Street. The proposed vertical alignment adjustment in the 700 block of Eloise Street would terminate approximately 60' west of the historic district's western boundary along Drovers Way and approximately 60' west of its nearest contributing property at 1201 Buena Vista Street.

Alternative 2 has a moderate to high potential to affect the NRHP-listed Allegheny Commons Historic District. The proposed vertical alignment adjustment in the 700 block of W. North Avenue and in the 900 and 1000 blocks of Brighton Road would require temporary construction impacts due to sidewalk replacement, and toe wall construction, and permanent property acquisitions for fill slopes along a small portion of the historic district's north and west boundaries. The permanent property impact in the park would be approximately 0.09 acre and the temporary impact would be 0.04 acre. The replacement W. North Avenue Bridge would incorporate a triangular concrete covering over the railroad corridor extending approximately 35' east of the current outside edge of the present bridge and within the historic district. The existing bus shelter in the 700 block of W. North Avenue would be grade adjusted, and the existing retaining wall and pedestrian railing along the east side of Brighton Road would be replaced with a new retaining wall and pedestrian railing.

Alternative 2 has a moderate potential to affect the NRHP-eligible Allegheny Second Ward Industrial Historic District. Activities within the district would include approximately 160' of roadway approach work within the 800 block of W. North Avenue, a vertical alignment adjustment to Rope Way to accommodate the raised profile adjustment to W. North Avenue, roadway pavement and sidewalk reconstruction, and the construction of a fill slope and a retaining wall, both with pedestrian railings. The proposed vertical alignment adjustment in the 800 block of W. North Avenue would increase the profile grade to a maximum of 8%. Sidewalk grades would follow the roadway profile except for the sidewalk segment fronting the International Harvester Building, a contributing element of the historic district, which would have a sidewalk length of 90' consisting of 30' lengths of 8.3% with three 5' level landings, to meet ADA requirements. The ramp runs would be separated from the roadway with a proposed landscape area in order to maintain access to the building's existing main entrance. While the doorway would not require alteration, the partially infilled first-floor display windows east of the doorway would need to be shortened by raising the limestone water table and sills to accommodate the increased vertical alignment of the sidewalk. This same treatment was used on the building when W. North Avenue was initially grade separated ca. 1906, resulting in the stepped limestone water table seen on the building today. Concrete stairs would be constructed to access the existing walkway along the building's northeast façade, and a 27' retaining wall with a protective fence would be constructed along W. North Avenue between the stairs and the new bridge. The former Hipwell Manufacturing Company complex consists of five separate buildings, all of which contribute to the historic district. The proposed vertical alignment adjustment in the 800 block of W. North Avenue would only affect the eastern-most Hipwell building (825-829 W. North Avenue) where the profile of an approximately 25' segment of sidewalk would be raised to accommodate the new profile of W. North Avenue. The two remaining contributing buildings of the historic district located in the APE, the Katsafanas Coffee Company Building (828 W. North Avenue) and the Allegheny City Stables Building (836 W. North Avenue), would not be directly affected by project activities.

Alternative 2 has a moderate to high potential to affect the NRHP-listed International Harvester Building as noted in the above assessment of the Allegheny Second Ward Industrial Historic District. The building would be directly affected by the shortening of the first-floor display windows, the raising of the limestone water table and windowsills, and the construction of a concrete stair to access an existing walkway along the building's northeast facade.

Alternative 2 has a low potential to affect the NRHP-eligible Allegheny City Stables Building. No project activities would occur within the property boundary. The proposed vertical alignment adjustment in the 800 block of W. North Avenue would terminate approximately 100' east of the property boundary.

Overall, Alternative 2 is anticipated to have a moderate to high potential to impact historic properties.

This alternative would have a high potential to impact Section 2002 resources since it would result in the replacement of the contributing W. North Avenue Bridge superstructure as well as both temporary and permanent impacts to the Allegheny Commons Park/Historic District. It could also result in impacts to the Allegheny Second Ward Industrial Historic District and International Harvester Building, which is both a contributing element of the Second Ward Industrial Historic District and individually listed in the NRHP.

4.3.3 Alternative 3—Replace bridge and lower railroad tracks to achieve 22' vertical clearance

Alternative 3 would lower the railroad tracks to achieve 22' of vertical clearance and replace the bridge at the same roadway elevation. For the track lowering, buttressing of the existing retaining walls and site work would need to be performed for distances well beyond the W. North Avenue crossing. In order to accommodate the approximately 7,228' of required buttressing of the existing bridge abutments and adjacent retaining walls, the number of tracks would need to be reduced from four to three from Federal Street to just north of Pennsylvania Avenue, which would reduce the flexibility and fluidity of Norfolk Southern's operations through the area and incur increased operation costs. The work would entail the removal of all four tracks and associated turnouts and the reconfiguration of the CP Penn interlocking within the project limits. This would result in the significant interruption of interstate freight rail through the region. A new CP Penn interlocking would be constructed in addition to a new interlocking at Federal Street where the Conemaugh Line would be reduced from two tracks to one track. Approximately 7,700 track feet (TF) of new track, 16 new turnouts, and approximately 8,900 TF of track lining would be installed. Retaining present operational capacity with four tracks would be significantly more expensive, requiring the replacement of the existing retaining walls, potential impacts to three properties, major impacts to park property, and additional utility relocations.

The roadway work would require replacing existing approach slabs, reconstructing the W. North Avenue and Brighton Road intersection to the limits of the ADA ramps, highway lighting upgrades, traffic signal upgrades, and widening the western approach of W. North Avenue to Rope Way to provide the necessary lane configuration. Roadway approach work along W. North Avenue would extend approximately 150' to the west and 80' to the east of the bridge. Roadway approach work along Brighton Road would extend approximately 60' to the south and 80' to the north of the bridge. Existing bike lanes along Brighton Road would be maintained. A right turn bypass from eastbound W. North Avenue to southbound Brighton Road will be eliminated to exclude free flow traffic due to limited sight distance. "No Turn on Red" signs would be installed to increase safety. (Note: existing sight distance requirements are not met at this location either.)

Both W. North Avenue and Brighton Road would be closed to traffic during bridge reconstruction. Brighton Road traffic would have a 2.5-mile detour across the Pennsylvania Avenue and West Ohio Street Bridges. W. North Avenue traffic would have a 1.5-mile detour across the West Ohio Street Bridge.

Temporary construction easements would also be required along several properties, including through Allegheny Commons Park, for the construction of the wall buttressing. The temporary construction easements through the park would be approximately 0.94 acre of temporary disturbance.

Utilities that would be impacted under Alternative 3 include utility poles along W. North Avenue west of the intersection and along Brighton Road north of the intersection. Verizon, Level 3, and Duquesne Light duct banks, as well as the Peoples Natural Gas 18" gas line, that cross along the existing bridge would be replaced and installed on the new bridge structure. The existing fire hydrant would need to be removed and reset. Existing water and gas valves would need to be grade adjusted in the vicinity of the bridge approach work. The PWSA 30" watermain and the 345kV/138kV high voltage Duquesne Light primary line would also need to be relocated. The relocations of the 30" watermain and 345kv/138kv high voltage Duquesne Light primary are both significant mains that would require considerable impacts outside the general project limits including: temporary interruptions to services; substantial coordination between the project design and construction teams and each utility; deep jack and bore pits to jack the utilities under the PWSA combined sewer; impacts to the Brighton and Beech intersection; and impacts to the park.

Alternative 3 would require the removal of the entire existing superstructure and require the existing abutments to be modified in height and width to facilitate the new superstructure. The proposed superstructure would be a single-span prestressed concrete spread box beam bridge. The reinforced concrete deck would be 8" thick and would be supported by 33 concrete box beams measuring 48" wide and 30" deep. The box beams would be flared, ranging in spacing from 6'-0" center to center at Abutment 2 to 7'-9 7/8" (-) center to center at Abutment 1, with three beams along the centerline of bridge at 7'-9 7/8" (-), as required by the configuration of the roadway lanes on the bridge. Abutment 2 would be lengthened to correspond with the new superstructure plan-view configuration. Backwalls would not be required for the revised abutments. Approach slabs would be provided at each abutment with sleeper slabs and pavement relief joints.

Alternative 3 is anticipated to have a moderate to high impact relative to the other alternatives for waste management due to the increased potential for management of contaminated historic fill and groundwater. Excavation is likely to require dewatering. Shallow groundwater was encountered just below the surface when test pits were excavated along the railroad retaining wall in 2020. Special provisions would be prepared for the testing, management, and disposal of historic fill and groundwater if encountered during construction. Special provisions would also be developed to properly manage painted steel during repairs, removal, and/or repainting similar to the other alternatives.

Alternative 3 activities that could affect historic properties include the replacement of the W. North Avenue bridge superstructure; modifications in height and width to the existing abutments to facilitate the new superstructure; roadway work, including replacing existing approach slabs, reconstructing the W. North Avenue and Brighton Road intersection to the limits of the ADA ramps, and widening the western approach of W. North Avenue and Rope Way to provide the necessary lane configuration; the buttressing of approximately 7,228' of existing retaining walls and bridge abutments; the reduction in the number of

tracks from four to three; and temporary construction easements affecting several properties, including the Allegheny Commons Historic District.

Alternative 3 has a high potential to affect the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District. The alternative would require replacement of the W. North Avenue Bridge superstructure and repairs to the substructure necessary to raise the bridge. The W. North Avenue Bridge is a contributing element of the NRHP-eligible railroad corridor historic district, and its removal would affect the characteristics of the historic district that qualify it for NRHP eligibility. The existing through-girder superstructure would be replaced with a single-span prestressed concrete spread box beam bridge and would result in a substantial visual change within the railroad corridor historic district. The expanded footprint of the bridge to the southeast and northwest would alter and obscure the concrete retaining walls with stone coping, remove portions of the standard railroad safety railings north of the bridge, and remove portions of the decorative wrought-iron fencing south of the bridge in this grade depressed section of the corridor. All of these elements contribute to the railroad corridor historic district and their removal would affect the characteristics of the historic district that qualify it for NRHP eligibility. Minor repairs to the bridge's substructure, the removal of ballast, and the removal of one track would not affect the characteristics of the railroad corridor historic district that qualify it for NRHP eligibility. However, the required buttressing of approximately 7,228' the concrete retaining walls to provide stability necessary for track lowering would alter the design of the walls and reduce the clear width of the railroad corridor, which contribute to the character of the historic district, resulting in a high potential to impact the historic property.

Alternative 3 has a low potential to affect the NRHP-listed Allegheny West Historic District. No project activities would occur within the boundary of the historic district. The proposed roadway work in the 1000 block of Brighton Road would terminate approximately 275' north of the historic district's northeast boundary and nearest contributing property at 913 Brighton Road and would be located approximately 240' east of the historic district's eastern boundary and nearest contributing property at 824 Beech Avenue.

Alternative 3 has a low potential to affect the NRHP-listed Mexican War Streets Historic District. No project activities would occur within the boundary of the historic district. The proposed roadway work in the 700 block of W. North Avenue would terminate approximately 175' west of the historic district's southeast boundary at the corner of W. North Avenue and Buena Vista Street.

Alternative 3 has a moderate potential to affect the NRHP-listed Allegheny Commons Historic District. Temporary construction easements would be required for the construction of the wall buttressing. The temporary construction easements through the park would be approximately 0.94 acre. The replacement W. North Avenue Bridge would incorporate a triangular concrete covering over the railroad corridor extending approximately 35' east of the current outside edge of the present bridge and within the historic district.

Alternative 3 has a low potential to affect the NRHP-eligible Allegheny Second Ward Industrial Historic District. No project activities would occur within or adjacent to the property boundaries of the district's contributing buildings within the APE, including the International Harvester Building (810-822 W. North Avenue), the Katsafanas Coffee Company Building (828 W. North Avenue), the Allegheny City Stables Building (836 W. North Avenue), and the five buildings comprised by the former Hipwell Manufacturing

Company complex (825-839 W. North Avenue). Project activities adjacent to the district's southern boundary along W. North Avenue and Rope Way would include the proposed bridge replacement and approach slab work and the widening of the western approach of W. North Avenue and Rope Way. While both activities would be within the viewshed of the district, the visual impact would be minor and would not affect the characteristics of the historic district that qualify it for the NRHP.

Alternative 3 has low potential to affect the NRHP-listed International Harvester Building as noted in the above assessment of the Allegheny Second Ward Industrial Historic District. No project activities would occur within or next to the property boundary. The proposed bridge replacement and approach slab work would terminate approximately 25' east of the property boundary, and the widening of the western approach of W. North Avenue and Rope Way to provide the necessary lane configuration would be located approximately 40' south of the building's south (front) façade. While both activities would be within the viewshed of the building, the visual impact to the International Harvester Building would be minor and would not affect the characteristics of the property that qualify it for the NRHP.

Alternative 3 has a low potential to affect the NRHP-eligible Allegheny City Stables Building. No project activities would occur within the property boundary. The proposed widening of the western approach of W. North Avenue and Rope Way in the 800 block of W. North Avenue would terminate approximately 130' east of the property boundary.

Overall, Alternative 3 is anticipated to have a moderate to high potential to impact historic properties.

This alternative would have a high potential to impact Section 2002 resources since it would result in the replacement of the contributing W. North Avenue Bridge superstructure as well as potential impacts to the Allegheny Commons Park/Historic District.

4.3.4 Alternative 4—Combination replace and raise bridge and lower railroad tracks to achieve 22' vertical clearance

Alternative 4 would raise the bridge a maximum of 3'-9" and lower the railroad tracks approximately 6" under the bridge to achieve 22' of vertical clearance over the railroad tracks. Roadway approach work along W. North Avenue would extend approximately 155' to the west and 240' to the east of the bridge. Roadway approach work along Brighton Road would extend approximately 210' to the south and 340' to the north of the bridge. Approach work would include roadway pavement and sidewalk reconstruction, including the construction of a retaining wall in the northwest quadrant and toe walls with pedestrian railings along Brighton Road. Due to the profile change, side street adjustments are required along Beech Avenue, Eloise Street, and the Buncher property driveway at 1201 Brighton Road.

The existing lane configuration, including the Brighton Road bike and parking lanes, would be maintained in Alternative 4. A right turn bypass from eastbound W. North Avenue to southbound Brighton Road would be eliminated to exclude free flow traffic due to limited sight distance. "No Turn on Red" signs would be installed to increase safety. (Note: existing sight distance requirements are not met at this location either.)

The proposed vertical alignment would increase the profile grade to be a maximum of 8% on W. North Avenue and a maximum of 6.8% on Brighton Road. Sidewalk grades would follow the roadway profile, with the exception of the sidewalk in the northwest quadrant, which is proposed to have a sidewalk length

of 40’ with ramp runs of 8.3% and two 5’ level landings. The ramp runs would be separated from the roadway with a proposed landscape area in order to maintain access to the existing entry door at 810-822 W. North Avenue.

The profile change would result in approximately 365’ of toe wall with a pedestrian handrail along the exterior edge of the reconstructed sidewalk along both sides of Brighton Road on both approaches to the raised bridge. A retaining wall of 27’ with a protective fence would be needed in the northwest quadrant along W. North Avenue between the bridge and the proposed stairs to the existing walkway along the exterior of the 810-822 W. North Avenue building. Proposed fencing would be set along the exterior edge of the sidewalk in the southwest and northeast quadrants.

Work along the railroad corridor to lower the railroad tracks to the required elevation based on the necessary track design requirements would extend a total of approximately 3,310’. This total length includes approximately 1,225' southeast of the bridge, terminating just north of the West Ohio Street Bridge, and approximately 2,085' northwest of the bridge, terminating between the Pennsylvania Avenue and Columbus Avenue bridges. Several turnouts within the trackwork limits would require adjusting and the switching lead into the yard would need to be raised and adjusted.

Both W. North Avenue and Brighton Road would be closed during bridge reconstruction. Brighton Road traffic would have a 2.5-mile detour across the Pennsylvania Avenue and West Ohio Street bridges. W. North Avenue traffic would have a 1.5-mile detour across the West Ohio Street Bridge.

Property impacts under Alternative 4 would include temporary construction impacts due to sidewalk replacement, driveway adjustments, and retaining wall and toe wall construction along several of the adjacent properties, along with permanent property acquisitions for embankment slopes in all four quadrants. Fill slopes in Allegheny Commons Park due to the bridge raise and the bridge construction phase would require both permanent property takes and temporary construction easements. The permanent property impact in the park would be approximately 0.09 acre and the temporary impact would be 0.04 acre.

Utilities that would be impacted under Alternative 4 include utility poles along W. North Avenue west of the intersection and along Brighton Road north of the intersection. Verizon, Level 3, and Duquesne Light ductbanks, as well as the Peoples Natural Gas 18” gas line that cross along the existing bridge, would be replaced and installed on the new bridge structure. The existing fire hydrant would need to be removed and reset. Existing water and gas valves would need to be grade adjusted. The PWSA 30” watermain and the 345kV/138kV high voltage Duquesne Light primary line would need to be assessed for probable relocation due to a reduction in cover/embankment. If relocation is required, the 30” watermain and 345kv/138kv high voltage Duquesne Light primary are both significant mains that would require considerable impacts outside the general project limits including: temporary interruptions to services; substantial coordination between the project design and construction teams and each utility; deep jack and bore pits to jack the utilities under the PWSA combined sewer; impacts to the Brighton and Beech intersection; and impacts to the park.

Alternative 4 would require the removal of the entire existing superstructure and require the existing abutments to be modified in height and width to facilitate the new superstructure. The proposed superstructure would be a single-span prestressed concrete spread box beam bridge. The reinforced

concrete deck would be 8" thick and would be supported by 33 concrete box beams measuring 48" wide and 30" deep. The box beams are flared, ranging in spacing from 6'-0" center to center at Abutment 2 to 7'-9 7/8" (-) center to center at Abutment 1, with three beams along the centerline of bridge at 7'-9 7/8" (-), as required by the configuration of roadway lanes on the bridge. Abutment 2 would be lengthened to correspond with the new superstructure plan-view configuration. Backwalls are not required for the revised abutments. Approach slabs would be provided at each abutment with sleeper slabs and pavement relief joints. The possibility of replacing backfill with lightweight material to reduce lateral loading would be considered with this alternative.

Alternative 4 is anticipated to have a low to moderate impact relative to the other alternatives for waste management due to the moderate potential for management of contaminated historic fill and groundwater. It is unlikely that groundwater would be encountered for Alternative 4. Special provisions would be prepared for the testing, management, and disposal of historic fill, if encountered during construction. Special provisions would also be developed to properly manage painted steel during repairs, removal, and/or repainting similar to other alternatives.

Alternative 4 activities that could affect historic properties include the replacement of the W. North Avenue bridge superstructure; repairs to the substructure necessary to raise the bridge; approximately 3,310' of track lowering, increasing the vertical grade of the bridge approaches and sidewalks; side street adjustments to accommodate the roadway profile change; temporary construction impacts due to sidewalk replacement, driveway adjustments, and retaining wall and toe wall construction along several of the adjacent properties; permanent property acquisitions for embankment slopes in all four quadrants; and permanent property takes and temporary construction easements required for fill slopes in Allegheny Commons Park due to the bridge raising and construction.

Alternative 4 has a high potential to affect the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District. The alternative would require replacement of the W. North Avenue Bridge superstructure, repairs to the substructure necessary to raise the bridge, and approximately 3,310' of track lowering. The W. North Avenue Bridge is a contributing element of the NRHP-eligible railroad corridor historic district, and its removal would affect the characteristics of the historic district that qualify it for NRHP eligibility. The existing through-girder superstructure would be replaced with a single-span prestressed concrete spread box beam bridge and would result in a substantial visual change within the railroad corridor historic district. The expanded footprint of the bridge to the southeast and northwest would alter and obscure the concrete retaining walls with stone coping, remove portions of the standard railroad safety railings north of the bridge, and remove portions of the decorative wrought-iron fencing south of the bridge in this grade depressed section of the corridor. All of these elements contribute to the railroad corridor historic district and their removal would affect the characteristics of the historic district that qualify it for NRHP eligibility. The removal of ballast for the track lowering, however, would not affect the characteristics of the historic district that qualify it for NRHP eligibility.

Alternative 4 has a low potential to affect the NRHP-listed Allegheny West Historic District. No project activities would occur within the boundary of the historic district. The proposed vertical alignment adjustment in the 800 block of Beech Avenue would terminate approximately 225' east of the historic district's eastern boundary and nearest contributing property at 824 Beech Avenue. The vertical

alignment adjustment in the 900 block of Brighton Road would terminate approximately 90' north of the historic district's northeast boundary and nearest contributing property at 913 Brighton Road.

Alternative 4 has a low potential to affect the NRHP-listed Mexican War Streets Historic District. No project activities would occur within the boundary of the historic district. The proposed vertical alignment adjustment in the 700 block of W. North Avenue would terminate approximately 35' west of the historic district's southeast boundary at the corner of W. North Avenue and Buena Vista Street and approximately 185' south of its nearest contributing property at 1201 Buena Vista Street. The proposed vertical alignment adjustment in the 700 block of Eloise Street would terminate approximately 60' west of the historic district's western boundary along Drovers Way and approximately 60' west of its nearest contributing property at 1201 Buena Vista Street.

Alternative 4 has a moderate to high potential to affect the NRHP-listed Allegheny Commons Historic District. The proposed vertical alignment adjustment in the 700 block of W. North Avenue and in the 900 and 1000 blocks of Brighton Road would require temporary construction impacts due to sidewalk replacement and toe wall construction, and permanent property acquisitions for fill slopes along a small portion of the historic district's north and west boundaries. The permanent property impact in the park would be approximately 0.09 acre and the temporary impact in the park would be 0.04 acre. The replacement W. North Avenue Bridge would incorporate a triangular concrete covering over the railroad corridor extending approximately 35' east of the current outside edge of the present bridge and within the historic district. The existing bus shelter in the 700 block of W. North Avenue would be grade adjusted, and the existing retaining wall and pedestrian railing along the east side of Brighton Road would be replaced with a new retaining wall and pedestrian railing.

Alternative 4 has a moderate potential to affect the NRHP-eligible Allegheny Second Ward Industrial Historic District. Activities within the district would include approximately 160' of roadway approach work within the 800 block of W. North Avenue, a vertical alignment adjustment to Rope Way to accommodate the raised profile adjustment to W. North Avenue, roadway pavement and sidewalk reconstruction, and the construction of a fill slope and a retaining wall, both with pedestrian railings. The proposed vertical alignment adjustment in the 800 block of W. North Avenue would increase the profile grade to a maximum of 8%. Sidewalk grades would follow the roadway profile except for the sidewalk segment fronting the International Harvester Building, a contributing element of the historic district, which would have a sidewalk length of 90' consisting of 30' ramp runs of 8.3% with two 5' level landings. The ramp runs would be separated from the roadway with a proposed landscape area in order to maintain access to the building's existing main entrance. While the doorway would not require alteration, the partially infilled first-floor display windows east of the doorway would need to be shortened by raising the limestone water table and sills to accommodate the increased vertical alignment of the sidewalk. This same treatment was used on the building when W. North Avenue was initially grade separated ca. 1906, resulting in the stepped limestone water table seen on the building today. Concrete stairs would be constructed to access the existing walkway along the building's northeast façade, and a 27' retaining wall with a protective fence would be constructed along W. North Avenue between the stairs and the new bridge. The former Hipwell Manufacturing Company complex consists of five separate buildings, all of which contribute to the historic district. The proposed vertical alignment adjustment in the 800 block of W. North Avenue would only affect the eastern-most Hipwell building (825-829 W. North Avenue) where the profile of an approximately 25' segment of sidewalk would be raised to accommodate the new profile of W. North

Avenue. The two remaining contributing buildings of the historic district located in the APE, the Katsafanas Coffee Company Building (828 W. North Avenue) and the Allegheny City Stables Building (836 W. North Avenue), would not be directly affected by project activities.

Alternative 4 has a moderate to high potential to affect the NRHP-listed International Harvester Building as noted in the above assessment of the Allegheny Second Ward Industrial Historic District. The building would be directly affected by the shortening of the first-floor display windows, the raising of the limestone water table and windowsills, and the construction of a concrete stair to access an existing walkway along the building's northeast facade.

Alternative 4 has a low potential to affect the NRHP-eligible Allegheny City Stables Building. No project activities would occur within the property boundary. The proposed vertical alignment adjustment in the 800 block of W. North Avenue would terminate approximately 100' east of the property boundary.

Overall, Alternative 4 is anticipated to have a moderate to high potential to impact historic properties.

This alternative would have a high potential to impact Section 2002 resources since it would result in the replacement of the contributing W. North Avenue Bridge superstructure as well as both temporary and permanent impacts to the Allegheny Commons Park/Historic District. It could also result in impacts to the Allegheny Second Ward Industrial Historic District and International Harvester Building, which is both a contributing element of the Second Ward Industrial Historic District and individually listed in the NRHP.

4.3.5 Alternatives Comparison Summary

Alternative 1 would not meet the needs of the project and therefore can be eliminated from consideration. Alternative 2 would meet the project need and would result in the lowest construction cost and utility impacts but would require the most property impacts of any of the alternatives. Alternative 3 would meet the project need and would have the least property impacts; however, it would have the most utility impacts, would result in the greatest total construction length and cost, and four railroad tracks would not be able to be maintained through the corridor with this alternative. Alternative 4 would meet the project need but would result in the second greatest overall cost and construction length. It would also result in similar utility impacts as Alternative 3. When accounting for impacts to the surrounding community, project complexity, and potential historic and Section 2002 property impacts, Alternative 2 is recommended to be advanced for further consideration. A comparison matrix of the four identified alternatives is included in **Appendix D.**

4.3.6 Design Modification Options

A design modification was considered that involves an adjustment to the vertical alignment, typical section, and sidewalk treatment to maintain access to the entry door at the 810-822 W. North Avenue property and limit other property impacts.

The design modification would replace the bridge to 21'-4" vertical clearance instead of 22'-0" vertical clearance, while proposing the same vertical profile grades and impacts along W. North Avenue and Brighton Road as Alternative 2. The W. North Avenue profile has a maximum 8.0% grade on the west approach to the intersection and 7.15% grade on the east approach, with points of reverse vertical curvature on either side tying into flatter slopes from the intersection. The Brighton Road profile has a maximum 6.8% grade on the south approach and a 6.0% grade on the north approach to the intersection,

with each of these grades tying into points of reverse vertical curvature on the south and north ends further from the intersection with flatter grades. Similar to Alternative 2, the design modification would maintain the existing lane configuration and bike lanes; however, construction limits of the design modification would be reduced 25' on the western approach of W. North Avenue and 15' on the northern approach of Brighton Road compared to Alternative 2 due to the lower vertical clearance over the railroad. The eastern approach of W. North Avenue and the southern approach of Brighton Road tie in at the same point as Alternative 2.

Impacts to utilities would be similar to the impacts from the proposed roadway and bridge work of Alternative 2.

Property impacts under the design modification would include temporary construction impacts due to sidewalk replacement, driveway adjustments, and retaining wall and toe wall construction along several of the adjacent properties, along with permanent property acquisitions for embankment slopes in all four quadrants. Fill slopes in Allegheny Commons Park due to the bridge raise and the bridge construction phase would require both permanent property takes and temporary construction easements. The permanent property impact in the park would be approximately 0.09 acre and the temporary impact would be 0.04 acre.

The design modification would have a reduced impact to the abutment reconstruction due to the lower vertical clearance but there would be no change to the superstructure from Alternatives 2 and 4.

The design modification is anticipated to have no benefit or drawbacks with respect to waste management when applied to Alternative 2.

The design modification is still anticipated to have a moderate to high potential to impact historic properties and high potential to impact Section 2002 resources, but some of the impacts would be minimized.

4.4 Selection of Preferred Alternative

Based on these considerations, Alternative 2–Replace and raise bridge, with the design modification of raising the bridge to 21'-4" vertical clearance is the preferred alternative for the W. North Avenue Bridge Project.

5.0 Allegheny Commons Pedestrian Bridge

The Allegheny Commons Pedestrian Bridge project is located in the City of Pittsburgh, Allegheny County, Pennsylvania. See **Figure 5-1** for a location map.

Alternatives have been identified to address the purpose and need for the Pittsburgh Vertical Clearance Projects and to meet PUC requirements. The alternatives will be discussed in further detail later in this chapter. Below is a brief description of each alternative:

- Alternative 1 – No Build Alternative
- Alternative 2 – Steel girder bridge with 10'-wide approach paths to achieve 22'-0" vertical clearance
- Alternative 3 – Through girder bridge with 6'-wide approach paths to achieve 21'-4" vertical clearance

Conceptual plans and profiles for each Build alternative as well as typical sections can be found in **Appendix B.** Conceptual cost estimates for each Build alternative can be found in **Appendix C**. An Alternatives Comparison Matrix is included in **Appendix D**.

5.1 Environmental Considerations

As noted in Chapter 1, this section discusses those resources that could influence the selection of a preferred alternative for this project location. The Act 120 document will analyze impacts of the preferred alternative on these and the remaining of the 23 resource categories.

5.1.1 Hazardous or Residual Waste Sites

A Phase II ESA was performed in conjunction with geotechnical drilling for the bridge. The fill consisted of soil with trace brick fragments and had no evidence of residuals (e.g., slag or cinders) or contamination. One of four borings (PB-3) had black colored fill with an odor like rotting vegetation or sewage. It was located near a sewer main. This discolored fill was tested and found to meet the clean fill limits. Therefore, excavated materials can be managed as clean fill. Additionally, the existing bridge abutment masonry materials were tested for asbestos. No asbestos was detected above the EPA criteria level of 1%.

5.1.2 Historic Properties

The APE for the proposed undertaking contains two historic properties. The Allegheny Commons Historic District was listed in the NRHP on September 17, 2013. Character-defining features identified in the nomination form that are located within the APE include plantings, paths, and topography; decorative wrought iron fencing along the railroad corridor; lighting; a deer sculpture; the Soldiers Monument; concrete stairs; and the former concrete pedestrian bridge, the center span of which was demolished in 2013. The Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District was determined eligible for the NRHP on September 14, 1993. As part of the current study, contributing elements of the railroad corridor historic district were identified within the approximately 566-foot segment of the corridor contained within the APE. Project historians identified three contributing elements of the railroad corridor historic district as being functional and/or decorative components that were constructed during the corridor's period of significance and that retain historic integrity. These include the concrete retaining walls with stone coping along the outer edges of the

depressed section of rail corridor, decorative wrought-iron fencing, and the former pedestrian bridge, all of which are attributable to an early-twentieth-century grade separation project.

5.1.3 Section 2002 Resources

There are two Section 2002 resources located in the project vicinity, the NRHP-listed Allegheny Commons Historic District and the NRHP-eligible Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District. Potential impacts to both of these resources may occur as the result of the Build Alternatives.

5.1.4 Air Quality

The current National Ambient Air Quality Standard designations for the Pittsburgh area pollutants are:

- Marginal nonattainment for the 2008 ozone standard
- Maintenance for the 1971 carbon monoxide standard
- Maintenance for the 2006 PM2.5 standard
- Moderate nonattainment for the 2012 PM2.5 standard
- Nonattainment for the 2010 SO2 standard
- Attainment for lead
- Attainment for NO2

The proposed project will not have a direct effect on air quality with the exception of minor construction related emissions for Alternatives 2 and 3, which would consist of construction equipment regulated under EPA emission standards. NSR has conducted a project-level air quality analysis for the Pittsburgh Vertical Clearance Projects corridor to evaluate secondary or indirect effects on air quality (see **Appendix E**). A general conformity determination is not required since there is no federal action or federal money being used for the project. The No Build Alternative would not result in any impacts to air quality. However, due to the inability to utilize more efficient double-stack containers and the need for additional train trips to accommodate future forecasted freight needs, with a commensurate increase in locomotive emissions for single-stack trains, future emissions would increase slightly under the No Build Alternative as compared to Alternatives 2 and 3, where the more efficient double-stack trains would allow for fewer trains and lower locomotive emissions for the same freight needs. It is anticipated that Alternatives 2 and 3 would have similar impacts on emissions levels. Therefore, from an emissions perspective, any of the approaches to achieving the needed vertical clearance at these locations are considered the same. With the Build alternatives, there would be a slight net reduction in annual regional locomotive operational emissions in comparison to both existing and future 2045 No Build emission levels, and therefore no significant adverse impacts would result with implementation of the project.

5.1.5 Noise

Direct noise effects will be limited to temporary construction-related impacts. The No Build Alternative would have no noise effects. Any noise effects of the Build alternatives would be temporary and the difference between Build alternatives would not be significant.

Regarding indirect or secondary effects, NSR has conducted a noise impact assessment to evaluate the potential impacts associated with the Pittsburgh Vertical Clearance Projects corridor (see **Appendix F**). Noise levels would be slightly higher under the No Build Alternative than Alternatives 2 and 3 due to the

greater number of single-stack trains that would be required to accommodate future rail traffic demand as compared to the fewer double-stack trains capable of carrying the same amount of rail freight. Existing noise levels were measured at three sites near the Allegheny Commons Pedestrian Bridge Project location: the Iron Deer Playground at Allegheny Commons Park West, 710 W. North Avenue, and 410 W. Commons. All three of these locations contain both Category 2 (where people sleep) and Category 3 (institutional) land use categories. There were no Category 2 or Category 3 sensitive land use sites predicted to be above the Surface Transportation Board noise impact threshold identified near the Allegheny Commons Pedestrian Bridge project location under both the No Build and the Build alternatives for both low-growth and high-growth scenarios. The dominant consideration for noise in these circumstances is the number of trains per day, and that would not be different for any of the Build alternatives for these projects. Therefore, from a noise perspective, any of the approaches to replacing the pedestrian bridge in the same location are considered the same.

5.1.5 Vibration

NSR conducted a vibration analysis for the Pittsburgh Vertical Clearance Projects corridor in consideration of guidance provided by the Pennsylvania History Code (see **Appendix F**). It is anticipated that there will be no impacts as a result of any of the alternatives. Currently, the study corridor is defined as "heavily used" (i.e., more than 12 freight trains per day). Under future conditions there is no change to the train speeds or track locations, other than small reductions in vertical alignment in areas that would result in a negligible change in vibration. Therefore, both the No Build Alternative and Alternatives 2 and 3 would only result in an increase in the number of trains per day. However, because the number of trains is not predicted to result in an increase of 3 VdB or greater at any vibration-sensitive land uses, there would be no vibration impacts under any of the alternatives.

5.2 Engineering Considerations

5.2.1 Roadway

NSR operates four tracks in a depressed corridor through Allegheny Commons Park in the City of Pittsburgh. The construction of a new pedestrian bridge was listed as a priority project in the 2002 Allegheny Commons Master Plan and again in the 2018 Action Plan. The Parks Conservancy developed concept sketches and renderings for a new pedestrian bridge to replace the previous bridge. The alternatives developed for a replacement bridge and associated approach work are based on the Conservancy's concepts as well as other recent local bridge designs along the corridor including West Ohio Street and W. North Avenue.

The existing typical section of the bridge prior to demolition consisted of a 10' path with stairs leading to the bridge. To meet ADA requirements, in addition to stairs, accessible paths are proposed to provide access to the crossing. In order to avoid impacts to the large sewers on the north side of the railroad, the pedestrian bridge will utilize the existing abutments. Typical sections of the pedestrian bridge and the approach paths are included in **Appendix B**.

5.2.2 Structure

The former Allegheny Commons Pedestrian Bridge, constructed circa 1906, was located in Allegheny Commons Park and carried pedestrian traffic over the NSR until it was closed in 1999. The bridge connected the West Commons and Northwest Commons/Lake Elizabeth sections of the park located in the Allegheny Center neighborhood of the City of Pittsburgh. The bridge superstructure was demolished in November of 2013 and only the abutments remain.

The former bridge was a two-girder simple span cast-in-place concrete structure with a total length of approximately 69 feet. The superstructure consisted of two variable depth cast-in-place concrete beams with a minimum depth of 2'-6". The cast-in-place floor beams were 6" wide by 10" deep and spaced at 9'-2" along the bridge. A 10'-wide walkway was supported by a variable 2 1/2 to 4" reinforced concrete composite deck with a 2-inch overlay. Cast concrete parapets flanked the walkway.

The remaining abutments are being considered for reuse for a new pedestrian bridge.

5.2.3 Right-Of-Way

Permanent right-of-way takes and temporary easements for construction for locations for cranes to operate and a construction compound/contractor laydown area are anticipated within Allegheny Commons for Alternatives 2 and 3.

5.2.4 Utilities

Field reconnaissance indicates the presence of the following utilities within or adjacent to the project area:

- The PWSA maintains a 78" diameter combined sewer located directly behind the northeast retaining wall. This sewer is constructed of three-ring brick and has been gunite lined to maintain its integrity. This sewer was inspected via closed circuit television camera (CCTV) in May 2020 and visually appears to be structurally sound, including the area directly in the vicinity of the existing bridge abutment. Based on depths measured at upstream and downstream manholes, the invert of this sewer is approximately 20' deep. Designers have been advised that new construction or modifications to the existing abutment should be configured to ensure that this sewer receives no additional loading.

  A PWSA 36" combined sewer (likely three-ring brick construction) traverses the park and connects to the 78" sewer approximately 85' north of the proposed bridge centerline. The depth to invert of this sewer is estimated at 15'-20' and will not be affected by the pathway construction that will cross it at approximate (pathway) Sta. 51+00.

  A PWSA 36" ductile iron waterline traverses the park and crosses beneath the proposed pathway between station 52+35 and 53+50. This facility is deep and will not be affected by the shallow path construction work and landscaping.

  A PWSA 60" combined sewer of three-ring brick construction traverses the park southwest of the bridge. The sewer is located at the limits of construction and will not be affected by the work.

- Duquesne Light Company (DLC) maintains a 345 KV primary transmission duct bank that traverses the park and crosses beneath the proposed pathway between stations 52+50 and 53+00. This facility is very deep and will not be affected by the shallow path construction work and landscaping.

- Lumen (previously Century Link/Qwest) maintains a fiber optic cable duct bank along the base of the southwestern railroad retaining wall. The duct bank conduits were located via SUE efforts at the toe of the wall footer and are very shallow. Work is not expected to affect these facilities but any activity in proximity to them should be done with caution as many are exposed.

- Elantic maintains a fiber optic cable duct bank along the base of the northeastern railroad retaining wall. The duct bank conduits were located via SUE efforts at the toe of the wall footer and are very shallow. Some are exposed and may be intermingled with NSRR signal cables. Work is not expected to affect these facilities but any activity in proximity to them should be done with caution as many are exposed.

- The City of Pittsburgh Parks Department maintains pedestrian lighting and storm drainage facilities in the park. Record drawings also indicate the presence of buried hose bibbs connected to small diameter waterlines which were likely used for maintenance purposes. No evidence of these was found during field reconnaissance, so they may be either covered over or previously removed. They are shown on the plans accordingly.

  Pedestrian lighting is known to be non-functional and is proposed to be replaced as part of the project. Record drawings are available and indicate that the park lighting is supplied from a panel in the nearby Aviary facility.

  The small diameter storm drainage facilities in the park are likely connected to the PWSA combined sewers. These storm sewers are owned by the City of Pittsburgh Parks Department and are not owned/maintained by PWSA. Minor modifications and/or adjustments may be required to accommodate construction.

- Norfolk Southern maintains a new signal control cabinet with associated underground vault and deep vertical duct bank connection that runs to the base of the northeastern retaining wall. These facilities are in very close proximity to the proposed bridge and are being integrated into the new design. They were also constructed directly above the existing PWSA 78” combined sewer.

5.3 *Alternatives Description and Evaluation*

5.3.1 Alternative 1—No Build Alternative

This alternative would consist of doing nothing to replace the existing Allegheny Commons Pedestrian Bridge. However, this alternative would not meet the project need.

5.3.2 Alternative 2—Steel girder bridge with 10’-wide approach paths to achieve 22’-0” clearance

Alternative 2 would construct a new pedestrian bridge and would achieve 22'-0” of vertical clearance over the railroad corridor. The proposed structure would be on the same horizontal alignment as was the existing structure. Walkway approach work would extend approximately 170’ to the south of the

pedestrian bridge and 160' to the north of the proposed structure. Walkway approach work would include walkway pavement reconstruction, reconstruction of the existing stairs, and construction of pedestrian railings. Oval plazas would be constructed at each end of the structure. Accessible paths would also be constructed at each approach of the proposed structure. Accessible ramp path construction would include retaining walls and pedestrian railings. The southern accessible path would include the construction of an 87’ long toe wall to separate fill slopes from a section of proposed relocated sidewalk. “Roundabout” path connections would be constructed on the south and the north to connect proposed walkways, accessible paths, and existing sidewalks.

The typical section of the proposed walkways and accessible paths would consist of 10’ wide pavement having cross slopes of 1.5%. Side slopes would vary between 2:1 to 4:1. Embankment slopes would potentially impact the drip line of 14 trees. Maximum retaining wall heights would vary between 4’ to 5’. The toe wall would have a maximum height of 2’.

The proposed vertical alignment along the proposed structure would provide a profile grade of 0.75%. Walkway approach grades and sidewalk grades would vary between 1.50% and 5.00%. The accessible ramp path grades would be 5.00%.

The proposed Alternative 2 bridge is a three-girder steel rolled beam structure with a 10’ walkway width plus required barrier/fencing, resulting in an overall width of 12’-1 1/2”. The span length would be 68’-9” to match the existing span length.

The superstructure is supported by six elastomeric bearing pads (three for each CL of bearing), sitting directly underneath the rolled beam girders.

The new structure will be built upon cantilever abutments with spread footings built to bear on the existing abutments demolished down to an elevation equal to the top of the existing railroad retaining walls. The design needs to account for the 72" brick sewer that runs parallel to the retaining wall on the north side of the railway corridor. Any disturbance to the sewer is to be avoided. In addition, it was previously agreed that the new signal cabinet located 70' to the west of the existing structure would be relocated under the bridge as part of this project.

Alternative 2 is anticipated to have a low impact potential with respect to waste management.

Alternative 2 would replace the former pedestrian bridge in the same location with a steel girder bridge with 10’-wide approach paths to achieve 22’-0” vertical clearance. Because the bridge’s center span over the railroad corridor was demolished in 2013, leaving only the abutments and approach stairs remaining, the bridge has lost sufficient historic integrity to no longer be considered a contributing element of both the Allegheny Commons Historic District and the railroad corridor historic district. The replacement of the pedestrian bridge under Alternative 2 would have a moderate potential to affect character-defining features of the Allegheny Commons Historic District such as plantings, existing pathways and stairs, and topography resulting from direct physical impacts related to the construction of new abutments and approaches including ADA-compliant pathways. It is anticipated that Alternative 2 would result in 38,202 square feet of permanent impacts to the Allegheny Commons Historic District as well as temporary impacts for construction staging and access. The embankment slopes would potentially impact the drip line of 14 trees, which have been identified as character-defining features. Alternative 2 also has the potential have visual effects on the Allegheny Commons Historic District resulting from the introduction

of a new pedestrian bridge and its associated approach pathways and stairs. Alternative 2 has a moderate to low potential to affect character-defining features of the Pennsylvania Railroad: Main Line (Harrisburg to Pittsburgh) Railroad Corridor Historic District. Alternative 2 will not alter any of the extant character-defining features of the historic district present within the APE. Alternative 2 has the potential to have a visual impact on the historic district resulting from the introduction of a new pedestrian bridge over the railroad corridor. Overall, Alternative 2 is anticipated to have a moderate potential to impact historic properties.

This alternative would result in a high potential to impact Section 2002 resources since it would result in both permanent and temporary property impacts to the NRHP-listed Allegheny Commons Historic District and potential proximity impacts to the Pennsylvania Railroad: Main Line (Harrisburg to Pittsburgh) Railroad Corridor Historic District.

5.3.3 Alternative 3–Through girder bridge with 6'-wide approach paths to achieve 21'-4" vertical clearance

Based on meetings and comments from the project's Design Advisory Team (DAT) it was agreed to refine Alternative 2 and move forward with the pedestrian bridge in the existing location/alignment with the following goals:

- Minimize retaining walls
- Minimize slopes (4:1 preferred for ease of maintenance)
- Maintain trees
- Re-use existing lower stairs where possible (upper stairs are in poor condition)
- Include oval plazas at bridge level (considered context-sensitive design)
- Keep landscaping minimal due to existing being minimal and to reduce future maintenance
- Use a steel through girder deck while still preserving the concrete panel system
- Reduce the minimum vertical clearance to 21'-4" to match W. North Ave.
- Match existing path widths

Alternative 2 went through multiple refinements to minimize impacts to the park and maximize the pedestrian experience. By reducing the clearance and utilizing a through girder deck the elevation difference from the existing park paths to the bridge crossing was reduced, thereby reducing the lengths of the accessible paths and impacts to the park. Multiple iterations were investigated to retain the lower approach stairs. The stairs on the north side of the bridge can remain; however, the alternatives to keep the stairs on the south side have more impacts to the park landscape, potentially more walls, and higher walls due to the elevation constraint at the top of the existing stairs. This elevation constraint also results in a longer ADA accessible path and pushes the proximity of the grading closer to the trees and dripline which could potentially impact an existing 66" tree.

Due to the condition of the existing stairs and the additional impacts to the park due to the longer paths, a refinement, Alternative 3, was developed that would replace the stairs, generally in the same location but with a lower elevation at the top landing, which would reduce the impacts to the park landscape, reduce the wall heights, and move the grading further away from the trees and dripline and potentially

not impact the 66’ tree. This would also allow the path alignment to follow the contours of the existing mound more closely, thereby reducing the visual impact of the new paths.

The proposed Alternative 3 bridge would consist of two through girders, connected at even intervals by floor beams. The through girders would be built-up sections which follow the vertical curve to achieve the desired vertical clearance. The floor beams would be rolled wide flange sections. The deck would be a continuous 8.5” reinforced concrete slab that spans between floor beams. The inner “pockets” of the through girder would be filled with concrete, creating a continuous surface similar to a curb. The outside of the through girders would be covered with façade panels to achieve the desired appearance. The façade panels would be attached to the girders with an engineered embed and a matching receptacle on the girder. Panels and girders would be tied together via a concrete cap which would also support the decorative fence.

The superstructure would be supported by four elastomeric bearing pads (two for each CL of bearing), sitting directly underneath the through girders.

The new superstructure would be built upon cantilever abutments with spread footings built to bear on the existing abutments demolished down to an elevation equal to the top of the existing railroad retaining walls. The design needs to account for the 72" brick sewer that runs parallel to the retaining wall on the north side of the railway corridor. Any disturbance to the sewer has to be avoided. In addition, it was previously agreed that the new signal cabinet located 70' to the west of the existing structure would be relocated under the bridge as part of this project.

Alternative 3 is anticipated to have a low impact potential with respect to waste management.

Alternative 3 would replace the former pedestrian bridge in the same location with a steel girder bridge with 6’-wide approach paths to achieve 21’-4” vertical clearance. Because the bridge’s center span over the railroad corridor was demolished in 2013, leaving only the abutments and approach stairs remaining, the bridge has lost sufficient historic integrity to no longer be considered a contributing element of both the Allegheny Commons Historic District and the railroad corridor historic district. The replacement of the pedestrian bridge under Alternative 3 would have less impact than under Alternative 2 but would still have a moderate potential to affect character-defining features of the Allegheny Commons Historic District such as plantings, existing pathways and stairs, and topography resulting from direct physical impacts related to the construction of new abutments and approaches including ADA-compliant pathways. It is anticipated that Alternative 3 would result in 11,895 square feet of permanent impacts to the Allegheny Commons Historic District as well as temporary impacts for construction staging and access. Because of the lowered clearance height and resulting lowered top landing for the pathways, the less fill would be required for the approach pathways and would have less impacts to mature trees than under Alternative 2. Alternative 3 also has the potential have visual effects on the Allegheny Commons Historic District resulting from the introduction of a new pedestrian bridge and its associated approach pathways and stairs. Alternative 3 has a moderate to low potential to affect character-defining features of the Pennsylvania Railroad: Main Line (Harrisburg to Pittsburgh) Railroad Corridor Historic District. Alternative 3 will not alter any of the extant character-defining features of the historic district present within the APE. However, Alternative 3 has the potential to have a visual impact on the historic district resulting from the introduction of a new pedestrian bridge over the railroad corridor. Alternative 3 is anticipated to have a low to moderate potential to impact historic properties.

This alternative would result in a high potential to impact Section 2002 resources since it would result in both permanent and temporary property impacts to the NRHP-listed Allegheny Commons Historic District and potential proximity impacts to the Pennsylvania Railroad: Main Line (Harrisburg to Pittsburgh) Railroad Corridor Historic District. However, it would result in less property acquisition within the Allegheny Commons Historic District than Alternative 2.

5.3.6 Alternatives Comparison Summary

Alternative 1 would not meet the needs of the project and therefore can be eliminated from consideration. Alternative 2 would meet the project needs, but is estimated to have a higher construction cost, longer construction length, and would result in greater impacts to historic properties and Section 2002 resources within the project limits when compared to Alternative 3. When accounting for impacts to the surrounding area, project complexity, and potential historic property and Section 2002 impacts, Alternative 3 is recommended to be advanced for further consideration. A comparison matrix of the identified alternatives is included in **Appendix D.**

5.3.7 Design Modification Options

No other design modification options were considered for this project.

5.4 Selection of Preferred Alternative

Based on these considerations, Alternative 3 - through girder bridge with 6'-wide approach paths to achieve 21'-4" vertical clearance is the preferred alternative for the Allegheny Commons Pedestrian Bridge Project.

6.0 Pennsylvania Avenue Bridge

The Pennsylvania Avenue Bridge is located in the City of Pittsburgh, Allegheny County, Pennsylvania, and carries Pennsylvania Avenue over NSR tracks. See **Figure 6-1** for a location map.

Alternatives have been identified to address the purpose and need for the Pittsburgh Vertical Clearance Projects and to meet PUC requirements. Below is a brief description of the alternatives that will be discussed in further detail later in this chapter:

- Alternative 1 - No Build Alternative
- Alternative 2 - Replace and raise bridge to achieve 22' vertical clearance
- Alternative 3 - Repair substructure and lower railroad tracks to achieve 22'vertical clearance
- Alternative 4 - Combination replace and raise bridge and lower railroad tracks to achieve 22' vertical clearance

In addition to the four alternatives listed above, a design modification to minimize impacts of the preferred alternative was analyzed and is discussed in Section 6.3.6.

Conceptual plans and profiles for each Build alternative as well as typical sections can be found in **Appendix B.** Conceptual cost estimates for each Build alternative can be found in **Appendix C**. An Alternatives Comparison Matrix is included in **Appendix D**.

6.1 Environmental Considerations

As noted in Chapter 1, this section discusses those resources that could influence the selection of a preferred alternative for this project location. The Act 120 document will analyze impacts of the preferred alternative on these and the remaining 23 resource categories.

6.1.1 Hazardous or Residual Waste

The potential for contaminated materials was identified during the Phase I ESA conducted for the Pennsylvania Avenue Bridge Project and are as follows:

- The bridge paint has been confirmed to contain cadmium, chromium, and lead. All work will comply with applicable lead material handling, safety, and disposal requirements.
- Shallow soil under the Pennsylvania Avenue Bridge may have been impacted by flaking lead-based paint.
- At some locations, black surface staining is present on the railroad ties and ballast.
- Historic fill (e.g., slag, cinders and fly ash) may be present beneath the railroad ballast, since these materials have been commonly used as fill in Allegheny County. These materials sometimes contain elevated concentrations of metals and/or polynuclear aromatic hydrocarbons (PAHs).
- It should be noted that groundwater contamination sources may be present upgradient of the site. Most of the planned Build alternatives are not expected to encounter the uppermost aquifer. However, alternatives that require deep foundations and dewatering may encounter contamination within the uppermost aquifer. Furthermore, isolated lenses of contaminated perched groundwater may be present within the railroad ballast that could impact construction costs related to track-lowering alternatives.

6.1.2 Historic Properties

The APE for the proposed undertaking contains two historic districts: the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District and the Allegheny Second Ward Industrial Historic District. As part of the current study, contributing elements of the railroad corridor historic district were identified within the approximately 265' segment of the corridor contained within the APE. Project historians identified the concrete retaining walls with stone coping along the northeast and southwest edges of this depressed section of the corridor, standard railroad safety railings, and decorative wrought-iron fencing, all of which are attributable to an early-twentieth-century, grade-separation project as contributing elements of the railroad corridor historic district. The project APE contains one contributing building within the Allegheny Second Ward Industrial Historic District, the "House of Metals" (Williams & Company) building, located at 901 Pennsylvania Avenue.

6.1.3 Section 2002 Resources

There are two Section 2002 resources located in the project vicinity as discussed in the previous section, the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District and the Allegheny Second Ward Industrial Historic District. Since the Pennsylvania Avenue Bridge is a noncontributing element of the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District, there will not be a Section 2002 impact to this resource regardless of which alternative is selected.

6.1.4 Air Quality

The current National Ambient Air Quality Standard designations for the Pittsburgh area pollutants are:

- Marginal nonattainment for the 2008 ozone standard
- Maintenance for the 1971 carbon monoxide standard
- Maintenance for the 2006 PM2.5 standard
- Moderate nonattainment for the 2012 PM2.5 standard
- Nonattainment for the 2010 SO2 standard
- Attainment for lead
- Attainment for NO2

The proposed project will not have a direct effect on air quality with the exception of minor construction related emissions for Alternatives 2, 3 and 4, which would consist of construction equipment regulated under EPA emission standards. NSR has conducted a project-level air quality analysis for the Pittsburgh Vertical Clearance Projects corridor to evaluate secondary or indirect effects on air quality (see **Appendix E**). A general conformity determination is not required since there is no federal action or federal money being used for the project. The No Build Alternative would not result in any impacts to air quality. However, due to the inability to utilize more efficient double-stack containers and the need for additional train trips to accommodate future forecasted freight needs, with a commensurate increase in locomotive emissions for single-stack trains, future emissions would increase slightly under the No Build Alternative as compared to Alternatives 2, 3, and 4 where the more efficient double-stack trains would allow for fewer trains and lower locomotive emissions for the same freight needs. It is anticipated that Alternatives 2, 3, and 4 would have similar impacts on emissions levels. Therefore, from an emissions perspective, any of the approaches to achieving the needed vertical clearance at these locations are considered the same.

With the Build alternatives, there would be a slight net reduction in annual regional locomotive operational emissions in comparison to both existing and future 2045 No Build emission levels, and therefore no significant adverse impacts would result with implementation of the project.

6.1.5 Noise

Direct noise effects will be limited to temporary construction related impacts. The No Build Alternative would have no noise effects. Any noise effects of the Build alternatives would be temporary and the difference between Build alternatives would not be significant.

Regarding indirect or secondary effects, NSR has conducted a noise impact assessment to evaluate the potential impacts associated with the Pittsburgh Vertical Clearance Projects corridor (see **Appendix F**). Noise levels would be slightly higher under the No Build Alternative than Alternatives 2, 3, and 4 due to the greater number of single-stack trains that would be required to accommodate future rail traffic demand as compared to the fewer double-stack trains capable of carrying the same amount of rail freight. Under both the low-growth and high-growth scenarios, there were 13 Category 2 and no Category 3 sensitive land use sites above the Surface Transportation Board noise impact threshold identified near the Pennsylvania Avenue Bridge under both the No Build and all of the Build alternatives. It is anticipated that Alternatives 2, 3, and 4 would have a similar impact on noise levels. The variation in vertical alignments of the Build alternatives is small, anticipated to be less than five feet. Changes in the vertical bridge alignment associated with the Build alternatives would result in generally imperceptible differences in noise levels that are within tenths of a decibel of one another. The dominant consideration for noise in these circumstances is the number of trains per day, and that would not be different for any of the Build alternatives for these projects. Therefore, from a noise perspective, any of the approaches to achieving the needed vertical clearance at these locations are considered the same.

6.1.6 Vibration

NSR conducted a vibration analysis for the Pittsburgh Vertical Clearance Projects corridor in consideration of guidance provided by the Pennsylvania History Code (see **Appendix F**). It is anticipated that there will be no impacts as a result of any alternative. Currently, the study corridor is defined as “heavily used” (i.e., more than 12 freight trains per day). Under future conditions, there is no change to the train speeds or track locations other than small changes in vertical alignment in areas that would result in a negligible change in vibration. Therefore, both the No Build Alternative and Alternatives 2, 3, and 4 would only result in an increase in the number of trains per day. However, because the number of trains is not predicted to result in an increase of 3 VdB or greater at any vibration-sensitive land uses, there would be no vibration impacts under any of the alternatives.

6.2 Engineering Considerations

6.2.1 Roadway

Pennsylvania Avenue is classified as a Neighborhood Collector with a design speed of 25 mph. Pennsylvania Avenue is currently a curbed roadway having two lanes in each direction with parking permitted in the outside lane in the eastbound direction. Sidewalks are located on both sides of the roadway between the existing curb and legal right-of-way. The existing lane configuration of two 11’-0” travel lanes in each direction will be maintained. Multiple commercial drive entrances on both sides of

the bridge along the north side of the roadway provide access to United States Postal Service (USPS) and other businesses. A large brick building, known as the House of Metals, is located adjacent to the back of sidewalk along the southwest quadrant and provides street-level access to multiple tenants, including the Allegheny County Office of Children, Youth and Families.

The existing vertical grades on both approaches to the bridge vary to a maximum 5% with a crest curve over the railroad. Both roadways are generally flat with grades less than 1% farther away from the intersection.

6.2.2 Structure

The existing bridge is a through-girder, simple-span bridge with a total length of approximately 153'. The roadway is supported by an 8" reinforced concrete composite deck with a 3" asphalt overlay, 32"-high safety shape parapets, and 5'-wide sidewalks on both sides of the bridge. The bridge's substructure consists of reinforced concrete abutments and wingwalls. The reinforced concrete abutments are founded on steel HP piles. Adjacent sections of concrete retaining walls in the depressed railroad corridor date from the early-twentieth-century grade separation project and have rock-faced, cut sandstone capstones. The roadway width is 46'-0" from curb to curb, and it currently carries four lanes of bi-directional traffic.

The existing vertical clearance is 19'-8" above the tracks and does not meet minimum design requirements. The bridge was constructed in 1986. No known significant structural repair or rehabilitation has taken place since the bridge was constructed. The bridge has been inspected approximately every two years. The most recent inspection, conducted in September 2020, found no critical issues and no issues requiring immediate attention. The superstructure consists of two 120" deep welded steel box girders. The box girders support 36" rolled floor beams spaced at approximately 7'-2¼" along the entire length of the bridge. The superstructure is supported by three pot bearings at each abutment. This structure does not have a drainage system but drains along the curbs to the end of structure.

Movement of the existing backwall against the superstructure and beams is undetermined and non-conclusive. Based on visual inspections, the abutments do not appear to have moved significantly to cause separation from surrounding existing walls. However, the movement is visually observed in the backwall area between the superstructure and beam. The overall condition of the substructure is in fair condition. The primary structural elements are sound but may have minor section loss, cracking, and spalling. The top surface of the west abutment backwall is edge spalled and chipped along the expansion dam and approach slab for the full deck width. A few hairline cracks extend across the top and along the vertical face of the backwall, which are visible on the underside. The west seat is generally in good condition, except for the bearing pedestals where additional deterioration was noted. The west right pedestal is edge-cracked and spalled with exposed rebar and adjacent delamination 15" D x 19" H x up to 3' W, which is undermining the masonry plate up to 1-1/2". The center pedestal exhibits a hairline crack from the bottom left corner to the face of the stem. The west left pedestal is in good condition with no issues. The west stem has a few partial to full height minor hairline cracks present. One full height diagonal hairline crack is noted between floor beams 22 and 23. Full height hairline cracks exist under the center pedestal.

The east left and right pedestals are edge spalled 5’ W x 1” H x 8” D with voids exposing the anchor bolts and grout pockets. The east stem contains several hairline to fine vertical cracks near the center of the stem.

6.2.3 Right-Of-Way

Minor right-of-way impacts such as temporary easements for construction are anticipated for Alternatives 2 and 4 for construction of sidewalks and sidewalk moment slabs in all quadrants. Temporary easements are also anticipated along the rail line for the construction of the wall buttressing. Small, permanent sliver takes are anticipated from the USPS parcels in the northwest and northeast quadrant for the embankment slope for Alternatives 2 and 4.

6.2.4 Utilities

Utilities in the Pennsylvania Avenue project area include a Peoples Gas 12” steel gas main and a PWSA 12” ductile iron waterline in a 24” steel casing that both cross the existing bridge. Underground electric, underground street lighting, and gas and water service lines are present in the sidewalks. Fire hydrants are located in the sidewalk on all quadrants. Existing aerial utility poles are present on both sides of the roadway at the eastern end of the project.

An existing PWSA 42” combination sewer crosses under the tracks near the Pennsylvania Avenue Bridge. Also, within the NSRR corridor are two parallel fiber optic duct banks. An existing Elantic Fiber Optic duct bank is located on the north side of the tracks and a Century Link (QWEST) duct bank is located on the south side of the tracks.

6.3 Alternatives Description and Evaluation

6.3.1 Alternative 1—No Build Alternative

This alternative would consist of doing nothing to the existing Pennsylvania Avenue Bridge. However, this alternative would not meet the project need. While this alternative would not meet the purpose and need of the project, it is carried into the alternatives analysis as a basis of comparison with the Build alternatives.

6.3.2 Alternative 2—Replace and raise bridge to achieve 22’ vertical clearance

Alternative 2 would raise the bridge to achieve 22' of vertical clearance over the railroad tracks. Alternative 2 would elevate the proposed roadway profile to increase vertical clearance. Roadway approach work along Pennsylvania Avenue would extend approximately 150’ to the west and 250' to the east of the bridge. The proposed vertical alignment would increase the profile grade to a maximum of 8.0% on both approaches to the bridge. Due to the profile change, a driveway adjustment would be needed for the eastern USPS entrance at 206+80 LT. Approach work would include roadway pavement and sidewalk reconstruction, including the construction of sidewalk moment slab in all quadrants. Sidewalk grades would follow the roadway profile, except for the sidewalk in the southwest quadrant. Under Alternative 2, a bifurcated sidewalk in the southwest quadrant near Station 204+30 RT is required to maintain ADA-compliant access to the existing pedestrian entry door at 901 Pennsylvania Avenue. The

bifurcated section of sidewalk is proposed to have an 80'-long and 4'-wide sidewalk ramp that is separated from the 4'-5" sidewalk along the roadway by a proposed pedestrian rail barrier.

The profile adjustment and bifurcated sidewalk will affect four tree planter boxes along the southwest quadrant in front of 901 Pennsylvania Avenue. One of the tree planter boxes would be replaced; however, the three tree boxes closest to the bridge and entrance door would not be replaced due to the sidewalk width required for the bifurcated sidewalk ramp.

Pennsylvania Avenue would be closed during bridge reconstruction. Traffic would have a 0.6-mile detour along Allegheny Avenue, across the W. North Avenue Bridge, and along Brighton Road.

Utilities that would be impacted with Alternative 2 include a Peoples Gas 12" steel gas main that crosses under the bridge and a PWSA 12" waterline in a 24" steel casing pipe. Both utilities would be replaced and installed on the new bridge structure.

This alternative would require the entire existing superstructure to be removed and the existing abutments to be increased in height and modified to facilitate the new superstructure. The existing abutments and wingwalls would be retained, but the top portions of the substructure would be reconstructed to facilitate the raised superstructure. Approach slabs would be provided at each abutment with sleeper slabs and pavement relief joints. The possibility of replacing backfill with lightweight material to reduce lateral loading would be considered with this alternative.

The proposed span length of the new superstructure would be 145'-0" measured from centerline of bearings at Abutment 1 to centerline of bearings at Abutment 2. The proposed superstructure would be a single-span, steel structure supported by two pony trusses, one at each fascia. Steel floor beams would span between the pony trusses at intervals of approximately 7'-3". The pony trusses would have a 15' preliminary truss height, and the floor beams would be approximately 28" deep.

Alternative 2 is anticipated to have a low to moderate potential for waste management impacts. Special provisions may be required for proper management of painted steel in accordance with applicable Federal, state, and local requirements. In the event of historic fill containing potential hazardous materials (e.g., slag, cinders, and fly ash) are encountered during construction, special provisions will be developed to handle, manage, and dispose these materials.

Alternative 2 activities that could affect historic properties include the replacement of the Pennsylvania Avenue bridge superstructure, repairs to the substructure necessary to raise the bridge, and increasing the vertical grade of the bridge approaches and sidewalks.

Alternative 2 has a low potential to affect the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District. The alternative would require replacement of the bridge superstructure and repairs to the substructure necessary to raise the bridge. The bridge's substructure and superstructure do not contribute to the NRHP-eligible Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District. Any repairs to the substructure would be minor and would have a low potential to visually affect the district's character-defining features. None of the activities would result in a change in the character of the property's historic use of rail operations, or a change in the visual, atmospheric, or audible elements that would diminish the integrity of the property's significant historic features. The existing through-girder superstructure would be replaced with a steel

pony truss similar in scale and configuration to the original, ca. 1905 pony truss Pennsylvania Avenue bridge and would not result in a substantial visual change within the railroad corridor historic district.

Alternative 2 has a low to moderate potential to affect the Allegheny Second Ward Industrial Historic District. The alternative would require modification of the bridge approaches from a current maximum of 5% vertical grade to a maximum of 8.0% vertical grade for approximately 150’ to the west and 250' to the east of the bridge. Sidewalk grades would also be steepened to follow the roadway profile, resulting in a variable increase in surface elevation along the north façade of 901 Pennsylvania Avenue from 0” to 11”. A bifurcated sidewalk in the southwest quadrant with an 80’-long and 4’-wide sidewalk ramp that would be separated from the adjacent 4’-5”-wide sidewalk by a pedestrian handrail is proposed to avoid modifications to building entrances and to maintain ADA-compliant access to the existing entry door at 901 Pennsylvania Avenue, which contributes to Allegheny Second Ward Industrial Historic District. All basement-level window openings along the Pennsylvania Avenue-façade of the House of Metals Building are infilled with brick, so the raising of the sidewalk along the building would not affect character-defining features of the building. It is not expected that the raising of the street and sidewalk grade, the bifurcation of modern sidewalks, and the alteration of non-historic landscape elements would result in a substantial visual change within the historic district.

Overall, Alternative 2 is anticipated to have a low to moderate potential to impact historic properties.

Since no contributing elements of the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District and the Allegheny Second Ward Industrial Historic District are anticipated to be impacted by Alternative 2, this alternative would have a low potential to impact these Section 2002 resources.

6.3.3 Alternative 3—Repair substructure and lower railroad tracks to achieve 22’ vertical clearance

Alternative 3 would lower the railroad tracks to achieve 22' of vertical clearance and repair the existing bridge. No roadway work or detour would be required.

For the track lowering, buttressing of the existing retaining walls (7,228 linear feet [LF]) and site work would need to be performed for distances well beyond the Pennsylvania Avenue crossing. To accommodate buttressing of the existing abutments and adjacent retaining walls, the number of tracks would need to be reduced from four to three, reducing the flexibility and fluidity of Norfolk Southern operations through the area and region, which would result in an increased operation cost to Norfolk Southern and resultant impacts on interstate commerce. All four tracks and associated turnouts would be removed to accommodate the site work and reconfiguration of the CP Penn interlocking, which is within the project limits. In addition, one of the four tracks would be removed from the West Ohio Street Bridge east to the Federal Street Bridge. A new CP Penn interlocking would be constructed in addition to a new interlocking at Federal Street where the Conemaugh Line would be reduced from two tracks to one track. Approximately 7,700 track feet (TF) of new track and 16 new turnouts would be installed. Approximately 8,900 TF of track lining would be included at the east end of the project. Approximately 7,228 LF of buttressing of the existing retaining walls would be necessary within the project limits.

Attempting to retain present operational capacity with four tracks would be significantly more expensive than the reduction to three tracks and wall buttressing solution proposed under Alternative 3. Retaining

the fourth track would require the replacement of the retaining walls, potential impacts to three properties, impacts to a park property, and additional utility relocations.

Utilities that would be impacted under Alternative 3 include the replacement of the PWSA 30" watermain and the relocation of the 345kV/138kV high voltage Duquesne Light primary line. Underground fiber optic duct banks along both sides of the railroad trench would need to be relocated to lower depths.

Alternative 3 activities that could affect waste management impacts include the associated track lowering and utility work that would entail the removal of ballast and possibly other fill materials. No changes would be required to the bridge superstructure or substructure, and only minor repair of spalls and delaminations would be made to the substructure. Special provisions would be prepared for the testing and management of historic fill encountered during construction. Special provisions would also be developed to properly manage painted steel during repairs, removal, and/or repainting, if required, but impacts to steel should be minimal. All materials would be properly managed and disposed of if necessary. The depth to groundwater should be determined prior to excavation to determine if construction dewatering will be required. If groundwater is present, it would be properly managed and disposed of if necessary. Alternative 3 is anticipated to have a moderate to high impact relative to the other alternatives for waste management due to the increased potential for the management of historic fill and groundwater.

Alternative 3 activities that could affect historic properties include minor repairs to the bridge's substructure and the associated track lowering, which would entail the removal of ballast, the buttressing of the existing abutments and adjacent retaining walls, and the removal of one of the four extant tracks. Contributing elements of the NRHP-eligible Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District include concrete retaining walls with stone coping along the northeast and southwest edges of this depressed section of the corridor, standard railroad safety railings, and decorative wrought-iron fencing. The Pennsylvania Avenue Bridge, including both its substructure and superstructure, does not contribute to the historic district. Minor repairs to the bridge's substructure, the removal of ballast, and the removal of one track would not affect the characteristics of the railroad corridor historic district that qualify it for NRHP eligibility. However, buttressing the concrete retaining walls to provide stability necessary for track lowering would alter the design of the walls and reduce the clear width of the railroad corridor, which contribute to the character of the historic district, resulting in a moderate to high potential to impact the historic property.

While no building entrances or driveways would be impacted within the Allegheny Second Ward Industrial Historic District, the railroad corridor is a contributing element of the district, and its alteration resulting from the buttressing of the concrete retaining walls would affect the characteristics that qualify it for NRHP eligibility. Therefore, Alternative 3 is anticipated to also have a moderate to high potential to impact the Allegheny Second Ward Industrial Historic District.

Overall, Alternative 3 is anticipated to have a moderate to high potential to impact historic properties.

Since it is anticipated that Alternative 3 could result in impacts to contributing elements of the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District and the Allegheny Second Ward Industrial Historic District, this alternative would also have a moderate to high potential to result in impacts to these Section 2002 resources.

6.3.4 Alternative 4—Combination replace and raise bridge and lower railroad tracks to achieve 22' vertical clearance

Alternative 4 would raise the bridge and lower the railroad tracks under the bridge to achieve 22' of vertical clearance over the railroad tracks. Roadway approach work along Pennsylvania Avenue would extend approximately 160' to the west and 140' to the east of the bridge. The proposed vertical alignment would increase the profile grade to a maximum of 7.5% on the western approach and 7.0% on the eastern approach. Due to the profile change, a minimal driveway adjustment is needed for the eastern USPS entrance at 206+80 LT. Approach work would include roadway pavement and sidewalk reconstruction, including the construction of sidewalk moment slab in all quadrants. Sidewalk grades would follow the roadway profile, with the exception of the sidewalk in the southwest quadrant. Under Alternative 4, a bifurcated sidewalk in the southwest quadrant near Station 204+30 RT is required to maintain ADA-compliant access to the existing pedestrian entry door at 901 Pennsylvania Avenue. The bifurcated section of sidewalk which is proposed to have a 35'-long and 4'-wide sidewalk ramp that is separated from the 4'-5" sidewalk along the roadway with a pedestrian rail barrier.

The profile adjustment and bifurcated sidewalk will affect four tree planter boxes along the southwest quadrant in front of 901 Pennsylvania Avenue. Three of the tree planter boxes would be replaced; however, one tree box closest to the bridge and entrance door would not be replaced due to the sidewalk width required for the bifurcated sidewalk ramp.

Work along the railroad corridor would extend approximately 2,360' to the south of the bridge, beyond W. North Avenue, and approximately 950' to the north of the bridge to lower the railroad tracks to the required elevation based on the necessary track design requirements. Track lowering would be accomplished by the removal of ballast. The work limits of the track lowering would not affect any of the adjacent yard railroad tracks, nor would wall buttressing be required.

Pennsylvania Avenue would be closed during bridge reconstruction. Traffic would have a 0.6-mile detour along Allegheny Avenue, across the W. North Avenue Bridge, and along Brighton Road.

Utilities that would be impacted with Alternative 4 include a Peoples Gas 12" steel gas main that crosses under the bridge and a PWSA 12" waterline in a 24" steel casing pipe. Both utilities would be replaced and installed on the new bridge structure. Lowering the tracks would also require the replacement of a PWSA 30" watermain and a 345kV/138kV high voltage Duquesne Light primary line. Underground fiber optic duct banks along both sides of the railroad trench would need to be relocated to lower depths.

This alternative would require the entire existing superstructure to be removed and the existing abutments to be increased in height and modified to facilitate the new superstructure. The existing abutments and wingwalls would be retained, but the top portions of the substructure would be reconstructed to facilitate the raised superstructure. Approach slabs would be provided at each abutment with sleeper slabs and pavement relief joints. The possibility of replacing backfill with lightweight material to reduce lateral loading would be considered with this alternative.

The proposed span length of the new superstructure would be 145'-0" measured from centerline of bearings at Abutment 1 to centerline of bearings at Abutment 2. The proposed superstructure would be a single-span, steel structure supported by two pony trusses, one at each fascia. Steel floor beams would

span between the pony trusses at intervals of approximately 7’-3”. The pony trusses would have a 15-foot preliminary truss height, and the floor beams would be approximately 28” deep.

Alternative 4 activities that could affect waste management impacts include minor repairs to the bridge’s substructure, and the associated track lowering and utility work that would entail the removal of ballast and possibly other fill materials. The amount of excavation and potential for encountering groundwater is expected to be less than Alternative 3, but more than Alternative 2. Therefore, Alternative 4 is expected to have a moderate potential for waste management impacts relative to the other alternatives. Special provisions should be prepared for the testing and management of historic fill encountered during construction. Special provisions should also be developed to properly manage painted steel. All materials will be properly managed and disposed of if necessary. The depth to groundwater should be determined prior to excavation to determine if construction dewatering will be required. If groundwater is present, it will be properly managed and disposed of if necessary.

Similar to Alternative 2, Alternative 4 activities that could affect historic properties include the replacement of the Pennsylvania Avenue bridge superstructure; repairs to the substructure necessary to raise the bridge; increasing the vertical grade of the bridge approaches and sidewalks; and track lowering, which would entail the removal of ballast.

Alternative 4 would have a low potential to impact the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District. This alternative requires the replacement of the bridge superstructure and minor repairs to the substructure in order to raise the bridge and lower the tracks; however, the degree of bridge raising and track lowering would be less. The bridge’s substructure and superstructure do not contribute to the NRHP-eligible Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District. The existing through-girder superstructure would be replaced with a steel pony truss similar in scale and configuration to the original, ca. 1905 pony truss Pennsylvania Avenue bridge and would not result in a substantial visual change within the railroad corridor historic district. Superstructure replacement, minor repairs to the substructure, and the removal of ballast for track lowering have a low potential to visually affect the district’s character-defining features.

Like Alternative 2, Alternative 4 would have a low to moderate potential to impact the Allegheny Second Ward Industrial Historic District. This alternative would require modification of the bridge approaches but for less distance. Under Alternative 4, roadway approach work along Pennsylvania Avenue would extend approximately 160’ to the west and 140' to the east of the bridge. Sidewalk grades would also be steepened to follow the roadway profile. A bifurcated sidewalk in the southwest quadrant with a 35’-long and 4’-wide sidewalk ramp that would be separated from the adjacent 4’-5”-wide sidewalk by a pedestrian handrail is proposed to avoid modifications to building entrances and to maintain ADA-compliant access to the existing entry door at 901 Pennsylvania Avenue, which contributes to Allegheny Second Ward Industrial Historic District. All basement-level window openings along the Pennsylvania Avenue-façade of 901 Pennsylvania Avenue (the House of Metals Building) are infilled with brick, so the raising of the sidewalk along the building would not affect character-defining features of the building. It is not expected that the raising of the street and sidewalk grade, the bifurcation of modern sidewalks, and the alteration of non-historic landscape elements would result in a substantial visual change within the historic district.

Overall, Alternative 4 is anticipated to have a low to moderate potential to impact historic properties.

Since no contributing elements of the Pennsylvania Railroad: Main Line (Pittsburgh to Ohio State Line) Railroad Corridor Historic District and the Allegheny Second Ward Industrial Historic District are anticipated to be impacted by Alternative 4, this alternative would have a low potential to impact these Section 2002 resources.

6.3.5 Alternatives Comparison Summary

Alternative 1 would not meet the needs of the project and therefore can be eliminated from consideration. Alternative 2 would meet the project needs and would have the lowest potential to impact historic properties and Section 2002 resources as well as the lowest potential for encountering hazardous waste material. However, it would require a detour during construction, impacts to five properties, including both temporary and permanent impacts, as well as a driveway adjustment at the USPS facility. Alternative 3 would meet the project needs, would have no permanent property impacts, and would not require a detour. However, four railroad tracks could not be maintained through the corridor and this alternative would have the most potential to impact historic properties and Section 2002 resources and the most utility impacts due to the track lowering. It would also have a far greater cost than any of the other alternatives. Alternative 4 would meet the project needs but would require a detour during construction and would have similar property impacts as Alternative 2. This alternative would have a moderate potential to impact both historic properties and Section 2002 resources as well as hazardous waste material. It would also impact utilities to a greater extent due to the track lowering required. When accounting for impacts to the surrounding community, project complexity, and potential historic and Section 2002 property impacts, Alternative 2 is recommended to be advanced for further consideration. A comparison matrix of the identified alternatives is included in **Appendix D.**

6.3.6 Design Modification Options

A design modification option was considered that involves adjustments to the Pennsylvania Avenue vertical alignment. The design modification replaces and raises the bridge to 21’-2” of vertical clearance over the railroad instead of the 22’-0” of vertical clearance proposed in Alternative 2, while maintaining the existing railroad profile. The roadway reconstruction limits, vertical alignment, right-of-way impacts, utility impacts, and temporary traffic control are all the same as listed above in Alternative 4, but without the railroad track lowering. The bridge configuration would also be the same as Alternative 4.

Impacts to utilities with the design modification would be similar to the impacts from the proposed roadway and bridge work of Alternatives 2 and 4 but there would be no impacts to the 30” PWSA watermain and Duquesne Light primary that cross under the railroad tracks.

The design modification to reduce the required vertical clearance would have no added benefit for Alternative 2 with respect to waste management.

The design modification is anticipated to have a low to moderate potential to impact historic properties and Section 2002 resources because of the sidewalk modification required for 901 Pennsylvania Avenue, a contributing element of the NRHP-eligible Allegheny Second Ward Industrial Historic District.

6.4 Selection of Preferred Alternative

Based on these considerations, Alternative 2–Replace and raise bridge to achieve 22’ of vertical clearance, with the design modification of replacing and raising the bridge to achieve 21’-2” of vertical clearance is the preferred alternative for the Pennsylvania Avenue Bridge Project.

Michael Baker
INTERNATIONAL

APPENDIX A

Purpose and Need Statement

Norfolk Southern Railway Company
Pittsburgh Vertical Clearance Projects

Project Purpose and Need Statement

June 2019
Revised November 2022
Revised April 2024

INTRODUCTION:

These proposed projects are railway improvement projects on the Pittsburgh and Fort Wayne Lines, owned and operated by Norfolk Southern Railway Company (NSR). The proposed projects consist of addressing freight capacity and delay constraints through the City of Pittsburgh, Allegheny County, Pennsylvania. The Pittsburgh and Fort Wayne Lines serve rail freight traffic in interstate commerce and operate as a primary link through Pittsburgh between Chicago and the New York/New Jersey commercial markets. NSR is a common carrier and the Pittsburgh and Fort Wayne Lines form a critical component of NSR's route between Chicago and the east coast, carrying a variety of commodities, both hazardous material such as chlorine, anhydrous ammonia, hydrogen fluoride, crude oil, and ethanol, as well as nonhazardous materials like coal, auto parts and finished vehicles, lumber, agricultural products, and intermodal containers and trailers.

The three overhead clearance projects [W. North Avenue Bridge (PC-1.60); Pennsylvania Avenue Bridge (PC-1.82); and Amtrak Station Canopy (PT-353.20)] have vertical obstructions along the Pittsburgh and Fort Wayne Lines that prevent efficient movement of freight, especially time-sensitive intermodal freight, by rail between Chicago and New York/New Jersey, and specifically through Pennsylvania. Unused capacity exists on the Pittsburgh and Fort Wayne Lines and these clearance projects will allow the line to accommodate anticipated freight growth while allowing for double-stack intermodal freight to use the Pittsburgh and Fort Wayne Lines in lieu of the Mon Line. The ability to move this double-stack traffic on the Pittsburgh and Fort Wayne Lines will eliminate exposure to hazardous conditions and delay to time-sensitive freight relating to the unpredictable landslides from adjacent property that occur along the Monongahela Line (Mon Line). In addition to clearance for double-stack trains, the W. North Avenue Bridge has corrosion and other conditions that are considered safety concerns that have resulted in a portion of it being closed to the traveling public. The fourth project, the replacement of the Allegheny Commons Pedestrian Bridge (PC-1.50), was added to the Pittsburgh Vertical Clearance Projects as the result of mediation with local residents. This structure was closed in 1998 due to safety concerns and the deck was removed in 2013, creating a mobility issue for pedestrians trying to access the Northwest Commons and Lake Elizabeth area from Allegheny Commons Park West/West Commons.

Maps of the individual projects, along with photographs of the existing conditions, are included in Appendix 1, along with additional purpose and/or need statements relating to the individual projects, as applicable.

This Purpose and Need Statement has been developed in accordance with Pennsylvania Act 120 of 1970. It follows guidance from several sources, including the Pennsylvania Department of Transportation

(PennDOT) Publication No. 319: Needs Study Handbook. Appendices, figures, and photographs referenced herein provide supporting documentation.

PURPOSE:

The purpose of the Pittsburgh Vertical Clearance Projects is to promote the efficient transportation of goods between Chicago and the New York/New Jersey commercial markets and to improve mobility and safety for freight traffic through Pittsburgh. The projects will remove some of the final remaining vertical clearance restrictions creating chokepoints and other hindrances to efficient flow of intermodal rail traffic and will support truck/rail intermodal facilities along this important rail corridor by allowing for double-stack intermodal traffic, which is a PennDOT goal under the Commonwealth's State Rail Plan, developed in compliance with Federal Railroad Administration requirement and with the Rail Freight Preservation and Improvement Act of 1984, as amended, Public Law 587-119. See US DOT, The Strategic Multimodal Analysis, Task 3: Chicago-New York City Corridor Analysis, Final Report (Apr. 2006) (https://www.fhwa.dot.gov/policy/otps/sma/index.cfm).

The Pittsburgh and Fort Wayne Lines comprise one of two NSR mainline routes through Pittsburgh. The second mainline on the south side of the city is referred to as the Mon Line. The Mon Line is not being considered as a viable railway improvement project due to several major physical constraints and engineering factors. These factors include the fact that the Mon Line is prone to unpredictable landslides from adjacent properties, which cause hazardous conditions and substantial transportation interruption and reliability concerns for freight movement. In addition, although the Mon Line is cleared for double-stack freight movement, it has substantial capacity constraints due to a single-track line through a tunnel and a major river crossing, thus causing further delay and capacity issues for freight transit between Chicago and the east coast on that line.

Because of the constraints of the Mon Line, the Pittsburgh and Fort Wayne Lines currently are the primary route through the City of Pittsburgh for sensitive freight such as hazardous materials and would be the preferred route for time-dependent freight such as intermodal traffic, in large part because it avoids the hazardous conditions and delay experienced on the Mon Line. Furthermore, the Pittsburgh and Fort Wayne Lines are a shorter route between Chicago and the east coast and use of that route increases network fluidity while reducing transit time.

Although the double-track Pittsburgh and Fort Wayne Lines are the preferred freight route through the City of Pittsburgh, several bridges on that line limit the clearance for rail freight such that double-stack intermodal and automobile multilevel freight cannot move on that line. Rail capacity exists on the double-track Pittsburgh and Fort Wayne Lines and these proposed projects will allow the line to accommodate anticipated freight growth and double-stack intermodal traffic. In addition, the condition of the bridge over the railroad at W. North Avenue in Pittsburgh has safety deficiencies that pose risks to current rail traffic and forecasted rail traffic increases throughout the United States and within Pennsylvania in particular.

NEEDS

The project needs for the railway improvement projects along the Pittsburgh and Fort Wayne Lines are to address:

A. Forecasted traffic demands
B. Vertical clearance constraints
C. Operational safety and reliability
D. Public safety
E. Facility deficiencies
F. Mobility

A. Forecasted traffic demands:

Anticipated increases in freight capacity projections, especially in the intermodal market, indicate that double-stack utilization will increase over the next 30 years. Pennsylvania state and national rail plans have identified clearances restricting freight rail transportation as a major impediment to freight capacity, recommending reducing choke points restricting double-stack intermodal traffic [2015 Pennsylvania State Rail Plan (Dec. 2016); The Strategic Multimodal Analysis, Task 3: Chicago-New York City Corridor Analysis, Final Report (U.S. DOT, Apr. 2006); Pennsylvania Intercity Passenger and Freight Rail Plan (PennDOT 2010); 2003 Pennsylvania State Rail Plan (PennDOT 2003).] Intermodal shipment is a method of moving freight from origin to final destination using two or more transportation modes, without handling the freight itself when changing modes. This method improves efficiency by allowing for use of the most efficient transportation mode for each segment of a shipment of goods in a trailer or container (Congressional Research Service, 2003). In an intermodal transportation network, trains, trucks, ships, and aircraft are connected seamlessly to provide an efficient and flexible transportation system meeting the needs of the nation's consumers, carriers, and shippers (FHWA, 2009a).

The intermodal business is one way to achieve a long-term sustainable balance between business needs and the impact of railroad operations on the environment. In intermodal operations, containers often are loaded two high, called “double-stack,” to allow twice as many shipments to be moved on one intermodal train. Double-stack intermodal traffic increases capacity using the existing infrastructure, with appropriate clearance and without requiring new rail lines for additional trains. Double-stack rail traffic also reduces shipping costs and improves service, while at the same time providing new competitive rail alternatives and new economic development opportunities for customers and communities.

The need for improving freight transportation throughout the United States is driven by factors such as:

- Growing congestion on U.S. highways used for long-haul freight movement;
- Volatile or high fuel prices and the quest for energy-efficiency;
- The strain on the truck driver labor pool;
- Need for improvements in shipping services; and
- The national policy toward the reduction of greenhouse gas (GHG) emissions.

The Federal Highway Administration (FHWA) Freight Analysis Framework (FAF) forecasts that the tons of freight transported within the U.S. by rail will increase by more than 20% between 2015 and 2045, with a more than 80% increase in value of freight by rail over that same time frame. (https://www.bts.gov/newsroom/dot-releases-30-year-freight-projections;

https://www.bts.gov/sites/bts.dot.gov/files/docs/FFF_2017_Full_June2018revision.pdf). FHWA's FAF, which compares relevant statistics from 2012 to 2045, also predicts that, with current infrastructure, highway congestion would increase dramatically because of the increase in freight and intermodal demand. See Appendix 2. It is infeasible to accommodate these anticipated increases in freight requirements by merely maintaining the current national rail infrastructure. Projects are needed to address the national need to enhance rail infrastructure as evidenced by the forecasted increase in demand and congestion.

Pennsylvania ranks first in the country in the number of operating railroads (approximately 65) and ranks near the top in total track mileage (more than 5,600 miles). Each year, around 200 million tons of freight originate in, terminate in, or pass through Pennsylvania by rail, including more than 50 million tons of coal, steel, food, and other products mined or grown throughout the Commonwealth. The Commonwealth of Pennsylvania is expected to face substantial highway-truck traffic congestion as a result of the increase in demand and freight transportation, as shown in the FAF graphics in Appendix 2. PennDOT predicts that within the Commonwealth of Pennsylvania, intermodal freight rail traffic will increase by 86.4%. The primary east-west Class I freight rail corridor in Pennsylvania is through Pittsburgh. The Pittsburgh-Allegheny County region in particular is expected to be highly congested in the absence of additional freight transportation planning. See Appendix 2.

To accommodate the expected increases in rail demand, as well as to support national goals relating to GHG emissions and fuel efficiency, the national freight rail system has been substantially modernized over the past decades to raise clearances, upgrade tunnels, and modify rail lines throughout much of America's 140,000-mile freight rail network to accommodate double-stack intermodal trains. (See https://www.aar.org/article/6-milestones-intermodal-growth/) Limitations for double-stack intermodal trains still impact freight transportation through Pennsylvania, however. The clearance projects represent the final obstacles for double-stack and automobile multilevel traffic along the Pittsburgh and Fort Wayne Lines and complement the clearance of 163 previously existing obstructions to double-stack container traffic in the 1990s through a Conrail/PennDOT partnership.

B. Vertical clearance constraints:

The Pittsburgh and Fort Wayne Lines serve as an alternate route for the Mon Line but currently have limited vertical clearance at various locations that prevent the passage of double-stack trains or automobile multilevel traffic. The W. North Avenue and Pennsylvania Avenue bridges limit the height of freight railroad cars travelling along the Pittsburgh and Fort Wayne Lines. The structures do not provide sufficient vertical clearance between the bridge and the tracks. Additionally, Amtrak Station's shed canopy over the freight line is not tall enough to allow double-stack intermodal trains to travel underneath.

The current vertical clearance at the project locations varies along the corridor from 18'-3" to 20'-6". The PUC requirement for vertical clearance in Pennsylvania is 22'-0", absent a waiver.

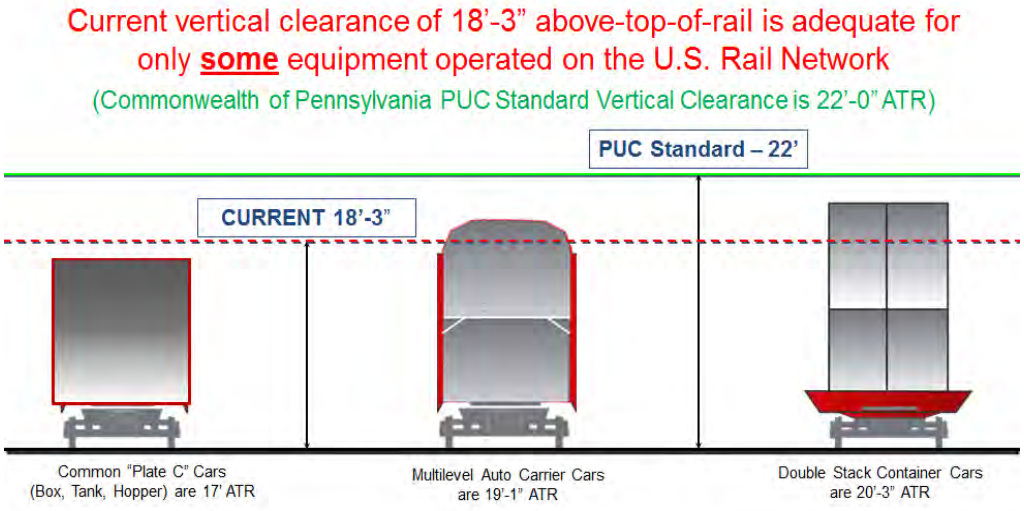


Figure 2. Vertical Clearance Standards

C. Operational safety and reliability:

The NSR line between Chicago and metropolitan New York City via Cleveland, Pittsburgh, and Harrisburg is referred to as the "Premier Corridor" and is the most critical freight artery on Norfolk Southern's 22-state network. NSR has two east-west freight routes through Pittsburgh, one of which is cleared for double-stacked intermodal trains and automobile multilevel trains. However, that double-stack route, known as the Port Perry Branch and the Mon Line (together, the Mon Line) is currently at or near capacity and, as a result, frequently faces congestion issues and service delays. In addition, the infrastructure and geography of the Mon Line create challenges for timely delivery of the service-sensitive intermodal freight that uses it today. The Mon Line has a 3-mile single-tracked segment that includes a tunnel and an adjacent bridge over the Monongahela River. This 3-mile segment is the largest chokepoint on NSR's route between Chicago and the New York metropolitan area. In addition to the choke point, and more importantly, the topography adjacent to the railroad right-of-way is susceptible to landslides from the adjacent Mount Washington. The slope of Mount Washington continues to shift, and each time it does, the potential exists for soil and rock to be deposited on the railroad tracks, making them unable to be traversed until the debris is removed and the slide area stabilized. Besides the substantial costs incurred for cleanup, the unpredictable slides create hazardous conditions and cause hours of delay annually. These landslides range from moderate to severe in nature and the timing and severity of the incidents are unpredictable. Further, the landslides originate on property not owned or controlled by NSR, and as such NSR can merely react to landslides as they may occur. (See Appendix 3.) Each year, delay times resulting from these events, averaging approximately 32.9 hours, create substantial cost for the railroad, customers, and businesses. Delays on the Mon Line relating to landslides are projected to cause almost 4.3 million hours of closures over the next 30 years. Service-sensitive freight on this line and the additional capacity through southwest Pennsylvania anticipated in the future will need to be accommodated.

NSR's second mainline through Pittsburgh is the Pittsburgh and Fort Wayne Lines, which has double track throughout for more efficient operations. However, the current vertical clearance on this line is inadequate for double-stack trains in several locations, and consequently the line constrains the capability to accommodate the projected increases in freight tons, and the anticipated increase in intermodal

capacity, expected to be moving on the nation's transportation network. These limitations result in freight rail congestion and lead to less efficient intermodal transportation. An increase in intermodal traffic in order to keep trucks off highways needs to be accommodated for this major east-west artery. Under the current circumstances, adding more traffic to the Mon Line route to accommodate the forecasted increases in intermodal and other freight over the next many years would result in additional delays to train schedules and worsened congestion. In addition, NSR's dependence on the capacity- and geography-constrained Mon Line through Pittsburgh for its double-stack intermodal traffic, most of which has interstate commerce related time sensitivities, affects its ability to deliver quality service to customers and, ultimately, to compete with trucks. The structural risks adjacent to the current Mon Line route pose a threat to its long-term vitality, especially for this service-sensitive traffic. Considering that intermodal traffic through this part of Pennsylvania is expected to substantially increase in the coming years, it is crucial that investment be made in infrastructure improvement on the Pittsburgh and Fort Wayne Lines in the near-term for operational safety and reliability.

D. Public safety:

Public safety is the primary operational focus of NSR, PennDOT, the City of Pittsburgh, Allegheny County, and Amtrak. The safety of citizens, employees, and operations are central to the goals of the Pittsburgh Vertical Clearance Projects. Additional rail capacity is beneficial to the safety of the motoring public by removing long-haul trucks from the highways of multiple states.

The Pittsburgh and Fort Wayne Lines (in the project area) have only three at-grade crossings, of which just one is a public at-grade crossing. Adding freight to the Pittsburgh and Fort Wayne Lines presents less risk of automobile/rail conflict for high-volume freight transportation. While at-grade crossing accidents have been greatly reduced through public education initiatives nationwide, projects like the Pittsburgh Vertical Clearance Projects boost these efforts by routing trains on heavily gated lines with pedestrian and motor vehicle crossing options.

E. Facility deficiencies:

Structurally deficient structures become less effective and more expensive to maintain or repair as their conditions worsen. Facility deficiencies must be addressed for this key component of the rail network in order to help to minimize future maintenance and address existing structural deficiencies and traffic demands (e.g., rail, vehicular, pedestrian, and bicycle). The W. North Avenue Bridge, at the intersection of W. North Avenue and Brighton Road in Pittsburgh, is in poor condition. The current poor condition of the W. North Avenue Bridge has led to the partial closure of the structure and increased maintenance actions. These maintenance activities eventually will require more frequent interruptions on the Pittsburgh and Fort Wayne Lines to allow for more extensive maintenance repairs, thus causing significant disruption to interstate commerce on the busiest corridor between the Midwest and the East Coast. If the structural conditions are not addressed, the poor condition of this bridge will result in its full closure, resulting in the loss of connectivity over the NSR in this location for the traveling public.

F. Mobility:

The Allegheny Commons Pedestrian Bridge over the NSR tracks was closed due to safety concerns in 1998 and the deck removed in 2013, creating a mobility issue for pedestrians trying to access the Lake Elizabeth

area from West Commons. Currently, park visitors wishing to access Northwest Commons and Lake Elizabeth from West Commons must take a circuitous route from West Ohio Street to Brighton Road to the W. North Avenue Park entrance, resulting in a .32-mile pedestrian detour from one side of the former pedestrian bridge to the other. As the result, the replacement of this bridge was listed as a priority project in the 2022 Allegheny Common Master Plan and again in the Allegheny Commons 2018 Action Plan by the Pittsburgh Park Conservancy.

APPENDIX 1

PROJECT LOCATIONS

The locations of the four individual proposed projects are shown below in Figure 1.1.

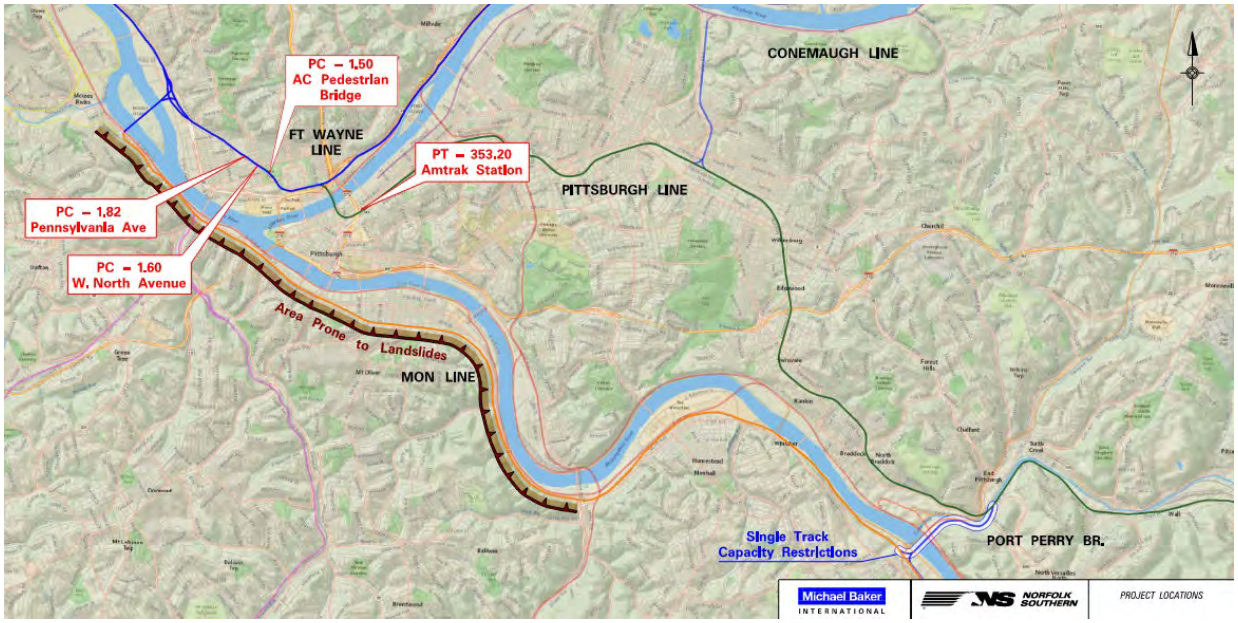
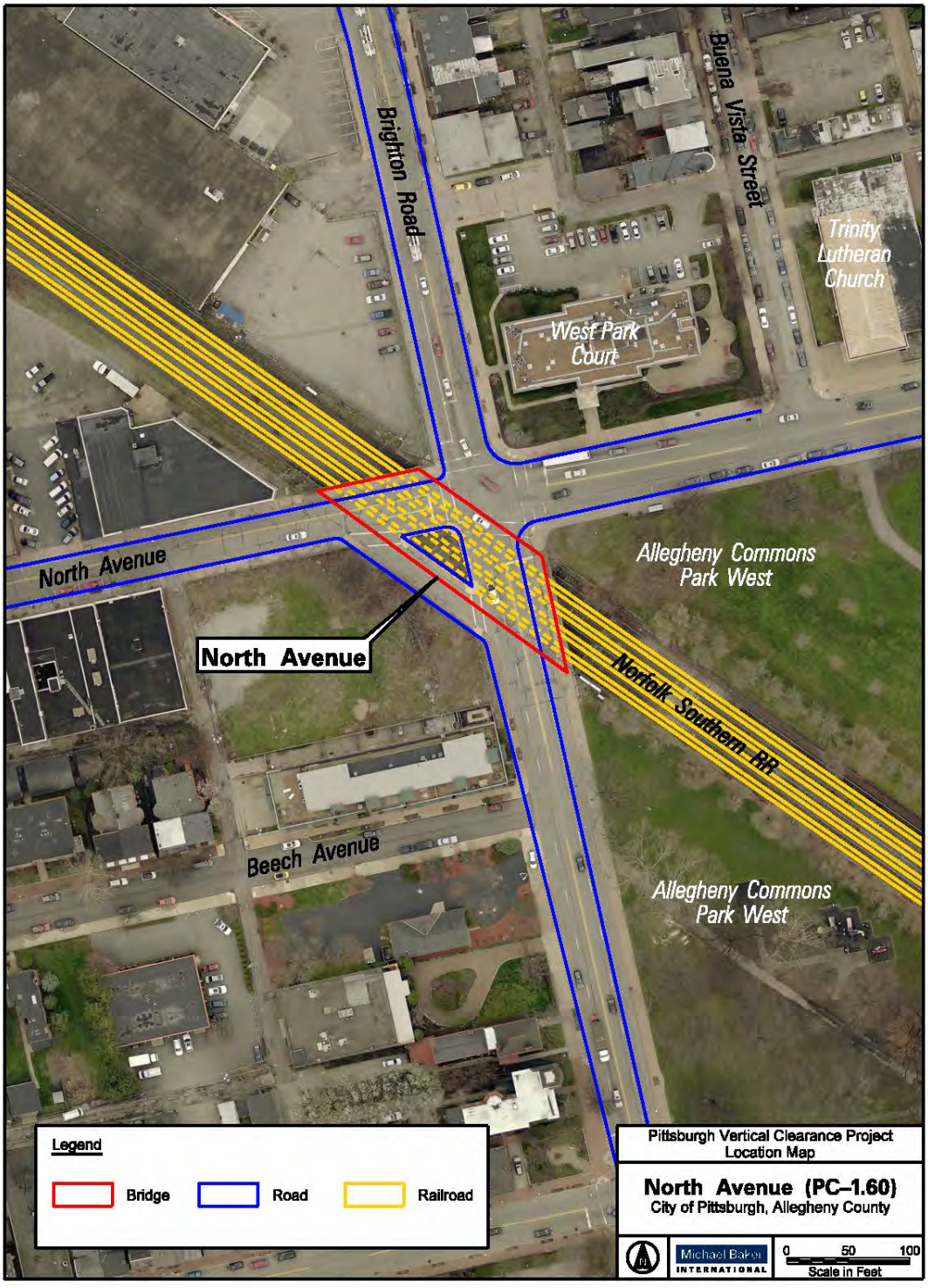


Figure 1.1. Map of Project Locations showing Port Perry Bridge, Mon Line, Pittsburgh Line and Fort Wayne Line

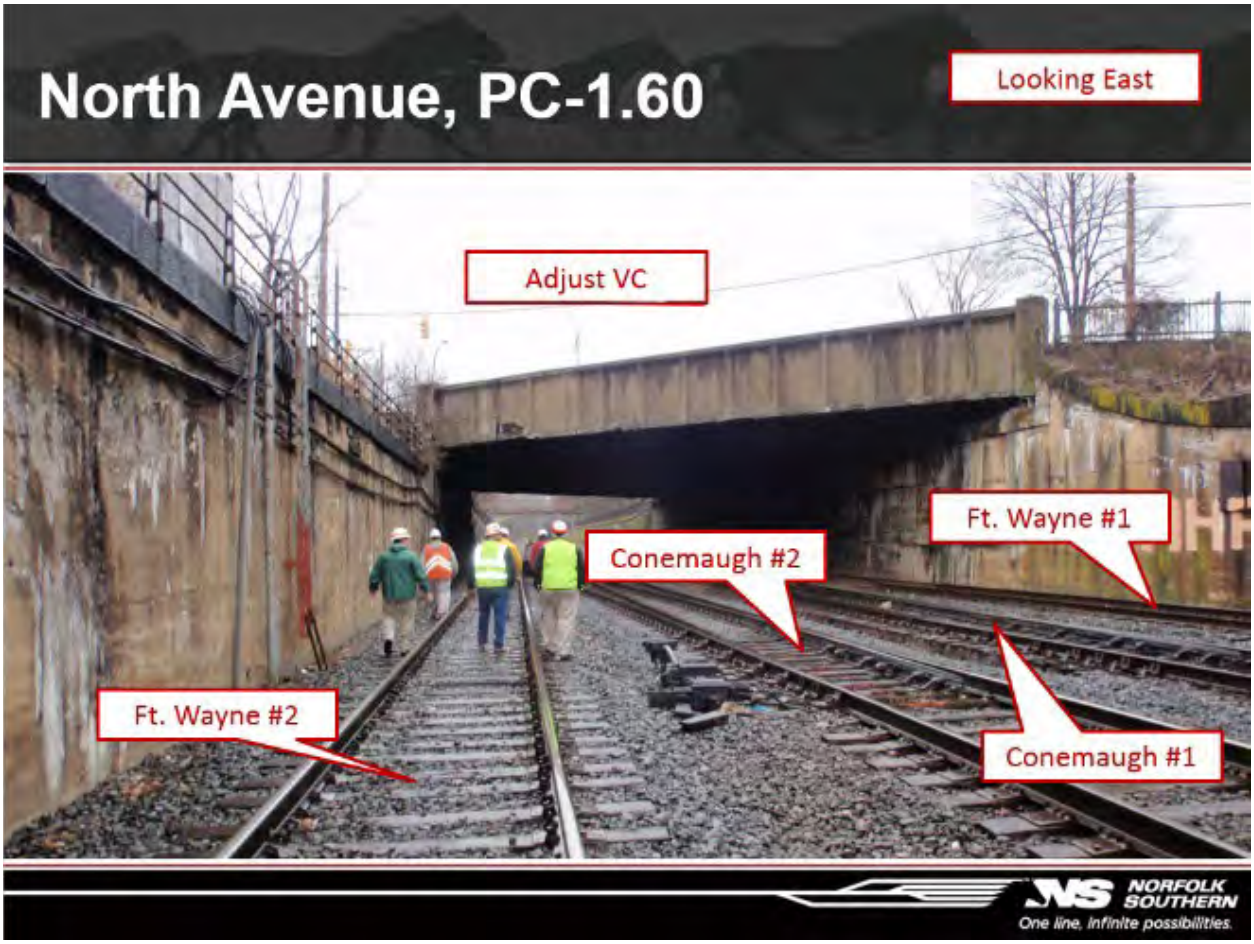
Maps of the individual projects, along with photographs of the existing conditions, are presented in this Appendix, along with descriptions relating to the individual projects.

1. Project Location Map:
W. North Avenue Bridge over NS (PC-1.60), City of Pittsburgh, Allegheny County

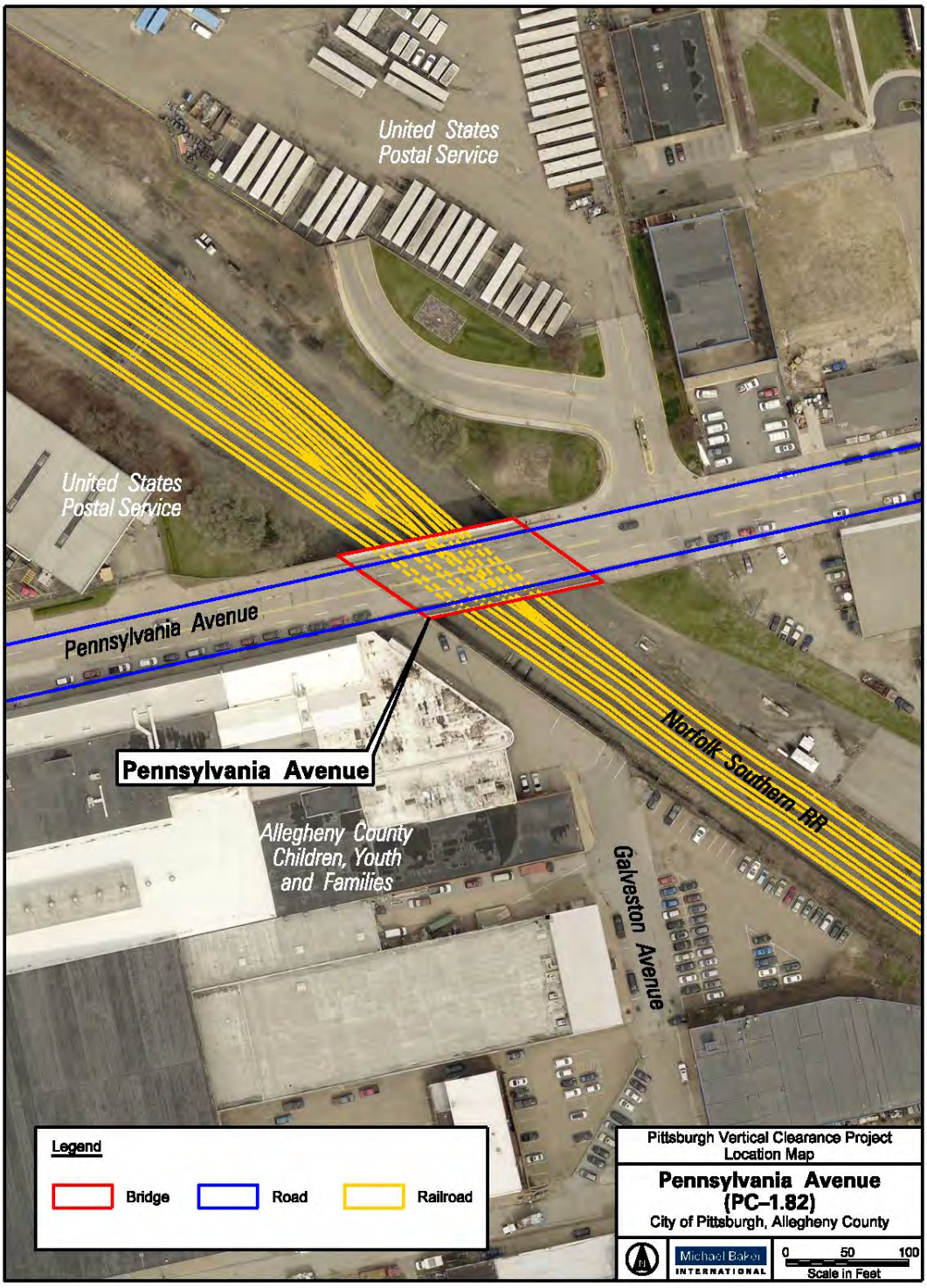


Description:
W. North Avenue Bridge over NS (PC-1.60), City of Pittsburgh, Allegheny County

To increase vertical clearance between the Fort Wayne Line tracks and the bridge to accommodate double-stack railroad traffic and to address structural deficiencies of the bridge in order to provide for safe and efficient rail transportation. The bridge needs attention and is structurally deficient according to the most recent inspection report. The bridge has an existing vertical clearance of 18'-2", which does not provide adequate clearance for the passage of double-stack intermodal trains. The bridge has spalling concrete, and the back wall is falling onto a bearing on the left side of the bridge. A portion of the structure was closed in 2023.



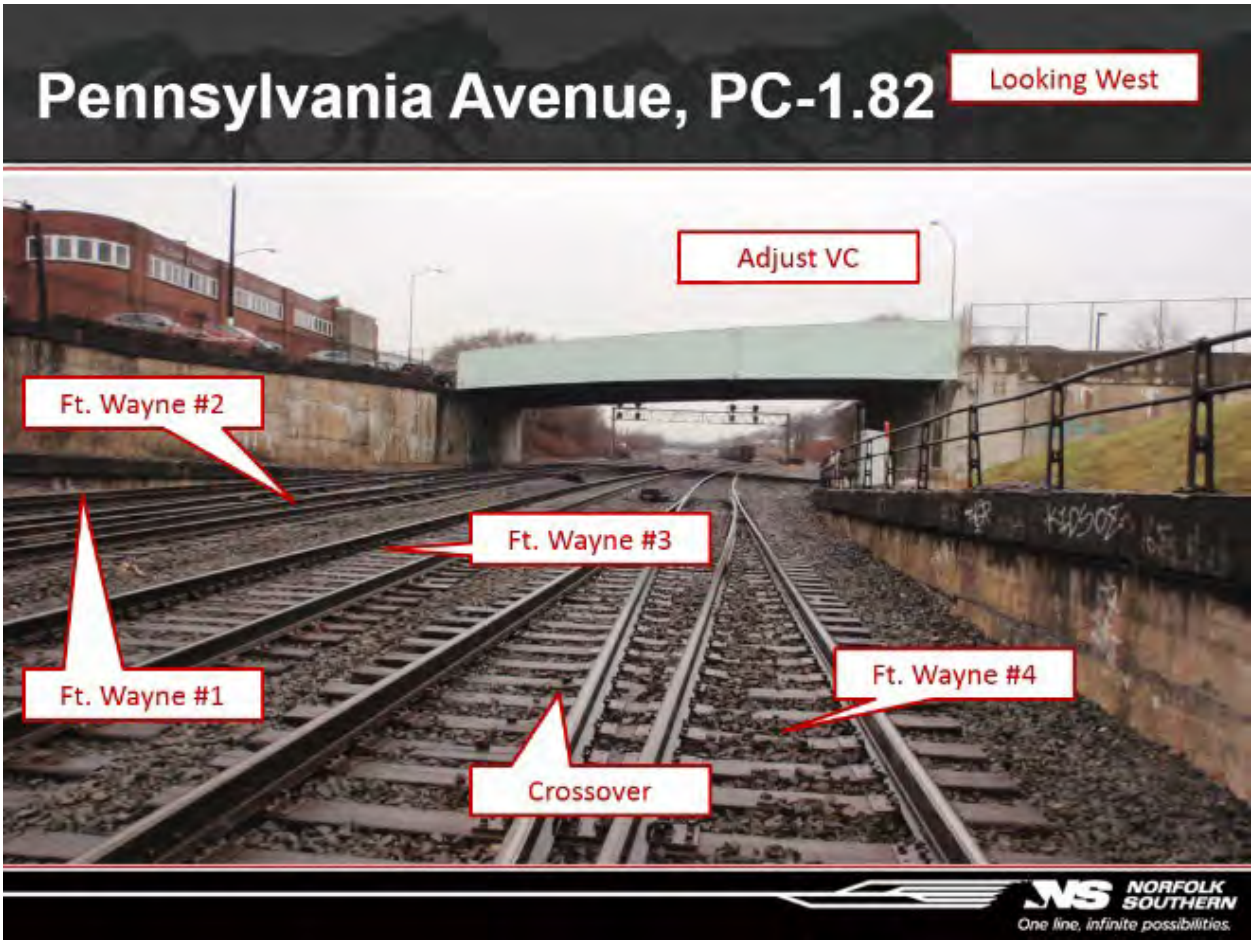
2. Project Location Map:
Pennsylvania Avenue Bridge over NS (PC-1.82), City of Pittsburgh, Allegheny County



Description:

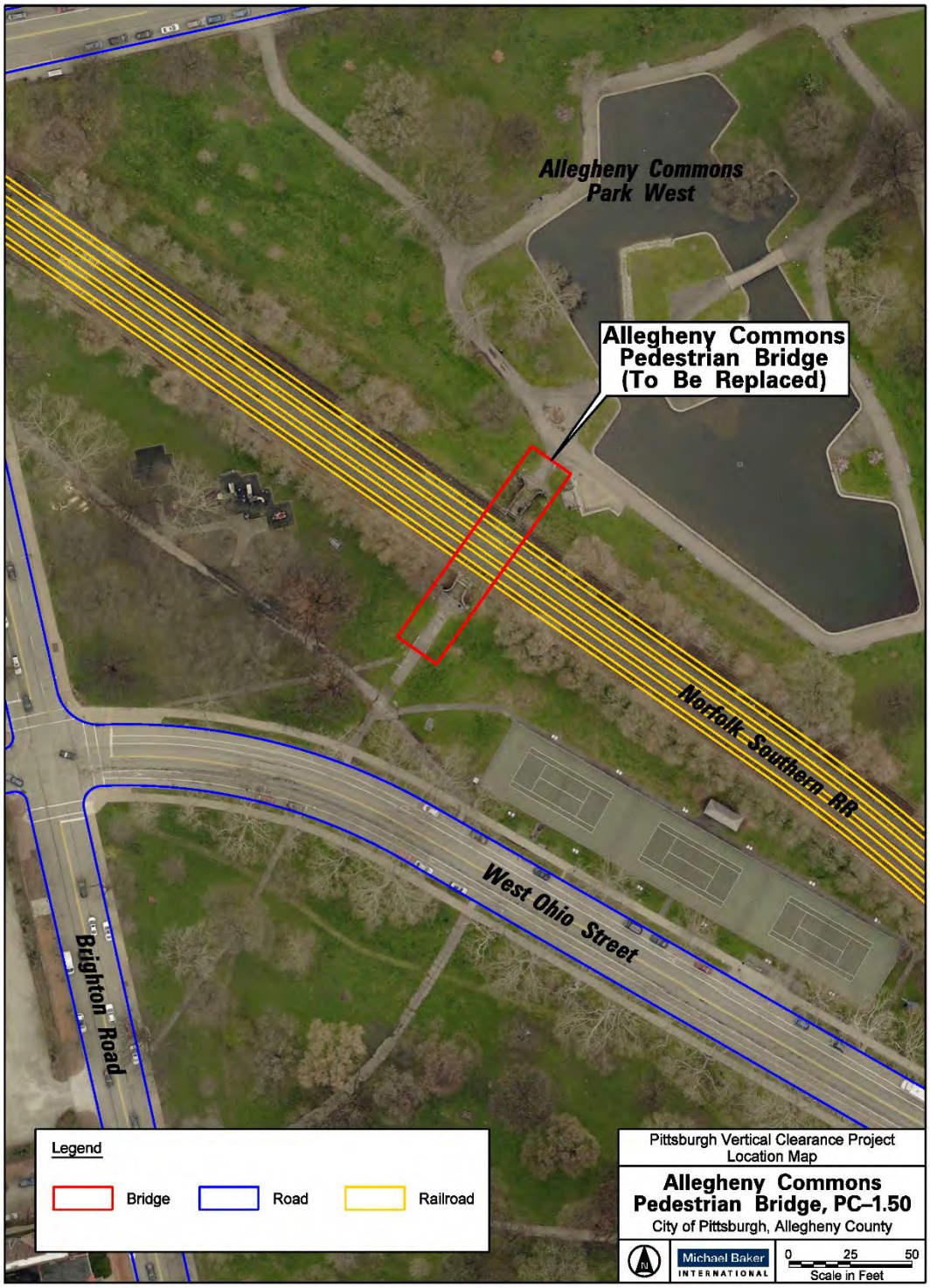
Pennsylvania Avenue Bridge over NS (PC-1.82), City of Pittsburgh, Allegheny County

To increase vertical clearance between the Fort Wayne Line tracks and the bridge to accommodate double-stack railroad traffic. The bridge has an existing vertical clearance of 19'-7", which does not provide adequate clearance for the passage of double-stack intermodal trains.



3. Project Location Map:

Allegheny Commons Pedestrian Bridge over NS (PC-1.50), City of Pittsburgh, Allegheny County

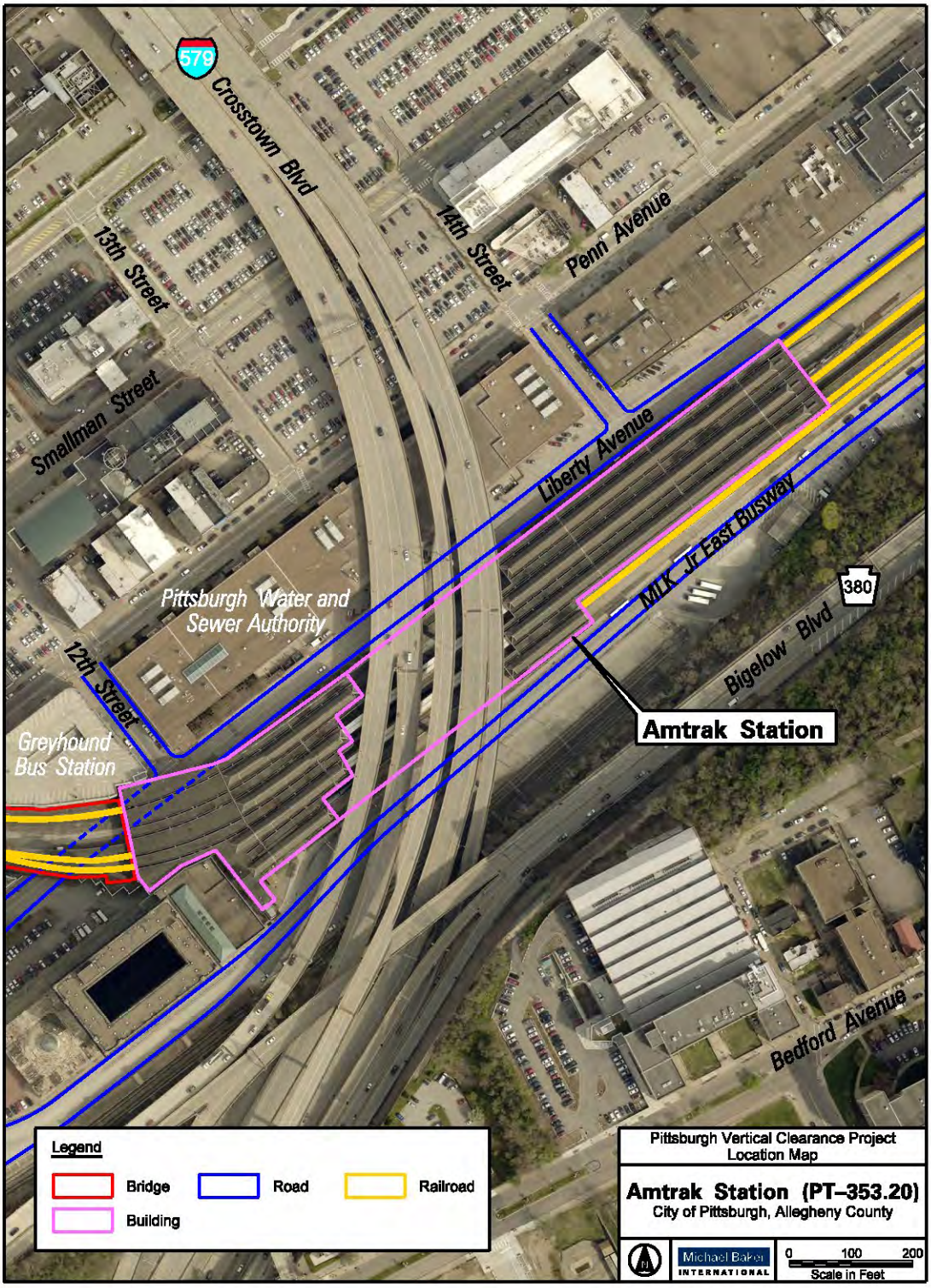


Description:

Allegheny Commons Pedestrian Bridge over NS (PC-1.50), City of Pittsburgh, Allegheny County

To restore the pedestrian connection and provide vertical clearance between the Fort Wayne Line tracks and the bridge to accommodate double-stack railroad traffic. The bridge was closed due to safety concerns in 1998 and the deck was removed in 2013.

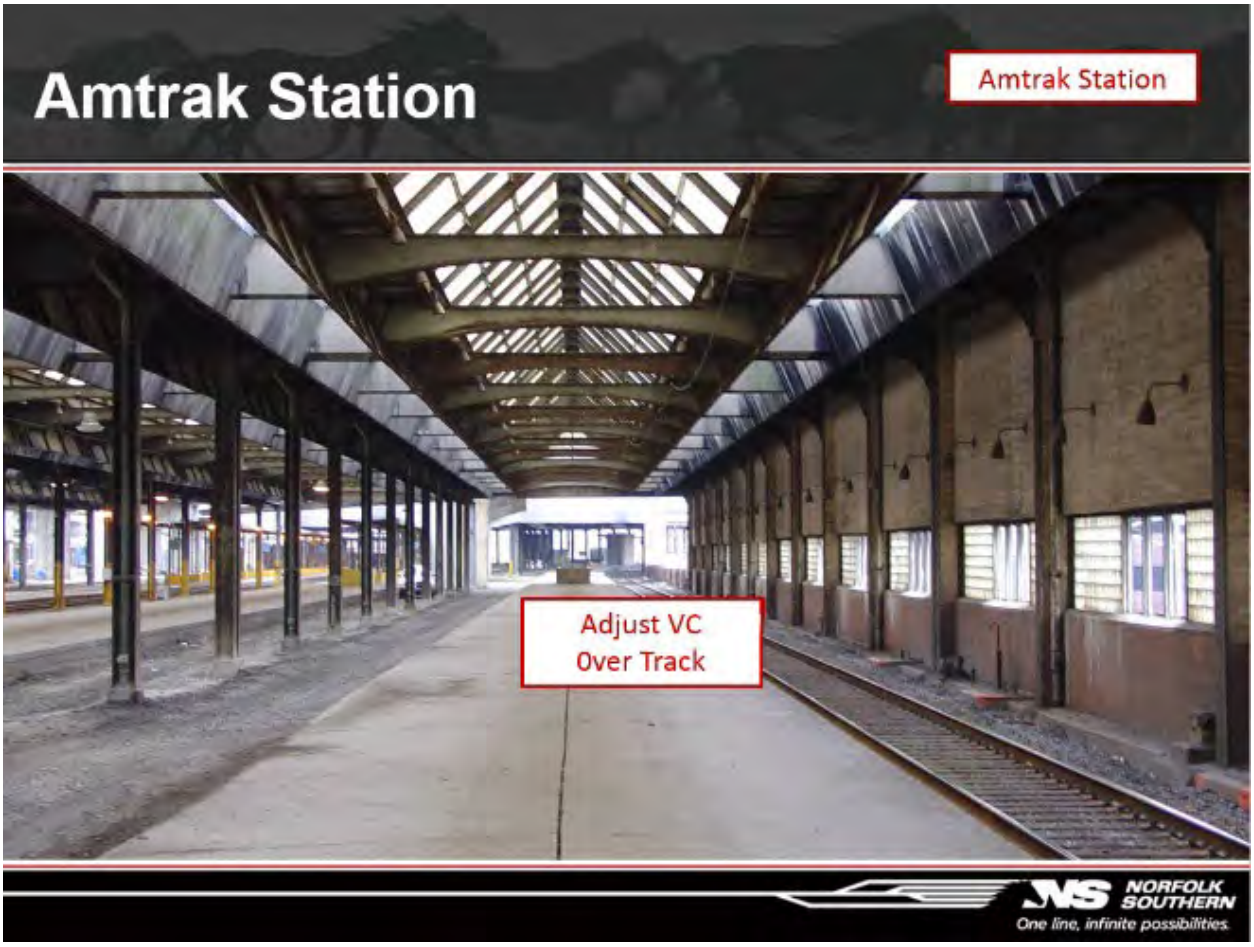
4. Project Location Map:
Amtrak Station Canopy (PT-353.20), City of Pittsburgh, Allegheny County



Description:

Amtrak Station Canopy (PT-353.20), City of Pittsburgh, Allegheny County

To increase vertical clearance between the Pittsburgh Line track and station overhanging roof to accommodate double-stack railroad traffic. The station has an existing vertical clearance of 19', which does not provide adequate clearance for the passage of double-stack intermodal trains.



APPENDIX 2

FHWA FREIGHT ANALYSIS FRAMEWORK

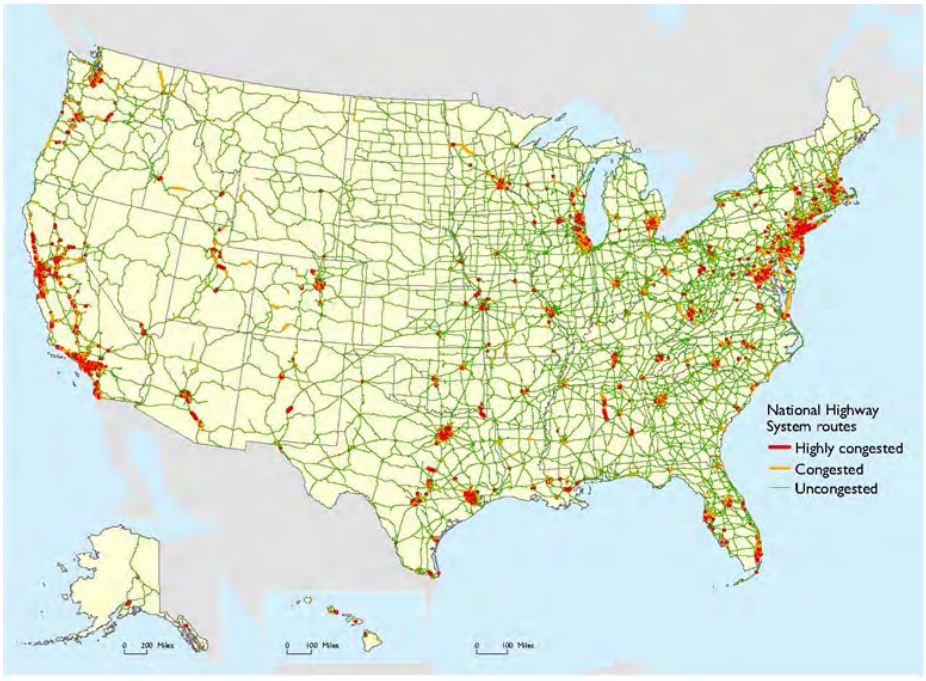


Figure 2.1: Freight Facts & Figures 2017 - Chapter 4: Freight Transportation System Performance. 2012 National Highway System (NHS) routes. (https://www.bts.gov/sites/bts.dot.gov/files/docs/FFF_2017_Full_June2018revision.pdf)

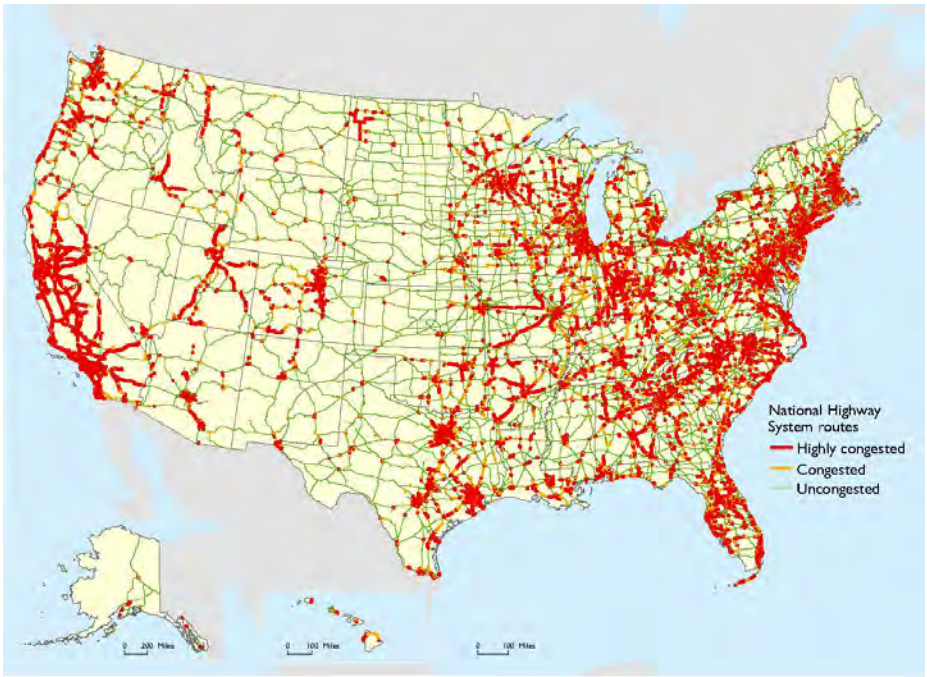


Figure 2.2: Freight Facts & Figures 2017 - Chapter 4: Freight Transportation System Performance. 2045 NHS routes. (https://www.bts.gov/sites/bts.dot.gov/files/docs/FFF_2017_Full_June2018revision.pdf)

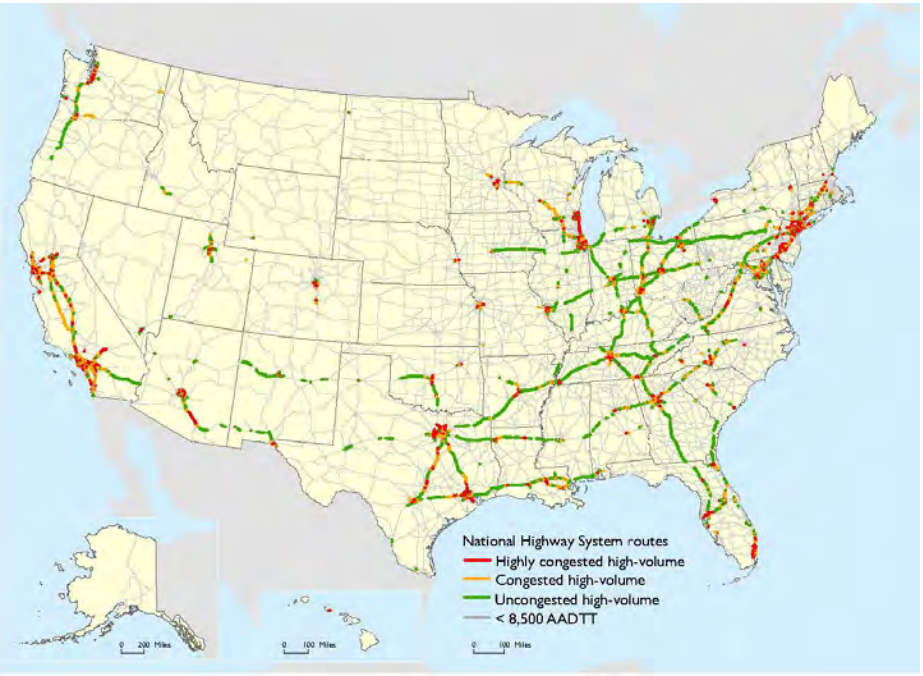


Figure 2.3: Freight Facts & Figures 2017 - Chapter 4: Freight Transportation System Performance. Peak-Period Congestion on High-Volume Truck Portions of the National Highway System: 2012 Map.
(https://www.bts.gov/sites/bts.dot.gov/files/docs/FFF_2017_Full_June2018revision.pdf)

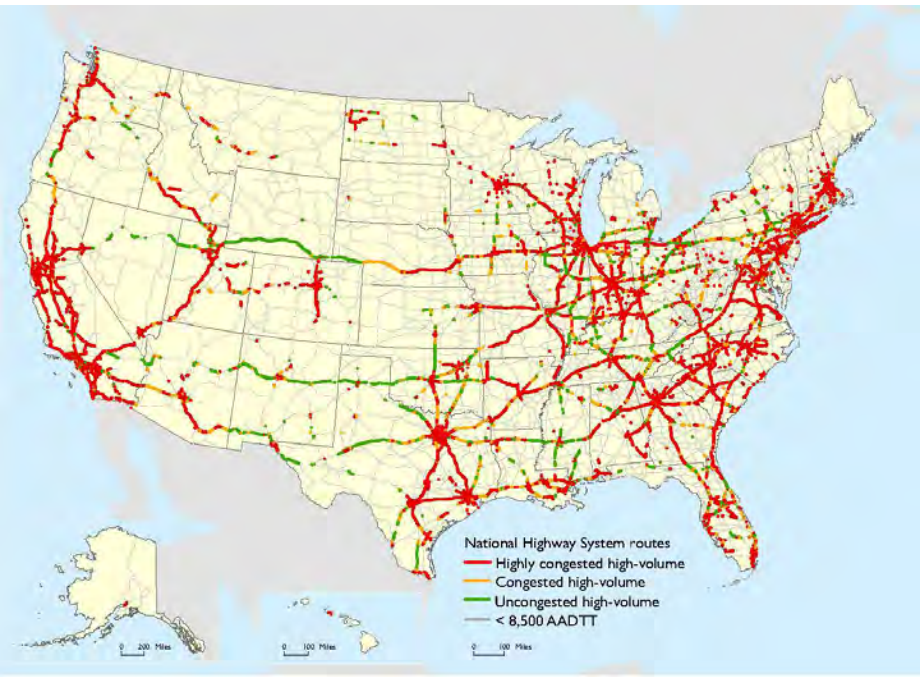


Figure 2.4: Freight Facts & Figures 2017 - Chapter 4: Freight Transportation System Performance. Peak-Period Congestion on High-Volume Truck Portions of the National Highway System: 2045 Map.
(https://www.bts.gov/sites/bts.dot.gov/files/docs/FFF_2017_Full_June2018revision.pdf)

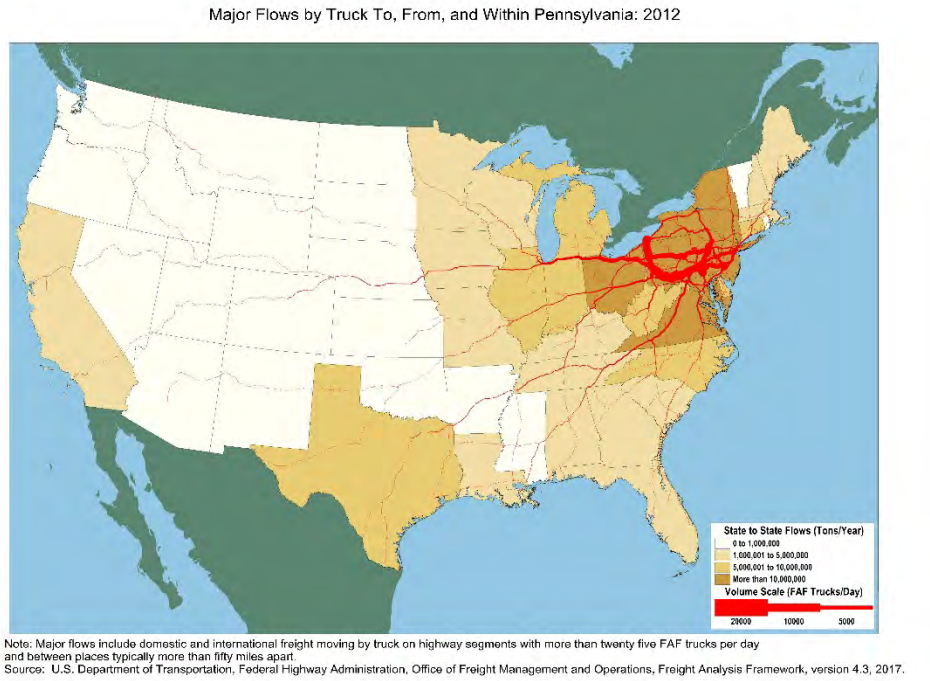


Figure 2.5: Source US DOT, FHWA, Office of Freight Management and Operations, Freight Analysis Framework, 2017. Major Flows by Truck to, From, and Within Pennsylvania: 2012.
https://ops.fhwa.dot.gov/freight/freight_analysis/state_info/pennsylvania/truckflow.htm

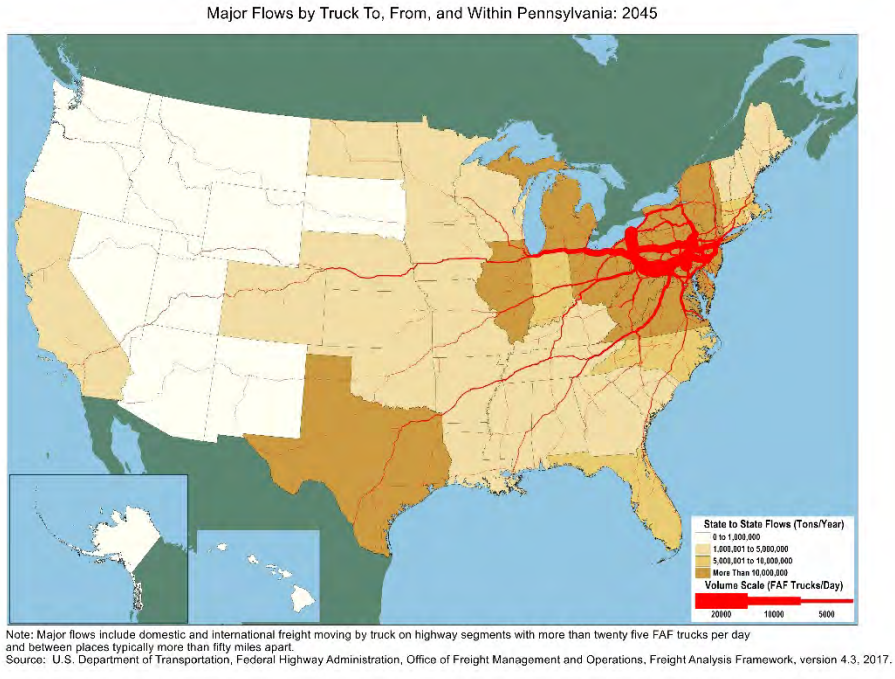


Figure 2.6: Source US DOT, FHWA, Office of Freight Management and Operations, Freight Analysis Framework, 2017. Major Flows by Truck to, From, and Within Pennsylvania: 2045.
https://ops.fhwa.dot.gov/freight/freight_analysis/state_info/pennsylvania/truckflow.htm

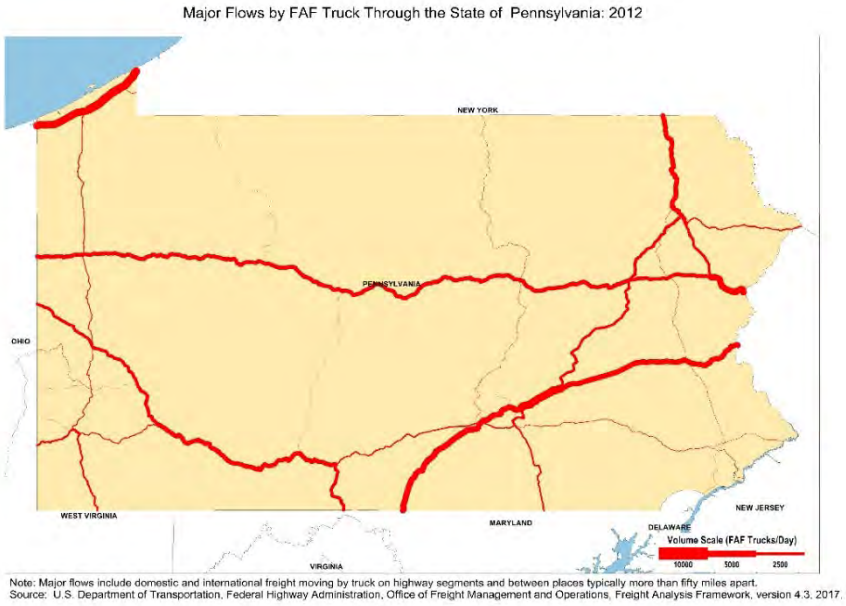


Figure 2.7: Source US DOT, FHWA, Office of Freight Management and Operations, Freight Analysis Framework, 2017. Major Flows by FAF Truck Through the State of Pennsylvania: 2012.
https://ops.fhwa.dot.gov/Freight/freight_analysis/state_info/pennsylvania/statetruckflow.htm

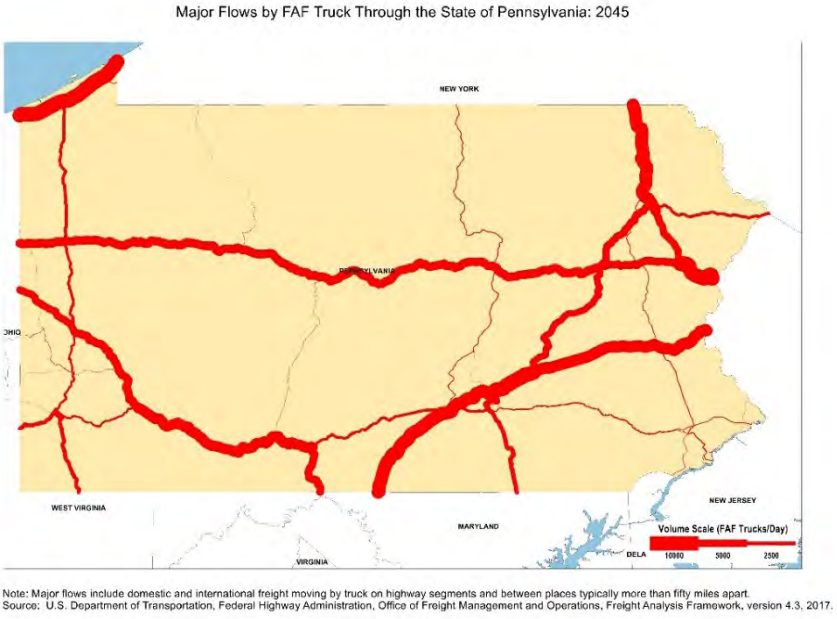


Figure 2.8: Source US DOT, FHWA, Office of Freight Management and Operations, Freight Analysis Framework, 2017. Major Flows by FAF Truck Through the State of Pennsylvania: 2045.
https://ops.fhwa.dot.gov/Freight/freight_analysis/state_info/pennsylvania/statetruckflow.htm

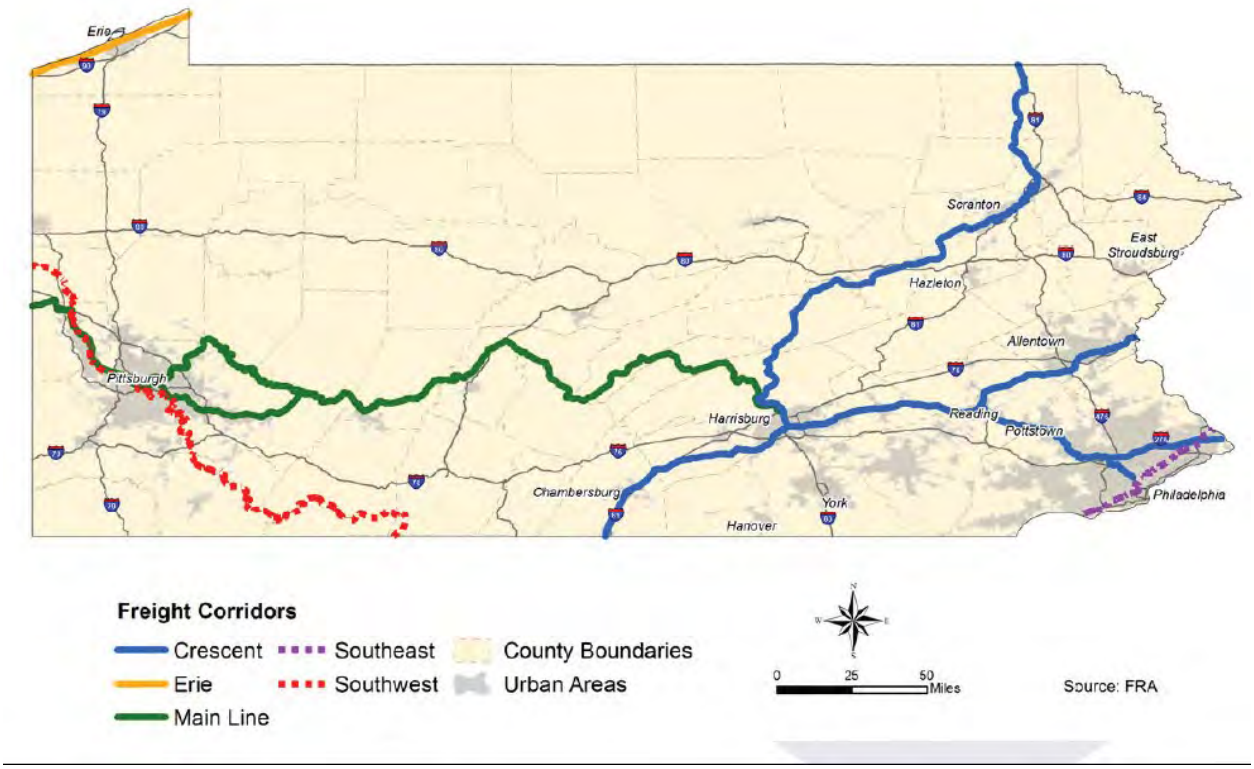


Figure 2.9: Major Class I Freight Corridors in Pennsylvania. Source: PennDOT 2015 Pennsylvania State Rail Plan (Dec. 2016) (adapted from Federal Railroad Administration)
https://www.penndot.gov/Doing-Business/Transit/InformationandReports/Documents/2015%20Pennsylvania%20State%20Rail%20Plan%20(low).pdf

APPENDIX 3

LANDSLIDES FROM MOUNT WASHINGTON

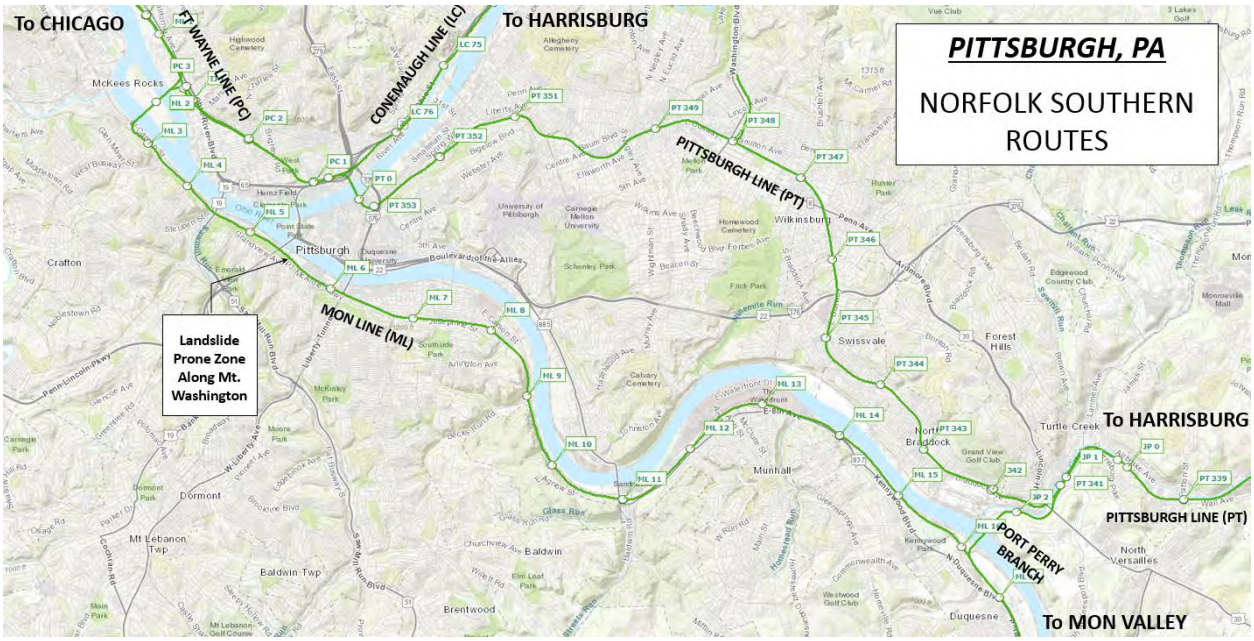


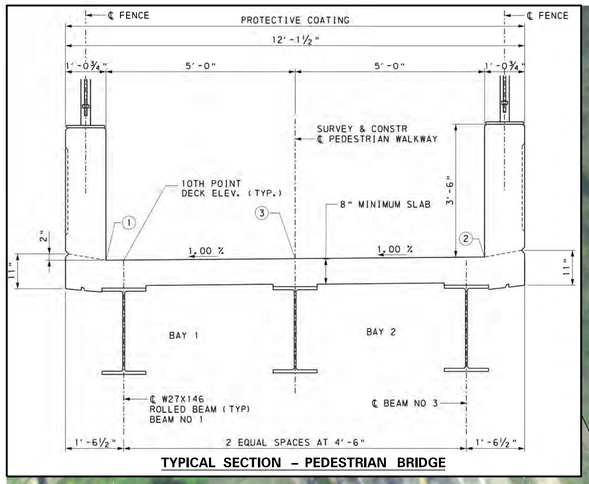
Figure 3.1: Overview Map of Project Locations showing Port Perry Bridge, Mon Line, Pittsburgh Line and Fort Wayne Line

Figure 3.2: Image courtesy of Pittsburgh Post-Gazette, 2014.

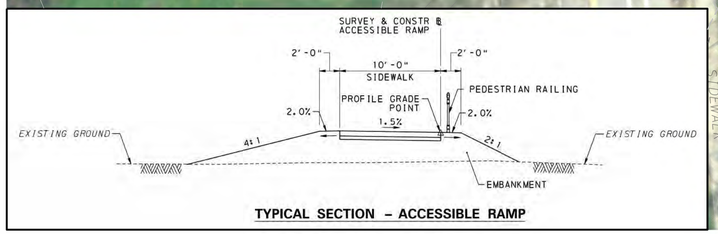
Michael Baker
INTERNATIONAL

APPENDIX B

Conceptual Plans and Profiles



TYPICAL SECTION – PEDESTRIAN BRIDGE



TYPICAL SECTION – ACCESSIBLE RAMP

LEGEND

PROPOSED WINGWALL/RETAINING WALL

PROPOSED PEDESTRIAN RAILING

SCALE: 1" = 25'

25' 0 25' 50'

DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

ALTERNATE 2
CONSTRUCT BRIDGE
WITH 22' CLEARANCE

Michael Baker INTERNATIONAL
AIRSIDE BUSINESS PARK
100 AIRSIDE DRIVE
MOON TOWNSHIP, PA 15108
Phone: (412) 269-6300

NORFOLK SOUTHERN
NORFOLK SOUTHERN RAILWAY COMPANY
OWNING COMPANY
PITTSBURGH
OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER – DESIGN AND CONSTRUCTION – ATLANTA, GA.

REV	BY	DATE	DESCRIPTION

LOCATION: PITTSBURGH, PENNSYLVANIA
TITLE: BR0027857 BRIDGE PC-1.5 WALKWAY PLAN 01

DSN JAH	PID No.	MN	MILE POST PC 1.50
DWN WRB	FILE No. BR0027857		DRAWING NUMBER
CHK WVB	DATE 01/24/2024		

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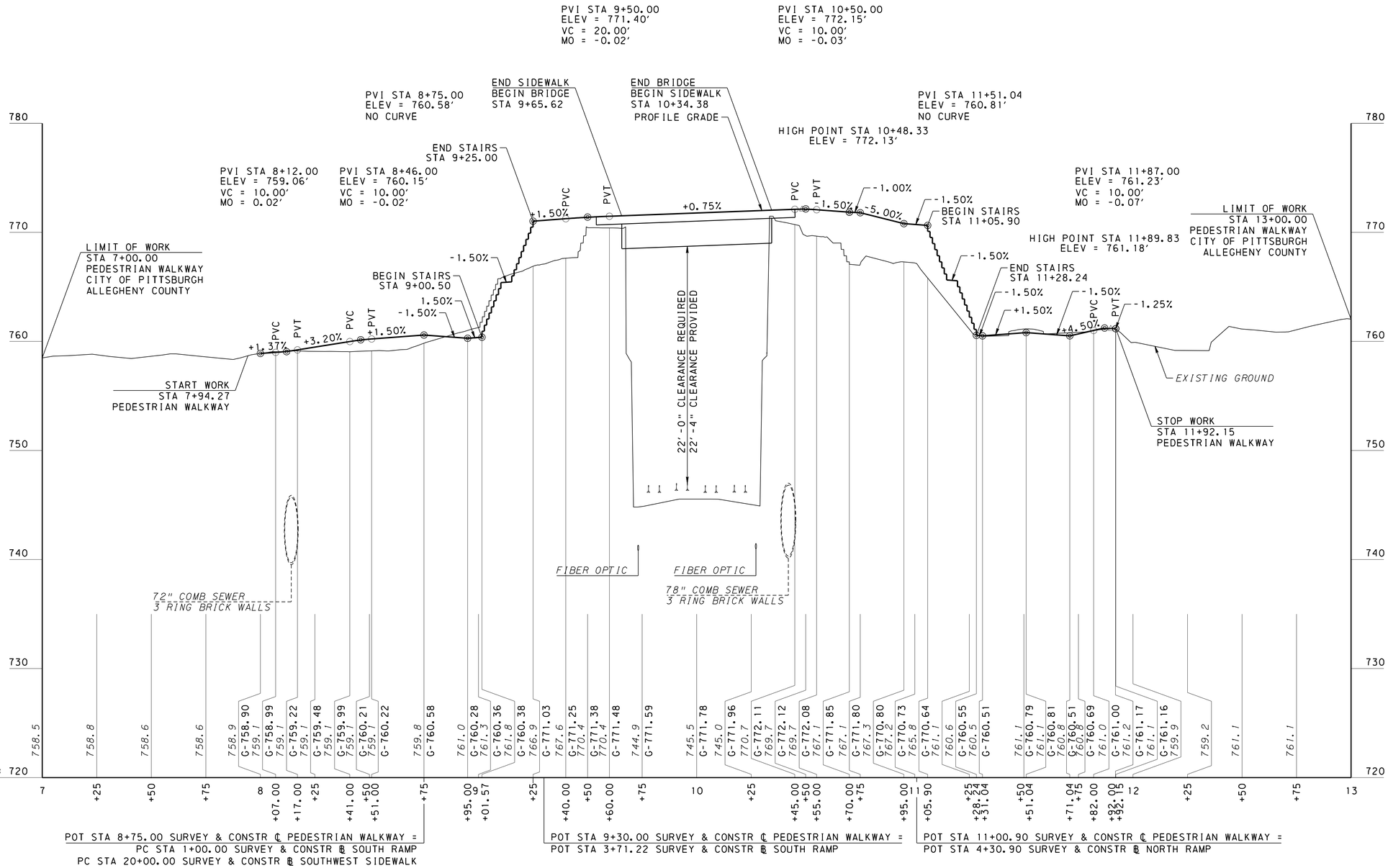
2/5/2024
NS_ Ped_Bridge_Plan – Alternate 2.dgn



PROFILE – PEDESTRIAN WALKWAY

HORIZONTAL
SCALE: 1"=25'
25' 0 25' 50'
DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

VERTICAL
SCALE: 1"=5'
5' 0 5' 10'
DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

ALTERNATE 2
CONSTRUCT BRIDGE
WITH 22' CLEARANCE

Michael Baker INTERNATIONAL
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100 AIRSIDE DRIVE
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NORFOLK SOUTHERN
NORFOLK SOUTHERN RAILWAY COMPANY
OWNING COMPANY
PITTSBURGH
OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER – DESIGN AND CONSTRUCTION – ATLANTA, GA.

REV	BY	DATE	DESCRIPTION

LOCATION: PITTSBURGH, PENNSYLVANIA
TITLE: BR0027857 BRIDGE PC-1.5 WALKWAY
PROFILE – PEDESTRIAN WALKWAY

DSN JAH	PID No.	MRN	MILE POST PC 1.50
DWN WRB	FILE No. BR0027857		DRAWING NUMBER
CK WVB	DATE 01/24/2024		

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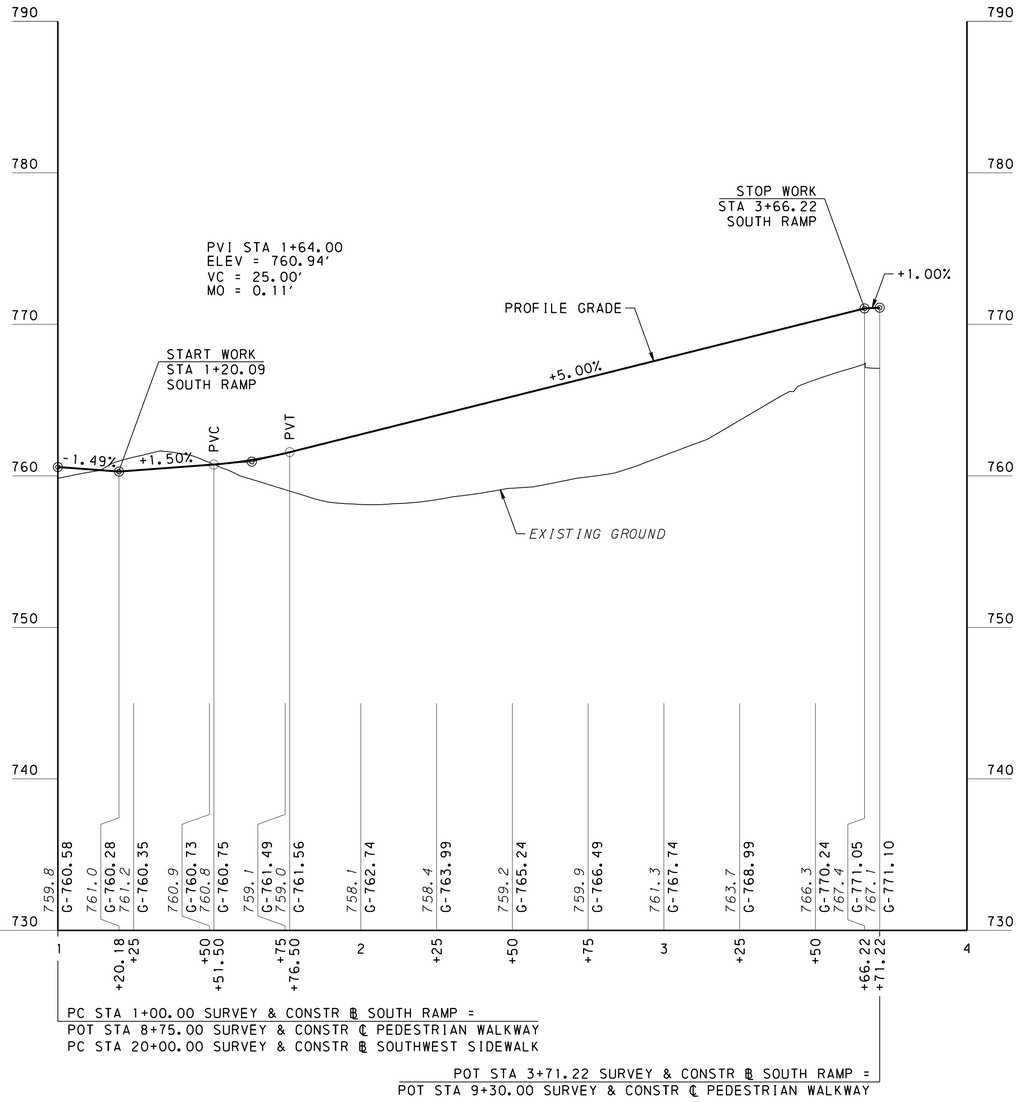
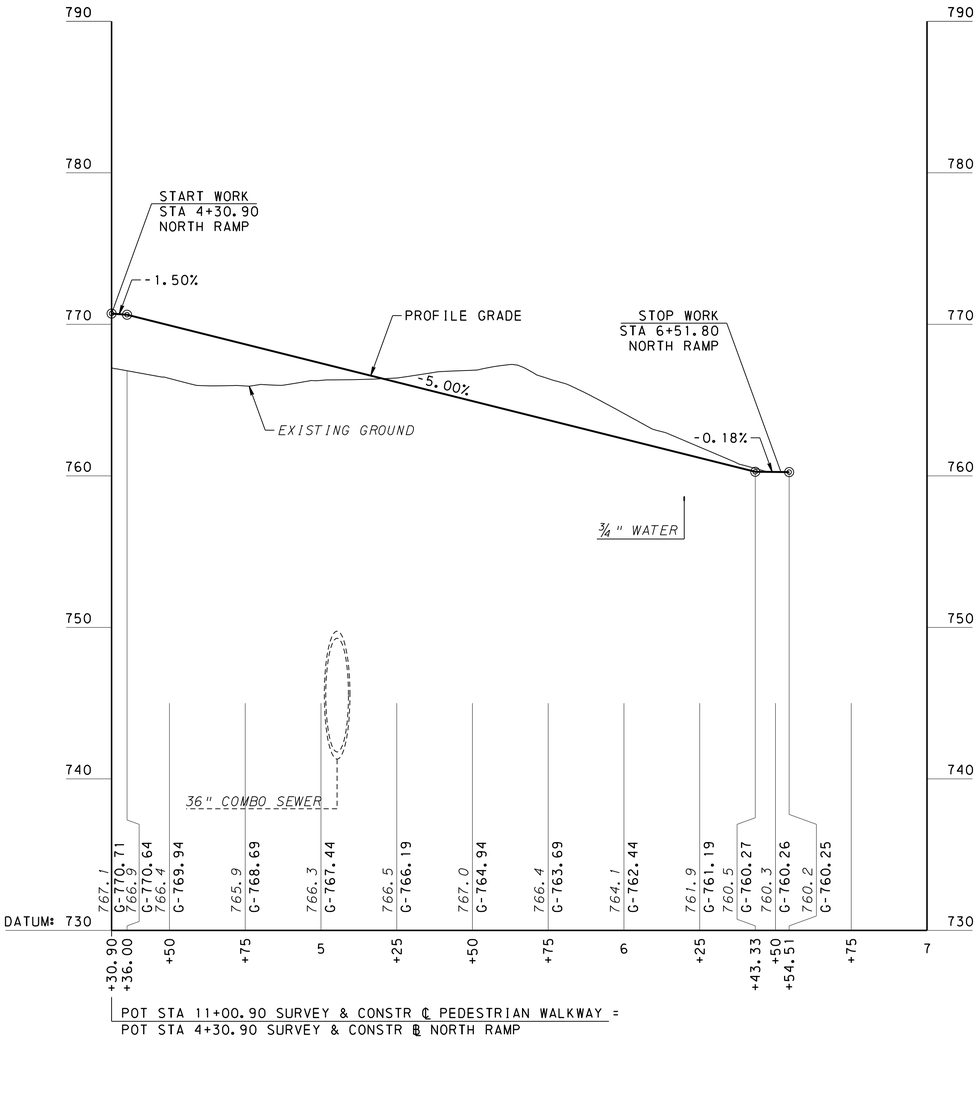


PROFILE – SOUTH RAMP



PROFILE – NORTH RAMP

HORIZONTAL
SCALE: 1"=25'
25' 0 25' 50'
DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

VERTICAL
SCALE: 1"=5'
5' 0 5' 10'
DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

ALTERNATE 2
CONSTRUCT BRIDGE
WITH 22' CLEARANCE

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OWNING COMPANY
NORFOLK SOUTHERN RAILWAY COMPANY
PITTSBURGH
OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER – DESIGN AND CONSTRUCTION – ATLANTA, GA.

REV	BY	DATE	DESCRIPTION

LOCATION: PITTSBURGH, PENNSYLVANIA
TITLE: BR0027857 BRIDGE PC-1.5 WALKWAY
PROFILES – NORTH RAMP AND SOUTH RAMP

DSN	JAH	PID No.		MILE POST	PC 1.50
DWN	WRB	FILE No.	BR0027857	DRAWING NUMBER	
CHK	WVB	DATE	01/24/2024		

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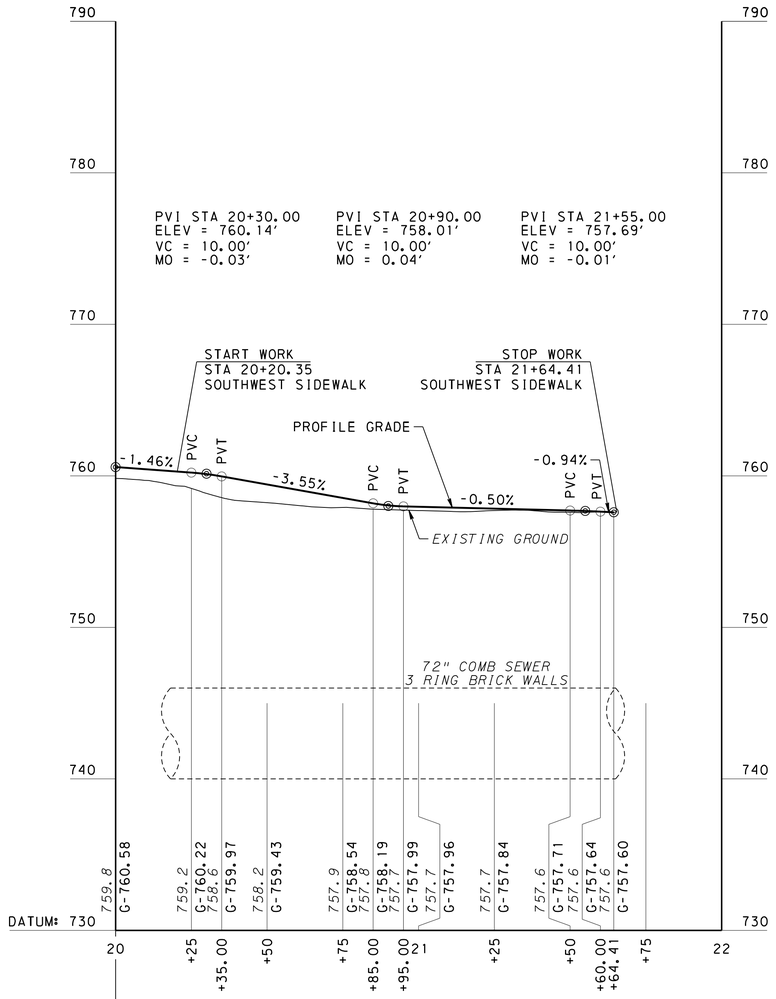

PC STA 20+00.00 SURVEY & CONSTR ℄ SOUTHWEST SIDEWALK =
POT STA 8+75.00 SURVEY & CONSTR ℄ PEDESTRIAN WALKWAY
PC STA 1+00.00 SURVEY & CONSTR ℄ SOUTH RAMP

PROFILE – SOUTHWEST SIDEWALK

HORIZONTAL
SCALE: 1"=25'
25' 0 25' 50'
DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

VERTICAL
SCALE: 1"=5'
5' 0 5' 10'
DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

ALTERNATE 2
CONSTRUCT BRIDGE
WITH 22' CLEARANCE

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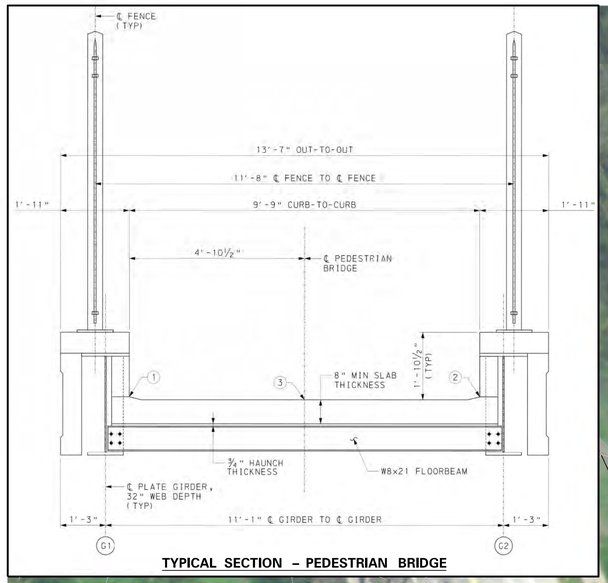
NORFOLK SOUTHERN RAILWAY COMPANY
OWNING COMPANY
PITTSBURGH
OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER – DESIGN AND CONSTRUCTION – ATLANTA, GA.

REV.	BY	DATE	DESCRIPTION

LOCATION: PITTSBURGH, PENNSYLVANIA
TITLE: BR0027857 BRIDGE PC-1.5 WALKWAY
PROFILE – SOUTHWEST SIDEWALK

DSN. JAH	PID No.	MRN	MILE POST PC 1.50
DWN. WRB	FILE No. BR0027857		DRAWING NUMBER
CHK. WVB	DATE 01/24/2024		



TYPICAL SECTION – PEDESTRIAN BRIDGE

TYPICAL SECTION – ACCESSIBLE RAMP

LEGEND

PROPOSED WINGWALL/RETAINING WALL

PROPOSED PEDESTRIAN RAILING

SCALE: 1"=25'

25' 0 25' 50'

DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

ALTERNATE 3
CONSTRUCT BRIDGE
WITH 21'–4" CLEARANCE

Michael Baker INTERNATIONAL
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100 AIRSIDE DRIVE
MOON TOWNSHIP, PA 15108
Phone: (412) 269-6300

NORFOLK SOUTHERN

NORFOLK SOUTHERN RAILWAY COMPANY
OWNING COMPANY

PITTSBURGH
OPERATING DIVISION

OFFICE OF THE CHIEF ENGINEER – DESIGN AND CONSTRUCTION – ATLANTA, GA.

REV.	BY	DATE	DESCRIPTION

LOCATION: PITTSBURGH, PENNSYLVANIA

TITLE: BR0027857 BRIDGE PC–1.5 WALKWAY PLAN 01

DSN JAH	PID No.	WIN	MILE POST PC 1.50
DWN WRB	PCE No. BR0027857		DRAWING NUMBER
CHK WVB	DATE 01/24/2024		

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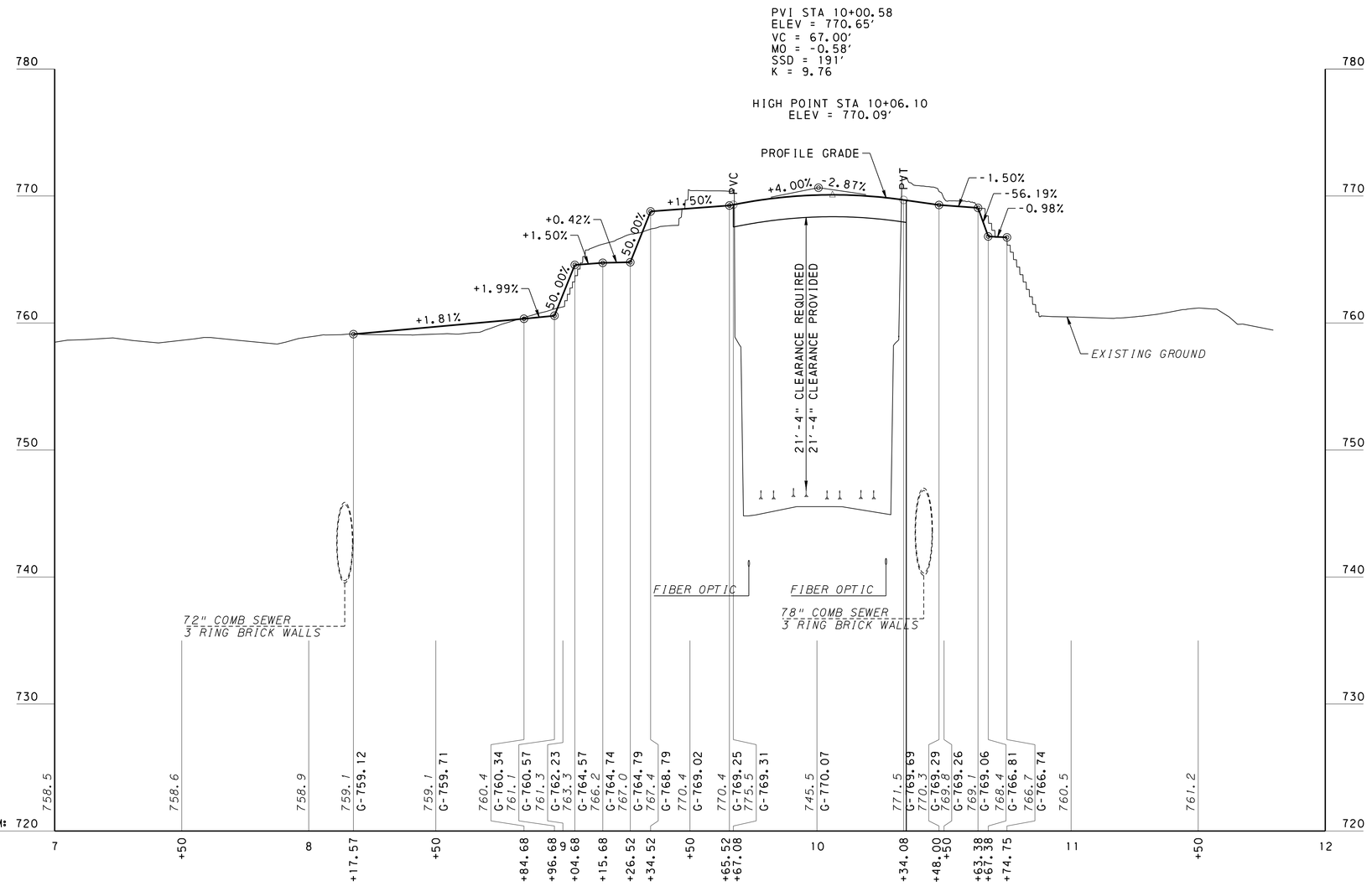

PROFILE – PEDESTRIAN WALKWAY

HORIZONTAL
SCALE: 1"=25'
25' 0 25' 50'
DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

VERTICAL
SCALE: 1"=5'
5' 0 5' 10'
DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

ALTERNATE
CONSTRUCT BRIDGE
WITH 21'-4" CLEARANCE

Michael Baker INTERNATIONAL
AIRSIDE BUSINESS PARK
100 AIRSIDE DRIVE
MOON TOWNSHIP, PA 15108
Phone: (412) 269-6300

NORFOLK SOUTHERN RAILWAY COMPANY
OWNING COMPANY
PITTSBURGH
OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER – DESIGN AND CONSTRUCTION – ATLANTA, GA.

REV	BY	DATE	DESCRIPTION

LOCATION: PITTSBURGH, PENNSYLVANIA
TITLE: BR0027857 BRIDGE PC-1.5 WALKWAY
PROFILE – PEDESTRIAN WALKWAY

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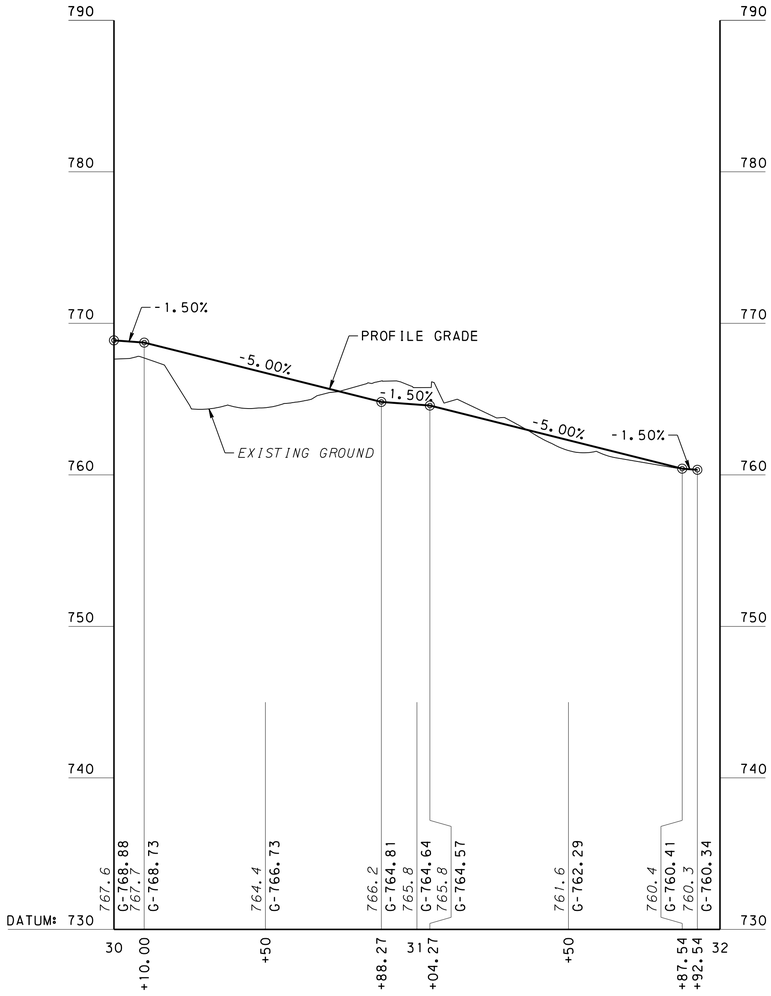
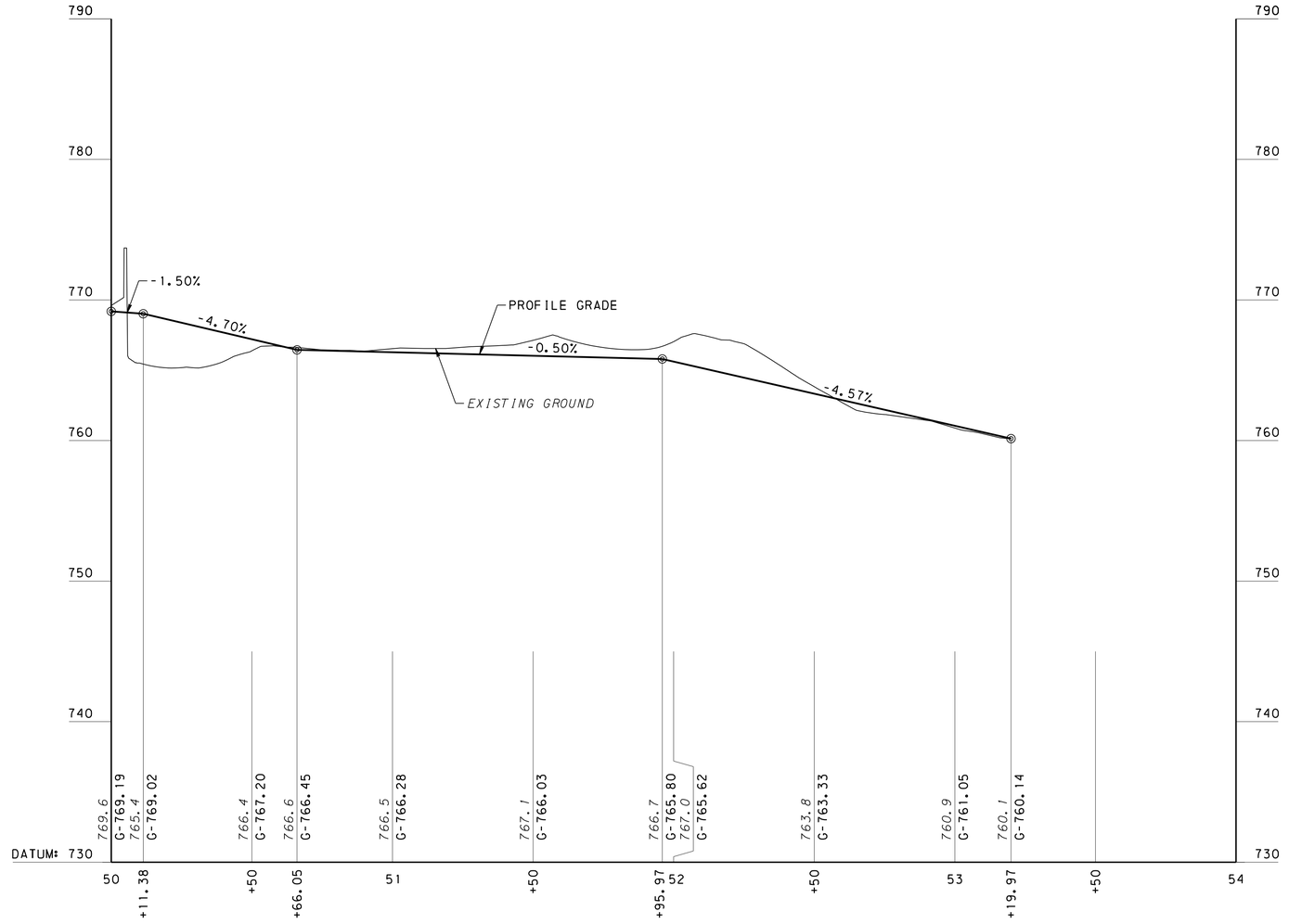


PROFILE – SOUTH WALKWAY



PROFILE – NORTH WALKWAY

SCALE: 1"=25'

HORIZONTAL

25' 0 25' 50'

DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

SCALE: 1"=5'

VERTICAL

5' 0 5' 10'

DO NOT SCALE THIS DRAWING FOR DIMENSIONS NOT GIVEN

ALTERNATE 3
CONSTRUCT BRIDGE
WITH 21'-4" CLEARANCE

Michael Baker INTERNATIONAL
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NORFOLK SOUTHERN RAILWAY COMPANY
OWNING COMPANY
PITTSBURGH
OPERATING DIVISION
OFFICE OF THE CHIEF ENGINEER – DESIGN AND CONSTRUCTION – ATLANTA, GA.

REV	BY	DATE	DESCRIPTION

LOCATION: PITTSBURGH, PENNSYLVANIA
TITLE: BR0027857 BRIDGE PC-1.5 WALKWAY
PROFILE – NORTH WALKWAY AND SOUTH WALKWAY

DSN	JAH	PID No.		MILE POST	PC 1.50
DWN	WRB	FILE No.	BR0027857	DRAWING NUMBER	
CHK	WVB	DATE	01/24/2024		

CADD FILE: NS_ Ped_Bridge_Profiles – Alternate 3.dgn

Michael Baker
INTERNATIONAL

APPENDIX C

Conceptual Cost Estimates

Michael Baker INTERNATIONAL

Norfolk Southern Vertical Clearance
Pittsburgh Amtrak Station Modifications
Alternative 2
Construction Cost Estimate

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
Asbestos Abatement	1	LS	$3,808,760	$3,808,760
Canopy Concept	1	LS	$3,385,144	$3,385,144
Bay Removal	1	LS	$4,303,601	$4,303,601
			TOTAL CONSTRUCTION COST	**$11,497,505**

Cost estimate does not include the following:

-Final Design Engineering

-Consultation during construction

Michael Baker INTERNATIONAL

Norfolk Southern Vertical Clearance
Pittsburgh Station Platform Canopy - 12' wide
Construction Cost Estimate

ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE (2018)	INFLATION RATE			UNIT PRICE (2021)	COST
					2019	2020	2021		
1	SAWCUT AND REMOVE EXISTING PLATFORM CONCRETE	4,818	SF	$18.00	3.0%	3.0%	5.0%	$20.05	$96,605.77
2	EXCAVATION FOR FOUNDATION AND DRAIN PIPE	635	CY	$60.00	3.0%	3.0%	5.0%	$66.84	$42,441.30
3	TRANSPORT / STORAGE OF EXCAVATED MATERIALS	635	CY	$5.00	3.0%	3.0%	5.0%	$5.57	$3,536.78
4	BACKFILLING AND COMPACTION	400	CY	$30.00	3.0%	3.0%	5.0%	$33.42	$13,367.34
5	PLATFORM CONCRETE REPAIR/ RECONSTRUCTION (6" THICK SLAB-ON-GRADE INCL.FINISHING)	4,818	SF	$6.50	3.0%	3.0%	5.0%	$7.24	$34,885.42
6	WWF REINFORCING FOR PLATFORM RECONSTRUCTION	4,818	SF	$1.50	3.0%	3.0%	5.0%	$1.67	$8,050.48
7	MINI-PILES (FOR FOUNDATION LOCATIONS SPANNING OVER EXISTING TUNNEL)	82	EACH	$2,500.00	3.0%	3.0%	5.0%	$2,784.86	$228,358.73
8	CONCRETE MATERIAL FOR PILE CAPS IN PLACE	127	CY	$720.00	3.0%	3.0%	5.0%	$802.04	$101,859.13
9	CONCRETE MATERIAL FOR FOOTINGS IN PLACE	20	CY	$720.00	3.0%	3.0%	5.0%	$802.04	$16,040.81
10	REINFORCING FOR FOOTINGS AND PILE CAPS	(INCLUDED IN ITEMS 7 AND 8 ABOVE)							$0.00
11	CONCRETE PEDESTALS (INCLUDING REINFORCING AND FORMWORK)	6	CY	$1,632.00	3.0%	3.0%	5.0%	$1,817.96	$10,907.75
12	COMPRESSIBLE MATERIAL FOR FORMING OVER TUNNEL (STYROFOAM)	1,200	SF	$4.50	3.0%	3.0%	5.0%	$5.01	$6,015.30
13	STRUCTURAL STEEL, CONNECTIONS, AND DETAILING MATERIAL	110	TON	$5,800.00	3.0%	3.0%	5.0%	$6,460.88	$710,696.91
14	METAL ROOF DECK (STRUCTURE)	11,000	SF	$4.50	3.0%	3.0%	5.0%	$5.01	$55,140.28
15	ROOFING BASE MATERIALS	11,000	SF	$2.50	3.0%	3.0%	5.0%	$2.78	$30,633.49
16	ROOFING SURFACE MATERIALS	11,000	SF	$7.00	3.0%	3.0%	5.0%	$7.80	$85,773.77
17	COLD-FORMED METAL FACIA	2,600	SF	$9.00	3.0%	3.0%	5.0%	$10.03	$26,066.31
18	GUTTER	900	LF	$12.00	3.0%	3.0%	5.0%	$13.37	$12,030.61
19	DOWNSPOUT (ABOVE GRADE)	600	LF	$12.50	3.0%	3.0%	5.0%	$13.92	$8,354.59
20	DRAIN PIPING	1,200	LF	$16.00	3.0%	3.0%	5.0%	$17.82	$21,387.74
								CONSTRUCTION SUBTOTAL	**$1,512,200**
								4% MOBILIZATION	**$60,500**
								25% CONTINGENCY	**$378,100**
								TOTAL CONSTRUCTION COST	**$1,950,800**
								12% CONSTRUCTION OVERSIGHT	**$234,100**
								6.0% / YEAR ESCALATION (2 YEARS)	**$241,120**
								TOTAL CONSTRUCTION COST FOR 860 LF	**$2,426,020**
								ADDITIONAL CONSTRUCTION COST FOR 1,200 LF	**$959,124**
								TOTAL CONSTRUCTION COST FOR 1,200 LF	**$3,385,144**

Cost estimate does not include the following:

-Final Design Engineering

-Consultation during construction

Michael Baker INTERNATIONAL

Norfolk Southern Vertical Clearance
Pittsburgh Station Full Bay Removal
Construction Cost Estimate

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
Tangent Bay Removal				
SKYLIGHT REMOVAL (2.5 DAYS)				
IRON WORKERS (2 @ 20 HRS EACH)	40	HR	$70.93	$2,837
LABORERS (2 @ 20 HRS EACH)	40	HR	$39.97	$1,599
TRUCK DRIVER	20	HR	$51.64	$1,033
CRANE OPERATOR	20	HR	$60.44	$1,209
SUPERVISOR	20	HR	$85.50	$1,710
			SKYLIGHT REMOVAL SUBTOTAL	**$8,388**
PRECAST ROOF SLAB REMOVAL (1.5 DAYS)				
LABORERS (3 @ 12 HRS EACH)	36	HR	$39.97	$1,439
TRUCK DRIVER	12	HR	$51.64	$620
CRANE OPERATOR	12	HR	$60.44	$725
SUPERVISOR	12	HR	$85.50	$1,026
			PRECAST ROOF SLAB REMOVAL SUBTOTAL	**$3,810**
STRUCTURAL FRAMING REMOVAL (2.5 DAYS)				
IRON WORKERS (2 @ 20 HRS EACH)	40	HR	$70.93	$2,837
LABORERS (2 @ 20 HRS EACH)	40	HR	$39.97	$1,599
TRUCK DRIVER	20	HR	$51.64	$1,033
CRANE OPERATOR	20	HR	$60.44	$1,209
SUPERVISOR	20	HR	$85.50	$1,710
			STRUCTURAL FRAMING REMOVAL SUBTOTAL	**$8,388**
REDUCE WALL HEIGHT (1 DAY)				
LABORERS (2 @ 8 HRS EACH)	16	HR	$39.97	$640
TRUCK DRIVER	8	HR	$51.64	$413
CRANE OPERATOR	8	HR	$60.44	$484
SUPERVISOR	8	HR	$85.50	$684
			STRUCTURAL FRAMING REMOVAL SUBTOTAL	**$2,220**
REPAIR ROOF EDGE (2 DAYS)				
LABORERS (3 @ 16 HRS EACH)	48	HR	$39.97	$1,919
SUPERVISOR	16	HR	$85.50	$1,368
			STRUCTURAL FRAMING REMOVAL SUBTOTAL	**$3,287**
			REMOVAL OF SINGLE TANGENT BAY (PER TRACK) SUBTOTAL	**$26,092**
			REMOVAL OF 22 TANGENT BAYS (PER TRACK) SUBTOTAL	**$574,020**
UMBRELLA CANOPY				
INSTALL UMBRELLA CANOPY	200	LF	$1,000.00	$200,000.00
			UMBRELLA CANOPY SUBTOTAL	**$200,000**
			REMOVAL OF 22 TANGENT BAYS OVER 2 TRACKS SUBTOTAL	**$1,348,039**

Michael Baker INTERNATIONAL

Norfolk Southern Vertical Clearance
Pittsburgh Station Full Bay Removal
Construction Cost Estimate

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
Curved Bay Removal				
PRECAST ROOF SLAB REMOVAL (2 DAYS)				
LABORERS (3 @ 16 HRS EACH)	48	HR	$39.97	$1,919
TRUCK DRIVER	16	HR	$51.64	$826
CRANE OPERATOR	16	HR	$60.44	$967
SUPERVISOR	16	HR	$85.50	$1,368
PRECAST ROOF SLAB REMOVAL SUBTOTAL				**$5,080**
STRUCTURAL FRAMING REMOVAL (3.25 DAYS)				
IRON WORKERS (2 @ 26 HRS EACH)	52	HR	$70.93	$3,688
LABORERS (2 @ 26 HRS EACH)	52	HR	$39.97	$2,078
TRUCK DRIVER	26	HR	$51.64	$1,343
CRANE OPERATOR	26	HR	$60.44	$1,571
SUPERVISOR	26	HR	$85.50	$2,223
STRUCTURAL FRAMING REMOVAL SUBTOTAL				**$10,904**
REDUCE WALL HEIGHT (1.5 DAY)				
LABORERS (2 @ 12 HRS EACH)	24	HR	$39.97	$959
TRUCK DRIVER	12	HR	$51.64	$620
CRANE OPERATOR	12	HR	$60.44	$725
SUPERVISOR	12	HR	$85.50	$1,026
STRUCTURAL FRAMING REMOVAL SUBTOTAL				**$3,330**
REPAIR ROOF EDGE (2.5 DAYS)				
LABORERS (3 @ 20 HRS EACH)	60	HR	$39.97	$2,398
SUPERVISOR	20	HR	$85.50	$1,710
STRUCTURAL FRAMING REMOVAL SUBTOTAL				**$4,108**
REMOVAL OF SINGL CURVED BAY (PER TRACK) SUBTOTAL				**$23,422**
REMOVAL OF 12 CURVED BAYS (PER TRACK) SUBTOTAL				**$281,066**
UMBRELLA CANOPY				
INSTALL UMBRELLA CANOPY	200	LF	$1,000.00	$200,000
UMBRELLA CANOPY SUBTOTAL				**$200,000**
REMOVAL OF 12 CURVED BAYS OVER 2 TRACKS SUBTOTAL				**$762,132**
FULL BAY REMOVAL SUBTOTAL				**$2,110,171**
25% RAIL TRAFFIC CONTROL/RESTRICTION				**$527,500**
10% TRAFFIC CONTROL				**$211,000**
5% PERMITTING				**$105,500**
4% MOBILIZATION				**$84,400**
20% CONTINGENCY				**$422,000**
TOTAL CONSTRUCTION COST				**$3,460,571**
12% CONSTRUCTION OVERSIGHT				**$415,300**
6.0% / YEAR ESCALATION (2 YEARS)				**$427,730**
TOTAL				**$4,303,601**

Cost estimate does not include the following:

-Final Design Engineering

-Consultation during construction

Pittsburgh Amtrak Station Modifications May 2024
Alternative 3
Construction Cost Estimate

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
MOBILIZATION/DEMOBILIZATION/RR COORDINATION/FLAGGING	1	LS	$ 930,000.00	$930,000
CONSTRUCTION BARRICADES AND SEQUENCING	1	LS	$150,000	$150,000
HAZARDOUS MATERIALS DEMOLITION	1	LS	$ 500,000.00	$500,000
CHUTE RETROFIT	1	LS	$ 1,749,516.20	$1,749,516
STRUCTURAL MODIFICATIONS	1	LS	$1,935,969	$1,935,969
STRUCTURAL REPAIRS (DAMAGED COLUMNS)	4	EACH	$50,000	$200,000
ROOF MODIFICATIONS AND RETROFIT	0	EACH	$2,000	$0
DRAINAGE SYSTEM RECONFIGURATION	0	EACH	$1,000	$0
REROOF OF EFFECTED AREA	0	LS	$0	$0
MEP REPAIRS AND RECONSTRUCTION	1	LS	$75,000	$75,000
			CONSTRUCTION SUBTOTAL	**$5,540,500**
			MOBILIZATION 0% (included above)	**$0**
			10% CONTINGENCY	**$554,100**
			TOTAL CONSTRUCTION COST	**$6,094,600**
		12%	**CONSTRUCTION OVERSIGHT**	**$731,400**
		6.0%	**/ YEAR ESCALATION (2 YEARS)**	**$753,300**
			TOTAL	**$7,579,300**

Cost estimate does not include the following:
-Right-of-Way Acquisition
-Final Design Engineering
-Consultation during construction

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
REMOVAL OF EXISTING PAVEMENT AND SIDEWALKS	2,840	CY	$39.00	$110,760.00
FOREIGN BORROW EXCAVATION	4,124	CY	$51.00	$210,324.00
GEOTEXTILE, CLASS 1	1,842	LF	$3.50	$6,447.00
CEMENT CONCRETE BASE COURSE, 10" DEPTH, REINFORCED	4,043	SY	$155.00	$626,665.00
SUPERPAVE ASPHALT MIXTURE DESIGN, WEARING COURSE, 1 1/2" DEPTH	4,043	SY	$23.00	$92,989.00
SUPERPAVE ASPHALT MIXTURE DESIGN, BINDER COURSE, 2 1/2" DEPTH	4,043	SY	$18.50	$74,795.50
ASPHALT TACK COAT	11,866	SY	$0.75	$8,899.50
SUBBASE 5" DEPTH (NO. 2A)	183	SY	$25.00	$4,575.00
SUBBASE 8" DEPTH (NO. 2A)	4,508	SY	$40.00	$180,320.00
REINFORCED CEMENT CONCRETE PAVEMENT, 8" DEPTH	183	SY	$180.00	$32,940.00
PROTECTIVE COATING FOR CEMENT CONCRETE PAVEMENTS	3,170	SY	$4.50	$14,265.00
BRIDGE APPROACH SLAB	465	SY	$610.00	$283,650.00
INSPECTOR'S FIELD OFFICE AND INSPECTION FACILITIES, TYPE B	1	LS	$18,000.00	$18,000.00
EQUIPMENT PACKAGE	1	LS	$3,500.00	$3,500.00
4" PIPE UNDERDRAIN, TYPE 1 BACKFILL	1,842	LF	$19.00	$34,998.00
CONCRETE DEEP CURB	2,039	LF	$73.00	$148,847.00
CEMENT CONCRETE SIDEWALK MODIFIED	2,031	SY	$110.00	$223,410.00
TOE WALL SIDEWALK WITH PEDESTRIAN HANDRAIL	374	LF	$1,150.00	$430,100.00
RETAINING WALL	50	SF	$250.00	$12,500.00
RESET BUS STOP SHELTER	1	LS	$7,000.00	$7,000.00
CONSTRUCTION SURVEYING, TYPE B	1	LS	$20,000.00	$20,000.00
CONSTRUCTION SURVEYING, TYPE D	1	LS	$20,000.00	$20,000.00
CPM SCHEDULE	1	LS	$5,500.00	$5,500.00
DETECTABLE WARNING SURFACE, POLYMER CONCRETE	140	SF	$35.00	$4,900.00
TOPSOIL, FURNISHED AND PLACED	110	CY	$115.00	$12,650.00
SEEDING AND SOIL SUPPLEMENTS, FORMULA B	25	LB	$165.00	$4,125.00
RESET FENCE	476	LF	$45.00	$21,420.00
TREE REMOVAL	6	EA	$2,000.00	$12,000.00
LANDSCAPING	1	LS	$10,000.00	$10,000.00
AESTHETIC TREATMENTS FOR PEDESTRIAN AREA	1	LS	$30,000.00	$30,000.00
STREET LIGHTING ADJUSTMENTS	12	EACH	$20,000.00	$240,000.00
EROSION AND SEDIMENT POLLUTION CONTROL MEASURES	1	LS	$60,000.00	$60,000.00
TRAFFIC SIGNAL	1	LS	$225,000.00	$225,000.00
MAINTENANCE AND PROTECTION OF TRAFFIC DURING CONSTRUCTION	1	LS	$90,000.00	$90,000.00
SIGNING & PAVEMENT MARKINGS	1	LS	$27,000.00	$27,000.00
DRAINAGE	1	LS	$150,000.00	$150,000.00
UTILITY RELOCATIONS (NORTH AVENUE)	1	LS	$150,000.00	$150,000.00
ROADWAY CONSTRUCTION ITEMS SUBTOTAL				**$3,607,600**
4% MOBILIZATION				**$144,300**
20% CONTINGENCY				**$721,500**
TOTAL ROADWAY CONSTRUCTION SUBTOTAL				**$4,473,400**
12% CONSTRUCTION OVERSIGHT				**$536,800**
6.0% / YEAR ESCALATION (1 YEAR)				**$268,500**
TOTAL CONSTRUCTION COST				**$5,278,700**

Cost estimate does not include the following:

- -Right-of-Way Acquisition
- -Final Design Engineering
- -Consultation during construction
- -Bridge Construction Cost

Computed By: TJA
Checked By:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
REMOVAL OF EXISTING PAVEMENT AND SIDEWALKS	645	CY	$50.00	$32,250.00
FOREIGN BORROW EXCAVATION	63	CY	$97.00	$6,111.00
GEOTEXTILE, CLASS 1	451	LF	$3.75	$1,691.25
CEMENT CONCRETE BASE COURSE, 10" DEPTH, REINFORCED	445	SY	$198.00	$88,110.00
SUPERPAVE ASPHALT MIXTURE DESIGN, WEARING COURSE, 1 1/2" DEPTH	445	SY	$43.00	$19,135.00
SUPERPAVE ASPHALT MIXTURE DESIGN, BINDER COURSE, 2 1/2" DEPTH	445	SY	$30.00	$13,350.00
ASPHALT TACK COAT	891	SY	$1.00	$891.00
SUBBASE 8" DEPTH (NO. 2A)	445	SY	$35.00	$15,575.00
PROTECTIVE COATING FOR CEMENT CONCRETE PAVEMENTS	1,037	SY	$7.00	$7,259.00
BRIDGE APPROACH SLAB	463	SY	$610.00	$282,430.00
INSPECTOR'S FIELD OFFICE AND INSPECTION FACILITIES, TYPE B	1	LS	$18,000.00	$18,000.00
EQUIPMENT PACKAGE	1	LS	$3,500.00	$3,500.00
4" PIPE UNDERDRAIN, TYPE 1 BACKFILL	451	LF	$19.50	$8,794.50
CONCRETE DEEP CURB	451	LF	$83.00	$37,433.00
CEMENT CONCRETE SIDEWALK MODIFIED	511	SY	$140.00	$71,540.00
CONSTRUCTION SURVEYING, TYPE B	1	LS	$20,000.00	$20,000.00
CONSTRUCTION SURVEYING, TYPE D	1	LS	$20,000.00	$20,000.00
CPM SCHEDULE	1	LS	$5,500.00	$5,500.00
DETECTABLE WARNING SURFACE, POLYMER CONCRETE	90	SF	$32.00	$2,880.00
TOPSOIL, FURNISHED AND PLACED	30	CY	$140.00	$4,200.00
SEEDING AND SOIL SUPPLEMENTS, FORMULA B	6	LB	$350.00	$2,100.00
RESET FENCE	279	LF	$45.00	$12,555.00
LANDSCAPING	1	LS	$10,000.00	$10,000.00
AESTHETIC TREATMENTS FOR PEDESTRIAN AREA	1	LS	$30,000.00	$30,000.00
STREET LIGHTING ADJUSTMENTS	7	EACH	$20,000.00	$240,000.00
EROSION AND SEDIMENT POLLUTION CONTROL MEASURES	1	LS	$20,000.00	$20,000.00
TRAFFIC SIGNAL	1	LS	$225,000.00	$225,000.00
MAINTENANCE AND PROTECTION OF TRAFFIC DURING CONSTRUCTION	1	LS	$30,000.00	$30,000.00
SIGNING & PAVEMENT MARKINGS	1	LS	$10,000.00	$10,000.00
DRAINAGE	1	LS	$50,000.00	$50,000.00
UTILITY RELOCATIONS (NORTH AVENUE)	1	LS	$50,000.00	$50,000.00
ROADWAY CONSTRUCTION ITEMS SUBTOTAL				**$1,338,300**
4%	**MOBILIZATION**			**$53,500**
20%	**CONTINGENCY**			**$267,700**
TOTAL ROADWAY CONSTRUCTION SUBTOTAL				**$1,659,500**
12%	**CONSTRUCTION OVERSIGHT**			**$199,100**
6.0%	**/ YEAR ESCALATION (1 YEAR)**			**$99,600**
TOTAL ROADWAY CONSTRUCTION COST				**$1,958,200**
TRACK LOWERING - OPTION 1: REDUCING TRACKS FROM 4 TO 3 AND BUTTRESSING RETAINING WALLS	1	LS	$52,000,000.00	$52,000,000.00
30" PWSA WATERMAIN REPLACEMENT	1	LS	$1,080,000.00	$1,080,000.00
345KV/138KV DUQUESNE LIGHT PRIMARY REPLACEMENT	1	LS	$3,520,000.00	$3,520,000.00
DRAINAGE AND GROUND WATER MITIGATION	1	LS	$500,000.00	$500,000.00
TOTAL RAILROAD CONSTRUCTION COST				**$57,100,000**
TOTAL CONSTRUCTION COST				**$59,058,200**

Note: North Avenue Alternate 3 is necessarily accompanied by Pennsylvania Avenue Alternate 3 as track lowering limits extend under both the Pennsylvania Avenue Bridge and the North Avenue Bridge.

Cost estimate does not include the following:
-Right-of-Way Acquisition
-Final Design Engineering
-Consultation during construction
-Bridge Construction Cost

Computed By: TJA
Checked By:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
REMOVAL OF EXISTING PAVEMENT AND SIDEWALKS	2,696	CY	$39.00	$105,144.00
FOREIGN BORROW EXCAVATION	3,247	CY	$53.00	$172,091.00
GEOTEXTILE, CLASS 1	1,799	LF	$3.50	$6,296.50
CEMENT CONCRETE BASE COURSE, 10" DEPTH, REINFORCED	3,813	SY	$155.00	$591,015.00
SUPERPAVE ASPHALT MIXTURE DESIGN, WEARING COURSE, 1 1/2" DEPTH	3,813	SY	$24.00	$91,512.00
SUPERPAVE ASPHALT MIXTURE DESIGN, BINDER COURSE, 2 1/2" DEPTH	3,813	SY	$18.50	$70,540.50
ASPHALT TACK COAT	11,227	SY	$0.75	$8,420.25
SUBBASE 5" DEPTH (NO. 2A)	139	SY	$26.00	$3,614.00
SUBBASE 8" DEPTH (NO. 2A)	4,278	SY	$25.00	$106,950.00
REINFORCED CEMENT CONCRETE PAVEMENT, 8" DEPTH	139	SY	$185.00	$25,715.00
PROTECTIVE COATING FOR CEMENT CONCRETE PAVEMENTS	3,003	SY	$4.50	$13,513.50
BRIDGE APPROACH SLAB	465	SY	$610.00	$283,650.00
INSPECTOR'S FIELD OFFICE AND INSPECTION FACILITIES, TYPE B	1	LS	$18,000.00	$18,000.00
EQUIPMENT PACKAGE	1	LS	$3,500.00	$3,500.00
4" PIPE UNDERDRAIN, TYPE 1 BACKFILL	1,799	LF	$19.00	$34,181.00
CONCRETE DEEP CURB	1,916	LF	$73.00	$139,868.00
CEMENT CONCRETE SIDEWALK MODIFIED	1,935	SY	$110.00	$212,850.00
TOE WALL SIDEWALK WITH PEDESTRIAN HANDRAIL	364	LF	$1,150.00	$418,600.00
RETAINING WALL	50	SF	$250.00	$12,500.00
RESET BUS STOP SHELTER	1	LS	$7,000.00	$7,000.00
CONSTRUCTION SURVEYING, TYPE B	1	LS	$20,000.00	$20,000.00
CONSTRUCTION SURVEYING, TYPE D	1	LS	$20,000.00	$20,000.00
CPM SCHEDULE	1	LS	$5,500.00	$5,500.00
DETECTABLE WARNING SURFACE, POLYMER CONCRETE	130	SF	$35.00	$4,550.00
TOPSOIL, FURNISHED AND PLACED	110	CY	$115.00	$12,650.00
SEEDING AND SOIL SUPPLEMENTS, FORMULA B	25	LB	$165.00	$4,125.00
RESET FENCE	476	LF	$45.00	$21,420.00
TREE REMOVAL	6	EA	$2,000.00	$12,000.00
LANDSCAPING	1	LS	$10,000.00	$10,000.00
AESTHETIC TREATMENTS FOR PEDESTRIAN AREA	1	LS	$30,000.00	$30,000.00
STREET LIGHTING ADJUSTMENTS	12	EACH	$20,000.00	$240,000.00
EROSION AND SEDIMENT POLLUTION CONTROL MEASURES	1	LS	$56,000.00	$56,000.00
TRAFFIC SIGNAL	1	LS	$225,000.00	$225,000.00
MAINTENANCE AND PROTECTION OF TRAFFIC DURING CONSTRUCTION	1	LS	$84,000.00	$84,000.00
SIGNING & PAVEMENT MARKINGS	1	LS	$28,000.00	$28,000.00
DRAINAGE	1	LS	$140,000.00	$140,000.00
UTILITY RELOCATIONS (NORTH AVENUE)	1	LS	$140,000.00	$140,000.00
ROADWAY CONSTRUCTION ITEMS SUBTOTAL				**$3,378,200**
4%	**MOBILIZATION**			**$135,100**
20%	**CONTINGENCY**			**$675,600**
TOTAL ROADWAY CONSTRUCTION SUBTOTAL				**$4,188,900**
12%	**CONSTRUCTION OVERSIGHT**			**$502,700**
6.0%	**/ YEAR ESCALATION (1 YEAR)**			**$251,400**
TOTAL ROADWAY CONSTRUCTION COST				**$4,943,000**
TRACK LOWERING	18,862	TF	$430.00	$8,110,660.00
30" PWSA WATERMAIN REPLACEMENT	1	LS	$1,080,000.00	$1,080,000.00
345KV/138KV DUQUESNE LIGHT PRIMARY REPLACEMENT	1	LS	$3,520,000.00	$3,520,000.00
DRAINAGE AND GROUND WATER MITIGATION	1	LS	$500,000.00	$500,000.00
TOTAL RAILROAD CONSTRUCTION COST				**$13,210,660**
TOTAL CONSTRUCTION COST				**$18,153,660**

Cost estimate does not include the following:

-Right-of-Way Acquisition
-Final Design Engineering
-Consultation during construction
-Bridge Construction Cost

Computed By: TJA
Checked By:

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
REMOVAL OF EXISTING PAVEMENT AND SIDEWALKS	2,696	CY	$39.00	$105,144.00
FOREIGN BORROW EXCAVATION	3,247	CY	$53.00	$172,091.00
GEOTEXTILE, CLASS 1	1,799	LF	$3.50	$6,296.50
CEMENT CONCRETE BASE COURSE, 10" DEPTH, REINFORCED	3,813	SY	$155.00	$591,015.00
SUPERPAVE ASPHALT MIXTURE DESIGN, WEARING COURSE, 1 1/2" DEPTH	3,813	SY	$24.00	$91,512.00
SUPERPAVE ASPHALT MIXTURE DESIGN, BINDER COURSE, 2 1/2" DEPTH	3,813	SY	$18.50	$70,540.50
ASPHALT TACK COAT	11,227	SY	$0.75	$8,420.25
SUBBASE 5" DEPTH (NO. 2A)	139	SY	$26.00	$3,614.00
SUBBASE 8" DEPTH (NO. 2A)	4,278	SY	$25.00	$106,950.00
REINFORCED CEMENT CONCRETE PAVEMENT, 8" DEPTH	139	SY	$185.00	$25,715.00
PROTECTIVE COATING FOR CEMENT CONCRETE PAVEMENTS	3,003	SY	$4.50	$13,513.50
BRIDGE APPROACH SLAB	465	SY	$610.00	$283,650.00
INSPECTOR'S FIELD OFFICE AND INSPECTION FACILITIES, TYPE B	1	LS	$18,000.00	$18,000.00
EQUIPMENT PACKAGE	1	LS	$3,500.00	$3,500.00
4" PIPE UNDERDRAIN, TYPE 1 BACKFILL	1,799	LF	$19.00	$34,181.00
CONCRETE DEEP CURB	1,916	LF	$73.00	$139,868.00
CEMENT CONCRETE SIDEWALK MODIFIED	1,935	SY	$110.00	$212,850.00
TOE WALL SIDEWALK WITH PEDESTRIAN HANDRAIL	364	LF	$1,150.00	$418,600.00
RETAINING WALL	50	SF	$250.00	$12,500.00
RESET BUS STOP SHELTER	1	LS	$7,000.00	$7,000.00
CONSTRUCTION SURVEYING, TYPE B	1	LS	$20,000.00	$20,000.00
CONSTRUCTION SURVEYING, TYPE D	1	LS	$20,000.00	$20,000.00
CPM SCHEDULE	1	LS	$5,500.00	$5,500.00
DETECTABLE WARNING SURFACE, POLYMER CONCRETE	130	SF	$35.00	$4,550.00
TOPSOIL, FURNISHED AND PLACED	110	CY	$115.00	$12,650.00
SEEDING AND SOIL SUPPLEMENTS, FORMULA B	25	LB	$165.00	$4,125.00
RESET FENCE	476	LF	$45.00	$21,420.00
TREE REMOVAL	6	EA	$2,000.00	$12,000.00
LANDSCAPING	1	LS	$10,000.00	$10,000.00
AESTHETIC TREATMENTS FOR PEDESTRIAN AREA	1	LS	$30,000.00	$30,000.00
STREET LIGHTING ADJUSTMENTS	12	EACH	$20,000.00	$240,000.00
EROSION AND SEDIMENT POLLUTION CONTROL MEASURES	1	LS	$56,000.00	$56,000.00
TRAFFIC SIGNAL	1	LS	$225,000.00	$225,000.00
MAINTENANCE AND PROTECTION OF TRAFFIC DURING CONSTRUCTION	1	LS	$84,000.00	$84,000.00
SIGNING & PAVEMENT MARKINGS	1	LS	$28,000.00	$28,000.00
DRAINAGE	1	LS	$140,000.00	$140,000.00
UTILITY RELOCATIONS (NORTH AVENUE)	1	LS	$140,000.00	$140,000.00
ROADWAY CONSTRUCTION ITEMS SUBTOTAL				**$3,378,200**
4% MOBILIZATION				**$135,100**
20% CONTINGENCY				**$675,600**
TOTAL ROADWAY CONSTRUCTION SUBTOTAL				**$4,188,900**
12% CONSTRUCTION OVERSIGHT				**$502,700**
6.0% / YEAR ESCALATION (1 YEAR)				**$251,400**
TOTAL CONSTRUCTION COST				**$4,943,000**

Cost estimate does not include the following:

-Right-of-Way Acquisition
-Final Design Engineering
-Consultation during construction
-Bridge Construction Cost

Computed By: TJA
Checked By:

NORTH AVENUE BRIDGE OVER NSRR

COST ESTIMATE - TS&L INVESTIGATIONS

Rev1 CGF 11/5/2018
Rev2 CGF 1/14/2022
Rev3 ABC 2/5/2024

SUPERSTRUCTURE

ITEM DESCRIPTION	UNIT	UNIT COST	UNIT TOTAL	TOTAL COST
CLASS AAAP CEMENT CONCRETE	CY	$ 1,400.00	480	$ 672,000
CLASS AA CEMENT CONCRETE	CY	$ 1,250.00	212	$ 265,000
EPOXY COATED REINFORCEMENT STEEL	LB	$ 2.35	96880	$ 227,668
PENETRATING SEALER	SY	$ 10.00	1743	$ 17,430
PROTECTIVE FENCE, SPECIAL COMBINED BARRIER	LF	$ 1,654.36	146	$ 241,536
REMOVAL OF PORTION OF EXISTING BRIDGE	LS	$334,000.00	1	$ 334,000
PRESTRESSED CONCRETE SPREAD BOX BEAMS, 48"x30"	LF	$ 553.25	2316	$ 1,281,327
PEDESTRIAN RAILING	LF	$ 228.19	169	$ 38,564
ARCHITECTURAL SURFACE TREATMENT	SF	$ 4.56	361	$ 1,648

Subtotal Superstructure Cost = $ 3,079,172

SUBSTRUCTURE

ITEM DESCRIPTION	UNIT	UNIT COST	UNIT TOTAL	TOTAL COST
CLASS 3 EXCAVATION	CY	$ 60.00	1327	$ 79,620
STRUCTURE BACKFILL	CY	$ 85.00	1650	$ 140,250
DOWELS	EA	$ 60.00	466	$ 27,960
CLASS A CEMENT CONCRETE	CY	$ 1,400.00	688	$ 963,200
CLASS AA CEMENT CONCRETE	CY	$ 1,250.00	6	$ 7,500
EPOXY COATED REINFORCEMENT STEEL	LB	$ 2.35	31420	$ 73,837
MEMBRANE WATERPROOFING	SY	$ 75.00	430	$ 32,250
PREFORMED CELLULAR POLYSTYRENE	SY	$ 28.52	189	$ 5,391
REPAIR DETERIORATED CONCRETE	CF	$ 700.00	122	$ 85,400
6" FOUNDATION DRAIN	LF	$ 22.82	564	$ 12,870

Subtotal Substructure Cost = $ 1,428,278

Subtotal Combined Cost = $ 4,507,450

Cost per SF = $349.97

Contingency (20%) = $ 901,490

Total Cost = $ 5,409,000

Michael Baker INTERNATIONAL

Pittsburgh Subdivision Vertical Clearance Project
Allegheny Commons Pedestrian Bridge
Alternate 2 - Construct Bridge to Achieve 22' Clearance
Preliminary Cost Estimate

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
CLASS 1 EXCAVATION	349	CY	$52.00	$18,148.00
SAWCUTTING	101	LF	$10.00	$1,010.00
CLEARING AND GRUBBING	1	LS	$6,000.00	$6,000.00
FOREIGN BORROW EXCAVATION	2,051	CY	$63.00	$129,213.00
CEMENT CONCRETE SIDEWALK	702	SY	$120.00	$84,226.67
TOPSOIL FURNISHED AND PLACED	178	CY	$107.00	$19,042.04
TEMORARY PROTECTIVE FENCE, CHAIN LINK	958	LF	$50.00	$47,900.00
DECORATIVE CEMENT CONCRETE SIDEWALK	306	SY	$180.00	$55,100.00
CONCRETE PERIMETER BENCH	73	LF	$250.00	$18,250.00
CONCRETE STAIRS	22	RSR	$500.00	$11,000.00
DECORATIVE METAL HAND RAIL	569	LF	$385.00	$219,065.00
PARK BENCH	2	EA	$500.00	$1,000.00
CONCRETE WALL	61	LF	$200.00	$12,200.00
16' ROUND ALUMINUM LIGHT POLES	24	EA	$1,075.00	$25,800.00
POLE BASE & FOUNDATIONS, 24" DIA. X 48"D	24	EA	$675.00	$16,200.00
31" LED LIGHT FIXTURE	24	EA	$600.00	$14,400.00
ELECTRICAL CONDUIT AND TRENCH	815	LF	$13.00	$10,595.00
LIGHTING CONTROL AND MONITORING SYSTEM	1	EA	$8,000.00	$8,000.00
POWER SUPPLY	1	EA	$6,000.00	$6,000.00
LANDSCAPING	1	LS	$105,000.00	$105,000.00
SEEDING AND MULCHING	1602	SY	$20.00	$32,033.33
TREE PROTECTION	1	LS	$1,000.00	$1,000.00
DRAINAGE PIPE AND STRUCTURES	1	LS	$37,750.00	$37,750.00
LIGHT POLE REMOVAL	1	EA	$1,000.00	$1,000.00
TREE REMOVAL	4	EA	$2,000.00	$8,000.00
ROADWAY CONSTRUCTION ITEMS SUBTOTAL				**$887,900**
4% MOBILIZATION				**$35,500**
20% CONTINGENCY				**$177,600**
TOTAL ROADWAY CONSTRUCTION SUBTOTAL				**$1,101,000**
12% CONSTRUCTION OVERSIGHT				**$132,100**
6.0% / YEAR ESCALATION (1 YEAR)				**$66,100**
TOTAL CONSTRUCTION COST				**$1,299,200**

Cost estimate does not include the following:
-Right-of-Way Acquisition
-Final Design Engineering
-Consultation during construction
-Bridge Construction costs

Computed By: TJA
Checked By: DLJ

Michael Baker INTERNATIONAL

Pittsburgh Subdivision Vertical Clearance Project
Allegheny Commons Pedestrian Bridge
Alternate 3 - Construct Bridge to Achieve 21'-4" Clearance
Preliminary Cost Estimate

February 2024

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
CLASS 1 EXCAVATION	191	CY	$52.00	$9,932.00
SAWCUTTING	101	LF	$10.00	$1,010.00
CLEARING AND GRUBBING	1	LS	$6,000.00	$6,000.00
FOREIGN BORROW EXCAVATION	60	CY	$63.00	$3,780.00
CEMENT CONCRETE SIDEWALK	581	SY	$120.00	$69,720.00
TOPSOIL FURNISHED AND PLACED	178	CY	$107.00	$19,042.04
TEMPORARY PROTECTICE FENCE, CHAIN LINK	465	LF	$50.00	$23,250.00
DECORATIVE CEMENT CONCRETE SIDEWALK	306	SY	$180.00	$55,100.00
CONCRETE PERIMETER BENCH	73	LF	$250.00	$18,250.00
CONCRETE STAIRS	20	RSR	$500.00	$10,000.00
DECORATIVE METAL HAND RAIL	371	LF	$385.00	$142,835.00
PARK BENCH	2	EA	$500.00	$1,000.00
CONCRETE WALL	61	LF	$200.00	$12,200.00
16' ROUND ALUMINUM LIGHT POLES	24	EA	$1,075.00	$25,800.00
POLE BASE & FOUNDATIONS, 24" DIA. X 48"D	24	EA	$675.00	$16,200.00
31" LED LIGHT FIXTURE	24	EA	$600.00	$14,400.00
ELECTRICAL CONDUIT AND TRENCH	815	LF	$13.00	$10,595.00
LIGHTING CONTROL AND MONITORING SYSTEM	1	EA	$8,000.00	$8,000.00
POWER SUPPLY	1	EA	$6,000.00	$6,000.00
LANDSCAPING	1	LS	$105,000.00	$105,000.00
SEEDING AND MULCHING	1602	SY	$20.00	$32,033.33
TREE PROTECTION	1	LS	$1,000.00	$1,000.00
DRAINAGE PIPE AND STRUCTURES	1	LS	$37,750.00	$37,750.00
LIGHT POLE REMOVAL	1	EA	$1,000.00	$1,000.00
ROADWAY CONSTRUCTION ITEMS SUBTOTAL				**$629,900**
4% MOBILIZATION				**$25,200**
20% CONTINGENCY				**$126,000**
TOTAL ROADWAY CONSTRUCTION SUBTOTAL				**$781,100**
12% CONSTRUCTION OVERSIGHT				**$93,700**
6.0% / YEAR ESCALATION (1 YEAR)				**$46,900**
TOTAL CONSTRUCTION COST				**$921,700**

Cost estimate does not include the following:
-Right-of-Way Acquisition
-Final Design Engineering
-Consultation during construction
-Bridge Construction costs

Computed By: TJA
Checked By: DLJ

Michael Baker
INTERNATIONAL

Allegheny Commons Pedestrian Bridge - Alternate 2
Preliminary Cost Estimate - February 2024

Item Description	*Quantity*	*Unit*	*Unit Cost*	*Item Cost*
BRIDGE				
SUPERSTRUCTURE - STEEL BEAMS	1	LS	$145,539.74	$145,540
BEAM INSTALLATION	1	LS	$30,000.00	$30,000
CIP DECK, AAAP	21	CY	$1,300.00	$27,438
AESTHETIC TREATMENTS - STAINING AND FORMWORK	1	LS	$50,000.00	$50,000
ANODIZED ALUMINUM RAILINGS	175	LF	$100.00	$17,500
DECORATIVE PROTECTIVE FENCE	1	LS	$91,650.00	$91,650
LIGHT POLES ON ABUTMENT	8	EA	$7,000.00	$56,000
REPAIR DETERIORATED CONCRETE	150	SF	$75.00	$11,250
EXISTING ABUT AND WING WALL MODIFICATIONS - CONC	200	CY	$1,000.00	$200,000
			BRIDGE SUBTOTAL	**$629,378**
			Subtotal	**$629,378**
		Contingency @	20%	$125,876
			Total Construction Cost	**$755,254**

Estimated Total Structure Cost: $756,000

Note:
Value rounded up nearest $1,000
Cost does not include the Signal Cabinet Relocation by NS

Michael Baker
INTERNATIONAL

Allegheny Commons Pedestrian Bridge - Alternate 3
Preliminary Cost Estimate - February 2024

Item Description	*Quantity*	*Unit*	*Unit Cost*	*Item Cost*
BRIDGE				
SUPERSTRUCTURE - STEEL BEAMS	1	LS	$152,196.30	$152,196
BEAM INSTALLATION	1	LS	$38,530.71	$38,531
CIP DECK AND CURB, AAAP	21	CY	$1,300.00	$27,438
AESTHETIC TREATMENTS - STAINING AND FORMWORK	1	LS	$50,000.00	$50,000
ANODIZED ALUMINUM RAILINGS	175	LF	$100.00	$17,500
DECORATIVE PROTECTIVE FENCE	1	LS	$91,650.00	$91,650
FAÇADE PANELS	28	EA	$1,000.00	$28,000
LIGHT POLES ON ABUTMENT	8	EA	$7,000.00	$56,000
REPAIR DETERIORATED CONCRETE	150	SF	$75.00	$11,250
EXISTING ABUT AND WING WALL MODIFICATIONS - CONC	200	CY	$1,000.00	$200,000
			BRIDGE SUBTOTAL	**$672,565**
			Subtotal	**$672,565**
		Contingency @	20%	$134,513
			Total Construction Cost	**$807,079**

Estimated Total Structure Cost: $808,000

Note:
Value rounded up nearest $1,000
Cost does not include the Signal Cabinet Relocation by NS

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
CLASS 1 EXCAVATION	1,379	CY	$44.00	$60,676.00
FOREIGN BORROW EXCAVATION	909	CY	$65.00	$59,085.00
GEOTEXTILE, CLASS 1	777	LF	$3.75	$2,913.75
EITHER CEMENT TREATED PERMEABLE BASE COURSE, 4" DEPTH	1,675	SY	$33.00	$55,275.00
OR ASPHALT TREATED PERMEABLE BASE COURSE, 4" DEPTH	1,675	SY	-	-
SUBBASE 4" DEPTH (NO. 2A)	2,462	SY	$11.50	$28,313.00
SUBBASE 5" DEPTH (NO. 2A)	371	SY	$17.50	$6,492.50
REINFORCED CEMENT CONCRETE PAVEMENT, 8" DEPTH	371	SY	$173.00	$64,183.00
REINFORCED CEMENT CONCRETE PAVEMENT, 10" DEPTH	1,675	SY	$150.00	$251,250.00
PROTECTIVE COATING FOR CEMENT CONCRETE PAVEMENTS	3,407	SY	$4.50	$15,331.50
PAVEMENT RELIEF JOINT	88	LF	$187.00	$16,456.00
INSPECTOR'S FIELD OFFICE AND INSPECTION FACILITIES, TYPE B	1	LS	$10,000.00	$10,000.00
EQUIPMENT PACKAGE	1	LS	$5,000.00	$5,000.00
4" PIPE UNDERDRAIN, TYPE 1 BACKFILL	777	LF	$20.00	$15,540.00
CONCRETE DEEP CURB	800	LF	$50.00	$40,000.00
PLAIN CONCRETE MOUNTABLE CURB	46	LF	$195.00	$8,970.00
CEMENT CONCRETE SIDEWALK MODIFIED	665	SY	$150.00	$99,711.67
TOE WALL SIDEWALK WITH PEDESTRIAN HANDRAIL	82	LF	$225.00	$18,450.00
CONSTRUCTION SURVEYING, TYPE B	1	LS	$10,000.00	$10,000.00
CONSTRUCTION SURVEYING, TYPE D	1	LS	$6,000.00	$6,000.00
CPM SCHEDULE	1	LS	$700.00	$700.00
DETECTABLE WARNING SURFACE, POLYMER CONCRETE	30	SF	$102.00	$3,060.00
TOPSOIL, FURNISHED AND PLACED	10	CY	$164.00	$1,640.00
SEEDING AND SOIL SUPPLEMENTS, FORMULA B	2	LB	$593.00	$1,186.00
RESET FENCE	343	LF	$48.50	$16,635.50
TREE REMOVAL	7	EA	$2,000.00	$14,000.00
LANDSCAPING	1	LS	$5,000.00	$5,000.00
STREET LIGHTING ADJUSTMENTS	4	EA	$20,000.00	$80,000.00
EXCAVATION AND BACKFILL OF UNSUITABLE SLAG MATERIAL	1	LS	$14,000.00	$14,000.00
EROSION AND SEDIMENT POLLUTION CONTROL MEASURES	1	LS	$20,000.00	$20,000.00
MAINTENANCE AND PROTECTION OF TRAFFIC DURING CONSTRUCTION	1	LS	$30,000.00	$30,000.00
SIGNING & PAVEMENT MARKINGS	1	LS	$10,000.00	$10,000.00
DRAINAGE	1	LS	$50,000.00	$50,000.00
UTILITY RELOCATIONS	1	LS	$50,000.00	$50,000.00
ROADWAY CONSTRUCTION ITEMS SUBTOTAL				**$1,069,900**
4% MOBILIZATION				**$42,800**
20% CONTINGENCY				**$214,000**
TOTAL ROADWAY CONSTRUCTION SUBTOTAL				**$1,326,700**
12% CONSTRUCTION OVERSIGHT				**$159,200**
6.0% / YEAR ESCALATION (1 YEAR)				**$79,700**
TOTAL CONSTRUCTION COST				**$1,565,600**

Cost estimate does not include the following:
-Right-of-Way Acquisition
-Final Design Engineering
-Consultation during construction
-Bridge Construction costs

Computed By: TJA
Checked By: DLJ

Michael Baker INTERNATIONAL

Pittsburgh Subdivision Vertical Clearance Project
Pennsylvania Avenue Bridge - Alternate 3 -
Repair Substructure and Lower Tracks to Achieve 22' Clearance
Preliminary Cost Estimate

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
TRACK LOWERING - OPTION 1: REDUCING TRACKS FROM 4 TO 3 AND BUTTRESSING RETAINING WALLS	1	LS	$52,000,000.00	$52,000,000.00
30" PWSA WATERMAIN REPLACEMENT	1	LS	$1,080,000.00	$1,080,000.00
345KV/138KV DUQUESNE LIGHT PRIMARY REPLACEMENT	1	LS	$3,520,000.00	$3,520,000.00
DRAINAGE AND GROUND WATER MITIGATION	1	LS	$500,000.00	$500,000.00
TOTAL RAILROAD CONSTRUCTION COST				**$57,100,000**
TOTAL CONSTRUCTION COST				**$57,100,000**

Note: Pennsylvania Avenue Alternate 3 is necessarily accompanied by North Avenue Alternate 3 as track lowering limits extend under both the Pennsylvania Avenue Bridge and the North Avenue Bridge.

Cost estimate does not include the following:
-Right-of-Way Acquisition
-Final Design Engineering
-Consultation during construction
-Bridge Rehabilitation Cost
-North Avenue Bridge Replacement and Roadway Reconstruction

Computed By: DLJ
Checked By: TJA

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
REMOVAL OF EXISTING PAVEMENT AND SIDEWALKS	918	CY	$53.00	$48,654.00
FOREIGN BORROW EXCAVATION	503	CY	$71.00	$35,713.00
GEOTEXTILE, CLASS 1	572	LF	$3.75	$2,145.00
EITHER CEMENT TREATED PERMEABLE BASE COURSE, 4" DEPTH	1,079	SY	$35.00	$37,765.00
OR ASPHALT TREATED PERMEABLE BASE COURSE, 4" DEPTH	1,079	SY	-	-
SUBBASE 4" DEPTH (NO. 2A)	1,818	SY	$12.00	$21,816.00
SUBBASE 5" DEPTH (NO. 2A)	128	SY	$20.00	$2,560.00
REINFORCED CEMENT CONCRETE PAVEMENT, 8" DEPTH	128	SY	$173.00	$22,144.00
REINFORCED CEMENT CONCRETE PAVEMENT, 10" DEPTH	1,079	SY	$164.00	$176,956.00
PROTECTIVE COATING FOR CEMENT CONCRETE PAVEMENTS	2,332	SY	$5.00	$11,660.00
PAVEMENT RELIEF JOINT	88	LF	$187.00	$16,456.00
INSPECTOR'S FIELD OFFICE AND INSPECTION FACILITIES, TYPE B	1	LS	$24,000.00	$24,000.00
EQUIPMENT PACKAGE	1	LS	$5,000.00	$5,000.00
4" PIPE UNDERDRAIN, TYPE 1 BACKFILL	572	LF	$20.00	$11,440.00
CONCRETE DEEP CURB	511	LF	$54.00	$27,594.00
CEMENT CONCRETE SIDEWALK MODIFIED	495	SY	$163.00	$80,628.86
TOE WALL WITH PEDESTRIAN HANDRAIL	37	LF	$380.00	$14,060.00
SIDEWALK MOMENT SLAB	203	LF	$2,260.00	$457,943.80
CONSTRUCTION SURVEYING, TYPE B	1	LS	$10,000.00	$10,000.00
CONSTRUCTION SURVEYING, TYPE D	1	LS	$10,000.00	$10,000.00
CPM SCHEDULE	1	LS	$1,000.00	$1,000.00
DETECTABLE WARNING SURFACE, POLYMER CONCRETE	30	SF	$102.00	$3,060.00
TOPSOIL, FURNISHED AND PLACED	9	CY	$166.00	$1,494.00
SEEDING AND SOIL SUPPLEMENTS, FORMULA B	4	LB	$420.00	$1,680.00
RESET FENCE	149	LF	$48.50	$7,226.50
TREE REMOVAL	5	EA	$2,000.00	$10,000.00
LANDSCAPING	1	LS	$5,000.00	$5,000.00
STREET LIGHTING ADJUSTMENTS	3	EACH	$20,000.00	$60,000.00
EXCAVATION AND BACKFILL OF UNSUITABLE SLAG MATERIAL	1	LS	$14,000.00	$14,000.00
EROSION AND SEDIMENT POLLUTION CONTROL MEASURES	1	LS	$24,000.00	$24,000.00
MAINTENANCE AND PROTECTION OF TRAFFIC DURING CONSTRUCTION	1	LS	$36,000.00	$36,000.00
SIGNING & PAVEMENT MARKINGS	1	LS	$12,000.00	$12,000.00
DRAINAGE	1	LS	$60,000.00	$60,000.00
UTILITY RELOCATIONS	1	LS	$60,000.00	$60,000.00
ROADWAY CONSTRUCTION ITEMS SUBTOTAL				**$1,312,000**
4% MOBILIZATION				**$52,500**
20% CONTINGENCY				**$262,400**
TOTAL ROADWAY CONSTRUCTION SUBTOTAL				**$1,626,900**
12% CONSTRUCTION OVERSIGHT				**$195,200**
6.0% / YEAR ESCALATION (1 YEAR)				**$97,700**
TOTAL ROADWAY CONSTRUCTION COST				**$1,919,800**
TRACK LOWERING	18,862	TF	$430.00	$8,110,660.00
30" PWSA WATERMAIN REPLACEMENT	1	LS	$1,080,000.00	$1,080,000.00
345KV/138KV DUQUESNE LIGHT PRIMARY REPLACEMENT	1	LS	$3,520,000.00	$3,520,000.00
DRAINAGE AND GROUND WATER MITIGATION	1	LS	$500,000.00	$500,000.00
TOTAL RAILROAD CONSTRUCTION COST				**$13,210,660**
TOTAL CONSTRUCTION COST				**$15,130,460**

Cost estimate does not include the following:
-Right-of-Way Acquisition
-Final Design Engineering
-Consultation during construction
-Bridge Construction costs

Computed By: TJA
Checked By:DLJ

Michael Baker INTERNATIONAL

Pittsburgh Subdivision Vertical Clearance Project
Pennsylvania Avenue Bridge - Design Modification A -
Replace and Raise Bridge to Achieve 21'-2" Clearance
Preliminary Cost Estimate

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
CLASS 1 EXCAVATION	771	CY	$48.00	$37,008.00
SAW CUTTING	218	LF	$9.00	$1,962.00
CLASS 4 EXCAVATION	1	CY	$75.00	$75.00
FOREIGN BORROW EXCAVATION	198	CY	$81.00	$16,038.00
SELECTED BORROW EXCAVATION, COARSE AGGREGATE, NO. 8	1	CY	$54.00	-
SPECIAL ROLLING	8	HOUR	$135.00	$1,080.00
EXCAVATION/BACKFILL/COMPACTION	337	CY	$108.00	$36,396.00
GEOTEXTILE, CLASS 4	676	SY	$5.00	$3,380.00
GEOTEXTILE, CLASS 1	485	LF	$3.75	$1,818.75
GEOTEXTILE, CLASS 4, TYPE A	1,350	SY	$3.75	$5,062.50
TEMPORARY PROJECT AIR POLLUTION CONTROL	1,000	DOLLA	$1.00	$1,000.00
PLAIN CEMENET CONCRETE PAVEMENT, 4" DEPTH	8	SY	$182.00	$1,456.00
REINFORCED CEMENT CONCRETE PAVEMENT, 10" DEPTH MODIFIED	1,350	SY	$150.00	$202,500.00
PAVEMENT RELIEF JOINT	120	LF	$157.00	$18,840.00
INSPECTOR'S FIELD OFFICE AND INSPECTION FACILITIES, TYPE C	1	LS	$20,000.00	$20,000.00
EQUIPMENT PACKAGE	1	LS	$5,000.00	$5,000.00
4" PIPE UNDERDRAIN, TYPE 1 BACKFILL	60	LF	$19.00	$1,140.00
SUBGRADE DRAINS	120	LF	$29.00	$3,480.00
PLAIN CONCRETE MOUNTABLE CURB, TYPE A	41	LF	$202.00	$8,282.00
CEMENT CONRETE SIDEWALK	216	SY	$205.00	$44,280.00
CONSTRUCTION SURVEYING, TYPE B	1	LS	$10,000.00	$10,000.00
CONSTRUCTION SURVEYING, TYPE D	1	LS	$6,000.00	$6,000.00
CPM SCHEDULE, WITH UPDATES	1	LS	$1,000.00	$1,000.00
DETECTABLE WARNING SURFACE, POLYMER CONCRETE	158	SF	$56.00	$8,848.00
MULCH	67	LB	$62.00	$4,154.00
SEEDING - FORMULA T TEMPORARY GRASS MIX, INCLUDING MULCH	12	LB	$82.00	$984.00
UNFORESEEN WATER POLLUTION CONTROL	5,000	DOLLA	$1.00	$5,000.00
PUMPED WATER FILTER BAG	1	EA	$1,000.00	$1,000.00
INLET FILTER BAG FOR TYPE M INLET	1	EA	$262.00	$262.00
COMPOST FILTER SOCK, 12" DIAMETER	234	LF	$12.00	$2,808.00
MAINTENANCE AND PROTECTION OF TRAFFIC DURING CONSTRUCTION	1	LS	$21,600.00	$21,600.00
AWG 8 UNDERGROUND CABLE, COPPER 1 CONDUCTOR	7,920	LF	$3.00	$23,760.00
2" DIRECT BURIAL CONDUIT	1,000	LF	$12.00	$12,000.00
2" EXPOSED CONDUIT	400	LF	$70.00	$28,000.00
TRENCH	990	LF	$30.00	$29,700.00
POST MOUNTED SIGNS, TYPE B, STEEL SQUARE POST	6	SF	$46.00	$276.00
POST MOUNTED SIGNS, TYPE F	11	SF	$25.00	$275.00
RESET POST MOUNTED SIGNS, TYPE F	1	EA	$70.00	-
WHITE HOT THERMOPLASTIC LEGEND, "BICYCLE WITH RIDER", 8'-0" X 4'-0"	2	EA	$550.00	$1,100.00
4" WHITE EPOXY PAVEMENT MARKINGS	1,222	LF	$4.50	$5,499.00
4" YELLOW EPOXY PAVEMENT MARKINGS	840	LF	$2.90	$2,436.00
6" WHITE EPOXY PAVEMENT MARKINGS	735	LF	$3.15	$2,315.25
8" WHITE EPOXY TRANSVERSE PAVEMENT MARKINGS	84	LF	$14.00	$1,176.00
REMOVE POST MOUNTED SIGNS, TYPE F	3	EA	$51.00	$153.00
CONCRETE DEEP CURB	464	LF	$56.00	$25,984.00
CEMENT CONRETE CURB RAMP	78	SY	$175.00	$13,650.00
25' END TRANSITION, SINGLE FACE CONCRETE BARRIER, 1'-8 1/4" WIDTH	2	EA	$8,000.00	$16,000.00
20:1 END TRANSITION, SINGLE FACE CONCRETE BARRIER, 1'-8 1/4" WIDTH	2	EA	$9,000.00	$18,000.00
SIDEWALK TOE WALL	32	LF	$125.00	$4,000.00
PEDESTRIAN RAILING	32	LF	$100.00	$3,200.00
RESET EXISTING FENCE	42	LF	$80.00	$3,360.00
CLEARING AND GRUBBING	900	SY	$3.50	$3,150.00
JUNCTION BOXES	4	EA	$2,500.00	$10,000.00
WHITE HOT THERMOPLASTIC LEGEND, STRAIGHT ARROW, 8'-0" X 4'-0"	2	EA	$500.00	$1,000.00
24" GREEN EPOXY PAVEMENT MARKINGS	96	LF	$12.00	$1,152.00
FOUNDATION	4	EA	$9,750.00	$39,000.00
REMOVE EXISTING LIGHTING	1	LS	$3,380.00	$3,380.00
TESTING OF EACH ENTIRE LIGHTING SYSTEM	1	LS	$3,200.00	$3,200.00
REMOVE EXISTING CATCH BASIN	1	EA	$250.00	$250.00
PWSA 3 FLANGE FRAME, TYPE 13 CATCH BASIN	1	EA	$5,500.00	$5,500.00
PVC, SDR-26 PIPE FITTINGS LESS THAN 15" IN DIAMETER	2	EA	$1,100.00	$2,200.00
15" PVC, SDR-26 PIPE FITTINGS	2	EA	$1,100.00	$2,200.00
WASTE MANAGEMENT MOBILIZATION/DEMOBILIZATION	1	LS	$15,500.00	$15,500.00
SOLIDS SAMPLING FOR RESIDUAL WASTE DISPOSAL	15	EA	$2,300.00	$34,500.00
TRANSPORTATION & DISPOSAL OF RESIDUAL WASTE	5,690	TON	$60.00	$341,400.00
PWSA WATERLINE ON BRIDGE STRUCTURE	1	LS	$95,000.00	$95,000.00
PWSA WATER SYSTEM FACILITIES	1	LS	$25,000.00	$25,000.00
INSTALLATION OF PEOPLES GAS COMPANY FACILITIES	1	LS	$35,000.00	$35,000.00
TEST PIT FOR UNDERGROUND UTILITIES	30	CY	$400.00	$12,000.00
ROADWAY CONSTRUCTION ITEMS SUBTOTAL				**$1,333,900**
4%	**MOBILIZATION**			**$53,400**
20%	**CONTINGENCY**			**$266,800**
TOTAL ROADWAY CONSTRUCTION SUBTOTAL				**$1,654,100**
12%	**CONSTRUCTION OVERSIGHT**			**$198,500**
6.0%	**/ YEAR ESCALATION (1 YEAR)**			**$99,300**
TOTAL CONSTRUCTION COST				**$1,951,900**

Cost estimate does not include the following:
-Right-of-Way Acquisition
-Final Design Engineering
-Consultation during construction
-Bridge Construction costs

Computed By: TJA
Checked By: DLJ

SO No. 161571
Subject : Pennsylvania Avenue Bridge - Preliminary Quantities
Superstructure
Computed By: RMS Checked By: ABC Date: 11/16/2018

Michael Baker INTERNATIONAL

/meghan_morris_mbakerintl_com/Documents/Desktop/Projects/NS Penn Avenue/Superstructure/Environmental Qty Updates/[NS Penn Ave - Alt Analysis Quantity Updates 20240205.xlsx]ALT 2 MOD A & ALT 4

Rev By: CGF 1/2020 and 12/2021, MEM 2/2024

COST ESTIMATE - TS&L INVESTIGATIONS TRUSS, 21 ft VC - ALT 2 (MOD A) & ALT 4

SUPERSTRUCTURE

ITEM DESCRIPTION	UNIT	UNIT COST	UNIT TOTAL	TOTAL COST
CLASS AAAP CEMENT CONCRETE	CY	$ 900.00	188	$ 169,200
CLASS AA CEMENT CONCRETE	CY	$ 550.00	94	$ 51,700
EPOXY COATED REINFORCEMENT STEEL	LBS	$ 1.75	63500	$ 111,125
FABRICATED STRUCTURAL STEEL	LBS	$ 4.30	575000	$ 2,472,500
PENETRATING SEALER	SY	$ 10.00	1130	$ 11,300
DISC BEARINGS	EA	$ 3,666.67	6	$ 22,000
PROTECTIVE FENCE	LF	$ 650.00	398	$ 258,700
REMOVAL OF PORTION OF EXISTING BRIDGE	LS	$ 384,000.00	1	$ 384,000
NEOPRENE STRIP SEAL, (4" MOVEMENT)	LF	$ 335.00	171	$ 57,285

Subtotal Superstructure Cost = $ 3,537,810

APPROACH SLABS

ITEM DESCRIPTION	UNIT	UNIT COST	UNIT TOTAL	TOTAL COST
CLASS AAAP CEMENT CONCRETE	CY	$ 900.00	117	$ 105,300
CLASS AA CEMENT CONCRETE	CY	$ 550.00	42	$ 23,100
EPOXY COATED REINFORCEMENT STEEL	LB	$ 1.75	32312	$ 56,546
PROTECTIVE COATING	SY	$ 10.00	109	$ 1,090

SubTotal Approach Slab Cost = $ 186,036

SUBSTRUCTURE

ITEM DESCRIPTION	UNIT	UNIT COST	UNIT TOTAL	TOTAL COST
CLASS III EXCAVATION	CY	$ 30.00	1733	$ 51,990
STRUCTURAL BACKFILL	CY	$ -	362	$ -
FLOWABLE BACKFILL (TYPE D)	CY	$ -	1591	$ -
LIGHTWEIGHT STRUCTURE BACKFILL	CY	$ 120.00	3126	$ 375,120
DOWELS	EA	$ 50.00	90	$ 4,500
CLASS A CEMENT CONCRETE	CY	$ 800.00	119	$ 95,200
CLASS AA CEMENT CONCRETE	CY	$ 550.00	79	$ 43,450
EPOXY COATED REINFORCEMENT STEEL	LBS	$ 1.75	56300	$ 98,525
REMOVAL OF EXISTING STRUCTURE	LS	$ -	1	$ -
REPAIR DETERIORATED CONCRETE	CF	$ 680.00	5	$ 3,400
PREFORMED CELLULAR POLYSTYRENE	SY	$ 57.05	105	$ 5,990

Subtotal Substructure Cost = $ 678,175

Subtotal Combined Cost = $ 4,402,021

cost per sf = $545.48

Contingency 20%= $ 880,404

Total Cost = $ 5,283,000

SO No. 161571
Subject : Pennsylvania Avenue Bridge - Preliminary Quantities
Superstructure
Computed By: RMS Checked By: ABC Date: 11/16/2018

Michael Baker INTERNATIONAL

ıt.com/personal/meghan_morris_mbakerintl_com/Documents/Desktop/Projects/NS Penn Avenue/Superstructure/Environmental Qty Updates/[NS Penn Ave - Alt Analysis Quantity Updates 20240205.xlsx]ALT 2

Rev By: CGF 1/2020 and 12/2021, MEM 2/2024

COST ESTIMATE - TS&L INVESTIGATIONS TRUSS, 22 ft VC - ALT 2

SUPERSTRUCTURE

ITEM DESCRIPTION	UNIT	UNIT COST	UNIT TOTAL	TOTAL COST
CLASS AAAP CEMENT CONCRETE	CY	$ 900.00	188	$ 169,200
CLASS AA CEMENT CONCRETE	CY	$ 550.00	94	$ 51,700
EPOXY COATED REINFORCEMENT STEEL	LBS	$ 1.75	63500	$ 111,125
FABRICATED STRUCTURAL STEEL	LBS	$ 4.30	575000	$ 2,472,500
PENETRATING SEALER	SY	$ 10.00	1130	$ 11,300
DISC BEARINGS	EA	$ 3,666.67	6	$ 22,000
PROTECTIVE FENCE	LF	$ 650.00	398	$ 258,700
REMOVAL OF PORTION OF EXISTING BRIDGE	LS	$ 384,000.00	1	$ 384,000
NEOPRENE STRIP SEAL, (4" MOVEMENT)	LF	$ 335.00	171	$ 57,285

Subtotal Superstructure Cost = $ 3,537,810

APPROACH SLABS

ITEM DESCRIPTION	UNIT	UNIT COST	UNIT TOTAL	TOTAL COST
CLASS AAAP CEMENT CONCRETE	CY	$ 900.00	117	$ 105,300
CLASS AA CEMENT CONCRETE	CY	$ 550.00	42	$ 23,100
EPOXY COATED REINFORCEMENT STEEL	LB	$ 1.75	32312	$ 56,546
PROTECTIVE COATING	SY	$ 10.00	109	$ 1,090

SubTotal Approach Slab Cost = $ 186,036

SUBSTRUCTURE

ITEM DESCRIPTION	UNIT	UNIT COST	UNIT TOTAL	TOTAL COST
CLASS III EXCAVATION	CY	$ 30.00	1733	$ 51,990
STRUCTURAL BACKFILL	CY	$ -	406	$ -
FLOWABLE BACKFILL (TYPE D)	CY	$ -	1591	$ -
LIGHTWEIGHT STRUCTURE BACKFILL	CY	$ 120.00	3216	$ 385,920
DOWELS	EA	$ 50.00	90	$ 4,500
CLASS A CEMENT CONCRETE	CY	$ 800.00	152	$ 121,600
CLASS AA CEMENT CONCRETE	CY	$ 550.00	79	$ 43,450
EPOXY COATED REINFORCEMENT STEEL	LBS	$ 1.75	57600	$ 100,800
REMOVAL OF EXISTING STRUCTURE	LS	$ -	1	$ -
REPAIR DETERIORATED CONCRETE	CF	$ 680.00	5	$ 3,400
PREFORMED CELLULAR POLYSTYRENE	SY	$ 57.05	105	$ 5,990

Subtotal Substructure Cost = $ 717,650

Subtotal Combined Cost = $ 4,441,496

cost per sf = $550.34

Contingency 20%= $ 888,299

Total Cost = $ 5,330,000

SO No. 161571
Subject : Pennsylvania Avenue Bridge - Preliminary Quantities
Superstructure
Computed By: RMS Checked By: ABC Date: 11/16/2018

Michael Baker INTERNATIONAL

ıt.com/personal/meghan_morris_mbakerintl_com/Documents/Desktop/Projects/NS Penn Avenue/Superstructure/Environmental Qty Updates/[NS Penn Ave - Alt Analysis Quantity Updates 20240205.xlsx]ALT 3

Rev By: CGF 1/2020 and 12/2021, MEM 2/2024

COST ESTIMATE - TS&L INVESTIGATIONS TRUSS, 21 ft VC - ALT 3

SUBSTRUCTURE

ITEM DESCRIPTION	UNIT	UNIT COST	UNIT TOTAL	TOTAL COST
REPAIR DETERIORATED CONCRETE	CY	$ 680.00	27	$ 18,360

	Subtotal Substructure Cost =	**$ 18,360**
	Subtotal Combined Cost =	**$ 18,360**
cost per sf =	**Contingency 20%=**	**$ 3,672**
$2.37	**Total Cost =**	**$ 23,000**

Michael Baker
INTERNATIONAL

APPENDIX D

Alternatives Comparison Matrices

AMTRAK ALTERNATIVES COMPARISON MATRIX
JULY 2020

Measures of Effectiveness	Alternative 1 No Build Alternative	Alternative 2 Remove portion of train shed	Alternative 3 Adjust train shed roof beams to achieve 21'-0" vertical clearance
1 PURPOSE AND NEED			
A. Forecasted Traffic Demands	*No*	*Yes*	*Yes*
B. Vertical Clearance Constraints	*No*	*Yes*	*Yes*
C. Operational Safety and Reliability	*No*	*Yes*	*Yes*
D. Public Safety	*No*	*Yes*	*Yes*
E. Facility Deficiencies	*No*	*Yes*	*Yes*
2 ENGINEERING			
A. Construction Phases	*0*	*2*	*2*
B. Avoids Construction Detour	*Yes*	*No*	*Yes*
C. Building Entrance Impacts	*N/A*	*N/A*	*N/A*
D. Driveways Impacted	*N/A*	*N/A*	*N/A*
E. Property Impacts	*N/A*	*N/A*	*N/A*
3 ENVIRONMENTAL & SOCIAL IMPACTS			
A. Air Quality	*None (Increased)**	*None (Decreased)***	*None (Decreased)***
B. Noise	*None (Increased)**	*None (Decreased)***	*None (Decreased)***
C. Vibration	*None (Increased)**	*None (Decreased)***	*None (Decreased)***
D. Hazardous Waste Potential	*None*	*High*	*High*
E. Historic Properties	*None*	*High*	*Low to Moderate*
F. Section 2002 Resources	*0*	*2*	*2*
3 CONSTRUCTABILITY			
A. **Construction Length**			
- Structure Over Railroad Corridor (SW portion)	*N/A*	*450'*	*450'*
-Structure Over Railroad Corridor (NE portion)	*N/A*	*650'*	*650'*
- Total Construction Length	*N/A*	*1100'*	*1100'*
B. Utility Involvement	*No*	*Yes*	*No*
4 ESTIMATED COSTS (Millions)			
A. Roadway/Railroad Costs	-	-	-
B. Initial Structure Costs	-	*$ 11,497,505.00*	*$ 5,490,610.00*
C. Total	-	*$ 11,497,505.00*	*$ 5,490,610.00*

*None = Does not meet regulatory thresholds to qualify as an impact; however, some changes from existing conditions may occur.
"Increased" denotes an increase between years 2019 and 2045 under the No-Build Alternative.
**None = Does not meet regulatory thresholds to qualify as an impact; however, some changes from existing conditions may occur.
"Decreased" denotes a decrease compared to future 2045 no-build conditions.

W. NORTH AVENUE BRIDGE ALTERNATIVES COMPARISON MATRIX
FEBRUARY 2024

Measures of Effectiveness	Alternative 1 No Build Alternative	Alternative 2 Replace and Raise Bridge to Achieve 22' / 21' Clearance Alt 2 22' Clearance	Alternative 2 Replace and Raise Bridge to Achieve 22' / 21' Clearance Design Mod 21'-4" Clearance	Alternative 3*** Replace Bridge and Lower Tracks to Achieve 22' Clearance	Alternative 4 Replace and Raise Bridge and Lower Tracks to Achieve 22' Clearance
1 PURPOSE AND NEED					
A. Forecasted Traffic Demands	*No*	*Yes*	*Yes*	*Yes*	*Yes*
B. Vertical Clearance Constraints	*No*	*Yes*	*Yes*	*Yes*	*Yes*
C. Operational Safety and Reliability	*No*	*Yes*	*Yes*	*Yes*	*Yes*
D. Public Safety	*No*	*Yes*	*Yes*	*Yes*	*Yes*
E. Facility Deficiencies	*No*	*Yes*	*Yes*	*Yes*	*Yes*
2 ENGINEERING					
A. Construction Phases	*0*	*1*	*1*	*2*	*2*
B. Avoids Construction Detour	*Yes*	*No*	*No*	*No*	*No*
C. Building Entrances Impacted	*0*	*9*	*8*	*0*	*8*
D. Driveways Impacted	*0*	*2*	*2*	*0*	*2*
E. Property Impacts	*No*	*11*	*9*	*1*	*9*
F. Maintains 4 Railroad Tracks	*Yes*	*Yes*	*Yes*	*No*	*Yes*
3 ENVIRONMENTAL & SOCIAL IMPACTS					
A. Air Quality	*None (Increased)**	*None (Decreased)**	*None (Decreased)***	*None (Decreased)***	*None (Decreased)***
B. Noise	*None (Increased)**	*None (Decreased)**	*None (Decreased)***	*None (Decreased)***	*None (Decreased)***
C. Vibration	*None (Increased)**	*None (Decreased)**	*None (Decreased)***	*None (Decreased)***	*None (Decreased)***
D. Hazardous Waste Potential	*None*	*Low*	*Low*	*Moderate to High*	*Low to Moderate*
E. Historic Properties	*None*	*Moderate to High*	*Moderate to High*	*Moderate to High*	*Moderate to High*
F. Section 2002 Resources	*0*	*3*	*3*	*2*	*3*
3 CONSTRUCTABILITY					
A. **Construction Length**					
- Railroad Corridor	*N/A*	*N/A*	*N/A*	*6,850'*	*3,310'*
- Brighton Road	*N/A*	*670'*	*655'*	*250'*	*655'*
- North Avenue	*N/A*	*512'*	*487'*	*345'*	*487'*
- Total Construction Length	*N/A*	*1182'*	*1142'*	*7445'*	*4452'*
B. Utility Involvement	*No*	*Yes*	*Yes*	*Yes*	*Yes*
4 ESTIMATED COSTS (Millions)					
A. Roadway/Railroad Costs	-	*$ 5,278,700.00*	*$ 4,943,000.00*	*$ 59,058,200.00*	*$ 18,153,660.00*
B. Initial Structure Costs	-	*$ 5,409,000.00*	*$ 5,409,000.00*	*$ 5,409,000.00*	*$ 5,409,000.00*
C. Total	-	*$ 10,687,700.00*	*$ 10,352,000.00*	*$ 64,467,200.00*	*$ 23,562,660.00*

*None = Does not meet regulatory thresholds to qualify as an impact; however, some changes from existing conditions may occur. "Increased" denotes an increase between years 2019 and 2045 under the No-Build Alternative.

**None = Does not meet regulatory thresholds to qualify as an impact; however, some changes from existing conditions may occur. "Decreased" denotes a decrease compared to future 2045 no-build conditions.

***North Avenue Alternate 3 is necessarily accompanied by Pennsylvania Avenue Alternate 3 as track lowering limits extend under both the Pennsylvania Avenue Bridge and the North Avenue Bridge. $57,100,000 is the total track lowering cost for the entire corridor common to both North Avenue and Pennsylvania Avenue.

ALLEGHENY COMMONS PEDESTRIAN BRIDGE ALTERNATIVES COMPARISON MATRIX
FEBRUARY 2024

Measures of Effectiveness	Alternative 1 No Build Alternative	Alternative 2 Construct Bridge to Achieve 22' Vertical Clearance	Alternative 3 Construct Bridge to Achieve 21'-4" Vertical Clearance
1 PURPOSE AND NEED			
A. Forecasted Traffic Demands	*No*	*Yes*	*Yes*
B. Vertical Clearance Constraints	*No*	*Yes*	*Yes*
C. Operational Safety and Reliability	*No*	*Yes*	*Yes*
D. Public Safety	*No*	*Yes*	*Yes*
E. Facility Deficiencies	*No*	*Yes*	*Yes*
2 ENGINEERING			
A. Construction Phases	*0*	*1*	*1*
B. Avoids Construction Detour	*Yes*	*Yes*	*Yes*
C. Building Entrance Impacts	*N/A*	*N/A*	*N/A*
D. Driveways Impacted	*N/A*	*N/A*	*N/A*
E. Property Impacts	*N/A*	*1*	*1*
3 ENVIRONMENTAL & SOCIAL IMPACTS			
A. Air Quality	*None (Increased)**	*None (Decreased)***	*None (Decreased)***
B. Noise	*None (Increased)**	*None (Decreased)***	*None (Decreased)***
C. Vibration	*None (Increased)**	*None (Decreased)***	*None (Decreased)***
D. Hazardous Waste Potential	*None*	*Low*	*Low*
E. Historic Properties	*None*	*Moderate*	*Low-Moderate*
F. Section 2002 Resources	*0*	*2*	*2*
3 CONSTRUCTABILITY			
A. **Construction Length**			
- Railroad Corridor	*N/A*	*N/A*	*N/A*
- Pedestrian Bridge Walkway	*N/A*	*400'*	*220'*
- South Ramp	*N/A*	*250'*	*170'*
- North Ramp	*N/A*	*225'*	*315'*
- Total Construction Length	*N/A*	*875'*	*705'*
B. Utility Involvement	*No*	*Yes*	*Yes*
4 ESTIMATED COSTS (Millions)			
A. Roadway/Railroad Costs	-	*$ 1,299,200.00*	*$ 921,700.00*
B. Initial Structure Costs	-	*$ 756,000.00*	*$ 808,000.00*
C. Total	-	*$ 2,055,200.00*	*$ 1,729,700.00*

*None = Does not meet regulatory thresholds to qualify as an impact; however, some changes from existing conditions may occur.
"Increased" denotes an increase between years 2019 and 2045 under the No-Build Alternative.
**None = Does not meet regulatory thresholds to qualify as an impact; however, some changes from existing conditions may occur.
"Decreased" denotes a decrease compared to future 2045 no-build conditions.

PENNSYLVANIA AVENUE BRIDGE ALTERNATIVES COMPARISON MATRIX
FEBRUARY 2024

	Alternative 1 **No Build Alternative**	**Alternative 2** **Replace and Raise Bridge to Achieve 22' / 21'-2" Clearance**		**Alternative 3***** **Repair substructure and Lower Tracks to Achieve 22' Clearance**	**Alternative 4** **Replace and Raise Bridge and Lower Tracks to Achieve 22' Clearance**
		Alt 2 **22' Clearance**	**Design Mod** **21'-2" Clearance**		
1 PURPOSE AND NEED					
A. Forecasted Traffic Demands	*No*	*Yes*	*Yes*	*Yes*	*Yes*
B. Vertical Clearance Constraints	*No*	*Yes*	*Yes*	*Yes*	*Yes*
C. Operational Safety and Reliability	*No*	*Yes*	*Yes*	*Yes*	*Yes*
D. Public Safety	*No*	*Yes*	*Yes*	*Yes*	*Yes*
E. Facility Deficiencies	*No*	*Yes*	*Yes*	*Yes*	*Yes*
2 ENGINEERING					
A. Construction Phases	*0*	*1*	*1*	*2*	*2*
B. Avoids Construction Detour	*Yes*	*No*	*No*	*Yes*	*No*
C. Building Entrances Impacted	*0*	*1*	*1*	*0*	*1*
D. Driveways Impacted	*0*	*1*	*1*	*0*	*1*
E. Property Impacts	*No*	*5*	*5*	*0*	*5*
F. Maintains 4 Railroad Tracks	*Yes*	*Yes*	*Yes*	*No*	*Yes*
3 ENVIRONMENTAL & SOCIAL IMPACTS					
A. Air Quality	*None (Increased)**	*None (Decreased)***	*None (Decreased)***	*None (Decreased)***	*None (Decreased)***
B. Noise	*None (Increased)**	*None (Decreased)***	*None (Decreased)***	*None (Decreased)***	*None (Decreased)***
C. Vibration	*None (Increased)**	*None (Decreased)***	*None (Decreased)***	*None (Decreased)***	*None (Decreased)***
D. Hazardous Waste Potential	*None*	*Low to Moderate*	*Low*	*Moderate to High*	*Moderate*
E. Historic Properties	*None*	*Low to Moderate*	*Low to Moderate*	*Moderate to High*	*Moderate*
F. Section 2002 Resources	*0*	*2*	*2*	*2*	*2*
3 CONSTRUCTABILITY					
A. **Construction Length**					
- Railroad Corridor	*N/A*	*N/A*	*N/A*	*7,700'*	*3,310'*
- Pennsylvania Avenue	*N/A*	*555'*	*449'*	*0'*	*449'*
- Total Construction Length	*N/A*	*555'*	*449'*	*7700'*	*3759'*
B. Utility Involvement	*No*	*Yes*	*Yes*	*Yes*	*Yes*
4 ESTIMATED COSTS (Millions)					
A. Roadway/Railroad Costs	-	*$ 1,565,600.00*	*$ 1,951,900.00*	*$ 57,100,000.00*	*$ 15,130,460.00*
B. Initial Structure Costs	-	*$ 5,330,000.00*	*$ 5,283,000.00*	*$ 23,000.00*	*$ 5,283,000.00*
C. Total	-	*$ 6,895,600.00*	*$ 7,234,900.00*	*$ 57,123,000.00*	*$ 20,413,460.00*

*None = Does not meet regulatory thresholds to qualify as an impact; however, some changes from existing conditions may occur. "Increased" denotes an increase between years 2019 and 2045 under the No-Build Alternative.

**None = Does not meet regulatory thresholds to qualify as an impact; however, some changes from existing conditions may occur. "Decreased" denotes a decrease compared to future 2045 no-build conditions.

***Pennsylvania Avenue Alternate 3 is necessarily accompanied by North Avenue Alternate 3 as track lowering limits extend under both the Pennsylvania Avenue Bridge and the North Avenue Bridge. $57,100,000 is the total track lowering cost for the entire corridor common to both North Avenue and Pennsylvania Avenue.

Michael Baker
INTERNATIONAL

APPENDIX E

Air Quality Memorandum

Norfolk Southern Railway Company

Pittsburgh Vertical Clearance Projects

Air Quality Technical Memorandum

HMMH Report No. 310190
February 14, 2024

Prepared for:

Michael Baker International
100 Airside Drive
Moon Township, PA 15108

Prepared by:
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Phil DeVita

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Contents

Figures

Tables

1 Introduction

The Pittsburgh Vertical Clearance Projects are comprised of four (4) railway improvement projects on the Pittsburgh and Fort Wayne Rail Lines (together referred to as the Pittsburgh Line), owned and operated by Norfolk Southern Railway Company (Norfolk Southern). The proposed projects address freight capacity and delay constraints through the City of Pittsburgh, Allegheny County, Pennsylvania. Norfolk Southern is a common carrier and the Pittsburgh Line forms a critical component of its route through Pittsburgh between Chicago and the New York/New Jersey commercial markets. Three projects are overhead clearance projects [North Avenue Bridge (PC-1.60); Pennsylvania Avenue Bridge (PC-1.82); and Amtrak Station Canopy (PT-353.20)] that have vertical clearance obstructions along the Pittsburgh Line and prevent efficient movement of freight, especially time-sensitive intermodal freight, by rail between Chicago and New York/New Jersey, and specifically through Pennsylvania. The fourth project is installation of a new Allegheny Commons Pedestrian Bridge (PC 1.50).

Unused capacity exists on the Pittsburgh Line and these clearance projects will allow the line to accommodate anticipated freight growth while allowing for double-stack intermodal freight to use the Pittsburgh Line in lieu of Norfolk Southern's Monongahela line (Mon Line) south of the rivers. The ability to move this double-stack traffic on the Pittsburgh Line will eliminate exposure to hazardous conditions and delay to time-sensitive freight relating to the unpredictable landslides from adjacent property that occur along the Mon Line.

The air quality assessment was conducted to evaluate the effects of the Pittsburgh Vertical Clearance Projects. Because air analysis is regional in nature, and while the Pittsburgh Vertical Clearance Projects are comprised of four individual projects, a regional air analysis was undertaken along a study corridor encompassing all four of the projects. Merchant Street Bridge is part of the Norfolk Southern Pittsburgh Line. The Merchant Street Bridge Project was to replace the bridge that carries the Pittsburgh Line over Merchant Street. As a separate, standalone replacement along the corridor, this air quality analysis performed for the Vertical Clearance Projects covered this location and therefore a separate quality assessment was not necessary for the separate Merchant Street Bridge Project. Figure 1 shows the study corridor, which includes an approximately 13-mile portion of the Pittsburgh Line north of the Allegheny and Ohio Rivers from just west of the Ohio Connecting (OC) Flyover Bridge Flyover to a point east of the Point Perry Bridge. While an air quality analysis may not be needed for the review of these projects, this analysis was developed in accordance with Pennsylvania Act 120 of 1970 and is consistent with the Pennsylvania Department of Transportation (PennDOT) Publication 321. See https://www.dot.state.pa.us/public/PubsForms/Publications/PUB%20321.pdf.

This memorandum addresses the affected environment and environmental consequences of the projects currently under consideration, including an overview of regulations, general conformity and attainment status, methodology, and estimates of pollutant emissions for the existing conditions ("Existing" scenario) and for the design year conditions without the projects ("No Build" scenario) and with the projects (or "Build" scenario). Because diesel locomotive emissions are the primary emissions relating to railroad operations along railroad line, this assessment studied the potential change in diesel locomotive emissions associated with rail traffic in each of these scenarios, accommodating for forecasted growth in freight volumes as well as rerouting of double-stack traffic from the Mon Line to the Pittsburgh Line in the Build scenarios.

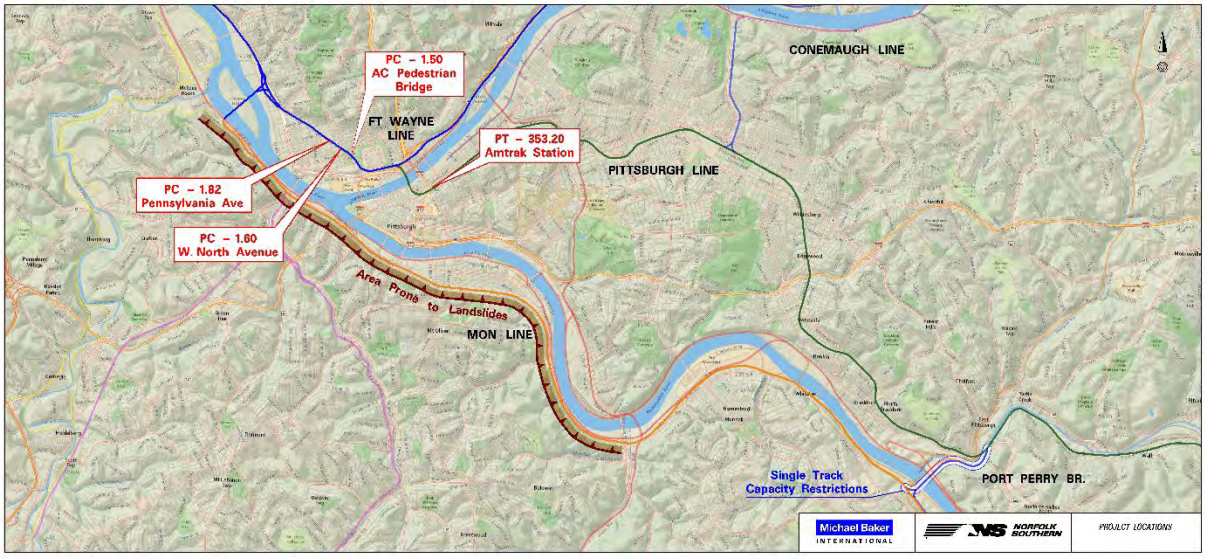


Figure 1. Location Map

2 Background and Regulatory Context

PennDOT has awarded state funding for the projects, which triggers a review under Pennsylvania's Act 120. As set forth in Publication 321, PennDOT's policy is to assess the air quality impacts of transportation improvement projects and to give consideration to the incorporation of appropriate avoidance and/or relief strategies into preliminary engineering designs and construction for those projects that have potential air quality impacts. PennDOT's guidelines are in compliance with 23 CFR Part 771, and also reflect recent procedures regarding conformity as promulgated by the United States Environmental Protection Agency (EPA) as of April 2012 (Final Conformity Rule 40 CFR Parts 51 and 93). PennDOT's policy is to follow regulations issued by EPA, the Federal Highway Administration (FHWA), and the Pennsylvania Department of Environmental Protection (DEP). To the extent Act 120 reviews would require analysis of air impacts, such analysis would be completed consistent with these guidelines. This air quality (qualitative) analysis was conducted for the projects based on the Clean Air Act, 42 U.S.C. § 7401 et seq., and the most recent EPA and DEP air quality classifications.

2.1 Criteria Pollutants and National and State Ambient Air Quality Standards

Table 1 presents the national ambient air quality standards (NAAQS), see 40 C.F.R. Part 50, established by the EPA for criteria air pollutants, namely: carbon monoxide (CO), sulfur dioxide (SO_2), ozone (O_3), particulate matter (PM), nitrogen dioxide (NO_2), and lead (Pb). There are two types of NAAQS—primary and secondary: "*Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public*

welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings."[1]

Table 1. Criteria Pollutant NAAQS

Pollutant	Primary/Secondary	Ave.Time	Level	Form
Carbon Monoxide (CO)	Primary	8 Hour	9 ppm	Not to be exceeded more than once per year
		1 Hour	35 ppm	
Lead (Pb)	Primary and Secondary	Rolling 3-month average	0.15 µg/m,[1]	Not to be exceeded
Nitrogen Dioxide (NO_2)	Primary	1 Hour	100 ppb	98th percentile of 1 hour daily maximum concentrations, averaged over 3 years
	Primary and Secondary	Annual	53 ppb, [2]	Annual Mean
Ozone	Primary and Secondary	8 hours	0.070 ppm, [3]	Annual fourth highest daily maximum 8-hour concentration, averaged over 3 years
Particulate Matter PM_{10}	Primary and secondary	24 hour	150 µg/m^3	Not to be exceeded more than once per year on average over 3 years
Particulate Matter $PM_{2.5}$	Primary	Annual	12.0 µg/m^3	Annual mean averaged over 3 years
	Secondary	Annual	15.0 µg/m^3	Annual mean averaged over 3 years
	Primary and Secondary	24 hour	35 µg/m^3	98th percentile, averaged over 3 years
Sulfur Dioxide (SO_2)	Primary	1 hour	75 ppb, [4]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

(as of February 2019: Source: http://www3.epa.gov/ttn/naaqs/criteria.html)
µg/m3 = Micrograms per cubic meter
ppm = Parts per million
primary standards = provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly.
Secondary standards = provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.
Form = denotes the form of the standard and how the standard is met.. Each standard has its own criteria for how many times it may be exceeded.

1. In areas designated non-attainment for the Pb standards prior to the promulgation of the current 2008 standards, and for which implementation plans to attain or maintain the current 2008 standards have not been submitted and approved, the previous standards (1.5 ug/m^3 as a calendar quarter average) also remain in effect.
2. The annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard.
3. Final rule signed October 1, 2015 and effected December 28, 2015.
4. The previous SO_2 standards 0.14 ppm 24-hour and 0.03 ppm annual will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current 2010 standards, and (2) any area for which an implementation plan providing for attainment of the current 2010 standard has not been submitted and approved and that is designated non-attainment under the previous SO_2

[1] From the EPA preamble to the NAAQS table: https://www.epa.gov/criteria-air-pollutants/naaqs-table

standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

2.2 Pollutants of Concern

As discussed above, the EPA established NAAQS for commonly found air pollutants, called criteria pollutants, in the CAA and 1990 Clean Air Act Amendments (CAAA). The seven criteria pollutants are CO, ozone, $PM_{2.5}$, PM_{10}, NO_2, SO_2, and lead. A number of these pollutants, such as CO, PM, ozone, and NO_2 commonly result from transportation-related sources. In particular[2]:

- CO is a colorless, odorless gas that is formed when carbon in fuel is not burned completely. It is a component of combustion engine exhaust, which contributes approximately 56 percent of all carbon emissions nationally. CO is affected by variations in temperature and vehicle speeds.
- PM is a term used to describe particles in the air including dust, dirt, soot, smoke, and liquid droplets. Sources that directly emit PM include on-road motor vehicles, construction activities, locomotives, and unpaved roads. Sources of particles that form in the air from chemical processes involving sunlight and water vapor include fuel combustion in combustion engines, at power plants and from industrial processes. PM_{10} is used as a measure of coarse particulate, in which the particles are 10 microns or less in size. Coarse particles of this size are typically formed by earth-based materials such as construction and re-entrained road dust and brake and tire wear. $PM_{2.5}$ is used as a measure of fine particulate, in which the particles are 2.5 microns or less in size. Fine particles of this size are typically, but not exclusively, formed as a product of combustion.
- Ozone (i.e., ground-level photochemical smog) is different from CO and PM in that it results from a chemical reaction between volatile organic compounds and oxides of nitrogen in the presence of sunlight. Also, the concentration and dispersion of ozone are significantly affected by an area's meteorology and topography. Because it is primarily an area wide pollutant, it is typically assessed in system-level planning as part of the air quality State Implementation Plan (SIP) development and conformity process. Through the Transportation Improvements Program (TIP)/SIP evaluation process, this pollutant is evaluated on a regional level.
- NO_2, along with particles in the air, is often seen as a reddish-brown layer over urban areas. The primary sources of NO_2 emissions are combustion engines, electric utilities, and industrial, commercial, and residential sources that burn fuel. NO_2 is considered an ozone precursor and are evaluated as part of the regional conformity requirements during the project planning phases.
- SO_2 is a product of fuel combustion at power plants, businesses, and residential locations using coal or oil containing sulfur. It forms acidic aerosols harmful to the respiratory tract and can aggravate symptoms associated with lung disease like asthma and bronchitis. SO_2 is a primary contributor to acid deposition which leads to acidification of lakes and streams and damage to vegetation and materials, along with diminution of visibility.
- Lead (Pb) is an elemental heavy metal found naturally in the environment as well as in manufactured products and industrially in the production of gasoline. Lead can be released directly into the air, as suspended particles. Low lead exposure can have adverse effects on the nervous system of fetuses and young children. Historic major sources of lead air emissions were motor vehicles and industrial sources. After lead was phased out of vehicle fuels in 1995, emissions of lead from the automotive

[2] Pennsylvania Department of Transportation, Project-Level Air Quality Handbook: https://www.dot.state.pa.us/public/PubsForms/Publications/PUB%20321.pdf

section have declined. Today, most lead emissions in the U.S. are from leaded aviation fuel in piston engine aircraft and industrial operations such as smelters.

2.3 NAAQS Attainment Status

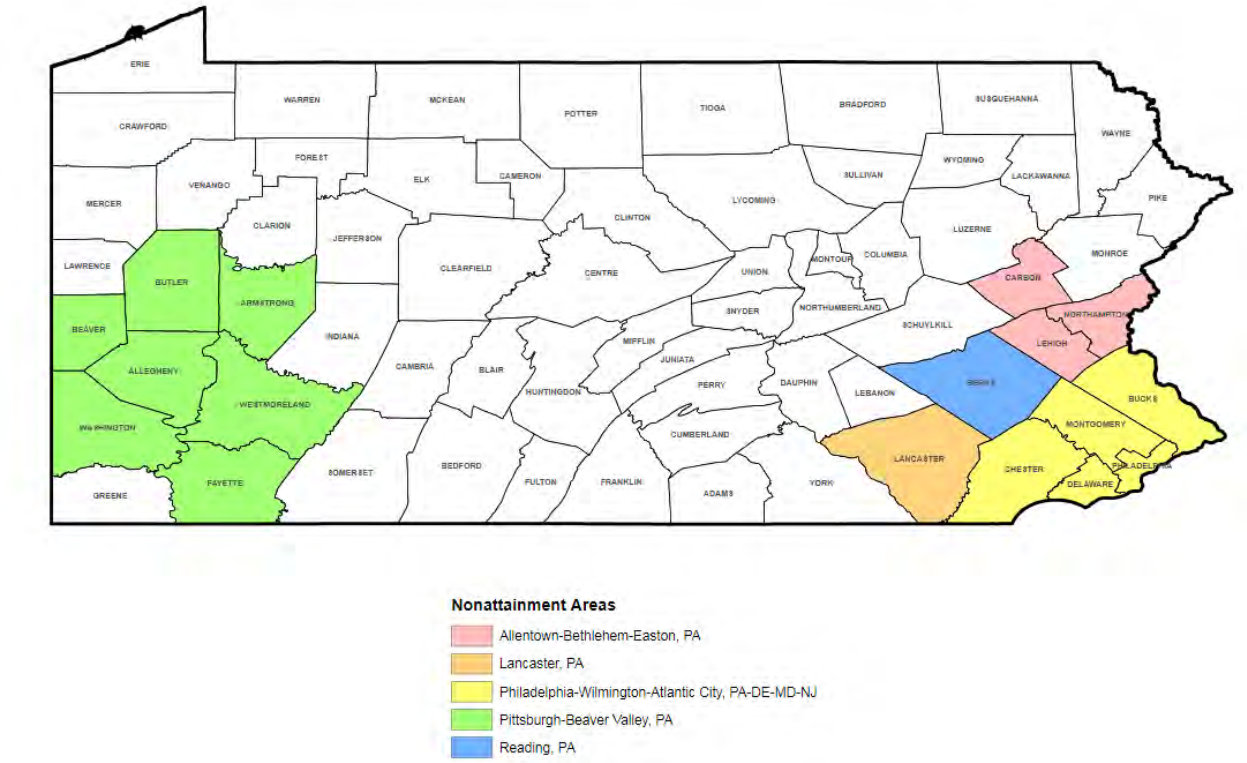
Areas that have never been designated by EPA as nonattainment for one or more of the NAAQS are classified as attainment areas, while areas that do not meet one or more of the NAAQS may be designated by EPA as nonattainment areas for that or those criteria pollutants. Areas that have failed to meet the NAAQS in the past but have since re-attained them may be re-designated as attainment (maintenance) areas, which are commonly referred to as maintenance areas.

The EPA Green Book[3] and the DEP[4] lists non-attainment, maintenance, and attainment areas across the nation. The current designations for the Pittsburgh area (located in Allegheny County), within which the projects lie, are as follows:

- Marginal nonattainment for the 2008 ozone standard;
- Maintenance for the 1971 carbon monoxide standard;
- Maintenance for the 2006 $PM_{2.5}$ standard;
- Moderate nonattainment for the 2012 $PM_{2.5}$ standard; and
- Nonattainment for the 2010 SO_2 standard.

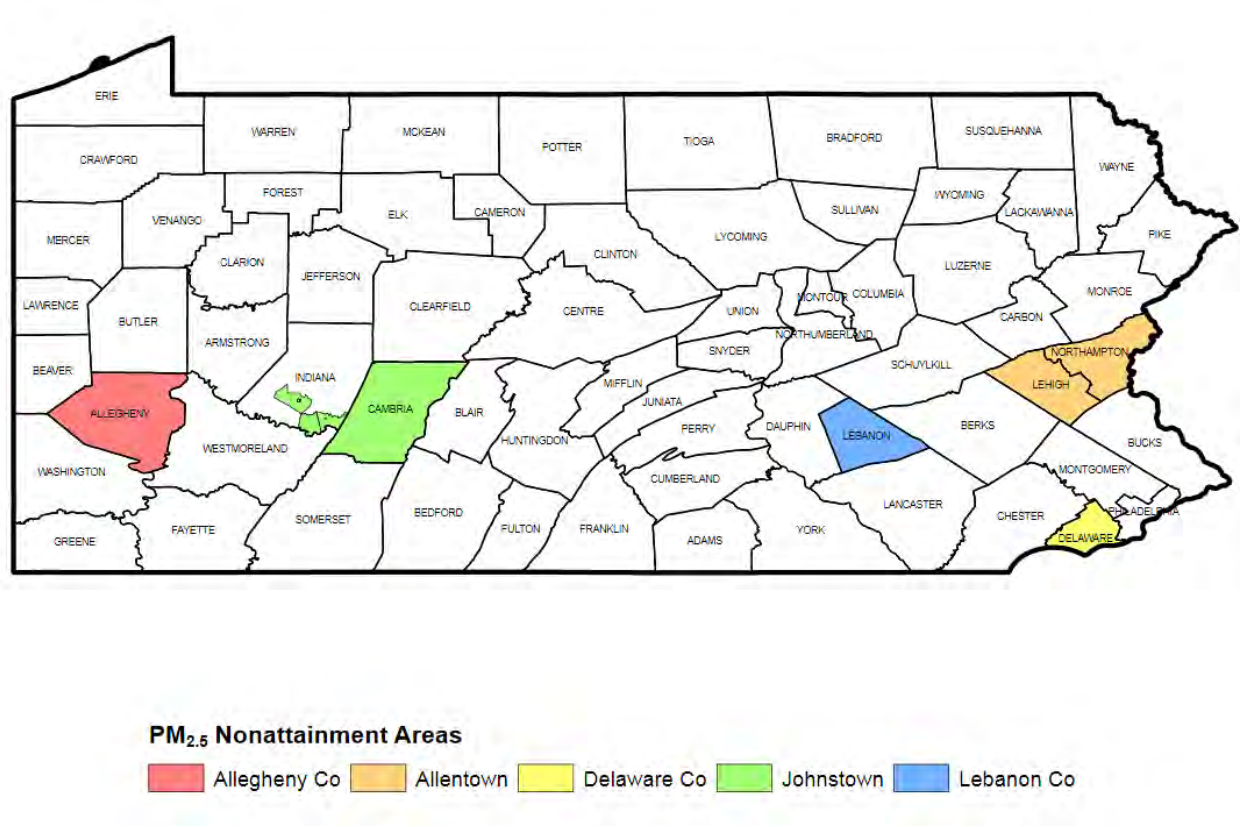
Figure 2 to Figure 4 show graphically the nonattainment region for each pollutant per DEP[5]. The remaining pollutants lead and NO_2 are designated as being in attainment for the NAAQS.

[3] EPA Green Book: https://www.epa.gov/green-book.
[4] Pennsylvania Department of Environmental Protection: https://www.dep.pa.gov/business/air/baq/regulations/pages/attainment-status.aspx
[5] https://www.dep.pa.gov/business/air/baq/regulations/pages/attainment-status.aspx



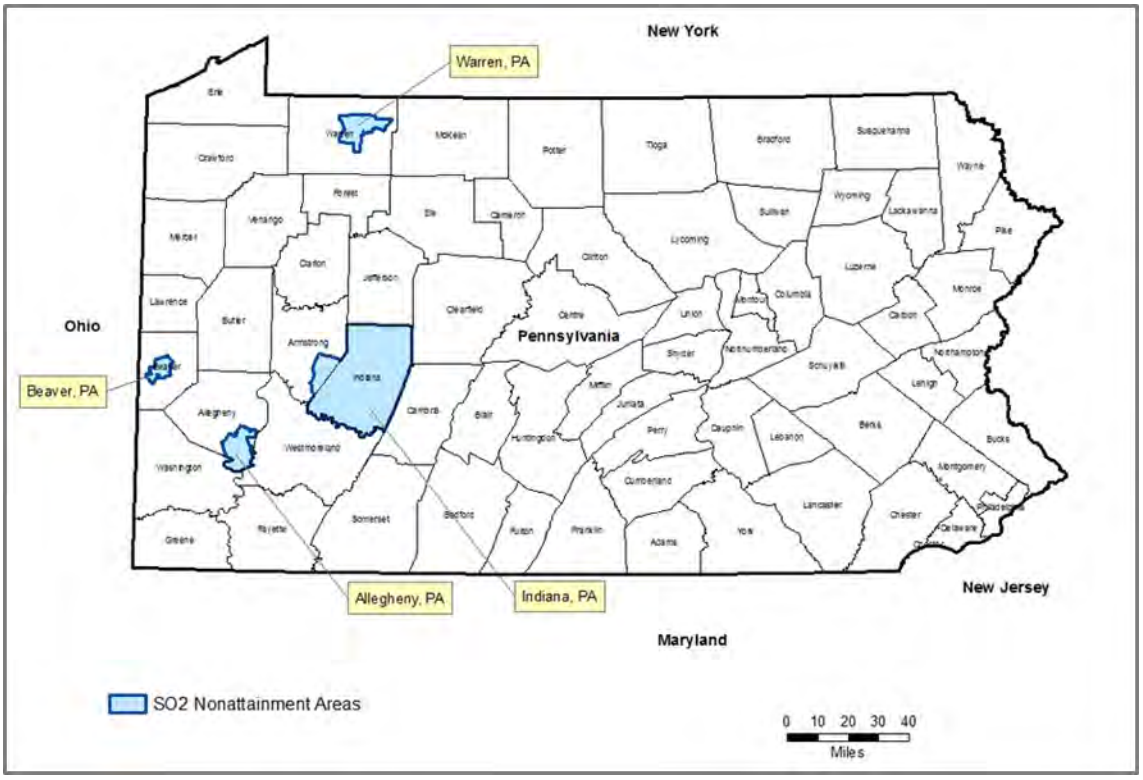
Source: https://www.dep.pa.gov/business/air/baq/regulations/pages/attainment-status.aspx
Note: Current Nonattainment: (All are classified Marginal) Allegheny, Armstrong, Beaver, Berks, Bucks, Butler, Carbon, Chester, Delaware, Fayette, Lancaster, Lehigh, Montgomery, Northampton, Philadelphia, Washington and Westmoreland.

Figure 2. Pennsylvania Ozone Nonattainment Area (2008 Standard)



Source: https://www.dep.pa.gov/business/air/baq/regulations/pages/attainment-status.aspx
Notes: current attainment status for PM2.5 is Allegheny, Delaware, and Lebanon are currently classified as moderate non attainment

Figure 3. Pennsylvania PM2.5 Nonattainment Area (2012 Standard)



Source: https://www.dep.pa.gov/business/air/baq/regulations/pages/attainment-status.aspx
Notes: current attainment status for PM2.5 is Allegheny, Delaware, and Lebanon are currently classified as moderate non attainment

Figure 4. Pennsylvania SO2 Nonattainment Area (2010 Standard)

2.4 General Conformity

Pursuant to 40 CFR Parts 51 and 93, the general conformity rule (GCR) applies to federal actions for non-FHWA components of a transportation project requiring actions by federal agencies in nonattainment or maintenance areas for any of the applicable criteria pollutants. The GCR specifies *de minimis* emission levels by pollutant to determine the applicability of a conformity requirement for a project. A conformity applicability analysis under GCR is the first step of a conformity evaluation and determines whether a conformity determination would be undertaken for a federal action.

The Pittsburgh Vertical Clearance Projects are not federal actions and require no action, approvals, or funding from any US Department of Transportation agency, including the Federal Railroad Administration (FRA), FHWA, or Federal Transit Authority (FTA). Rather, PennDOT has awarded state funding for these projects, which triggers a review under Pennsylvania's Act 120. To the extent Act 120 reviews would require analysis of air impacts, such analysis would be completed consistent with the GCR. If the analysis results indicate that the total projected emissions under both the construction and operational activities would not exceed the *de minimis* levels, then the conformity evaluation is the final step. If, however, the *de minimis* levels would be exceeded by the proposed action, under the federal GCR process, a general conformity determination would be undertaken for the applicable nonattainment/maintenance pollutants.

While the GCR analysis is not necessary for the vertical clearance projects, the applicability analysis was conducted to identify if *de minimis* levels have the potential to be exceeded by the projects.

3 Existing Air Quality

Existing air quality conditions in Allegheny County can be reflected through the current status of the NAAQS attainment and the recent ambient air monitoring data collected by DEP and published by EPA.

As shown above, the project area has EPA designations as follows:

- Marginal nonattainment for the 2008 ozone standard;
- Maintenance for the 1971 carbon monoxide standard;
- Maintenance for the 2006 $PM_{2.5}$ standard;
- Moderate nonattainment for the 2012 $PM_{2.5}$ standard;
- Nonattainment for the 2010 SO_2 standard.

The DEP operates the Commonwealth of Pennsylvania Air Monitoring System (COPAMS) air monitoring sites, including ambient (i.e., outdoor) air monitoring sites, to continuously monitor pollutant levels throughout the state. This data is used to monitor compliance with federal and state ambient air quality standards and is provided to the public in annual reports. According to its website, the DEP does not generally monitor air quality in Allegheny County and relies on the independent Allegheny County Health Department Air Quality Program to monitor air quality monitoring in the county.

The Allegheny County Health Department Air Quality Program's Annual Reports for 2016, 2017, and 2018 include both published data for each year as well as analysis concerning 1997-2018 air quality trends. Data provided for the most recent three years at the monitoring stations nearest the project area are used to describe the representative ambient air quality in the project area and are presented in Table 2. The measured ambient air concentrations closest to the project area were all well below the corresponding NAAQS, except for the exceedance of the 8-hour ozone standard recorded in Lawrenceville in 2016, 2017, and 2018. However, the annual fourth highest daily maximum 8-hour concentration averaged over 3 years, which is how EPA measures the compliance standard, are below the standard.

Table 2. Representative Monitored Ambient Air Quality Data

Pollutant	Averaging Time	Year			Primary Standard	Monitoring Site Location
		2021	2020	2019		
Carbon Monoxide (CO)	1-hour Maximum (ppm)	2.3	1.9	2.2	35	Lawrenceville
	8-hour Maximum (ppm)	1.1	1.4	1.4	9	
Ozone (O_3)	8-hour Maximum (ppm)	0.068	0.071	0.067	0.070	Lawrenceville
		2019 to 2021 3-Year Average of 4th Maximum 0.064				
Nitrogen Dioxide (NO_2)	1-hour Maximum (ppb)	46	51	40	100	Parkway East
	Annual (ppb)	10	9.0	10.0	53	
Particulate Matter (PM_{10})[1]	24-hour Maximum(ug/m^3)	24	31	26	150	Clairton
Particulate Matter ($PM_{2.5}$)[1]	24-hour (98th Percentile) (ug/m^3)	23.1	18.9	21.7	35	Lawrenceville
	Annual	8.8	7.7	9.0	12	
Sulfur Dioxide (SO_2)	1-hour Maximum (ppb)	15	7	21	75	Lawrenceville

Note: [1]Filter based monitor results presented.

Source: Allegheny County Air Quality Reports, 2019[6], 2020[7], 2021[8]

4 Methodology

The Pittsburgh Vertical Clearance Projects are designed to improve mobility and efficiency along the east-west rail corridor by allowing double stack intermodal train traffic to be rerouted from the Mon Line to the Pittsburgh Line, each of which are located within the Pittsburgh, PA metropolitan area. Currently, double stack intermodal traffic crosses the OC Bridge Flyover over the Ohio River and follows the Mon Line on the west side of the Ohio and Monongahela Rivers down to the single tracked Port Perry Bridge, where it crosses back over and connects to the Pittsburgh Line. Train emissions result primarily from the diesel fuel used in locomotives. Locomotives and locomotive engines, as well as the fuel allowed to be used in locomotives, are subject to federal EPA emissions standards. The air quality assessment is focused on the regional annual net changes in locomotive emissions that would result from the proposed projects. The GCR applicability analysis was completed for the net change in annual CO, $PM_{2.5}$, NO_2 and volatile organic compounds (VOCs) from locomotives to evaluate air quality impacts. Ultra-low sulfur diesel oil (ULSD) was fully phased in for locomotives by 2014, resulting in low SO_2 emissions. Therefore, emissions of SO_2 were not included and are expected to be well below the EPA *de minimis* levels. Emissions were estimated for the Existing (2019), the No Build (2045), and Build (2045)

[6] Allegheny County, 2019 Air Quality Annual Report: 2019-Air-Quality-Annual-Report.pdf (alleghenycounty.us)
[7] Allegheny County, 2020 Air Quality Annual Report: 2020-Air-Quality-Annual-Report.pdf (alleghenycounty.us)
[8] Allegheny County, 2021 Air Quality Annual Report: 2021-data-summary.pdf (alleghenycounty.us)

scenarios. The design year analysis is an anticipated future scenario informed by United States Department of Transportation (DOT) and PennDOT rail traffic forecasts.

Locomotive emissions were estimated using a weighted average of the fleet distribution of the current and expected fleet mix, assuming the EPA-established line haul locomotive exhaust emission standards (Tier 0, Tier 1, Tier 2, Tier 3, and Tier 4)[9]. For purposes of this analysis, Tier 0 and some of the Tier 0+ and Tier 1+ locomotives assumed for the existing condition will be phased out over time, with higher proportions of Tier 2, Tier 3, and Tier 4 locomotive engines comprising the fleet mix in the design year. The emission factors for the anticipated Norfolk Southern locomotive fleet mix for each condition is presented in Table 3.

Table 3. Norfolk Southern Fleet Mix Emission Factors

Operating Condition	N-S Systemwide Locomotive Emission Factors (g/bhp-hr)			
	NO_2	PM	CO	HC
2019 Existing Conditions	6.76	0.22	2.04	0.81
2045 Design Conditions	4.82	0.12	1.87	0.36

Note: PM represents $PM_{2.5}$ and PM_{10} emissions.

Figure 5 presents the air quality analysis segments. The study corridor along which the projects lie was divided into three segments: Segment 1 – Pittsburgh Line, Braddock/East Pittsburgh to Downtown Pittsburgh (distance of 11.8 miles); Segment 2 – Pittsburgh Line, Northside Segment, Mile Post 0.0 to PC 3.17 (distance of 3.9 miles); and Segment 3 – Mon Line from where it crosses the OC Bridge Flyover over the Ohio River and follows the Mon Line on the west side of the Ohio and Monongahela Rivers down to the single tracked Port Perry Bridge, where it crosses back over and connects to the Pittsburgh Line (distance of 15.9 miles). These segments encompass the entire study area. Daily locomotive movements were estimated for both the freight line and the passenger traffic over the two Amtrak routes along each segment. The Existing and No Build scenarios do not include the rerouting of any intermodal trains with double stacked cars from the Mon Line to the Pittsburgh Line because the Pittsburgh Line would not accommodate double stack in those scenarios, but the No Build scenario does include forecasted traffic projections for a low-growth scenario and a high-growth scenario. The low-growth scenario is based on the Pennsylvania Department of Transportation (PennDOT) 2020 Rail Plan[10] and the high-growth scenario is based on the PennDOT 2015 Rail Plan[11].

The high growth scenario is a result of the freight flow projections developed as part of the 2015 PA Freight Plan where PennDOT is projecting an 80+% growth in intermodal container traffic. The (low growth) projections for 2045 in the 2020 PA Freight Plan were modified significantly to reflect changes in global freight changes. The low growth reflects minor (1-2%) growth in intermodal over the next 20+

[9] See 40 CFR 1033.101

[10] Pennsylvania Department of Transportation 20202 Rail Plan: (PennDOT 2021 https://www.penndot.pa.gov/Doing-Business/RailFreightAndPorts/Planning/Documents/2020%20Pennsylvania%20State%20Rail%20Plan/2020%20Pennsylvania%20State%20Rail%20Plan.pdf)

[11] Pennsylvania Department of Transportation 2015 Rail Plan: (PennDOT 2016 https://www.penndot.pa.gov/Doing-Business/Transit/InformationandReports/Documents/2015%20Pennsylvania%20State%20Rail%20Plan%20(low).pdf)

years. Thus, the only changes between low and high growth for this analysis are the number of intermodal trains.

The Build scenarios assume the rerouting of intermodal trains with double stacked traffic to the Pittsburgh Line from the Mon Line as well as forecasted traffic projections. The Mon Line is currently operating at or near capacity. Therefore, the study presumes that under all future scenarios, to accommodate growth in intermodal train movements through the Pittsburgh area, additional trains operating with double stacked rail cars (in the Build scenario) or trains operating with single stacked rail cars (in the No Build scenario) would operate on the Pittsburgh Line. In general, this would mean that under the No Build condition, the Mon Line would continue to operate at capacity with double stack traffic and the study presumes growth in intermodal rail traffic would be routed in a larger number of single stack trains on the Pittsburgh Line. For the Build condition, growth in intermodal rail traffic is presumed to shift from the Mon Line to the Pittsburgh Line and all intermodal growth is presumed to also occur on the Pittsburgh Line. Remaining traffic on the Mon Line with the Build condition would include existing freight movements of any non-double stack intermodal trains.

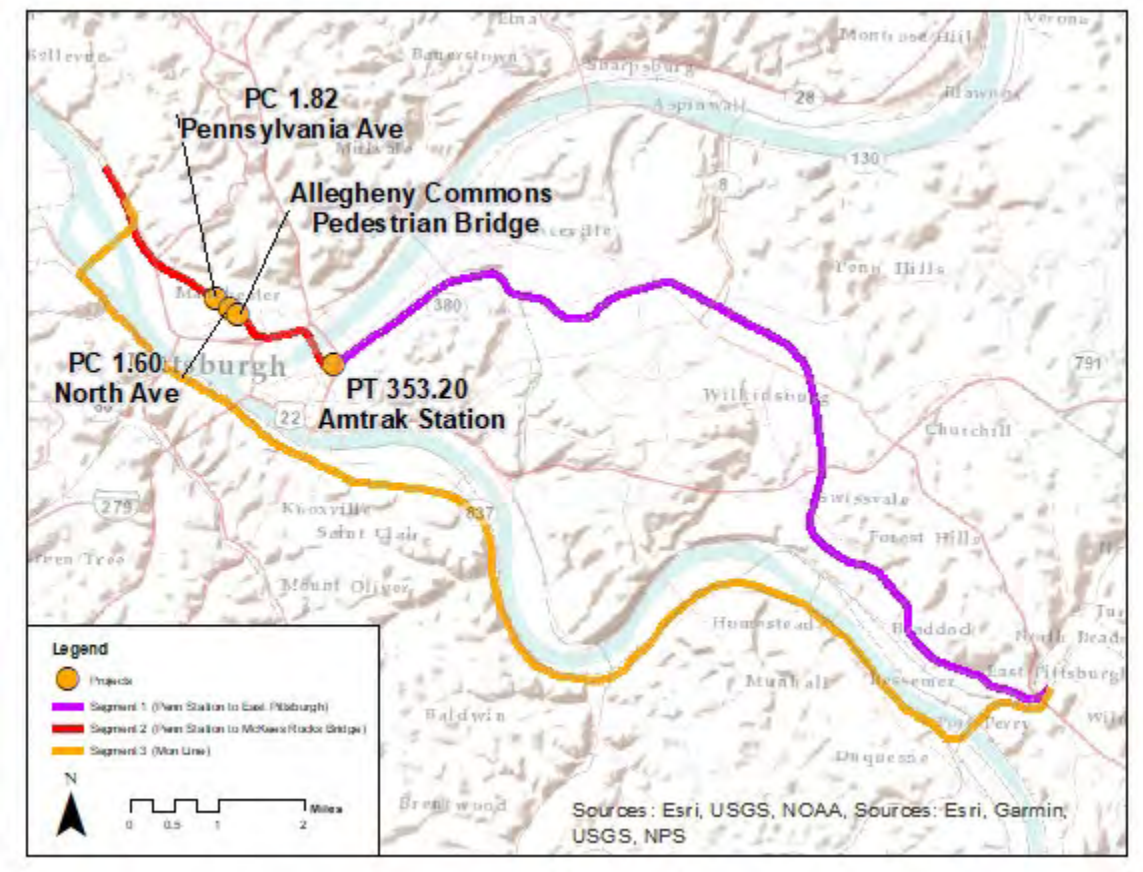


Figure 5. Air Quality Analysis Segments

There is variability in how locomotives operate throughout the study corridor, and generally in railroad operations, due to a number of factors, including maximum track speeds, slowing down or idling due to speed changes, increasing speed and use of higher throttle settings, and specific train consists (i.e., the number of locomotives, cars and their contents on a train). For these reasons, average locomotive speeds, weighted emission factors, average engine horsepower rating, and average load factors were included in the emission calculation. In lieu of project-specific values, a load factor of 0.28 was assumed for Existing and No Build and Build scenarios based on typical locomotives at these speeds. The load

factor corresponds to the percentage of full power applied in a given notch setting on the locomotive. Notch settings include engine braking, idle, and numeric values ranging from 1 to 8. A load factor of 0.28 means that the locomotive is using about 28% of full power, which corresponds to a notch setting of 3 or 4. Emissions were estimated for each of the segments for the Existing and 2045 No Build and Build scenarios, with a low-growth and high-growth scenario included for all future conditions. Table 4 and Table 5 summarizes the pollutant emissions in tons per year for each condition and segment with future low-growth in intermodal traffic and high-growth conditions, respectively.

Table 4. Locomotive Emissions Summary for Each Scenario under Low Growth in Intermodal Traffic

N-S Rail Line Operational Condition	Rail Segment Description	Train Type	Distance (miles)	Number of Locomotives per Day[1]	Annual VMT[2]	Ave. Speed (mph)	Load Factor[3]	Horsepower	NS Systemwide Locomotive Emission Factors (g/bhp-hr)[4]				Emissions Tons per Year (TPY)			
									NO_2	PM^5	CO	HC^6	NO_2	PM^5	CO	HC^6
2019 Existing Conditions	Pittsburgh Line - Braddock to Downtown Pittsburgh Segment - Milepost PT-341.00 to PT-353.35 (Pittsburgh Line from MP 341.0 to Start of Fort Wayne Line)	Freight	11.8	38	164,338.6	26.67	0.28	1226.1	6.76	0.22	2.04	0.81	15.7695	0.5171	4.7687	1.8933
		Passenger (Amtrak Pennsylvania Line)	11.8	2	8,649.4	30	0.28	1226.1	6.76	0.22	2.04	0.81	0.7378	0.0242	0.2231	0.0886
		Passenger (Amtrak Capitol Limited Line)	11.8	4	17,298.8	30	0.28	1226.1	6.76	0.22	2.04	0.81	1.4757	0.0484	0.4463	0.1772
	Pittsburgh Line - Northside Segment - Milepost PC-0.00 to PC-3.17 (From convergence of Fort Wayne and Conemaugh Lines westward to convergence of Ft. Wayne and Mon Lines west of OC Bridge)	Freight	3.9	68	96,386.7	26.67	0.28	1226.1	6.76	0.22	2.04	0.81	9.2490	0.3033	2.7969	1.1104
		Passenger (Amtrak Capitol Limited Line)	3.9	4	5,669.8	30.84	0.28	1226.1	6.76	0.22	2.04	0.81	0.4705	0.0154	0.1423	0.0565
	Mon Line (OC Bridge Flyover across the Ohio River south to the Port Perry Bridge and connectiont to the Pittsburgh Line)	Freight	15.9	68	395,370.3	30	0.28	1226.1	6.76	0.22	2.04	0.81	33.7275	1.1059	10.1993	4.0494
												Total	**61.43**	**2.01**	**18.58**	**7.38**
2045 No Build	Braddock to Downtown Pittsburgh Segment - Milepost PT-341.00 to PT-353.35 (Pittsburgh Line from MP 341.0 to Start of Fort Wayne Line)	Freight	11.8	82	354,624.7	26.67	0.28	1248.4	4.82	0.12	1.87	0.36	24.6814	0.6097	9.5627	1.8198
		Passenger (Amtrak Pennsylvania Line)	11.8	2	8,649.4	30	0.28	1248.4	4.82	0.12	1.87	0.36	0.5352	0.0132	0.2073	0.0395
		Passenger (Amtrak Capitol Limited Line)	11.8	4	17,298.8	30	0.28	1248.4	4.82	0.12	1.87	0.36	1.0703	0.0264	0.4147	0.0789
	Pittsburgh Line - Northside Segment - Milepost PC-0.00 to PC-3.17 (From convergence of Fort Wayne and Conemaugh Lines westward to convergence of Ft. Wayne and Mon Lines west of OC Bridge)	Freight	3.9	118	167,258.9	26.67	0.28	1248.4	4.82	0.12	1.87	0.36	11.6410	0.2876	4.5102	0.8583
		Passenger (Amtrak Capitol Limited Line)	3.9	4	5,669.8	30.84	0.28	1248.4	4.82	0.12	1.87	0.36	0.3413	0.0084	0.1322	0.0252
	Mon Line (OC Bridge Flyover across the Ohio River south to the Port Perry Bridge and connectiont to the Pittsburgh Line)	Freight	15.9	22	127,913.9	30	0.28	1248.4	4.82	0.12	1.87	0.36	7.9145	0.1955	3.0664	0.5836
												Total	**46.18**	**1.14**	**17.89**	**3.41**
2045 Build	Braddock to Downtown Pittsburgh Segment - Milepost PT-341.00 to PT-353.35 (Pittsburgh Line from MP 341.0 to Start of Fort Wayne Line)	Freight	11.8	58	250,832.1	26.67	0.28	1248.4	4.82	0.12	1.87	0.36	17.4576	0.4313	6.7638	1.2872
		Passenger (Amtrak Pennsylvania Line)	11.8	2	8,649.4	30	0.28	1248.4	4.82	0.12	1.87	0.36	0.5352	0.0132	0.2073	0.0395
		Passenger (Amtrak Capitol Limited Line)	11.8	4	17,298.8	30	0.28	1248.4	4.82	0.12	1.87	0.36	1.0703	0.0264	0.4147	0.0789
	Pittsburgh Line - Northside Segment - Milepost PC-0.00 to PC-3.17 (From convergence of Fort Wayne and Conemaugh Lines westward to convergence of Ft. Wayne and Mon Lines west of OC Bridge)	Freight	3.9	90	127,570.3	29.17	0.28	1248.4	4.82	0.12	1.87	0.36	8.1178	0.2005	3.1452	0.5986
		Passenger (Amtrak Capitol Limited Line)	3.9	4	5,669.8	30.84	0.28	1248.4	4.82	0.12	1.87	0.36	0.3413	0.0084	0.1322	0.0252
	Mon Line (OC Bridge Flyover across the Ohio River south to the Port Perry Bridge and connectiont to the Pittsburgh Line)	Freight	15.9	0	0.0	30	0.28	1248.4	4.82	0.12	1.87	0.36	0.0000	0.0000	0.0000	0.0000
												Total	**27.52**	**0.68**	**10.66**	**2.03**

Notes:

1. Number of locomotives per day assumptions are based on existing train movements with forecasted increases from the 2020 Pennsylvania Rail Plan (PennDOT 2021).
2. Vehicle Miles Traveled (VMT) assumes number of locomotives a day occur every day for 365 days per year.
3. Load factor of 0.28 based on typical engine at 20 to 25 mph.
4. Existing line haul emission factors use weighted average for 2019 Norfolk Southern fleet. Design line haul emission factors use weighted average of expected NS fleet mix for 2045 design year.
5. PM includes both PM_{10} and $PM_{2.5}$ emissions
6. Hydrocarbons (HC) are synonymous with volatile organic compounds (VOC)

Definitions:

VMT - Vehicle miles traveled is the total number of miles traveled by trains on each of the rail segments.

Load Factor - the load factor is the based on the notch setting (or throttle setting) of the locomotives operating along the segments and is based on an average setting provided by Norfolk Southern's operations staff.

Table 5. Locomotive Emissions Summary for Each Scenario under High Growth in Intermodal Traffic

N-S Rail Line Operational Condition	Rail Segment Description	Train Type	Distance (miles)	Number of Locomotives per Day[1]	Annual VMT[2]	Ave. Speed (mph)	Load Factor[3]	Horsepower	NS Systemwide Locomotive Emission Factors (g/bhp-hr)[4]				Emissions Tons per Year (TPY)			
									NO_2	PM^5	CO	HC[6]	NO_2	PM^5	CO	HC[6]
2019 Existing Conditions	Pittsburgh Line - Braddock to Downtown Pittsburgh Segment - Milepost PT-341.00 to PT-353.35 (Pittsburgh Line from MP 341.0 to Start of Fort Wayne Line)	Freight	11.8	38	164,338.6	26.67	0.28	1226.1	6.76	0.22	2.04	0.81	15.7695	0.5171	4.7687	1.8933
		Passenger (Amtrak Pennsylvania Line)	11.8	2	8,649.4	30	0.28	1226.1	6.76	0.22	2.04	0.81	0.7378	0.0242	0.2231	0.0886
		Passenger (Amtrak Capitol Limited Line)	11.8	4	17,298.8	30	0.28	1226.1	6.76	0.22	2.04	0.81	1.4757	0.0484	0.4463	0.1772
	Pittsburgh Line - Northside Segment - Milepost PC-0.00 to PC-3.17 (From convergence of Fort Wayne and Conemaugh Lines westward to convergence of Ft. Wayne and Mon Lines west of OC Bridge)	Freight	3.9	68	96,386.7	26.67	0.28	1226.1	6.76	0.22	2.04	0.81	9.2490	0.3033	2.7969	1.1104
		Passenger (Amtrak Capitol Limited Line)	3.9	4	5,669.8	30.84	0.28	1226.1	6.76	0.22	2.04	0.81	0.4705	0.0154	0.1423	0.0565
	Mon Line (OC Bridge Flyover across the Ohio River south to the Port Perry Bridge and connectiont to the Pittsburgh Line)	Freight	15.9	68	395,370.3	30	0.28	1226.1	6.76	0.22	2.04	0.81	33.7275	1.1059	10.1993	4.0494
												Total	**61.43**	**2.01**	**18.58**	**7.38**
2045 No Build	Braddock to Downtown Pittsburgh Segment - Milepost PT-341.00 to PT-353.35 (Pittsburgh Line from MP 341.0 to Start of Fort Wayne Line)	Freight	11.8	94	406,521.0	26.67	0.28	1248.4	4.82	0.12	1.87	0.36	28.2934	0.6989	10.9621	2.0862
		Passenger (Amtrak Pennsylvania Line)	11.8	2	8,649.4	30	0.28	1248.4	4.82	0.12	1.87	0.36	0.5352	0.0132	0.2073	0.0395
		Passenger (Amtrak Capitol Limited Line)	11.8	4	17,298.8	30	0.28	1248.4	4.82	0.12	1.87	0.36	1.0703	0.0264	0.4147	0.0789
	Pittsburgh Line - Northside Segment - Milepost PC-0.00 to PC-3.17 (From convergence of Fort Wayne and Conemaugh Lines westward to convergence of Ft. Wayne and Mon Lines west of OC Bridge)	Freight	3.9	120	170,093.8	26.67	0.28	1248.4	4.82	0.12	1.87	0.36	11.8383	0.2924	4.5867	0.8729
		Passenger (Amtrak Capitol Limited Line)	3.9	4	5,669.8	30.84	0.28	1248.4	4.82	0.12	1.87	0.36	0.3413	0.0084	0.1322	0.0252
	Mon Line (OC Bridge Flyover across the Ohio River south to the Port Perry Bridge and connectiont to the Pittsburgh Line)	Freight	15.9	68	395,370.3	30	0.28	1248.4	4.82	0.12	1.87	0.36	24.4629	0.6043	9.4780	1.8037
												Total	**66.54**	**1.64**	**25.78**	**4.91**
2045 Build	Braddock to Downtown Pittsburgh Segment - Milepost PT-341.00 to PT-353.35 (Pittsburgh Line from MP 341.0 to Start of Fort Wayne Line)	Freight	11.8	90	389,222.2	26.67	0.28	1248.4	4.82	0.12	1.87	0.36	27.0894	0.6692	10.4956	1.9974
		Passenger (Amtrak Pennsylvania Line)	11.8	2	8,649.4	30	0.28	1248.4	4.82	0.12	1.87	0.36	0.5352	0.0132	0.2073	0.0395
		Passenger (Amtrak Capitol Limited Line)	11.8	4	17,298.8	30	0.28	1248.4	4.82	0.12	1.87	0.36	1.0703	0.0264	0.4147	0.0789
	Pittsburgh Line - Northside Segment - Milepost PC-0.00 to PC-3.17 (From convergence of Fort Wayne and Conemaugh Lines westward to convergence of Ft. Wayne and Mon Lines west of OC Bridge)	Freight	3.9	112	158,754.2	29.17	0.28	1248.4	4.82	0.12	1.87	0.36	10.1021	0.2496	3.9140	0.7449
		Passenger (Amtrak Capitol Limited Line)	3.9	4	5,669.8	30.84	0.28	1248.4	4.82	0.12	1.87	0.36	0.3413	0.0084	0.1322	0.0252
	Mon Line (OC Bridge Flyover across the Ohio River south to the Port Perry Bridge and connectiont to the Pittsburgh Line)	Freight	15.9	24	139,542.5	30	0.28	1248.4	4.82	0.12	1.87	0.36	8.6340	0.2133	3.3452	0.6366
												Total	**47.77**	**1.18**	**18.51**	**3.52**

Notes:

1. Number of locomotives per day assumptions are based on existing train movements with forecasted increases from the 2015 Pennsylvania Rail Plan (PennDOT 2016).
2. Vehicle Miles Traveled (VMT) assumes number of locomotives a day occur every day for 365 days per year.
3. Load factor of 0.28 based on typical engine at 20 to 25 mph.
4. Existing line haul emission factors use weighted average for 2019 Norfolk Southern fleet. Design line haul emission factors use weighted average of expected NS fleet mix for 2045 design year.
5. PM includes both PM_{10} and $PM_{2.5}$ emissions
6. Hydrocarbons (HC) are synonymous with volatile organic compounds (VOC)

Definitions:

VMT - Vehicle miles traveled is the total number of miles traveled by trains on each of the rail segments.

Load Factor - the load factor is the based on the notch setting (or throttle setting) of the locomotives operating along the segments and is based on an average setting provided by Norfolk Southern's operations staff.

5 General Conformity Rule Applicability

The GCR applicability analysis was performed for the proposed action to determine whether a formal conformity analysis would be undertaken. Table 6 and Table 7 summarizes the regional locomotive emissions estimates for the Existing, No Build, and Build conditions for NO_2, VOC, CO, and $PM_{2.5}$ for intermodal low growth and high growth projections, respectively. As noted earlier, locomotives use ultra-low-sulfur diesel fuel consistent with EPA fuel standards and corresponding SO_2 emissions are expected to be very low and well below applicable *de minimis* levels.

As shown in Table 6 and Table 7 , the predicted annual net change in operational emissions is expected to decrease for all pollutants in the subarea region for the low growth and high growth projections for the2045 Build conditions as compared to the 2045 No Build conditions. This expected reduction is primarily due to more efficient utilization of locomotives (double stacking leading to fewer locomotives for the same amount of freight) under the Build scenario. Furthermore, the net change in emissions would also be below established EPA *de minimis* thresholds for NO2, $PM_{2.5}$, and CO for both growth projections and would not result in a significant air quality impact. Therefore, a general conformity determination is not required for the Build scenarios and no adverse air quality impacts would be expected to result from the Build scenario for the low growth and high growth projections.

Table 6. Pittsburgh Regional Annual Net Change in Emissions from Build Scenario Compared to EPA *de minimis* Thresholds for the Intermodal Low-Growth Future Conditions

	Emissions (TPY)[1,2]			
Scenarios	**NO_2**	**$PM_{2.5}$**	**CO**	**VOC**
2019 Existing	61.43	2.01	18.58	7.38
2045 No Build	46.18	1.14	17.89	3.41
2045 Build	27.52	0.68	10.66	2.03
Difference in No Build and Build scenarios	**-18.66**	**-0.46**	**-7.23**	**-1.38**
EPA *de minimis* thresholds	**100**	**100**	**100**	**50**
Below the *de minimis* thresholds	**Yes**	**Yes**	**Yes**	**Yes**

Notes:

1. As a conservative assumption, all PM in Table 6 is assumed to be $PM_{2.5}$ when comparing to the $PM_{2.5}$ de minimis levels.
2. For this analysis, VOC emissions are the same as the HC emissions as presented in Table 6 above.

Table 7. Pittsburgh Regional Annual Net Change in Emissions from Build Scenario Compared to EPA *de minimis* Thresholds for the Intermodal High-Growth Future Conditions

	Emissions (TPY)[1,2]			
Scenarios	**NO_2**	**$PM_{2.5}$**	**CO**	**VOC**
2019 Existing	61.43	2.01	18.58	7.38
2045 No Build	66.54	1.64	25.78	4.91
2045 Build	47.77	1.18	18.51	3.52
Difference in No Build and Build scenarios	**-18.77**	**-0.46**	**-7.27**	**-1.38**
EPA *de minimis* thresholds	**100**	**100**	**100**	**50**
Below the *de minimis* thresholds	**Yes**	**Yes**	**Yes**	**Yes**

Notes:

3. As a conservative assumption, all PM in Table 7 is assumed to be $PM_{2.5}$ when comparing to the $PM_{2.5}$ de minimis levels.
4. For this analysis, VOC emissions are the same as the HC emissions as presented in Table 7 above.

5.1 Mobile Source Air Toxics

Based on regulations now in effect, an analysis of national trends with EPA's MOVES2014 model forecasts a combined reduction of over 90 percent in the total annual emissions rate for the priority of mobile source air toxic (MSAT) from 2010 to 2050 while vehicle-miles of travel are projected to increase by over 45 percent (Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents, Federal Highway Administration, October 12, 2016). This will both reduce the background level MSAT as well as the possibility of even minor MSAT emissions from these projects. As shown in the GCR analysis above, these projects have been determined to generate minimal air quality impacts for Clean Air Act criteria pollutants and have not been linked with any special MSAT concerns. As such, the projects would not cause a significant increase in MSAT impacts over that of the No Build condition. Moreover, EPA regulations for locomotive engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades.

6 Construction Emissions

As indicated in PennDOT guidance, air quality impacts resulting from construction activities are typically not a concern when contractors utilize appropriate control measures. In Pennsylvania, contractors shall perform all construction activities / operations in accordance with 25 Pa. Code Article III (Chapters 121-145, Air Resources) to ensure adequate control measures are in place. PennDOT, Pub. 321, at 1.6. For that reason, the emissions results in this study only include operational emissions and do not include construction emissions, which would be temporary in nature.

7 Conclusions

Regional locomotive emissions were estimated for the Existing, 2045 Build and No Build conditions for the Proposed Action under low-growth and high-growth intermodal freight trains scenarios. Emissions

of NO_2, CO, $PM_{2.5}$ (i.e. PM), and VOCs (i.e. HC) were estimated and compared to the EPA *de minimis* levels for operational emissions only to determine significant air quality impacts. Construction emissions are short-term and typically not a concern and were not included as part of this analysis. With the Proposed Action under the low growth and high growth scenario, it is estimated there would be a net reduction in annual regional locomotive operational emissions, and therefore no significant impacts would result with implementation of the projects and a general conformity determination would not be required.

This analysis does not include the indirect beneficial effects of additional freight modal shifts from highway to rail that may result after these projects are completed. One freight train can carry the freight of several hundred trucks. Emissions of particulate matter and nitrogen oxides are significantly lower for railroads than for trucks. On average railroads are four times more fuel efficient than trucks. Because greenhouse gas emissions are directly related to fuel consumption, moving freight by rail instead of truck reduces greenhouse gas emissions by 75 percent[12].

[12] See https://www.aar.org/wp-content/uploads/2018/07/AAR-Rail-Intermodal.pdf.

Michael Baker
INTERNATIONAL

APPENDIX F

Noise and Vibration Analysis

Norfolk Southern Railway Company

Pittsburgh Vertical Clearance Projects

Noise and Vibration Technical Report

HMMH Report No. 310190
February 14, 2024

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Executive Summary

The Pittsburgh Vertical Clearance Projects comprise four (4) railway improvement projects on the Pittsburgh and Fort Wayne Rail Lines (together referred to as the Pittsburgh Line), owned and operated by Norfolk Southern Railway Company (Norfolk Southern). The proposed projects will address freight capacity and delay constraints through the City of Pittsburgh, Allegheny County, Pennsylvania. Norfolk Southern is a common carrier and the Pittsburgh Line forms a critical component of its route through Pittsburgh between Chicago and the New York/New Jersey commercial markets. Three (3) of the four (4) projects are overhead clearance projects [W. North Avenue Bridge (PC-1.60); Pennsylvania Avenue Bridge (PC-1.82); and Amtrak Station Canopy (PT-353.20)] that have vertical clearance obstructions along the Pittsburgh Line and prevent efficient movement of freight, especially time-sensitive intermodal freight, by rail between Chicago and New York/New Jersey, and specifically through Pennsylvania. The fourth project is the installation of a new Allegheny Commons Pedestrian Bridge (PC-1.50).

Unused capacity exists on the Pittsburgh Line and these clearance projects will allow the line to accommodate anticipated freight growth while allowing for double-stack intermodal freight to use the Pittsburgh Line in lieu of Norfolk Southern's Monongahela line (Mon Line) south of the rivers. The ability to move this double-stack traffic on the Pittsburgh Line will eliminate exposure to hazardous conditions and delay to time-sensitive freight relating to the unpredictable landslides from adjacent property that occur along the Mon Line.

Community meetings were held in June 2018 and December 2022 to obtain feedback from the community related to the scope of the projects. The community identified noise as a primary concern related to the projects. To address that concern, although noise and vibration analyses may not be needed for the environmental review of these projects, Norfolk Southern elected to conduct this noise and vibration impact assessment to evaluate the potential impacts associated with the projects. This analysis was developed in accordance with Pennsylvania Act 120 of 1970 and is consistent with the Pennsylvania Department of Transportation (PennDOT) Publication 24 "*Project Level Highway Traffic Noise Handbook*", see https://www.dot.state.pa.us/public/pubsforms/Publications/PUB%2024.pdf. Although Publication 24 relates to highway projects, the principles of that guidance have been applied to the analysis of these projects. The United States Environmental Protection Agency (EPA) regulations at 40 C.F.R. Part 201 establish noise emission standards for transportation equipment for interstate rail carriers, and Federal Railroad Administration (FRA) regulations at 49 C.F.R. Parts 210, 222, and 227 establish noise standards for rail equipment and operations. These standards apply to Norfolk Southern's rail operations as a general matter. For environmental analysis of noise for the purpose of Act 120 analysis, PennDOT incorporates Federal Highway Administration (FWHA) processes applicable to highway projects. FHWA processes do not address freight rail. As explained below, for this analysis HMMH has applied Surface Transportation Board (STB) regulations and Federal Transit Administration (FTA) noise and vibration guidance applicable to transit rail projects and/or high-speed rail projects consistent with previous FRA analyses.

Existing noise and vibration levels were measured along the study corridor to establish existing conditions and for use in determining potential impacts applying STB noise assessment guidelines and vibration thresholds per FTA/FRA guidance, specifically the FTA's "Transit Noise and Vibration Impact Assessment Manual" (FTA 2018). Existing sound levels along the corridor are typical of an urban

environment with sounds from urban sources, roadways, industrial sources, the existing Norfolk Southern line, and natural sounds.

Existing sound levels are variable depending on distance from sound sources, such as the rail line, but on average are approximately 65 day-night (L_{dn}) [1] A-weighted decibels (dBA). Under the "Build" (with projects) or "No Build" (without projects) future conditions sound levels would increase by an average of approximately 1 decibel (dB) throughout the analysis area, with slightly higher increases occurring under the No Build future conditions due to higher train traffic relative to the future Build conditions. The STB assessment guidelines are being used as a framework only and not because the projects are subject to review under the STB regulations and guidance. In accordance with 49 C.F.R. § 1105.7, STB impact thresholds are based on changes in noise exposure relative to the existing conditions, with an impact occurring if either of these two conditions occur:

1. STB regulations require identifying sensitive receptors where noise levels are increased by 3 decibels (dB) or more as a result of the Project;

2. Or, where sound levels are increased to 65 dBA L_{dn} or greater as a result of the Project.

Noise and vibration impacts were predicted for the train traffic that would result as an indirect effect of the clearance projects in the future under both the Build and No Build under low-growth and high-growth scenarios. The low-growth scenario is based on the 2020 State of Pennsylvania Rail Plan projections for freight trains and the high-growth scenario is based on the 2015 State of Pennsylvania Rail Plan projections for freight traffic. Noise levels would be slightly higher along the Pittsburgh Line under either growth scenario for the No Build scenario than the Build scenario, due to the greater number of single-stack trains that would be required to accommodate future rail traffic demand, as compared to the fewer double-stack trains capable of carrying the same amount of rail freight. Specifically, acoustic modeling identified that 58 less noise sensitive land uses would be impacted under the future Build conditions than under the future No Build conditions under both the low-growth and high-growth scenarios. In addition, all impacted land uses under the future Build conditions would also be impacted under the future No Build conditions.

Vibration from train trips is event based and for this reason is not additive like that of noise. Locomotives are the heaviest component of a train consist (the locomotives and cars in a train) and as such the most intense source of vibration from train pass-by events. The clearance projects will have no direct effect on vibration. Because the vibration source is not changing in intensity no potential indirect effects are predicted throughout the corridor. Additionally, small reductions in the vertical alignment of the Norfolk Southern line under the Build scenario provide negligible reductions in vibration, which would not be appreciably different than the No Build scenario. For these reasons no vibration impacts are predicted.

[1] The Ldn is the average equivalent sound level over a 24 hour period, with a penalty added for noise during the nighttime hours of 22:00 to 07:00. during the nighttime period 10 dB is added.

Contents

Figures

Tables

1 Introduction

The Pittsburgh Vertical Clearance Projects, also referred to as the "Build" conditions or scenario, are comprised of four (4) railway improvement projects on the Pittsburgh and Fort Wayne Rail Lines (together referred to as the Pittsburgh Line), owned and operated by Norfolk Southern Railway Company (Norfolk Southern). The proposed projects address freight capacity and delay constraints through the City of Pittsburgh, Allegheny County, Pennsylvania. Norfolk Southern is a common carrier and the Pittsburgh Line forms a critical component of its route through Pittsburgh between Chicago and the New York/New Jersey commercial markets. Three (3) of the four (4) projects are overhead clearance projects [W. North Avenue Bridge (PC-1.60); Pennsylvania Avenue Bridge (PC-1.82); and Amtrak Station Canopy (PT-353.20)] that have vertical clearance obstructions along the Pittsburgh Line and prevent efficient movement of freight, especially time-sensitive intermodal freight, by rail between Chicago and New York/New Jersey, and specifically through Pennsylvania. Unused capacity exists on the Pittsburgh Line and these clearance projects will allow the line to accommodate anticipated freight growth while allowing for double-stack intermodal freight to use the Pittsburgh Line in lieu of Norfolk Southern's Monongahela line (Mon Line) south of the rivers. The ability to move this double-stack traffic on the Pittsburgh Line will eliminate exposure to hazardous conditions and delay to time-sensitive freight relating to the unpredictable landslides from adjacent property that occur along the Mon Line. The fourth project is the installation of a new Allegheny Commons Pedestrian Bridge (PC-1.50).

The bridge improvements will not have a direct effect on noise and vibration, but due to community feedback and identification of noise and vibration as an issue of interest and potential indirect effect, Norfolk Southern engaged HMMH to conduct and elected to complete a noise and vibration impact assessment for the length of the rail corridor that encompasses all four of the projects, which is approximately 13 miles in length. This document presents the measured noise and vibration levels for the existing conditions and the predicted noise and vibration impact conditions associated with the projects through this study corridor.

2 Noise and Vibration Basics

2.1 Noise Fundamentals and Descriptors

Noise is typically defined as unwanted or undesirable sound, whereas sound is characterized by small air pressure fluctuations above and below the atmospheric pressure. The basic parameters of environmental noise that affect human subjective response are (1) intensity or level, (2) frequency content and (3) variation with time. The first parameter is determined by how greatly the sound pressure fluctuates above and below the atmospheric pressure and is expressed on a compressed scale in units of decibels. By using this scale, the range of normally encountered sound can be expressed by values between 0 and 120 decibels. On a relative basis, a 3-decibel change in sound level generally represents a barely noticeable change outside the laboratory, whereas a 10-decibel change in sound level would typically be perceived as a doubling (or halving) in the loudness of a sound. A 5-decibel change is readily noticeable by people with average hearing.

The frequency content of noise is related to the tone or pitch of the sound and is expressed based on the rate of the air pressure fluctuation in terms of cycles per second (called Hertz and abbreviated as Hz). The human ear can detect a wide range of frequencies from about 20 Hz to 17,000 Hz. However, because the sensitivity of human hearing varies with frequency, the A-weighting system is commonly used when measuring environmental noise to provide a single number descriptor that correlates with human subjective response. Sound levels measured using this weighting system are called "A-weighted" sound levels and are expressed in decibel notation as "dBA." The A-weighted sound level is widely accepted by acousticians as a proper unit for describing environmental noise. To indicate what various noise levels represent, Figure 1 shows typical A-weighted sound levels for both rail and non-rail sources. As indicated on this figure, most commonly encountered outdoor noise sources generate sound levels within the range of 60 dBA to 90 dBA at a distance of 50 feet.

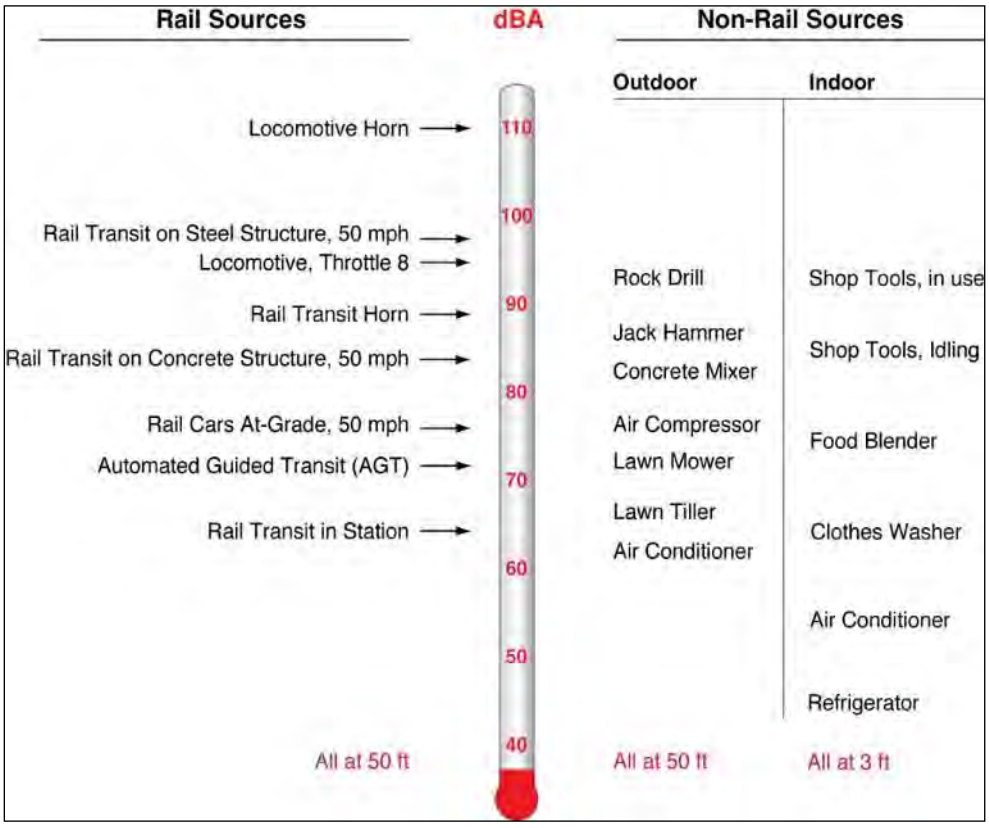


Figure 1. Weighted Sound Levels

Because environmental noise fluctuates from moment to moment, it is common practice to condense all of this information into a single number, called the "equivalent" sound level (L_{eq}). L_{eq} can be thought of as the steady sound level that represents the same sound energy as the varying sound levels over a specified time period (typically 1 hour or 24 hours). Often, the L_{eq} values over a 24-hour period are used to calculate cumulative noise exposure in terms of the Day-Night Sound Level (L_{dn}). L_{dn} is the A-weighed L_{eq} over a 24-hour period with an adjustment factor for noise during the nighttime hours (between 10:00 PM and 7:00 AM) to account for the greater sensitivity of most people to noise during the night. The effect of nighttime adjustment is that one nighttime event, such as a train passing by between 10:00 P.M. and 7:00 A.M., is equivalent to 10 similar events during the daytime. Figure 2 provides examples of typical noise environments and criteria in terms of L_{dn}. While the extremes of L_{dn} are shown to range

from 35 dBA in a wilderness environment to 85 dBA in noisy urban environments, L_{dn} is generally found to range between 55 dBA and 75 dBA in most communities.

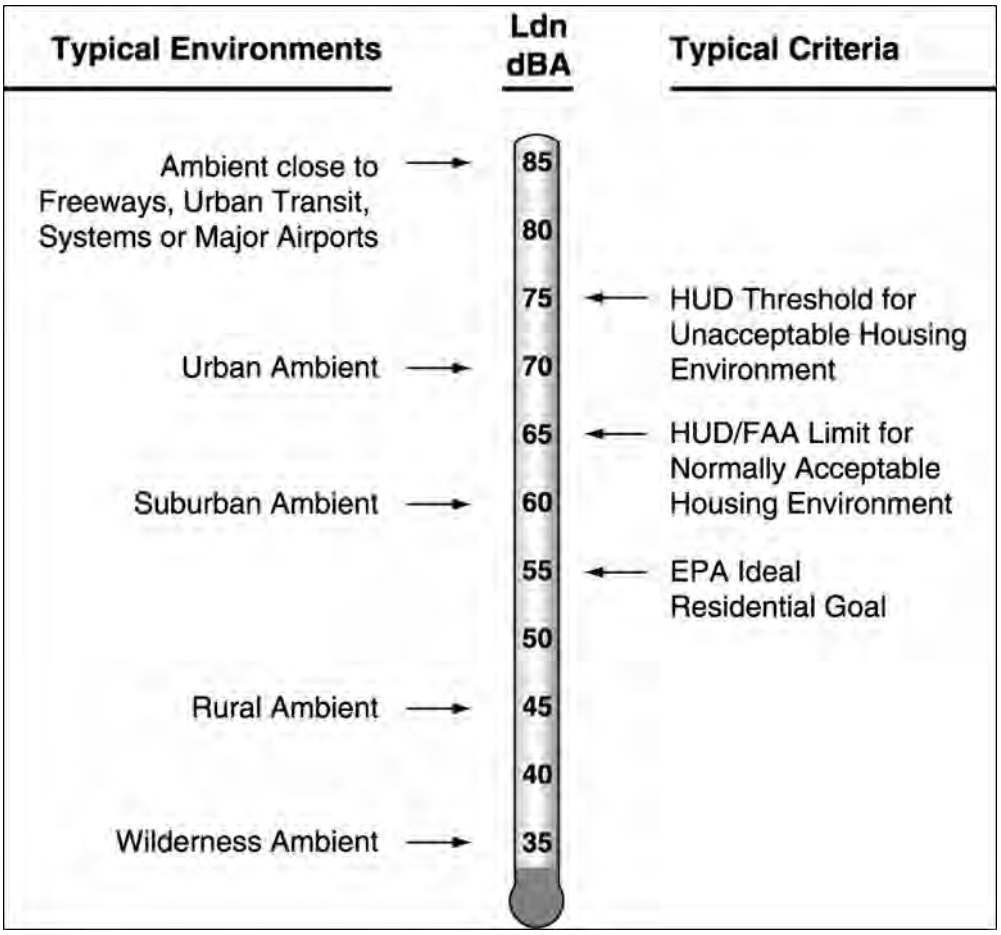


Figure 2. Examples of Typical Outdoor Noise Exposure

2.2 Ground-Borne Vibration Fundamentals and Descriptors

Ground-borne vibration is the oscillatory motion of the ground about some equilibrium position that can be described in terms of displacement, velocity or acceleration. Because sensitivity to vibration typically corresponds to the amplitude of vibration velocity within the low-frequency range of most concern for environmental vibration (roughly 5-100 Hz), velocity is the preferred measure for evaluating ground-borne vibration from transit projects.

The most common measure used to quantify vibration amplitude is the peak particle velocity (PPV), defined as the maximum instantaneous peak of the vibratory motion. PPV is typically used in monitoring blasting and other types of construction-generated vibration, since it is related to the stresses experienced by building components. Although PPV is appropriate for evaluating building damage, it is less suitable for evaluating human response, which is better related to the average vibration amplitude. Thus, ground-borne vibration from transit systems is usually characterized in terms of the "smoothed" root mean square (rms) vibration velocity level, in decibels (VdB), with a reference

quantity of one micro-inch per second. VdB is used in place of dB to avoid confusing vibration decibels with sound decibels.

Figure 3 illustrates typical ground-borne vibration levels for common sources as well as criteria for human and structural response to ground-borne vibration. As shown, the range of interest is from approximately 50 to 100 VdB, from imperceptible background vibration to the threshold of damage. Although the approximate threshold of human perception to vibration is 65 VdB, annoyance is usually not significant unless the vibration exceeds 70 VdB.

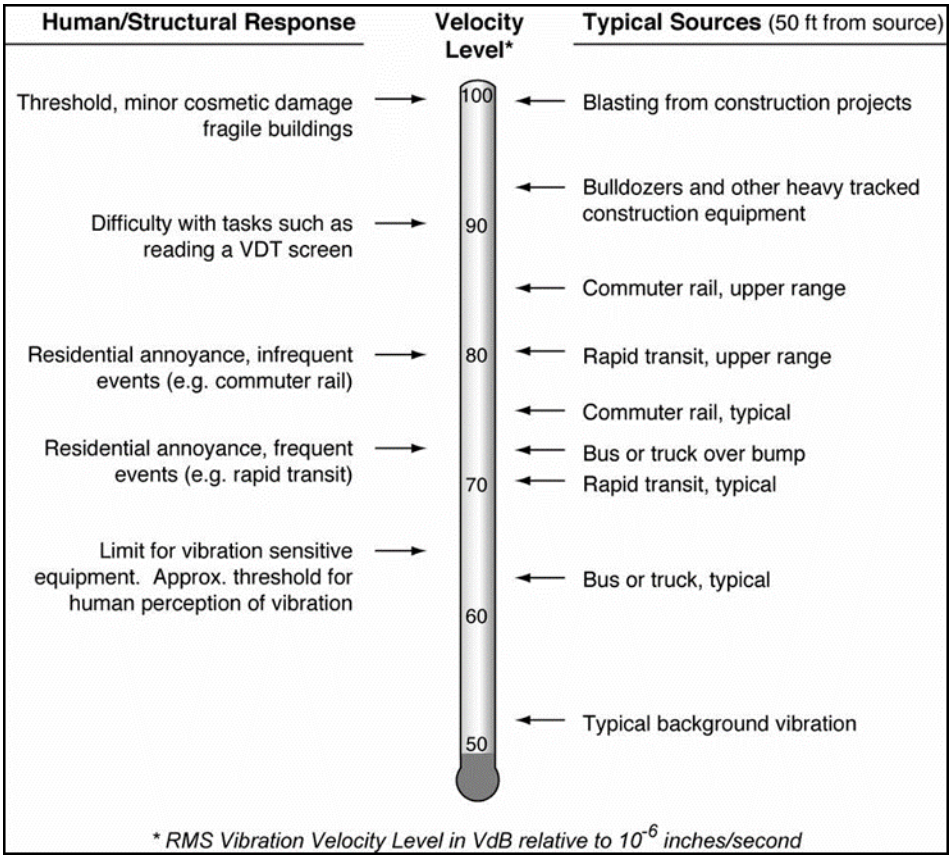


Figure 3. Typical Ground Borne Vibration Levels and Criteria

3 Noise and Vibration Impact Criteria

The following sections are included for informational purposes, to provide context for the noise and vibration levels discussed in this document. The noise assessments for these projects are based on U.S. Surface Transportation Board (STB) provisions for Procedures for Implementation of Environmental Laws in 49 C.F.R. 1105.7 and the noise and vibration impact criteria defined in the U.S. Federal Transit Administration (FTA) guidance manual, *Transit Noise and Vibration Impact Assessment* (FTA 2018) ("FTA Manual"). The Federal Railroad Administration (FRA) has applied methodology used in the FTA Manual for use on freight rail projects for environmental analysis. The FTA Manual sets forth methodologies for analyzing noise and vibration from commuter and intercity rail operations and as such are the standard

methodology for assessing potential impacts of new rail bridges and transit systems. Consequently, these impact criteria were utilized in the project's noise and vibration analysis.

3.1 Rail Noise Criteria

STB noise assessment guidelines are provided in 49 C.F.R. 1105.7(e) and are based on changes in noise exposure as compared to conditions that would exist without a proposed project. STB regulations involve noise assessment guidelines in cases where STB authorization is required for certain changes in freight rail operations. The STB regulations serve as a framework for analysis because they relate specifically to impacts from changes in rail operations; the Pittsburgh Vertical Clearance Projects are not subject to STB review and do not require any federal authorizations.

The STB criteria have two conditions to determine potential impacts:

1. STB regulations require identifying sensitive receptors where noise levels are increased by 3 decibels (dB) or more as a result of the Project;

2. Or, where sound levels are increased to 65 dBA L_{dn} or greater as a result of the Project.

49 C.F.R. § 1105.7.

Where a noise increase is below 3 dB, analysis is not specified by STB regulations due to the low potential for impact. However, both components together resulting in a 3 dB increase or greater and an overall 65 dBA L_{dn} or greater level must be met in order to consider an increase to be a potentially adverse noise impact (STB 1998). Both of these components (3 dB increase or 65 dBA L_{dn}) are employed to determine whether a potential noise impact should be included in environmental reports.

The FTA Manual provides procedures for predicting and assessing noise and vibration impacts of proposed transit projects for different stages of project development and different levels of analysis. As noted above, freight rail noise regulations are met by the Norfolk Southern fleet and are found at EPA regulations at 40 C.F.R. Part 201, and FRA regulations at 49 C.F.R. Parts 210, 222, and 227. The FTA Manual is intended for use in transit projects funded by FTA which include buses, trolleys, commuter and light rail, but not freight rail. STB regulations address procedures for environmental analysis of potential freight rail noise. (See 49 C.F.R. § 1105.7.) Similar to the STB regulations, the FTA Manual is not applicable here because the FTA has no jurisdiction over the projects, but the guidelines provide a framework for noise and vibration analyses for these projects.

Generally, the FTA Manual provides methods for determining potential effects, conducting screening and noise and vibration analyses, and determining noise and vibration impacts. A first step in determining potential effect includes an evaluation of land use categories. The FTA Manual provides procedures for predicting and assessing noise and vibration impacts of proposed transit projects for different stages of project development and different levels of analysis (FTA 2018).

FTA provides a screening level noise analysis that provides distances from freight rail lines where impacts may occur. If no noise-sensitive land uses or receivers are present in the area, then no further noise assessment is needed. If noise sensitive land uses are identified within the screening distance, FTA projects can select to conduct either a "General Assessment" or a "Detailed Assessment" of noise impacts. To identify noise impacts the FTA Manual provides a sliding scale of potential impact based on existing noise exposure that are measured and/or estimated at each of the noise sensitive land uses. Unlike the STB procedures, the FTA analysis is variable depending on existing noise exposure. Predicted

sound levels that are modeled to potentially result from a given project are compared to existing noise levels at sensitive land uses to identify the potential net increase in noise that would result from the project and without the project.

For noise analyses from freight railroads for the type of modeling assessment such as in the case of the projects, the most applicable regulations are the STB freight rail noise assessment procedures. This analysis has applied the STB regulations while adapting FTA's noise sensitive land use categories as defined in the FTA Manual which are provided Table 1. For example, the STB regulations require analysis at the following noise sensitive land uses which correspond to either FTA Land Use Category 2 or 3 as follows:

- Hospitals, residences, retirement communities, and nursing homes (FTA 2)
- Schools, parks (passive), and libraries (FTA 3)

FTA Land Use Category 1 includes land uses where quiet is an essential element of their intended purpose. These land uses are somewhat uncommon and would include things like the Tomb of the Unknown Soldier; whereas parks, such as the Allegheny Commons, would fall into FTA Category 3. There are no FTA Land Use Category 1 properties in the analysis area for this study.

Table 1. FTA Land Use Categories

Land Use Category	Description of Land Use Category
1	Tracts of land where quiet is an essential element in of its their intended purpose. Example land uses include preserved land for serenity and quiet, outdoor amphitheaters and concert pavilions, and as well as National Historic Landmarks with considerable outdoor use. Recording studios and concert halls are also included in this category.
2	This category is applicable to all residential land use and buildings where people normally sleep, such as hotels and hospitals.
3	This category is applicable to Institutional land uses with primarily daytime and evening use. Example land uses include schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities are included in this category.

Source: Transit Noise and Vibration Impact Assessment Manual, FTA, September 2018, Table 4-3 at p. 23

In addition to the STB thresholds for railroad projects, locomotive noise is governed by U.S. Environmental Protection Agency regulations Part 201, Subpart B Interstate Rail Carrier Operations Standards. EPA's criteria establish standards for interstate rail carriers promulgated under Federal law, 42 U.S.C. § 7641, Noise Abatement, as follows:

- Locomotives produce A-weighted sound levels at 96 dB or lower when moving at any time or under any condition of grade, load, acceleration, or deceleration, when measured in accordance with the criteria specified in Subpart C of this regulation with fast meter response at 30 meters (100 feet) from the centerline of any section of track having less than a two (2) degree curve (or a radius of curvature greater than 873 meters (2865 feet)).

- Locomotives or locomotive combinations produce A-weighted sound levels at 90 dB or lower when moving at any time or under any condition of grade, load, acceleration, or deceleration, when measured in accordance with the criteria specified in Subpart C of this part with fast meter

response at 30 meters (100 feet) from the centerline of any section of track having less than a two (2) degree curve (or a radius of curvature greater than 873 meters (2,865 feet)).

• Switcher locomotives produce A-weighted sound levels at 90 dB or below when moving at any time or under any condition of grade, load, acceleration or deceleration, and when measured in accordance with the criteria in Subpart C of this part with fast meter response at 30 meters (100 feet) from the centerline of any section of track having less than a two (2) degree curve (or a radius of curvature greater than 873 meters (2,865 feet)).

These Federal requirements are not changed or altered by an individual project assessment such as this noise assessment which is developed to assess potential for impacts of a project subject to review under Pennsylvania Act 120 of 1970.

3.2 Rail Ground-Borne Vibration Criteria

The FTA ground-borne vibration impact criteria are based on land use and operational frequency, as shown in Table 2 and are given in terms of the maximum RMS vibration level for an event. The ground-borne vibration criteria are based on levels that may cause human annoyance. The FTA criteria were developed for transit rail use, not freight rail, and are therefore applied here as a guideline as opposed to the federally required criteria.

FTA guidance provides that when the project will cause vibration more than 5 VdB above the existing vibration, "the existing source can be ignored" and the standard vibration criteria are appropriate. When the project will cause vibration less than 5 VdB above the existing vibration level, FTA guidance provides assessment methodology accounting for existing vibration (FTA Manual, at 127). For a project or project segment with "frequent events" (defined as more than 70 events per day), the FTA Manual states that for rail in heavily used areas (greater than 12 trains/day), an approximate doubling of the events is required for determination that there is a significant increase. Otherwise, the thresholds in Table 2 should be applied to determine potential for impact. Again, these FTA criteria apply to transit, not freight rail operations, but are being applied in this modeling analysis as a conservative approach.

Table 2. FTA Ground-Borne Vibration and Ground-Borne Noise Impact Criteria for General Vibration Assessment

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch /sec)			Ground-Borne Noise Impact Levels (dB re 20 micro Pascals)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibrations would interfere with interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]	N/A[4]	N/A[4]	N/A[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB	35 dBA	38 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB	40 dBA	43 dBA	48 dBA

(1) "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most freight rail projects fall into this category.

(2) "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.

(3) "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail branch lines.

(4) This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

(5) Vibration-sensitive equipment is generally not sensitive to ground-borne noise.

Source: FTA Manual, September 2018, Table 6-3, p. 126

Unlike noise analysis, the FTA vibration assessment is per event, and there is not a methodology to average daily events such as with the noise L_{dn}. Thus, the FTA analytical approach is intended to assess vibration for specific events.

4 Existing Conditions

4.1 Noise Environment

The existing noise environment along the study corridor varies depending on proximity to, and occurrence of, sound sources. The dominant sound sources are rail traffic and roadway traffic, with local community noise and air traffic as secondary sources. Land use along the corridor principally falls within Category 2, which includes residential land uses, hotels, hospitals and other land uses with nighttime sensitivity. There are scattered Category 3 land uses, which are primarily churches and passive parks. The Martin Luther King Jr. East Busway is a transit use adjacent to much of the corridor under analysis and provides public bus transportation services for the City. The projects are limited to the bridges being improved to address vertical obstructions and the installation of the new Allegheny Commons Pedestrian Bridge. The bridge improvements do not have direct effects on noise with the exception of temporary construction related potential effects. This analysis is being performed to assess the potential for indirect effects relating to changes in rail traffic and consequent potential vibration effects of those changes. Due to the greater capacity of double-stack intermodal trains and associated increases in freight rail efficiency, the analysis shows a long-term decrease in train trips and associated decrease in noise. The analysis included identification of changes in noise in accordance with STB assessment guidelines and potential sensitive receptors.

A baseline sound level survey was conducted throughout the study corridor to establish the existing sound levels and to determine applicable thresholds (see Section 3) for the projects. HMMH established plans for pre-project noise monitoring to establish baseline noise levels at sensitive locations. Sound was measured at these locations, which are depicted in Figures 6-41, Noise Assessment Maps. The sound measurement locations were selected to be representative of the noise sensitive areas of Category 2 and 3 land uses along the study corridor (and not necessarily near one of the project locations), and at locations most likely to be exposed to higher levels of train noise such as those near the railroad. At each site, the measurement microphone was positioned to characterize the exposure of the site to the dominant noise sources in the area. Brüel & Kjær noise monitors (models 2245, 2250 and 2270) were used for gathering noise data. The noise measurement locations are shown in Figure 4.

The results of the existing ambient noise measurements are summarized in Table 3 below. Narrative descriptions are provided in the paragraphs that follow. Appendix A and B provide additional detail on the monitoring locations and results.

Figure 4. Overview of Project Area and Measurement Locations

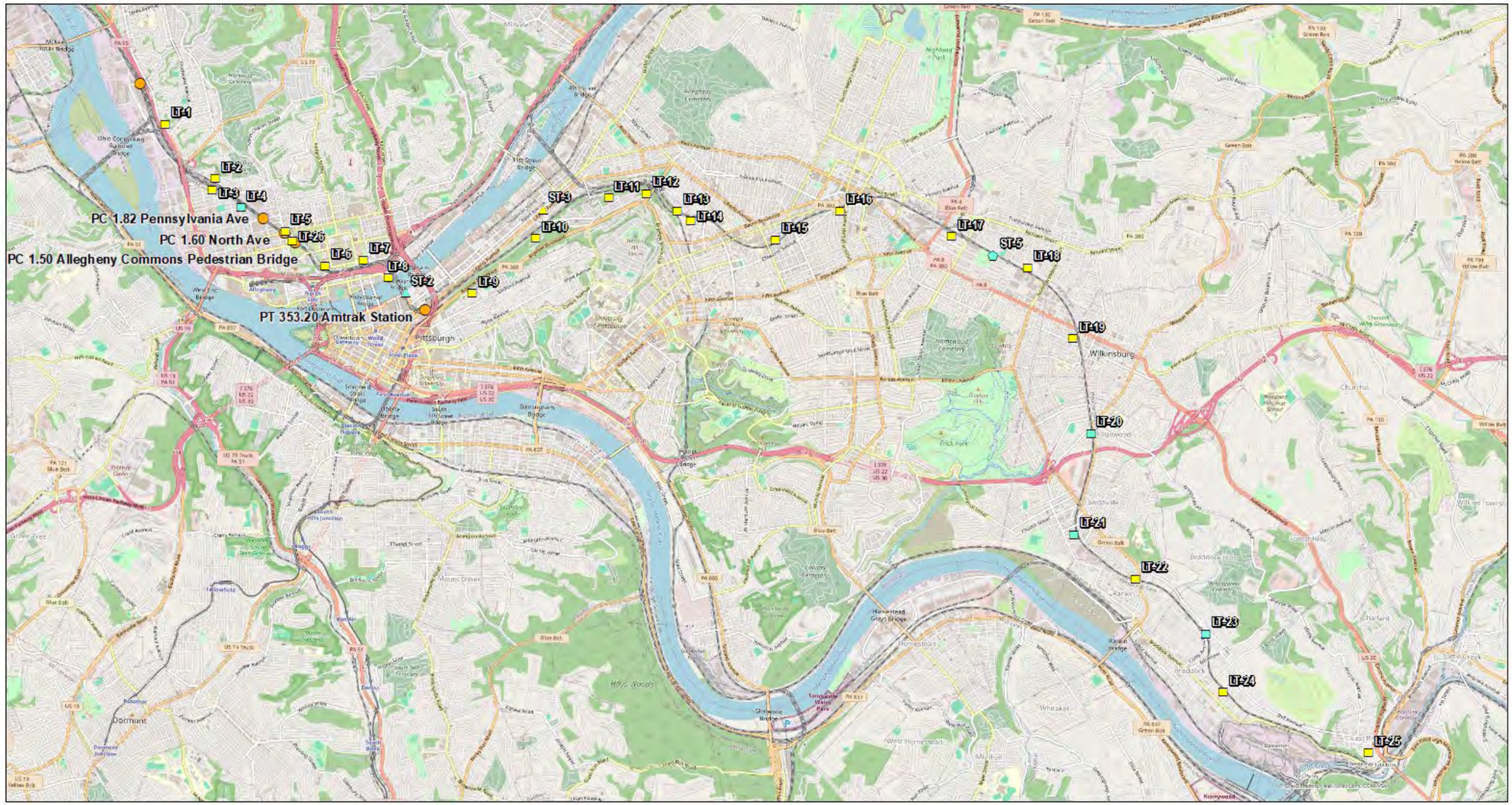


Table 3. Summary of Existing Ambient Noise Measurement Results

Site No.	Measurement Location	Start of Measurement		Meas. Duration (hrs)	Existing Sound Exposure (dBA)						
		Date	Time		L_{dn}	Peak Hour L_{eq}	$L_{eq\ (day)}$	$L_{eq\ (night)}$	L_{10}	L_{50}	L_{90}
LT-1	2462 California Avenue	12/6/2018	10:11	24	70.6	68.6	62.1	64.3	68.3	64.1	54.4
LT-2	1234 Sunday Street	12/6/2018	10:27	24	65.9	63.5	56.5	58.7	65.0	58.2	47.9
LT-3*	1907 Fulton Street	12/11/2018	12:34	24	62.9	72.4	58.5	58.5	57.8	55.0	52.8
LT-4	1016 N. Franklin Street	12/6/2018	9:35	3	64.3	62.1	54.4	56.6	60.6	52.4	48.1
LT-5	710 W. North Avenue	12/12/2018	10:32	24	71.2	71.0	62.4	64.6	68.5	62.4	54.7
LT-6	410 W. Commons	12/12/2018	11:03	24	68.9	68.2	60.5	62.7	65.0	57.9	53.7
LT-7*	301 Cedar Avenue	12/12/2018	13.38	3	63.5	62.8	59.2	59.4	59.3	55.9	54.0
LT-8	100 Anderson Street	12/12/2018	10:00	24	67.1	65.0	58.1	60.3	64.9	58.2	53.0
LT-9	1846 Arcena Street	12/11/2018	11:00	24	59.5	58.4	48.9	51.1	57.1	53.6	47.8
LT-10	2630 Brereton Street	12/11/2018	9:42	24	59.4	64.7	48.7	50.9	55.3	51.6	46.2
LT-11	3415 Flavian Street	12/6/2018	8:38	24	61.2	60.0	51.6	53.8	56.5	47.8	42.2
LT-12	3811 Fleetwood Street	12/3/2018	11:26	24	59.3	59.9	49.1	51.3	59.1	49.9	43.1
LT-13	4732 Juniper Street	12/6/2018	9:01	24	65.1	66.4	56.2	58.4	58.9	49.7	42.4
LT-14	15 Hemingway Street	12/11/2018	11:00	24	66.3	69.9	55.9	58.1	61.3	46.8	38.8
LT-15	5445 Potter Street	12/11/2018	9:08	24	58.8	57.5	48.9	51.1	51.7	46.4	44.0
LT-16	205 Lehigh Avenue	12/11/2018	9:00	24	59.0	59.3	49.5	51.7	53.4	50.1	47.6
LT-17	6736 Simonton Street	12/3/2018	11:56	24	62.1	60.8	52.7	55.0	56.5	48.2	40.8
LT-18	7357 Finance Street	12/3/2018	12:21	24	61.4	61.1	52.2	54.4	60.8	45.9	35.2
LT-19	444 Ross Avenue	12/4/2018	14:03	24	60.8	65.3	51.3	53.5	52.7	43.4	36.5
LT-20	1 Pennwood Avenue	12/3/2018	12:52	24	72.1	71.4	61.9	64.1	60.9	51.8	40.1
LT-21	Park Avenue	12/4/2018	14:37	24	67.3	70.7	58.4	60.6	54.4	44.2	33.8
LT-22	McKim Street	12/3/2018	10:26	24	74.9	76.2	64.0	66.2	60.8	53.7	41.6
LT-23	504 Hawkins Avenue	12/4/2018	15:34	24	71.5	75.7	60.4	62.6	51.4	42.6	35.2
LT-24	431 Verona Street	12/4/2018	15:52	24	68.2	68.5	59.4	61.6	56.1	52.7	49.3
LT-25	300 Main Street	12/4/2018	16:33	24	64.7	67.0	53.6	55.9	60.4	52.9	45.0
LT-26	Allegheny Commons Park West (Iron Deer Playground)	4/13/2022	21:53	24	74.2	72.3	64.8	68.1	59.2	50.8	47.2
ST-2	1000 Ft. Duquesne Blvd.	12/12/2018	14:55	0.5	N/A	70.6	N/A	N/A	74.8	65.9	59.8
ST-3	2901 Liberty Avenue	12/12/2018	15:44	0.5	N/A	60.5	N/A	N/A	63.2	59.8	54.7

Note: *Estimated using 1-hour samples during peak hour, midday, and nighttime.
Source: Harris Miller Miller & Hanson Inc., 2018

Site LT-1: 2462 California Avenue. The L_{dn} measured over a 24-hour period in the front yard of this single-family residence was 70.6 dBA. Marine traffic on the Ohio River, local roadway traffic on California Avenue and Highway 65, and rail traffic on the Norfolk Southern rail line contribute to the noise environment at this location. The peak hour L_{eq} sound level at this location was 68.6 dBA.

Site LT-2: 1234 Sunday Street. The L_{dn} measured over a 24-hour period in the side yard of this single-family residence was 65.9 dBA. Local roadway traffic on California Avenue and rail traffic on the Norfolk

Southern rail line contribute to the noise environment at this location. The peak hour L_{eq} sound level at this location was 63.5 dBA.

Site LT-3: 1907 Fulton Street. The L_{dn} estimated for a period of 24 hours, using 1-hour samples on the public rights of way (sidewalk), was 62.9 dBA. Local roadway traffic on Fulton and Adams Streets and rail traffic on the Norfolk Southern line contribute to the noise environment at this location. The peak hour L_{eq} at this location was 72.4 dBA.

Site LT-4: 1016 North Franklin Street. The L_{dn} measured over a 24-hour period in the side yard of this single-family residence was 64.3 dBA. Local roadway traffic on North Franklin Street and Allegheny Avenue and rail traffic on the Norfolk Southern line contribute to the noise environment at this location. The peak hour L_{eq} at this location was 62.1 dBA.

Site LT-5: 710 W. North Avenue. The L_{dn} measured over a 24-hour period from a southwest-facing balcony on the 8th floor of this apartment building was 71.2 dBA. Local roadway traffic on W. North Avenue and Brighton Road and rail traffic on the Norfolk Southern line contribute to the noise environment at this location. The peak hour L_{eq} at this location was 71.0 dBA.

Site LT-6: 401 West Commons. The L_{dn} measured over a 24-hour period in the front yard area of this retirement community was 68.9 dBA. The Norfolk Southern line and local roadway traffic on South Commons and Interstate 279 contribute to the noise environment at this location. The peak hour L_{eq} at this location was 68.2 dBA.

Site LT-7: 301 Cedar Avenue. The L_{dn} 63.5 dBA at this site was estimated using 1-hour samples from the sidewalk adjacent to an unoccupied public swimming pool complex. Local roadway traffic on Cedar and Stockton Avenues, as well as Canal Street, Anderson Street and East Commons contribute to the noise environment at this location, in addition to rail traffic on the Norfolk Southern line. The peak hour L_{eq} at this location was 62.8 dBA.

Site LT-8: 100 Anderson Street. The L_{dn} measured over a 24-hour period on the property of this riverfront apartment complex was 67.1 dBA. Freight trains on the Norfolk Southern rail line and local roadway traffic on River Avenue and Interstate 279 contribute to the noise environment at this location. Marine traffic on the Ohio River also contributed to the noise level. The peak hour L_{eq} at this location was 65.0 dBA.

Site LT-9: 1846 Arcena Street. The L_{dn} measured over a 24-hour period in the front yard of this single-family residence was 59.5 dBA. Rail traffic on the Norfolk Southern line and roadway traffic on Bigelow Boulevard and the East Busway contribute to the noise environment at this location. The peak hour L_{eq} at this location was 58.4 dBA.

Site LT-10: 2630 Brereton Street. The L_{dn} measured over a 24-hour period in the side yard of this single-family residence was 59.4 dBA. Rail traffic on the Norfolk Southern line and local roadway traffic on Brereton Street and the East Busway contribute to the noise environment at this location. The peak hour L_{eq} at this location was 64.7 dBA.

Site LT-11: 3415 Flavian Street. The L_{dn} measured over a 24-hour period in the side yard of this single-family residence was 61.2 dBA. Rail traffic on the Norfolk Southern line, bus transit on the East Busway and roadway traffic on local roads contribute to the noise environment at this location. The peak hour L_{eq} at this location was 60.0 dBA.

Site LT-12: 3811 Melwood Avenue. The L_{dn} measured over a 24-hour period in this undeveloped tax lot adjacent to single family residences was 59.3 dBA. Rail traffic on the Norfolk Southern line and local roadway traffic on Melwood Avenue and the Bloomfield Bridge contribute to the noise environment at this location. The peak hour L_{eq} at this location was 59.9 dBA.

Site LT-13: 4732 Juniper Street. The L_{dn} measured over a 24-hour period in the back yard of this single-family residence was 65.1 dBA. Rail traffic on the Norfolk Southern line and local roadway traffic on Juniper Street and the East Busway contribute to the noise environment at this location. The peak hour L_{eq} at this location was 66.4 dBA.

Site LT-14: 15 Hemingway Street. The L_{dn} measured over a 24-hour period in the rear yard of this multi-family townhome was 66.3 dBA. Rail traffic on the Norfolk Southern line and local roadway traffic on the East Busway contribute to the noise environment at this location. The peak hour L_{eq} at this location was 69.9 dBA.

Site LT-15: 5445 Potter Street. The L_{dn} measured over a 24-hour period in the back yard, behind the row of buildings, at this multi-family residence was 58.8 dBA. Rail traffic on the Norfolk Southern line and roadway traffic on the East Busway and Porter Street contribute to the noise environment at this location. The peak hour L_{eq} at this location was 57.5 dBA.

Site LT-16: 205 Lehigh Avenue. The L_{dn} measured over a 24-hour period in the back yard, behind the first row of residential structures, of this multi-family residence was 59.0 dBA. Rail traffic on the Norfolk Southern line and roadway traffic on the East Busway, Lehigh Way, Greenbriar Way, and Ellsworth Avenue contribute to the noise environment at this location. The peak hour L_{eq} at this location was 59.3 dBA.

Site LT-17: 6736 Simonton Street. The L_{dn} measured over a 24-hour period in this vacant, residentially zoned lot was 62.1 dBA. Rail traffic on the Norfolk Southern line and local roadway traffic on Simonton Street and North Linden Avenue contribute to the noise environment at this location. The peak hour L_{eq} at this location was 60.8 dBA.

Site LT-18: 7357 Finance Street. The L_{dn} measured over a 24-hour period in the front yard of this single-family residence was 61.4 dBA. Rail traffic on the Norfolk Southern line and roadway traffic on Finance Street and the East Busway contribute to the noise environment at this location. The peak hour L_{eq} at this location was 61.1 dBA.

Site LT-19: 444 Ross Avenue. The L_{dn} measured over a 24-hour period in the back yard of this single-family residence was 60.8 dBA. Rail traffic on the Norfolk Southern line and roadway traffic on Ross and Pennwood Avenues contribute to the noise environment at this location. The peak hour L_{eq} at this location was 65.3 dBA.

Site LT-20: 1 Pennwood Avenue. The L_{dn} measured over a 24-hour period in the rear outdoor storage area of the C.C. Mellor Memorial Library was 72.1 dBA. Rail traffic on the Norfolk Southern line in addition to local roadway traffic on Pennwood Avenue, Edgewood Avenue and the East Busway contribute to the noise environment at this location. The peak hour L_{eq} at this location was 71.4 dBA.

Site LT-21: 7499 Park Avenue. The L_{dn} measured over a 24-hour period in this public-use park area was 67.3 dBA. Rail traffic on the Norfolk Southern line and local roadway traffic on Park Avenue, Palmer Street and the East Busway contribute to the noise environment at this location. The peak hour L_{eq} at this location was 70.7 dBA.

Site LT-22: 2501 McKim Street. The L_{dn} measured over a 24-hour period in this road-facing wooded area was 74.9 dBA. Rail traffic on the Norfolk Southern line and bus transit on the East Busway contribute to the noise environment at this location. The peak hour L_{eq} at this location was 76.2 dBA.

Site LT-23: 504 Hawkins Avenue. The L_{dn} measured over a 24-hour period in the back yard of this single-family residence was 71.5 dBA. Rail traffic on the Norfolk Southern line and local roadway traffic on Hawkins Avenue contribute to the noise environment at this location. The peak hour L_{eq} at this location was 75.7 dBA.

Site LT-24: 431 Verona Street. The L_{dn} measured over a 24-hour period in the back yard of this single-family residence was 68.2 dBA. Rail traffic on the Norfolk Southern line and local roadway traffic on Ash Street contribute to the noise environment at this location. The peak L_{eq} at this location was 68.5 dBA.

Site LT-25: 300 Main Street. The L_{dn} measured over a 24-hour period in this wooded area abutting a public park was 64.7 dBA. Rail traffic on the Norfolk Southern line, which includes the use of locomotive warning horns at a nearby public grade crossing, and local roadway traffic on Bluff Street contribute to the noise environment at this location. The peak hour L_{eq} at this location was 67.0 dBA.

Site LT-26: Iron Deer Playground (a.k.a., Deer Pit Playground) at Allegheny Commons Park West. The L_{dn} measured over a 24-hour period in the park near the playground adjacent to the railroad was 74.2 dBA. Rail traffic on the Norfolk Southern line and local roadway traffic on Brighton Road and Ohio Street contribute to the noise environment at this location. The peak hour L_{eq} at this location was 72.3 dBA.

Site ST-2: The L_{eq} measured over a 30-minute period was 70.6 dBA. This site was located in a public park area northwest of the intersection of Fort Duquesne Boulevard and Fort Wayne Bridge. A short-term 30-minute long noise measurement was completed at this public open space site during peak-hour conditions. Two train events crossing the Fort Wayne Bridge and relatively heavy roadway traffic on Fort Duquesne Boulevard were the dominant sound sources during the measurement.

Site ST-3: Denny Park. A short-term 30-minute-long noise measurement was completed at this public park during peak-hour conditions and measured 60.5 dBA L_{eq}. One train event crossing, in addition to relatively heavy roadway traffic on Liberty Avenue were the dominant sound sources during the measurement.

4.2 Existing Vibration Environment

The existing vibration environment in the vicinity of the Norfolk Southern railway in Pittsburgh varies with proximity to rail lines. To characterize existing vibration levels, measurements were obtained at the same locations where noise measurements were completed at LT-4, LT-20, LT-21, LT-23, and ST-2, and only vibrations were measured at ST-5, each of which are vibration sensitive uses or are representative of vibration sensitive uses. Vibration measurements were obtained from train pass-by events to determine if ground propagation characteristics are typical for the study corridor. Measurements were completed using a PCB 393A and 393C accelerometers and Brüel & Kjær noise and vibration monitors (model 2270). Two vibration accelerometers were deployed at each measurement site to obtain samples of vibration attenuation rates as a function of distance. Typically, the sensor situated nearest to the Norfolk Southern train tracks (“near sensor”) was located approximately 25 feet closer to the tracks than the sensor placed further away (“far sensor”). The vibration measurement locations are shown in Figure 4. Overview of Project Area and Measurement Locations, and the distances from the train tracks for each sensor are provided in Table 4. Summary of Existing Vibration Measurements, along with the maximum measured vibration levels (VdB).

Table 4. Summary of Existing Vibration Measurements

Site No.	Measurement Location Description	Date/Time	Near Sensor Distance (feet)[1]	Far Sensor Distance (feet)[1]	Max VdB (near)	Max VdB (far)
LT-4	1016 N. Franklin Street	12/13/2018 10:16	75	94	80.8	79.7
LT-20	1 Pennwood Avenue	12/3/2018 15:53	60	85	85.2	83.5
LT-21	Park Avenue	12/5/2018 13:26	70	95	80.1	83.3
LT-23	504 Hawkins Avenue	12/5/2018 15:00	75	100	82.3	78.6
ST-2	1000 Ft. Duquesne Blvd. Fort Wayne Bridge	12/12/2018 14:33	11.0	30	80.9	80.6
ST-2	1000 Ft. Duquesne Blvd. Fort Wayne Bridge	12/12/2018 14:50	11.0	30	80.9	76.8
ST-5	7051 Thomas Blvd.	12/5/2018 10:59	60	85	83.7	80.5

1. As measured from nearest rail.
Source: Harris Miller Miller & Hanson Inc., 2018

Site LT-4: 1016 North Franklin Street. Vibration sensors were deployed at locations 75 feet and 94 feet from the nearest track. One train pass-by event with a speed 30 mph was observed. The train was comprised of three locomotives and 115 rail cars.

Site LT-20: 1 Pennwood Avenue. Vibration sensors were placed at locations 60 feet and 85 feet from the nearest track. One train pass-by event with a speed of 20 mph was monitored. The train included two locomotives and no rail cars.

Site LT-21: Park Avenue. Vibration sensors were deployed at locations 70 feet and 95 feet from the nearest track. One train pass-by event with a speed of 35 mph was observed in which the train was comprised of four locomotives and 143 rail cars.

Site LT-23: 504 Hawkins Avenue. Vibration sensors were deployed at locations 75 feet and 100 feet from the nearest track. One train pass-by event with a speed of 20 mph was monitored. The train included 2 locomotives and 100 rail cars.

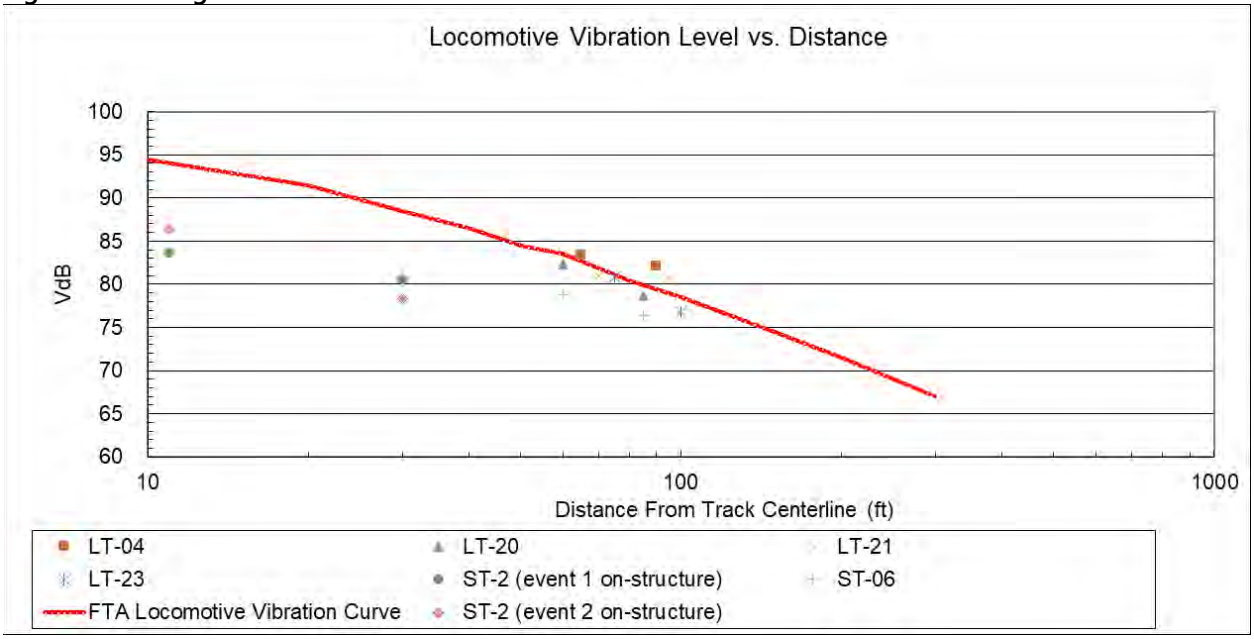
Site ST-2: One vibration sensor was located at the base of the concrete footing of the Fort Wayne Bridge and the second sensor was placed 19 feet away from the structure. Two train pass-by events were monitored. The first event included a train consisted of two locomotives and no rail cars and the second event included a train that was comprised of 2 locomotives and 150 rail cars. The speed of the first event was 11 mph and the speed of the second event was 20 mph.

Site ST-5 : This vibration-only measurement was completed at Westinghouse Park. Vibration sensors were located at locations 60 feet and 85 feet from the nearest track. One train pass-by event with a speed of 25 mph was monitored of a train with two locomotives and 54 rail cars.

Measurement data were normalized by adjusting vibration levels to match the reference speed of 50 mph for a diesel electric locomotive which is the heaviest component of each train and generally results in the highest vibration levels. The normalized vibration levels were plotted on a graph (Figure 5) and compared to the general vibration curve for diesel locomotives obtained from the FTA Manual. As Figure 5 demonstrates, all of the vibration measurements of trains operating on the ground show good agreement with the general locomotive vibration curve except for the vibration measurements near the

Fort Wayne Bridge (Site ST-2). These measurements are approximately 8 to 10 VdB lower than the general vibration curve for locomotives. The FTA Manual indicates that trains operating on structure typically result in vibration levels 10 VdB lower than those operating on the ground; therefore, these measurements show that the FTA adjustment factor of -10 VdB for on structure vibration sources is accurate for these projects.

Figure 5. Existing Vibration Levels



5 Methodology for Assessment of Noise and Vibration

Consistent with STB regulations for noise and FTA/FRA guidelines for vibration, a noise and vibration impact assessment was conducted for a study area covering the proposed projects. This section presents the information used in conducting the noise and vibration assessment. Section 6 presents the results of the assessments.

The following summarizes the primary alternatives being considered for each of the projects. These alternatives are for purposes of this analysis and a more detailed analysis for each project is being developed separately for the Act 120 analysis and other applicable provisions. For the purpose of this modeling analysis the alternative list below adequately covers the range of potential for direct, indirect, and cumulative effects vis a vis the noise and vibration analysis assessment.

Amtrak Station

- No Build Alternative
- Remove portion of train shed to achieve appropriate vertical clearance
- Adjust train shed roof beams to achieve appropriate vertical clearance

W. North Avenue Bridge Project

- No Build Alternative
- Rehabilitate and raise bridge to achieve appropriate vertical clearance
- Rehabilitate bridge and lower tracks to achieve appropriate vertical clearance
- Combination rehabilitate and raise bridge and lower tracks to achieve appropriate vertical clearance
- Replace and raise bridge to achieve appropriate vertical clearance
- Replace bridge and lower tracks to achieve appropriate vertical clearance
- Combination replace and raise bridge and lower railroad tracks to achieve appropriate vertical clearance

Pennsylvania Avenue Bridge Project

- No Build Alternative
- Replace and raise bridge to achieve appropriate vertical clearance
- Repair substructure and lower tracks to achieve appropriate vertical clearance
- Combination replace and raise bridge and lower tracks to achieve appropriate vertical clearance

Allegheny Commons Pedestrian Bridge Project

- No Build Alternative
- Replace bridge with appropriate vertical clearance

5.1 Noise Projections

The primary components of wayside noise from train operations are engine/exhaust noise for diesel locomotives and wheel/rail noise from the steel wheels rolling on steel rails for freight railcars. Projections of train operation noise were completed for two operational conditions, the post-project timeframe with the projects complete (the “Build” condition or scenario) and post-project timeframe without the projects completed (the “No Build” condition or scenario). The projection of wayside noise was carried out using models specified in the FTA Manual as they are implemented in three-dimensional acoustic modeling software package SoundPLAN Gmbh version 8.0 with the following assumptions:

- Noise measurements were completed throughout the areas in proximity to the study corridor as documented in Section 4. These measurements were used to determine the impact conditions for the projects.
- Increased rail traffic that would result with or without the projects is included in the prediction and was logarithmically added to the existing measured sound levels throughout the project area to identify the cumulative noise increases that would occur. Two rail traffic scenarios were evaluated:

  - Low-Growth: these projections are based on the Pennsylvania Department of Transportation (PennDOT) 2020 Pennsylvania Rail Plan (PennDOT 2021).
  - High-Growth: these projections are based on the PennDOT 2015 Pennsylvania Rail Plan (PennDOT 2016).

- Increased rail traffic would all consist of intermodal trains with two diesel electric locomotives and 125 single-stack intermodal rail cars or 125 double-stack intermodal rail cars for the No Build and Build future conditions, respectively.
- Sound exposure level (SEL) for the intermodal trains is based on measurements of intermodal train pass-by events on the Mon Line.
  - Measurements were normalized using FTA's methodology which results in an SEL of 100 dBA.
- Special track work locations, such as crossovers and turnouts, include a 5 dB increase adjustment consistent with FTA Manual, page 42.
- Locomotive noise would comply with 40 CFR 201.12.
- In accordance with the FRA train horn rule (49 CFR; Part 222; Part 229), horn use was included in the predictions for trains approaching within 20-seconds of the one public grade crossing where Norfolk Southern trains currently sound their horn as required, located at the southeastern end of the study corridor, with the assumption that they operate at 35 miles per hour (mph).
- Where trains operate on structure, the modeling includes a 4 dB increase adjustment consistent with the FTA Manual.
- Train speeds throughout the study corridor are assumed to operate at the maximum allowable speeds to be conservative.
  - Note that changes in operational speed from higher speeds to lower speeds can reduce noise levels; however, this reduction is offset somewhat because this also would result in a longer time period where the noise source is present.
- Predictions assume a track type of continuously welded rail on ballast and tie.

5.2 Vibration Projections

The potential vibration impact from trains operating along the study corridor was assessed using the FTA criteria. The following factors were used in determining potential vibration impacts along the proposed rail alignment:

- Existing ground-borne vibration measurements were conducted at 6 sites in the study area. These measurement results were compared with the typical locomotive maximum vibration level versus distance curve in the FTA Manual, as shown in Section 4. This curve was used to model vibration levels at sensitive receptor locations along the study corridor.
- The existing vibration conditions in the study area were assumed to be in the category of a "Heavily Used Rail Corridor," as defined in the FTA Manual.

- In locations where the existing train vibration exceeds the impact criteria, the projects will cause additional impact only if the project vibration is 3 VdB or more than existing vibration levels.
- For projects, in locations where the existing train vibration does not exceed the impact criteria, impact is assessed based on an exceedance of the vibration criteria.
- Due to the length of freight trains and the duration of the vibration events, freight operations were assessed using the "Frequent Events" category in the vibration impact criteria, as defined by the FTA Manual.
- Vibration predictions assume the same operational speeds as the noise predictions.
- Predictions of vibration from trains operating on aerial structures are reduced by 10 VdB consistent with FTA Manual.
- Predictions of vibration at locations where wheel impacts occur at special track areas such as crossovers or turnouts are increased by 10 VdB consistent with FTA guidance.

6 Noise and Vibration Impact Assessment

Two scenarios were evaluated, the low-growth scenario based on the 2020 Pennsylvania State Rail Plan (PennDOT 2021) and the high-growth scenario based on the 2015 Pennsylvania State Rail Plan (PennDOT 2015). Sections 6.1 and 6.2 summarize these two noise impact scenarios, respectively. The vibration impact assessment is summarized in Section 6.3 and would be the same for either the low-growth or high-growth scenarios since impacts are based on individual train pass-by events.

6.1 Noise Impact Assessment Low-Growth Scenario

Table 5 summarizes the results of the noise impact assessment for the project under the low-growth scenario compared to the No Build conditions at places where people sleep (Category 2) and institutional (Category 3) locations. The table provides information by noise sensitive receptor group, each of which is represented by a noise measurement location. Also provided in the table are the distances to the nearest rail line, train speeds, existing and predicted noise levels, impact criteria, and the numbers of both moderate and severe noise impacts predicted for each land use category.

Increases in Build and No build noise are predominantly a result of the increase in rail traffic during daytime and nighttime hours. The variation in vertical alignments of either the track or the roadways crossing the track that is associated with the alternatives for projects at W. North Avenue/Brighton Road and Pennsylvania Avenue are small, anticipated to be less than five feet. Changes in vertical track or vertical bridge alignment associated with these alternatives would result in generally imperceptible differences that are within tenths of dB of one another. The dominant consideration for noise in these circumstances is the number of train operations, and that would not be different for any of the alternatives for these projects. Therefore, from a noise perspective, any of the approaches to achieving the needed vertical clearance at these locations are considered the same. Nighttime train movements are more impactful than daytime train movements from a noise impact assessment perspective since the L_{dn} noise metric applies a 10 dB penalty to sounds that occur at night to account for heightened sensitivity during this time period. Rail traffic would increase in the study corridor in the Build (low-growth scenario) and No Build conditions as follows:

Milepost PT-341 to PT-353.35

- Daytime (7:00 a.m. to 10:00 p.m.) – existing 11 train movements, future Build 15 train movements, and future No Build 26 train movements
- Nighttime (10:00 p.m. to 7:00 a.m.) – existing 10 train movements, future Build 17 train movements, and future No Build 16 train movements

Milepost PC-0.00 to PC-3.17

- Daytime (7:00 a.m. to 10:00 p.m.) – existing 17 train movements, future Build 22 train movements, and future No Build 31 train movements
- Nighttime (10:00 p.m. to 7:00 a.m.) – existing 17 train movements, future Build 23 train movements, and future No Build 25 train movements

As Table 5 shows, the future Build low-growth scenario would result in 181 sites exceeding the STB assessment guidelines (e.g., increase above 3 dB or change to a level above 65 dB) and under the future No Build low-growth scenario 239 sites exceeding STB assessment guidelines would potentially result. Additionally, all of the Build scenario impacts would be impacted under the No Build scenario. This is due to future freight demand under the low-growth scenario which is constant with or without the projects, and the projects' clearance features allowing movement of more freight with fewer trains.

Table 5. Low-Growth Scenario Noise Impact Projections

NSA Group	Land Use Cat.	Distance to Near Track / Lane (ft)	Maximum Speed (mph)	Existing Noise Level (dBA L_{dn})	STB Assessment Guideline		No Build Sound Levels (dBA L_{dn})			Build Sound Levels (dBA L_{dn})			Number of Noise Sensitive Land Use Sites Above Threshold	
					W/ Project Limit if Existing <65 dBA L_{dn}	Increase over Existing (dB)	Predicted Noise Only	Predicted plus Existing	Increase over Existing	Predicted Noise Only	Predicted plus Existing	Increase over Existing	W/O Project Scenario	W/ Project Scenario
LT-1	2	184 - 470	40	66.3 - 77.5	65.0	3.0	48.3 - 60.6	66.4 - 77.6	0 - 0.4	46.7 - 59	66.3 - 77.6	0 - 0.3	0	0
	3	212 - 388		65.4 - 73.5	65.0	3.0	44 - 54.5	65.4 - 73.5	0 - 0.1	39.6 - 50.2	65.4 - 73.5	0 - 0	0	0
LT-2	2	80 - 439	40	62.2 - 71.5	65.0	3.0	47.3 - 67.6	62.3 - 73	0.1 - 1.5	45.6 - 66	62.3 - 72.6	0.1 - 1.1	0	0
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-3	2	157 - 473	40	63 - 74.3	65.0	3.0	51.6 - 61.4	63.5 - 74.3	0.1 - 1.6	50 - 59.8	63.3 - 74.3	0 - 1.2	0	0
	3	270 - 270		58.3 - 60.3	65.0	3.0	51.5 - 54.3	59.1 - 61.2	0.8 - 1	45.9 - 49.4	58.5 - 60.6	0.2 - 0.3	0	0
LT-4	2	69 - 503	40	57.6 - 68.2	65.0	3.0	47 - 67.8	58 - 71	0.3 - 3.8	45.6 - 66	57.9 - 70.3	0.2 - 2	13	13
	3	392 - 392		58.7 - 60.6	65.0	3.0	43.5 - 47.2	58.8 - 60.8	0.1 - 0.2	39.1 - 42.8	58.7 - 60.7	0 - 0.1	0	0
LT-5	2	94 - 504	40	64.5 - 72.1	65.0	3.0	45.3 - 61.8	64.6 - 72.2	0 - 0.4	43.7 - 60.3	64.6 - 72.2	0 - 0.3	0	0
	3	262 - 262		67.3 - 69.3	65.0	3.0	47 - 49.6	67.4 - 69.4	0 - 0	42.6 - 45.2	67.3 - 69.3	0 - 0	0	0
LT-6	2	194 - 654	20	63.7 - 75.6	65.0	3.0	42.1 - 60.5	63.7 - 75.7	0 - 0.3	40.5 - 58.9	63.7 - 75.6	0 - 0.2	0	0
	3	69 - 437		65.4 - 73.4	65.0	3.0	37 - 50.9	65.4 - 73.5	0 - 0	32.6 - 46.6	65.4 - 73.5	0 - 0	0	0
LT-7	2	252 - 471	20	60.5 - 69.6	65.0	3.0	48.8 - 61.9	60.8 - 69.7	0.1 - 1.1	47.2 - 60.3	60.7 - 69.7	0.1 - 0.8	0	0
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-8	2	53 - 488	20	67.9 - 75.8	65.0	3.0	#N/A	#N/A	#N/A	46.8 - 66.2	68.2 - 76.1	0 - 0.8	0	0
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-9	2	441 - 575	20	60 - 63.8	65.0	3.0	39.5 - 48.1	60.1 - 63.9	0 - 0.1	38.1 - 46.6	60.1 - 63.9	0 - 0.1	0	0
	3	96 - 96		57.9 - 59.9	65.0	3.0	51.3 - 53.4	58.7 - 60.7	0.8 - 0.9	45.7 - 47.8	58.1 - 60.1	0.2 - 0.3	0	0
LT-10	2	156 - 464	30	56.5 - 63.2	65.0	3.0	48.3 - 63	57.3 - 65.7	0.5 - 3.5	47 - 61.8	57.1 - 65.2	0.4 - 2.8	2	2
	3	213 - 478		57.6 - 64.9	65.0	3.0	39.4 - 57.1	57.7 - 65.1	0 - 1.5	33.8 - 51.3	57.6 - 64.9	0 - 0.5	0	0
LT-11	2	93 - 473	30	58.8 - 67.9	65.0	3.0	46.2 - 65.9	59.1 - 70	0.2 - 2.9	44.9 - 64.6	59 - 69.5	0.1 - 2.3	2	2
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-12	2	149 - 215	30	60.5 - 64.1	65.0	3.0	52.3 - 63.6	61.2 - 66.9	0.6 - 2.8	51 - 62.4	61.1 - 66.3	0.4 - 2.3	2	2
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0

Table 5. Low-Growth Scenario Noise Impact Projections

NSA Group	Land Use Cat.	Distance to Near Track / Lane (ft)	Maximum Speed (mph)	Existing Noise Level (dBA L_{dn})	STB Assessment Guideline		No Build Sound Levels (dBA L_{dn})			Build Sound Levels (dBA L_{dn})			Number of Noise Sensitive Land Use Sites Above Threshold	
					W/ Project Limit if Existing <65 dBA L_{dn}	Increase over Existing (dB)	Predicted Noise Only	Predicted plus Existing	Increase over Existing	Predicted Noise Only	Predicted plus Existing	Increase over Existing	W/O Project Scenario	W/ Project Scenario
LT-13	2	60 - 497	30	59.1 - 70.3	65.0	3.0	45.1 - 66.3	59.3 - 71.7	0.1 - 3.9	43.8 - 65	59.2 - 71.4	0.1 - 3.1	7	7
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-14	2	117 - 475	30	61.4 - 69.4	65.0	3.0	42.5 - 64.2	61.4 - 70.6	0.1 - 1.2	41.2 - 62.9	61.4 - 70.3	0 - 0.9	0	0
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-15	2	27 - 463	30	52.7 - 72	65.0	3.0	46.9 - 71.9	53.9 - 74.9	0.2 - 6.4	45.6 - 70.7	53.6 - 74.4	0.1 - 5.4	50	33
	3	412 - 412		58.2 - 60.2	65.0	3.0	42.1 - 43.5	58.3 - 60.3	0.1 - 0.1	36.3 - 37.8	58.2 - 60.2	0 - 0	0	0
LT-16	2	24 - 459	30	54.2 - 74	65.0	3.0	47.7 - 70.2	55.5 - 75.5	0.2 - 4	46.5 - 69	55.2 - 75.2	0.1 - 3.3	0	0
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-17	2	158 - 454	40	58.4 - 69.7	65.0	3.0	49.9 - 63	59.3 - 70.1	0.2 - 3	48.7 - 61.8	59.1 - 70	0.1 - 2.4	2	0
	3	139 - 139		63.3 - 63.3	65.0	3.0	56.8 - 56.8	64.2 - 64.2	0.9 - 0.9	51 - 51	63.6 - 63.6	0.2 - 0.2	0	0
LT-18	2	58 - 464	40	57 - 68	65.0	3.0	46.8 - 69.9	57.8 - 72.1	0.3 - 5.3	45.5 - 68.7	57.7 - 71.4	0.2 - 4.5	22	14
	3	432 - 432		57.3 - 59.3	65.0	3.0	51.7 - 54	58.4 - 60.4	0.9 - 1.1	46 - 48.2	57.7 - 59.7	0.3 - 0.3	0	0
LT-19	2	59 - 463	40	56.8 - 67.8	65.0	3.0	50.6 - 68.7	57.9 - 71.3	0.3 - 5.6	49.4 - 67.5	57.7 - 70.6	0.2 - 4.8	87	69
	3	332 - 406		57.4 - 60.3	65.0	3.0	50.9 - 55.1	58.3 - 61.4	0.8 - 1.2	45.1 - 49.4	57.7 - 60.6	0.2 - 0.3	0	0
LT-20	2	18 - 464	40	62.2 - 81.6	65.0	3.0	49.1 - 75	62.4 - 81.8	0 - 2.4	47.9 - 73.7	62.3 - 81.7	0 - 1.9	0	0
	3	47 - 47		72.1 - 74.1	65.0	3.0	66.2 - 66.3	73.1 - 74.8	0.7 - 1	60.4 - 60.5	72.4 - 74.3	0.2 - 0.3	0	0
LT-21	2	67 - 487	40	61 - 71.6	65.0	3.0	47.8 - 68.7	61.6 - 73.2	0.1 - 2.3	46.6 - 67.5	61.4 - 72.9	0.1 - 1.8	0	0
	3	388 - 388		62 - 64	65.0	3.0	50.8 - 53.8	62.3 - 64.4	0.3 - 0.4	45.1 - 48.1	62.1 - 64.1	0.1 - 0.1	0	0
LT-22	2	44 - 437	40	65.5 - 77.5	65.0	3.0	48.4 - 70.3	65.7 - 78.2	0.1 - 1.1	47.2 - 69.1	65.6 - 78.1	0.1 - 0.9	0	0
	3	226 - 263		67.7 - 70.4	65.0	3.0	50.6 - 54	67.8 - 70.5	0.1 - 0.1	44.9 - 48.3	67.8 - 70.4	0 - 0	0	0
LT-23	2	51 - 449	40	62.6 - 74	65.0	3.0	52.4 - 69.8	63.3 - 75.3	0.2 - 3.3	51.1 - 68.5	63.2 - 75.1	0.1 - 2.6	1	1
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-24	2	27 - 436	40	59.9 - 74	65.0	3.0	47.2 - 73.8	60.2 - 76.9	0.2 - 4	46 - 72.6	60.1 - 76.3	0.1 - 3.3	27	14
	3	177 - 326		61.1 - 65.8	65.0	3.0	46.8 - 57.1	61.3 - 65.9	0.1 - 0.7	41.1 - 51.4	61.2 - 65.8	0 - 0.2	0	0

Table 5. Low-Growth Scenario Noise Impact Projections

NSA Group	Land Use Cat.	Distance to Near Track / Lane (ft)	Maximum Speed (mph)	Existing Noise Level (dBA L_{dn})	STB Assessment Guideline		No Build Sound Levels (dBA L_{dn})			Build Sound Levels (dBA L_{dn})			Number of Noise Sensitive Land Use Sites Above Threshold	
					W/ Project Limit if Existing <65 dBA L_{dn}	Increase over Existing (dB)	Predicted Noise Only	Predicted plus Existing	Increase over Existing	Predicted Noise Only	Predicted plus Existing	Increase over Existing	W/O Project Scenario	W/ Project Scenario
LT-25	2	211 - 493	40	63.9 - 69.5	65.0	3.0	54.9 - 73.1	65.6 - 74	0.2 - 7.5	53.6 - 71.8	65.3 - 73	0.1 - 6.5	24	24
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-26	2	0 - 0	20	0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
	3	47 - 47		72.4 - 72.4	65.0	3.0	54.7 - 54.7	72.4 - 72.4	0.1 - 0.1	50.3 - 50.3	72.4 - 72.4	0 - 0	0	0
ST-2	2	0 - 0	20	0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
	3	105 - 290		66.2 - 70.6	65.0	3.0	51.9 - 54.2	66.3 - 70.7	0.1 - 0.2	47.5 - 49.7	66.2 - 70.6	0 - 0.1	0	0
												Total	**239**	**181**

6.2 Noise Impact Assessment High-Growth Scenario

Table 6 summarizes the results of the noise impact assessment for the project high-growth scenario compared to the No Build conditions at places where people sleep (Category 2) and institutional (Category 3) locations. The table provides information by noise sensitive receptor group, each of which is represented by a noise measurement location. Also provided in the table are the distances to the nearest rail line, train speeds, existing and project high-growth scenario noise levels, impact criteria, and the numbers of both moderate and severe noise impacts predicted for each land use category.

Increases in Build and No build noise under the high-growth scenario are predominantly a result of the increase in rail traffic during daytime and nighttime hours. The variation in vertical alignments of either the track or the roadways crossing the track that is associated with the alternatives for projects at W. North Avenue/Brighton Road and Pennsylvania Avenue are small, anticipated to be less than five feet. Changes in vertical track or vertical bridge alignment associated with these alternatives would result in generally imperceptible differences that are within tenths of dB of one another. The dominant consideration for noise in these circumstances is the number of train operations, and that would not be different for any of the alternatives for these projects. Therefore, from a noise perspective, any of the approaches to achieving the needed vertical clearance at these locations are considered the same. Nighttime train movements are more impactful than daytime train movements from a noise impact assessment perspective since the L_{dn} noise metric applies a 10 dB penalty to sounds that occur at night to account for heightened sensitivity during this time period. Rail traffic would increase in the study corridor in the Build and No Build conditions as follows:

Milepost PT-341 to PT-353.35

- Daytime (7:00 a.m. to 10:00 p.m.) – existing 11 train movements, future Build 29 train movements, and future No Build 29 train movements
- Nighttime (10:00 p.m. to 7:00 a.m.) – existing 10 train movements, future Build 20 train movements, and future No Build 21 train movements

Milepost PC-0.00 to PC-3.17

- Daytime (7:00 a.m. to 10:00 p.m.) – existing 17 train movements, future Build 31 train movements, and future No Build 34 train movements
- Nighttime (10:00 p.m. to 7:00 a.m.) – existing 17 train movements, future Build 27 train movements, and future No Build 28 train movements

As Table 6 shows, the future Build scenario would result in 263 sites exceeding the STB assessment guidelines (e.g., increase above 3 dB or change to a level above 65 dB) and under the future No Build scenario 321 sites exceeding STB assessment guidelines would potentially result. Additionally, all of the Build scenario impacts would also be impacted under the No Build scenario. This is due to future freight demand which is constant with or without the projects, and the projects' clearance features allowing movement of more freight with fewer trains.

6.3 Vibration Impact Assessment

No vibration impacts are predicted for the low-growth or high-growth Build scenarios. Currently the study corridor is defined as "heavily-used" (more than 12 freight trains per day). Under future conditions

there is no change to the train speeds or track locations, other than small changes in vertical alignment in areas that would result in a negligible change in vibration; therefore, both the Build scenario and No Build scenarios would only result in an increase in the number of trains per day. However, because the number of trains is not predicted to result in an increase of 3 VdB or greater at any vibration sensitive land uses, there would be no vibration impacts under either the Build or No Build scenarios.

Additionally, the variation in vertical alignments of either the track or the roadways crossing the track that is associated with the alternatives for projects at W. North Avenue/Brighton Road, Pennsylvania Avenue, and the Allegheny Commons Pedestrian Bridge are small, anticipated to be less than five feet. Additionally, none of these vertical alignment adjustments would result in the train tracks being closer to sensitive properties, which means that under any of the alternatives where the vertical alignment of the track is changed there would be a small reduction in vibration relative to the No Build conditions. Imperceptible differences in vibration from train operations would occur because the differences proposed for each of these projects' alternatives are small.

Table 6. High-Growth Scenario Noise Impact Projections

NSA Group	Land Use Cat.	Distance to Near Track / Lane (ft)	Maximum Speed (mph)	Existing Noise Level (dBA L_{dn})	STB Assessment Guideline		No Build Sound Levels (dBA L_{dn})			Build Sound Levels (dBA L_{dn})			Number of Noise Sensitive Land Use Sites Above Threshold	
					W/ Project Limit if Existing <65 dBA L_{dn}	Increase over Existing (dB)	Predicted Noise Only	Predicted plus Existing	Increase over Existing	Predicted Noise Only	Predicted plus Existing	Increase over Existing	W/O Project Scenario	W/ Project Scenario
LT-1	2	184 - 470	40	66.3 - 77.5	65.0	3.0	49.7 - 62	66.4 - 77.6	0 - 0.6	49.1 - 61.5	66.4 - 77.6	0 - 0.5	0	0
	3	212 - 388		65.4 - 73.5	65.0	3.0	44.8 - 55.3	65.4 - 73.5	0 - 0.1	44 - 54.5	65.4 - 73.5	0 - 0.1	0	0
LT-2	2	80 - 439	40	62.2 - 71.5	65.0	3.0	48.7 - 69	62.4 - 73.5	0.2 - 1.9	48 - 68.5	62.3 - 73.3	0.2 - 1.8	0	0
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-3	2	157 - 473	40	63 - 74.3	65.0	3.0	52.9 - 62.7	63.7 - 74.4	0.1 - 2.1	52.4 - 62.2	63.6 - 74.3	0.1 - 1.9	0	0
	3	270 - 270		58.3 - 60.3	65.0	3.0	52.4 - 55.2	59.3 - 61.4	0.9 - 1.2	50.4 - 53.9	58.9 - 61.2	0.7 - 0.9	0	0
LT-4	2	69 - 503	40	57.6 - 68.2	65.0	3.0	48.4 - 69.4	58.1 - 71.9	0.4 - 4.8	48 - 68.6	58.1 - 71.4	0.4 - 3.2	13	13
	3	392 - 392		58.7 - 60.6	65.0	3.0	44.3 - 48	58.8 - 60.9	0.1 - 0.2	43.5 - 47.2	58.8 - 60.8	0.1 - 0.2	0	0
LT-5	2	94 - 504	40	64.5 - 72.1	65.0	3.0	46.7 - 63.1	64.6 - 72.3	0 - 0.6	46.2 - 62.6	64.6 - 72.3	0 - 0.5	0	0
	3	262 - 262		67.3 - 69.3	65.0	3.0	47.8 - 50.6	67.4 - 69.4	0 - 0.1	46.9 - 49.8	67.4 - 69.4	0 - 0	0	0
LT-6	2	194 - 654	20	63.7 - 75.6	65.0	3.0	43.5 - 61.8	63.7 - 75.7	0 - 0.4	42.9 - 61.3	63.7 - 75.7	0 - 0.4	0	0
	3	69 - 437		65.4 - 73.4	65.0	3.0	37.8 - 51.8	65.4 - 73.5	0 - 0	37 - 51	65.4 - 73.5	0 - 0	0	0
LT-7	2	252 - 471	20	60.5 - 69.6	65.0	3.0	50.1 - 63.2	60.9 - 69.7	0.1 - 1.5	49.7 - 62.8	60.9 - 69.7	0.1 - 1.4	0	0
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-8	2	53 - 488	20	67.9 - 75.8	65.0	3.0	49.6 - 69.1	68.5 - 76.3	0 - 1.4	49.1 - 68.6	68.4 - 76.3	0 - 1.3	0	0
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-9	2	441 - 575	20	61.2 - 63.8	65.0	3.0	41.2 - 49.4	61.2 - 63.9	0 - 0.2	40.7 - 48.9	61.2 - 63.9	0 - 0.1	0	0
	3	96 - 96		57.9 - 59.9	65.0	3.0	52.4 - 54.5	59 - 61	1 - 1.1	52.1 - 54.2	58.9 - 60.9	0.9 - 1	0	0
LT-10	2	156 - 464	30	56.5 - 63.2	65.0	3.0	49 - 63.7	57.4 - 66.1	0.6 - 3.9	48.5 - 63.1	57.3 - 65.8	0.5 - 3.6	2	2
	3	213 - 478		57.6 - 64.9	65.0	3.0	40.4 - 58.1	57.7 - 65.2	0.1 - 1.9	40.1 - 57.8	57.7 - 65.1	0.1 - 1.8	0	0
LT-11	2	93 - 473	30	58.8 - 67.9	65.0	3.0	46.8 - 66.5	59.1 - 70.2	0.2 - 3.2	46.3 - 66	59.1 - 70	0.2 - 3	2	2
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-12	2	149 - 215	30	60.5 - 64.1	65.0	3.0	52.9 - 64.3	61.3 - 67.2	0.7 - 3.1	52.4 - 63.8	61.2 - 67	0.6 - 2.9	2	2
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0

Table 6. High-Growth Scenario Noise Impact Projections

NSA Group	Land Use Cat.	Distance to Near Track / Lane (ft)	Maximum Speed (mph)	Existing Noise Level (dBA L_{dn})	STB Assessment Guideline		No Build Sound Levels (dBA L_{dn})			Build Sound Levels (dBA L_{dn})			Number of Noise Sensitive Land Use Sites Above Threshold	
					W/ Project Limit if Existing <65 dBA L_{dn}	Increase over Existing (dB)	Predicted Noise Only	Predicted plus Existing	Increase over Existing	Predicted Noise Only	Predicted plus Existing	Increase over Existing	W/O Project Scenario	W/ Project Scenario
LT-13	2	60 - 497	30	59.1 - 70.3	65.0	3.0	45.7 - 66.9	59.3 - 71.9	0.1 - 4.2	45.2 - 66.4	59.3 - 71.8	0.1 - 3.9	7	7
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-14	2	117 - 475	30	61.4 - 69.4	65.0	3.0	43.1 - 64.9	61.4 - 70.7	0.1 - 1.3	42.6 - 64.3	61.4 - 70.6	0.1 - 1.2	0	0
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-15	2	27 - 463	30	52.7 - 72	65.0	3.0	47.6 - 72.6	54 - 75.3	0.2 - 6.8	47 - 72.1	53.9 - 75	0.2 - 6.4	92	56
	3	412 - 412		58.2 - 60.2	65.0	3.0	42.9 - 44.5	58.3 - 60.3	0.1 - 0.1	42.7 - 44.2	58.3 - 60.3	0.1 - 0.1	0	0
LT-16	2	24 - 459	30	54.2 - 74	65.0	3.0	48.4 - 70.9	55.6 - 75.8	0.2 - 4.4	47.9 - 70.4	55.5 - 75.6	0.2 - 4.1	0	0
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-17	2	158 - 454	40	58.4 - 69.7	65.0	3.0	50.6 - 63.7	59.4 - 70.2	0.2 - 3.3	50.1 - 63.2	59.3 - 70.1	0.2 - 3.1	2	2
	3	139 - 139		63.3 - 63.3	65.0	3.0	57.8 - 57.8	64.4 - 64.4	1.1 - 1.1	57.6 - 57.6	64.3 - 64.3	1 - 1	0	0
LT-18	2	58 - 464	40	57 - 68	65.0	3.0	47.4 - 70.6	57.9 - 72.5	0.4 - 5.8	46.9 - 70.1	57.9 - 72.2	0.3 - 5.4	27	23
	3	432 - 432		57.3 - 59.3	65.0	3.0	52.8 - 55	58.7 - 60.7	1.2 - 1.4	52.5 - 54.8	58.6 - 60.6	1.1 - 1.3	0	0
LT-19	2	59 - 463	40	56.8 - 67.8	65.0	3.0	51.3 - 69.4	58 - 71.7	0.3 - 6.1	50.8 - 68.9	57.9 - 71.4	0.3 - 5.7	95	88
	3	332 - 406		57.4 - 60.3	65.0	3.0	51.9 - 56.1	58.5 - 61.7	1 - 1.4	51.7 - 55.9	58.4 - 61.6	0.9 - 1.4	0	0
LT-20	2	18 - 464	40	62.2 - 81.6	65.0	3.0	49.8 - 75.6	62.4 - 81.8	0 - 2.7	49.3 - 75.1	62.4 - 81.8	0 - 2.4	0	0
	3	47 - 47		72.1 - 74.1	65.0	3.0	67.2 - 67.3	73.3 - 74.9	0.8 - 1.2	67 - 67.1	73.3 - 74.9	0.8 - 1.2	0	0
LT-21	2	67 - 487	40	61 - 71.6	65.0	3.0	48.5 - 69.4	61.7 - 73.4	0.1 - 2.6	48 - 68.9	61.6 - 73.3	0.1 - 2.3	0	0
	3	388 - 388		62 - 64	65.0	3.0	51.9 - 54.8	62.4 - 64.5	0.4 - 0.5	51.6 - 54.6	62.4 - 64.4	0.4 - 0.5	0	0
LT-22	2	44 - 437	40	65.5 - 77.5	65.0	3.0	49.1 - 71	65.7 - 78.4	0.1 - 1.3	48.6 - 70.5	65.7 - 78.3	0.1 - 1.2	0	0
	3	226 - 263		67.7 - 70.4	65.0	3.0	51.7 - 55.1	67.8 - 70.5	0.1 - 0.1	51.4 - 54.8	67.8 - 70.5	0.1 - 0.1	0	0
LT-23	2	51 - 449	40	62.6 - 74	65.0	3.0	53 - 70.4	63.4 - 75.5	0.2 - 3.6	52.5 - 69.9	63.3 - 75.4	0.2 - 3.3	3	1
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-24	2	27 - 436	40	59.9 - 74	65.0	3.0	47.9 - 74.5	60.2 - 77.2	0.2 - 4.4	47.3 - 74	60.2 - 76.9	0.2 - 4.1	39	33
	3	177 - 326		61.1 - 65.8	65.0	3.0	47.8 - 58.1	61.3 - 65.9	0.1 - 0.8	47.6 - 57.9	61.3 - 65.9	0.1 - 0.8	0	0

Table 6. High-Growth Scenario Noise Impact Projections

NSA Group	Land Use Cat.	Distance to Near Track / Lane (ft)	Maximum Speed (mph)	Existing Noise Level (dBA L_{dn})	STB Assessment Guideline		No Build Sound Levels (dBA L_{dn})			Build Sound Levels (dBA L_{dn})			Number of Noise Sensitive Land Use Sites Above Threshold	
					W/ Project Limit if Existing <65 dBA L_{dn}	Increase over Existing (dB)	Predicted Noise Only	Predicted plus Existing	Increase over Existing	Predicted Noise Only	Predicted plus Existing	Increase over Existing	W/O Project Scenario	W/ Project Scenario
LT-25	2	211 - 493	40	63.9 - 69.5	65.0	3.0	55.5 - 73.7	65.7 - 74.5	0.2 - 8.1	55 - 73.2	65.6 - 74.1	0.2 - 7.7	37	34
	3	0 - 0		0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
LT-26	2	0 - 0	20	0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
	3	47 - 47		72.4 - 72.4	65.0	3.0	55.5 - 55.5	72.4 - 72.4	0.1 - 0.1	54.7 - 54.7	72.4 - 72.4	0.1 - 0.1	0	0
ST-2	2	0 - 0	20	0 - 0	65.0	3.0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0 - 0	0	0
	3	105 - 290		66.2 - 70.6	65.0	3.0	52.8 - 55	66.4 - 70.7	0.1 - 0.2	51.9 - 54.2	66.3 - 70.7	0.1 - 0.2	0	0
												Total	**321**	**263**

7 References

FTA. 2018. Transit Noise and Vibration Impact Assessment (September 2018) ("FTA Manual").

Pennsylvania Department of Transportation (PennDOT): 2016. 2015 Pennsylvania State Rail Plan.

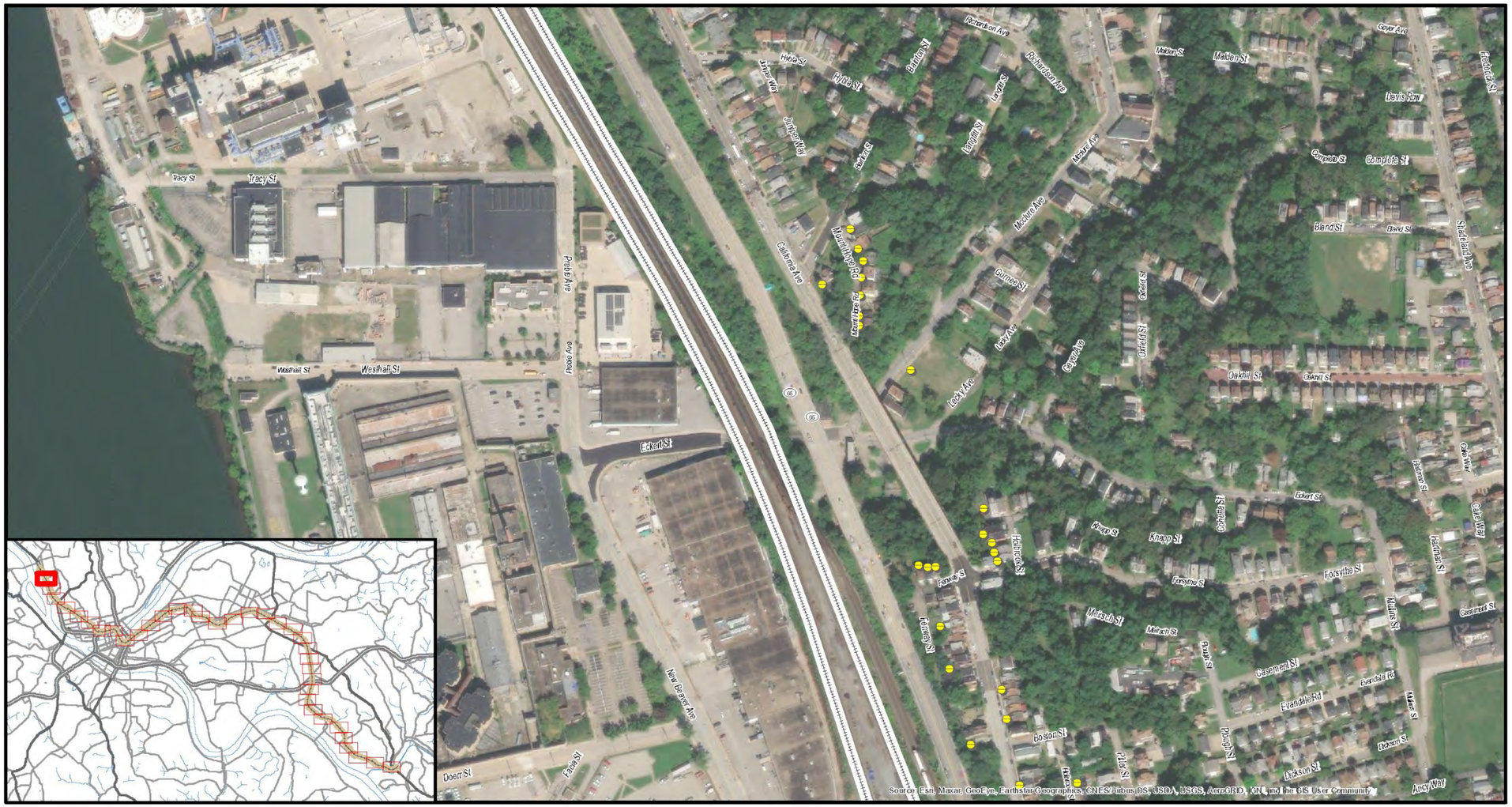
Pennsylvania Department of Transportation (PennDOT): 2021. 2020 Pennsylvania State Rail Plan.

STB. 1998. Final Environmental Impact Statement No. 980194, Conrail Acquisition (Finance Docket No. 33388) https://www.stb.gov/stb/docs/conrail_summary.pdf

8 Maps

This section provides detailed mapping for potential noise and vibration receptors within the 13-mile corridor assessed in this analysis. Figure 6 through Figure 41 are maps of the low-growth scenario impact conditions and Figure 42 through Figure 77 are maps of the high-growth scenario.

Figure 6. Low-Growth Scenario Noise and Vibration Assessment Map 1



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

0 100 200 400 Feet

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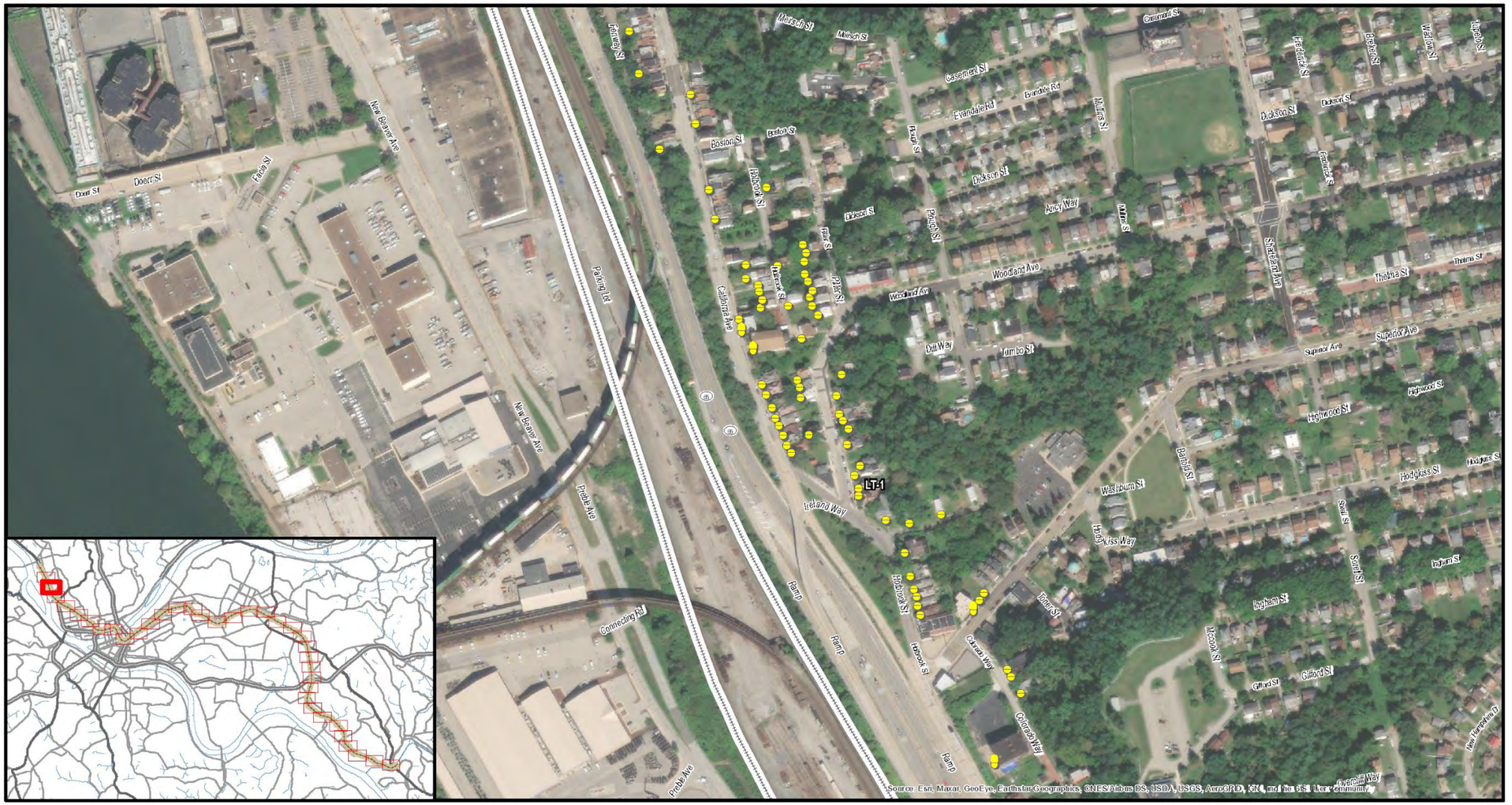
Figure 7. Low-Growth Scenario Noise and Vibration Assessment Map 2



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

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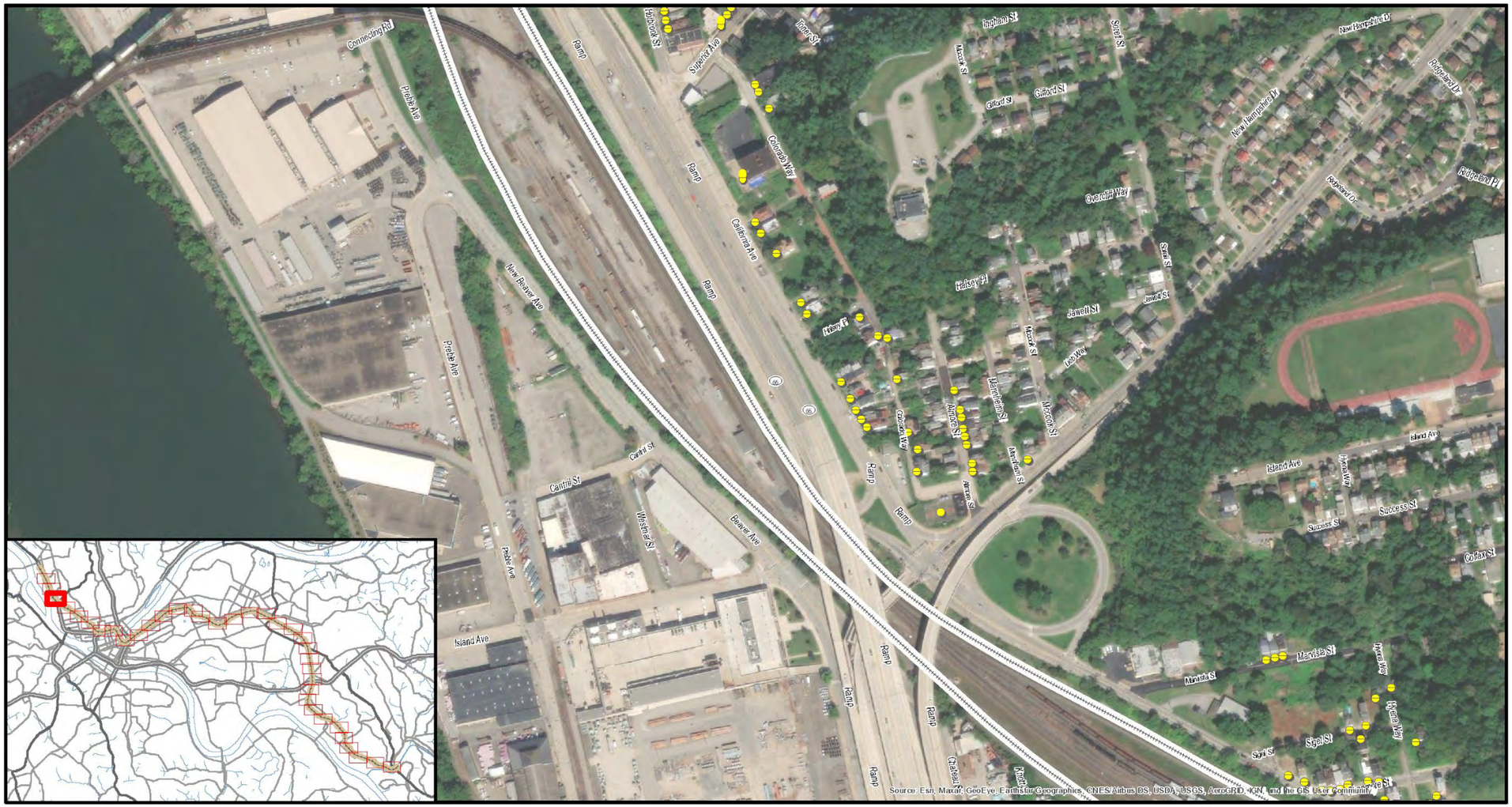
Figure 8. Low-Growth Scenario Noise and Vibration Assessment Map 3



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result

* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

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Figure 9. Low-Growth Scenario Noise and Vibration Assessment Map 4

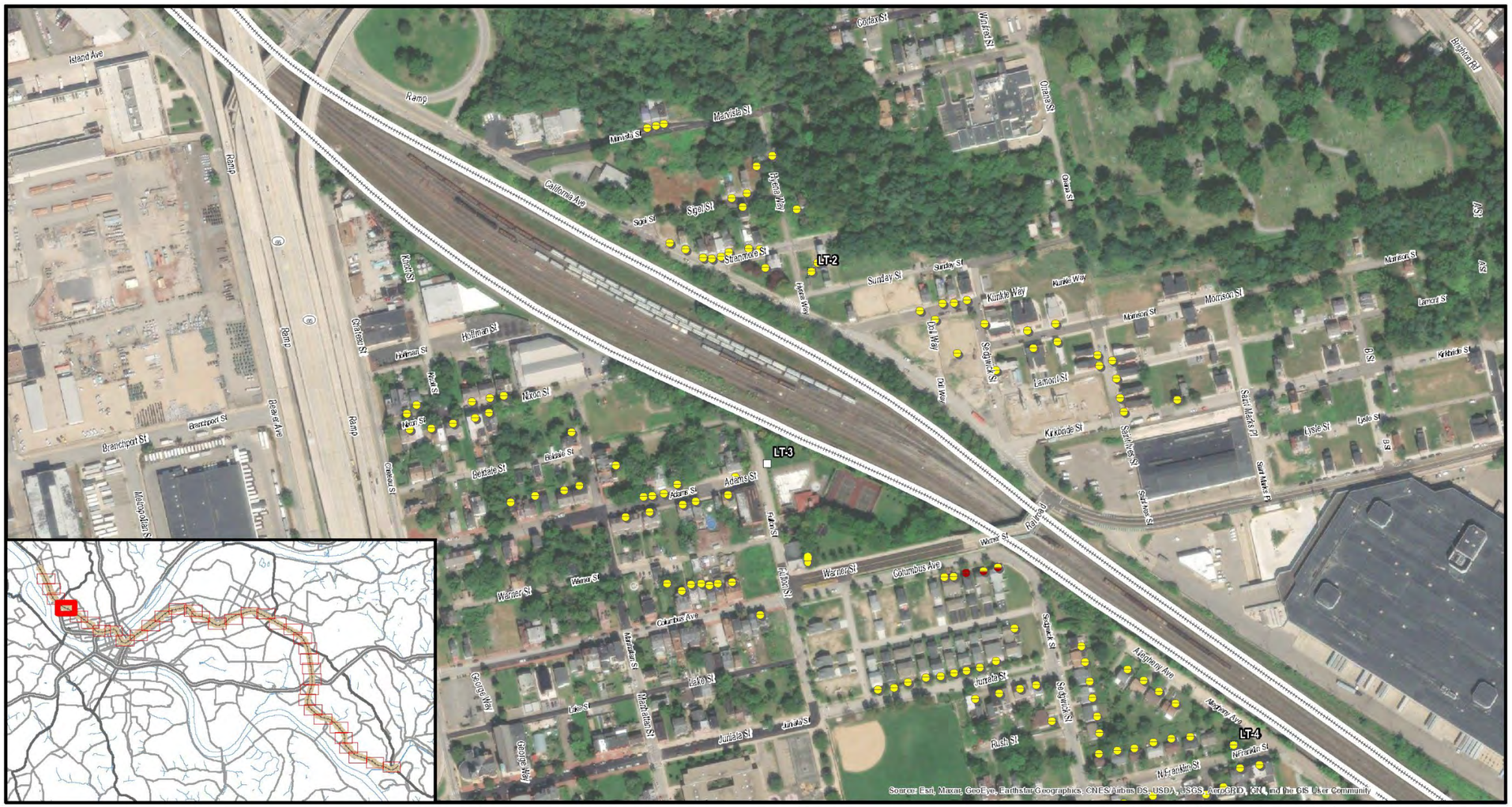

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Figure 10. Low-Growth Scenario Noise and Vibration Assessment Map 5

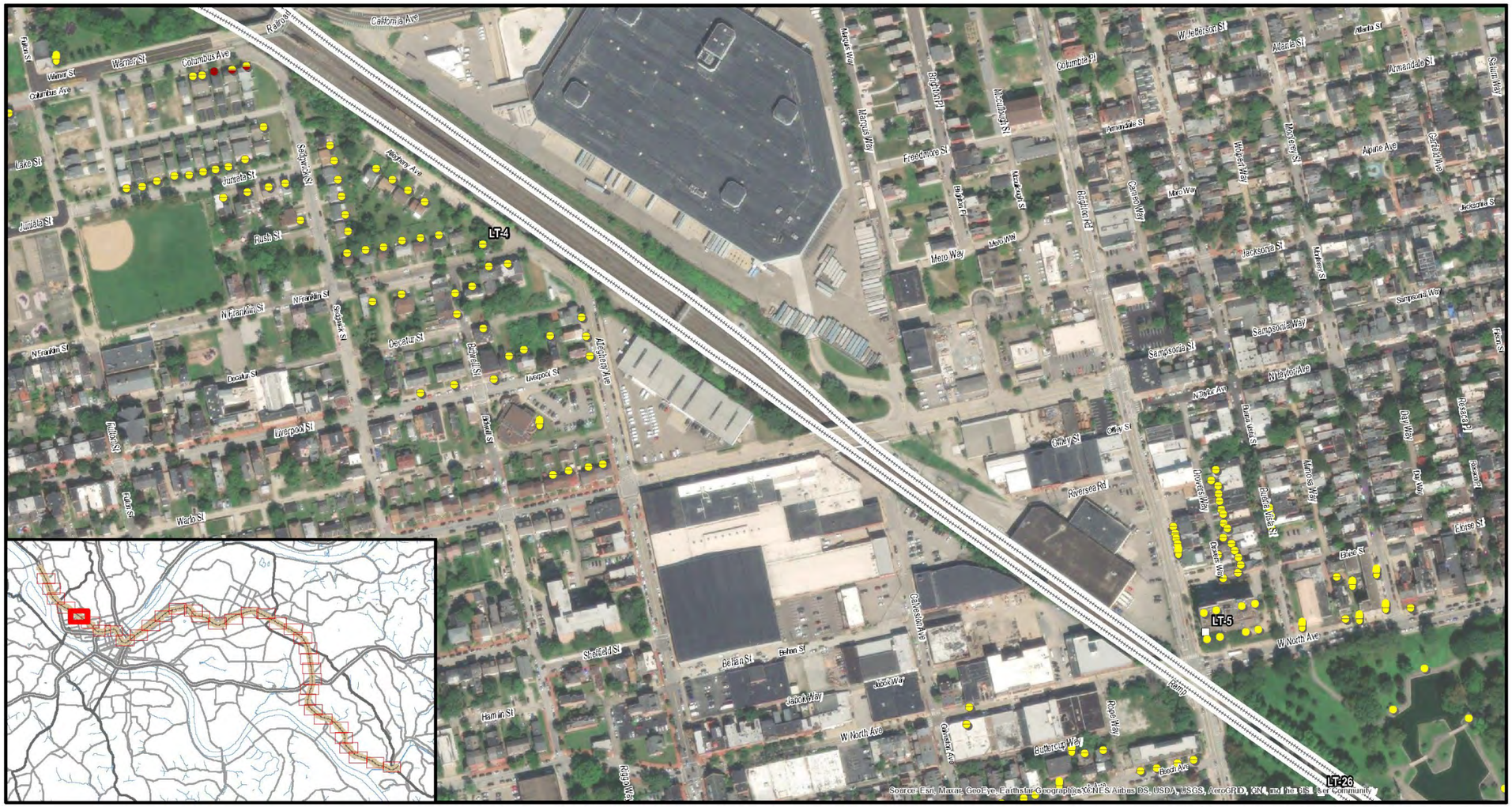

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Figure 11. Low-Growth Scenario Noise and Vibration Assessment Map 6

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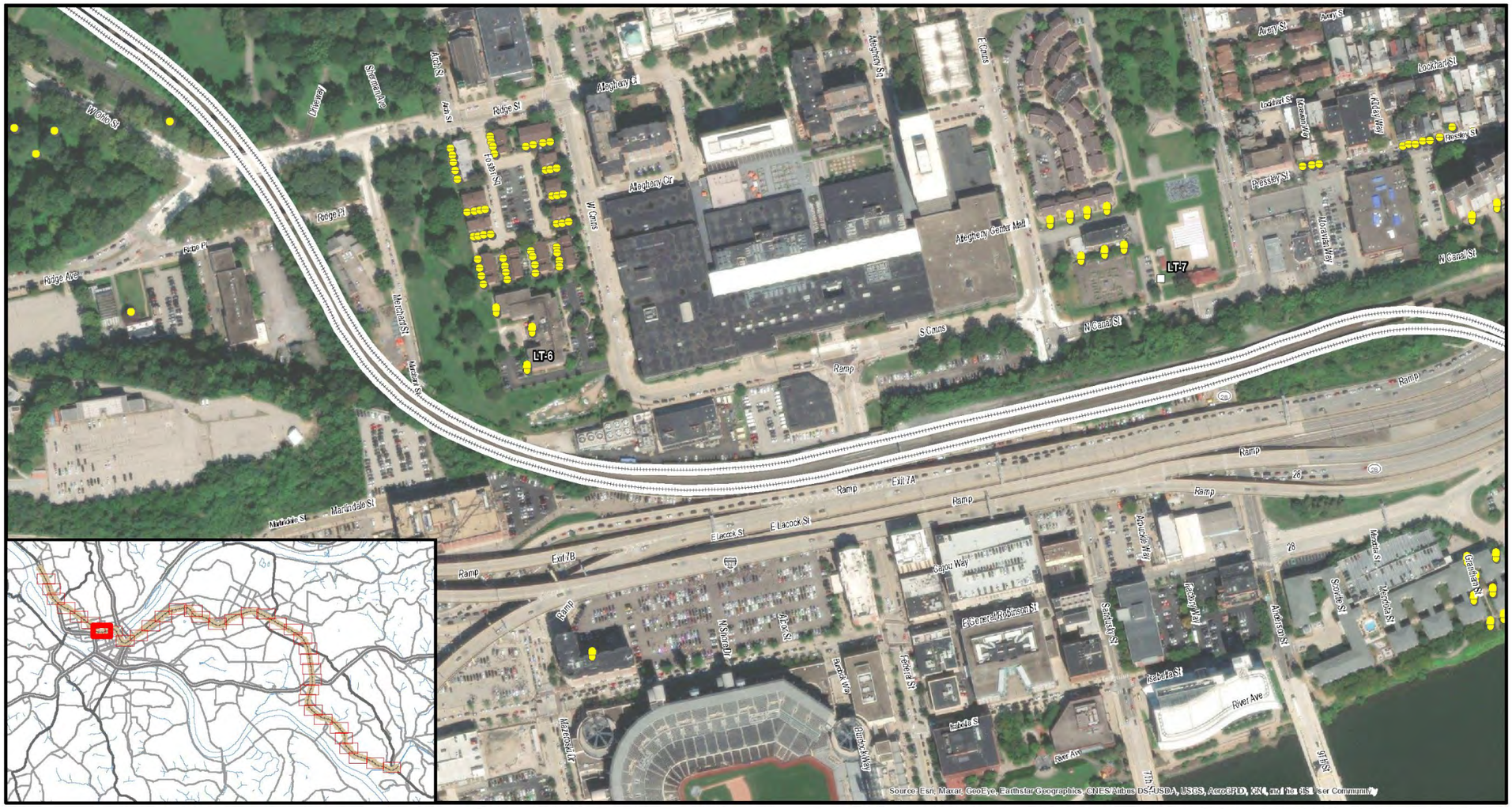
Figure 12. Low-Growth Scenario Noise and Vibration Assessment Map 7



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building*

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Figure 13. Low-Growth Scenario Noise and Vibration Assessment Map 8

- Long-Term Noise Measurement
- Long-Term Nosie and Short-Term Vibration Measurement
- Short-Term Noise Measurement
- Short-Term Noise and Vibration Measurement
- Short-Term Vibration Measurement

Feet
0 100 200 400

- Existing Rail
- Would not Exceed STB Threshold(s)with or without the Projects
- Would Exceed STB Threshold(s) with or without Projects
- Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result

* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

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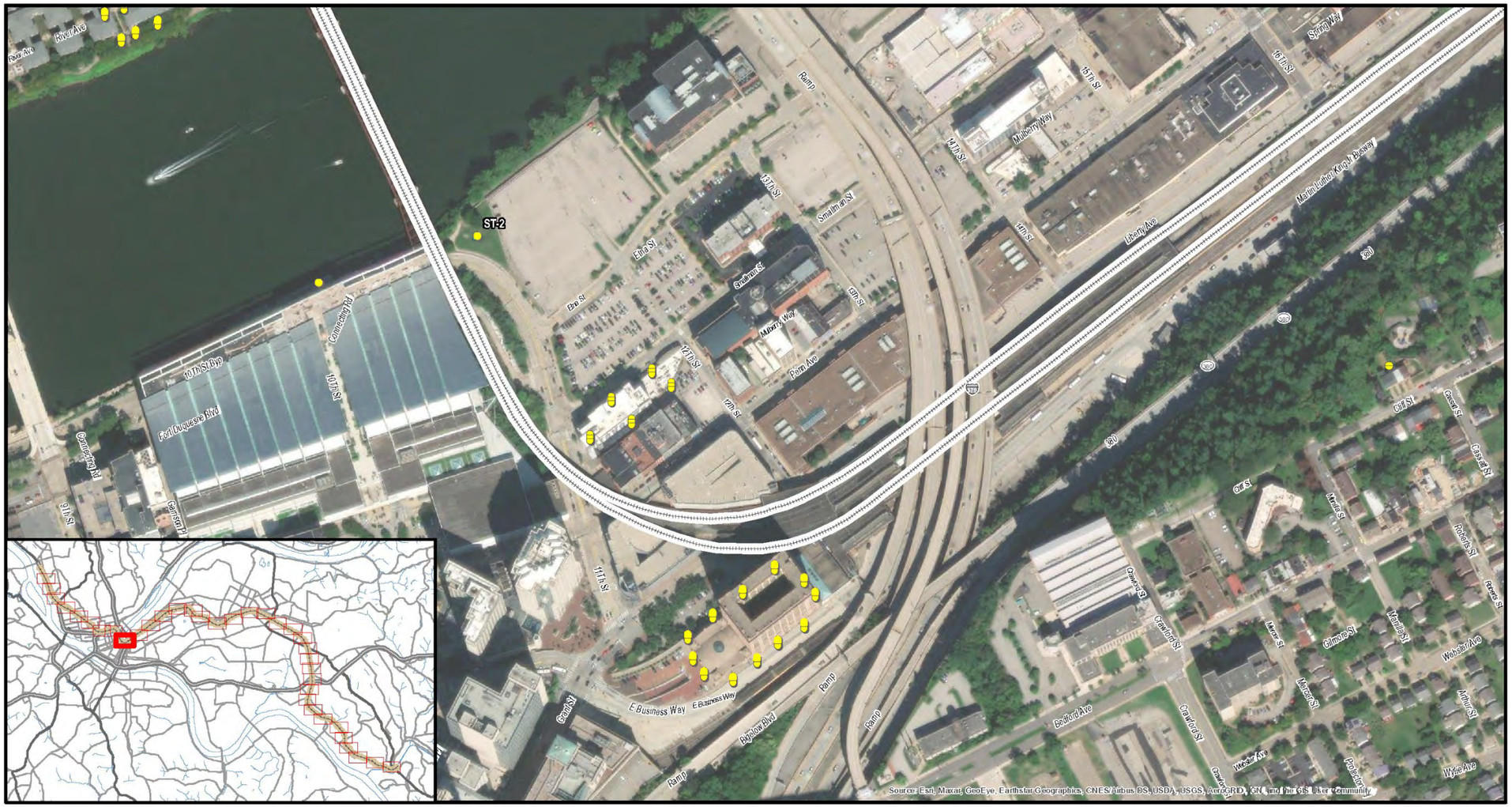
Figure 14. Low-Growth Scenario Noise and Vibration Assessment Map 9



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result

Dual colors = 2 Story Building
Triple colors = Multiple Story Building

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Figure 15. Low-Growth Scenario Noise and Vibration Assessment Map 10

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Figure 16. Low-Growth Scenario Noise and Vibration Assessment Map 11

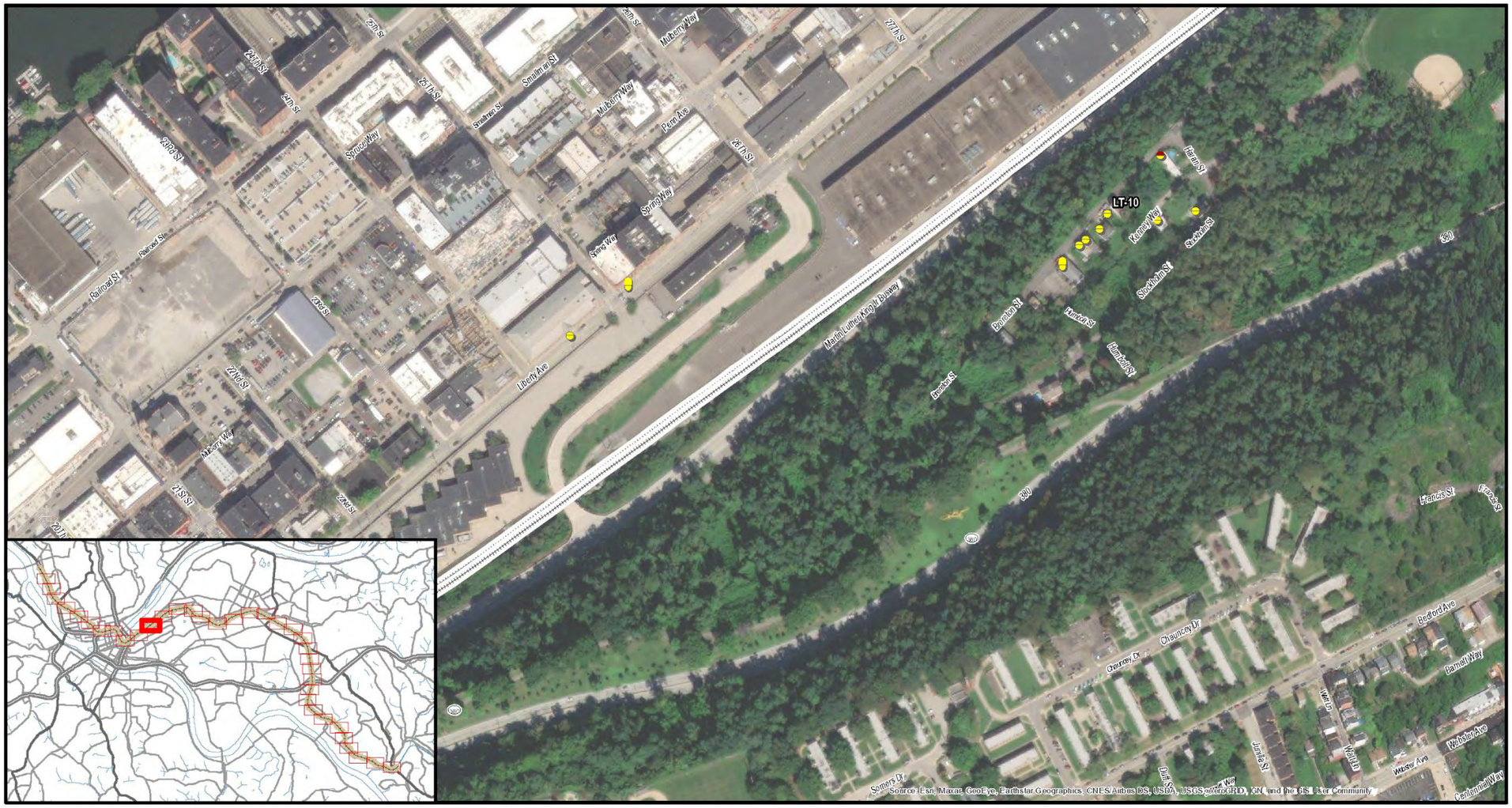

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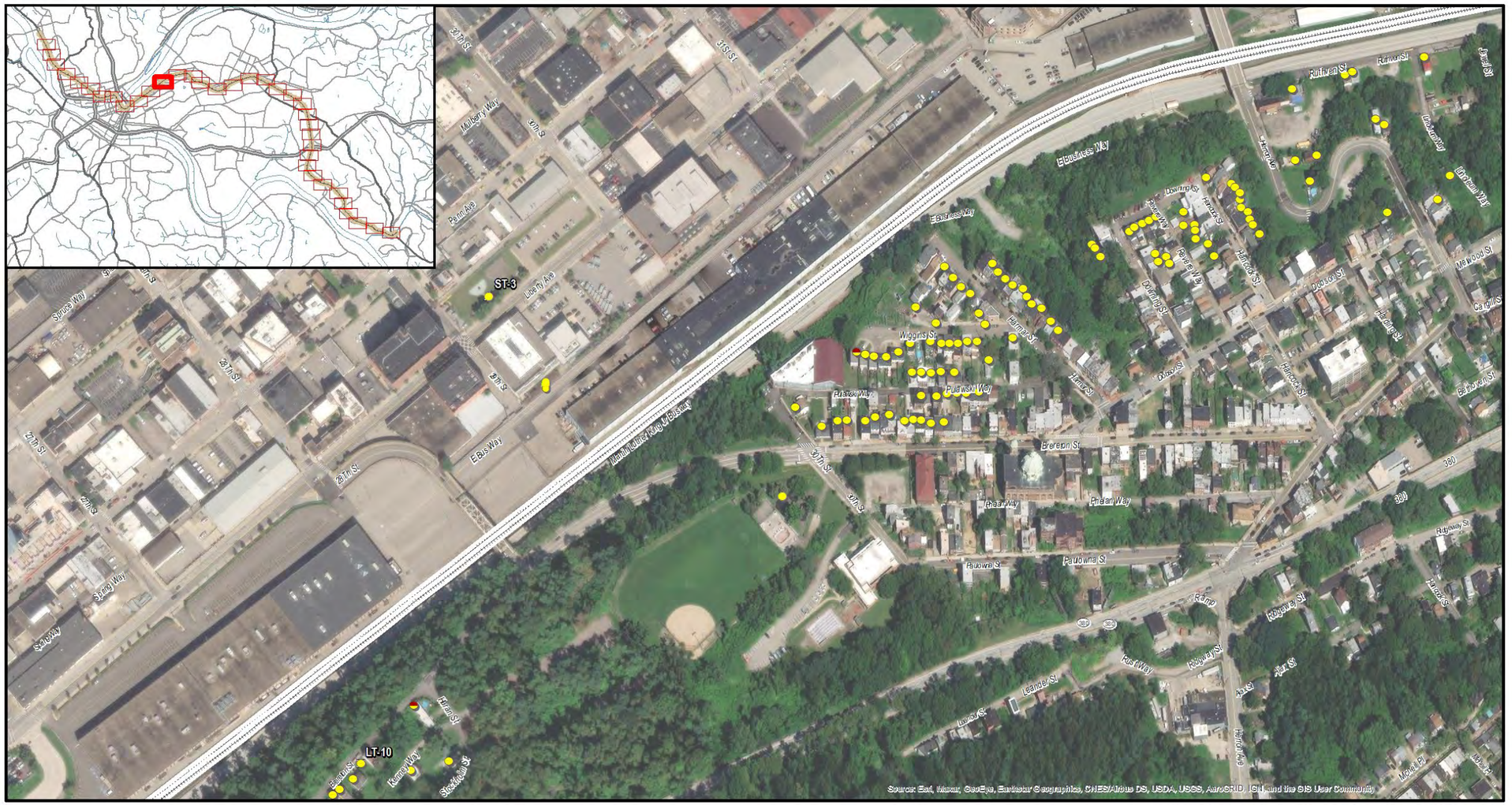
Figure 17. Low-Growth Scenario Noise and Vibration Assessment Map 12



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

0 100 200 400 Feet

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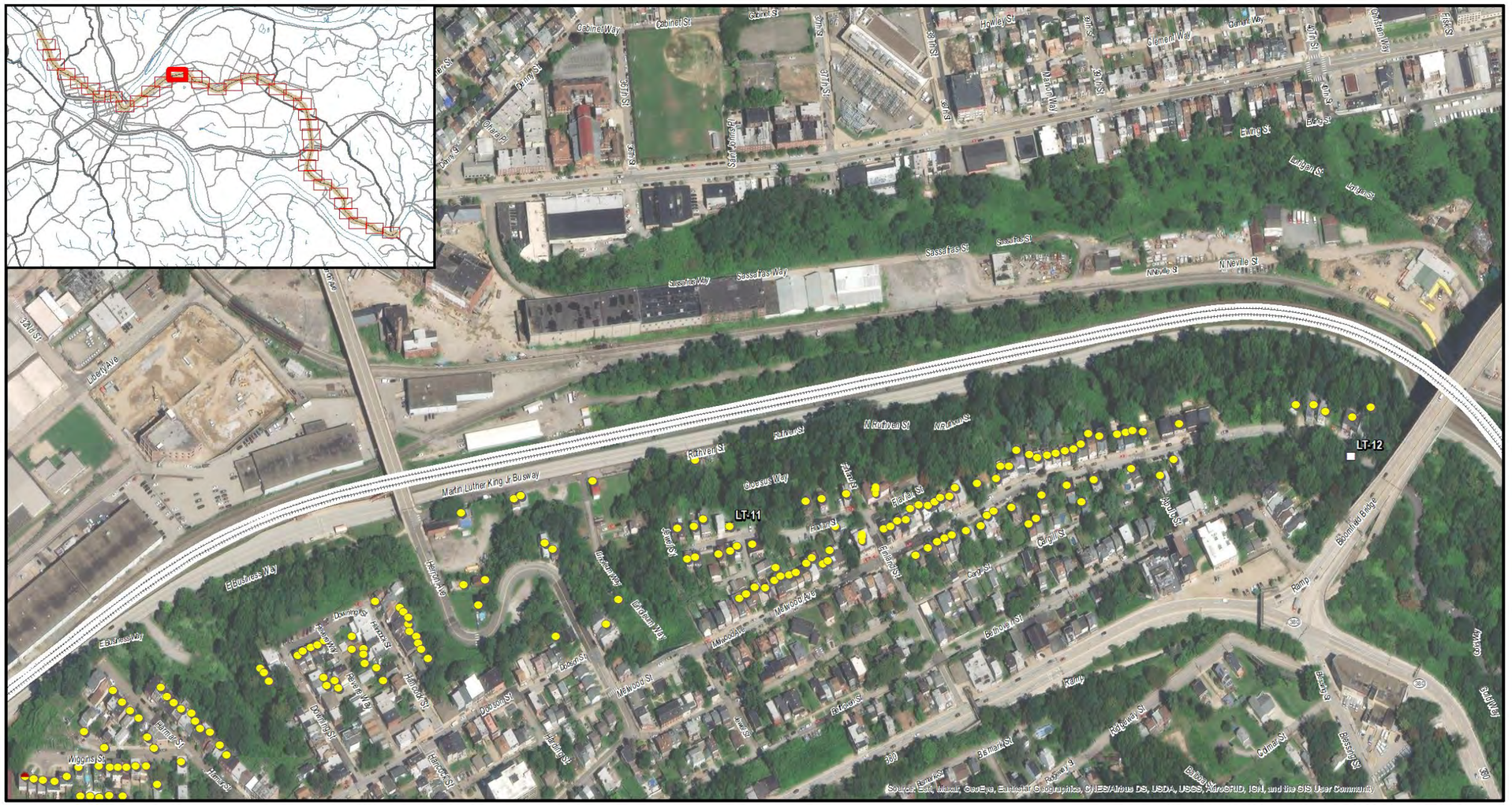
Figure 18. Low-Growth Scenario Noise and Vibration Assessment Map 13



- Long-Term Noise Measurement
- Long-Term Nosie and Short-Term Vibration Measurement
- Short-Term Noise Measurement
- Short-Term Noise and Vibration Measurement
- Short-Term Vibration Measurement

0 100 200 400 Feet

- Existing Rail
- Would not Exceed STB Threshold(s)with or without the Projects
- Would Exceed STB Threshold(s) with or without Projects
- Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result

*Dual colors = 2 Story Building *
*Triple colors = Multiple Story Building *

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Figure 19. Low-Growth Scenario Noise and Vibration Assessment Map 14

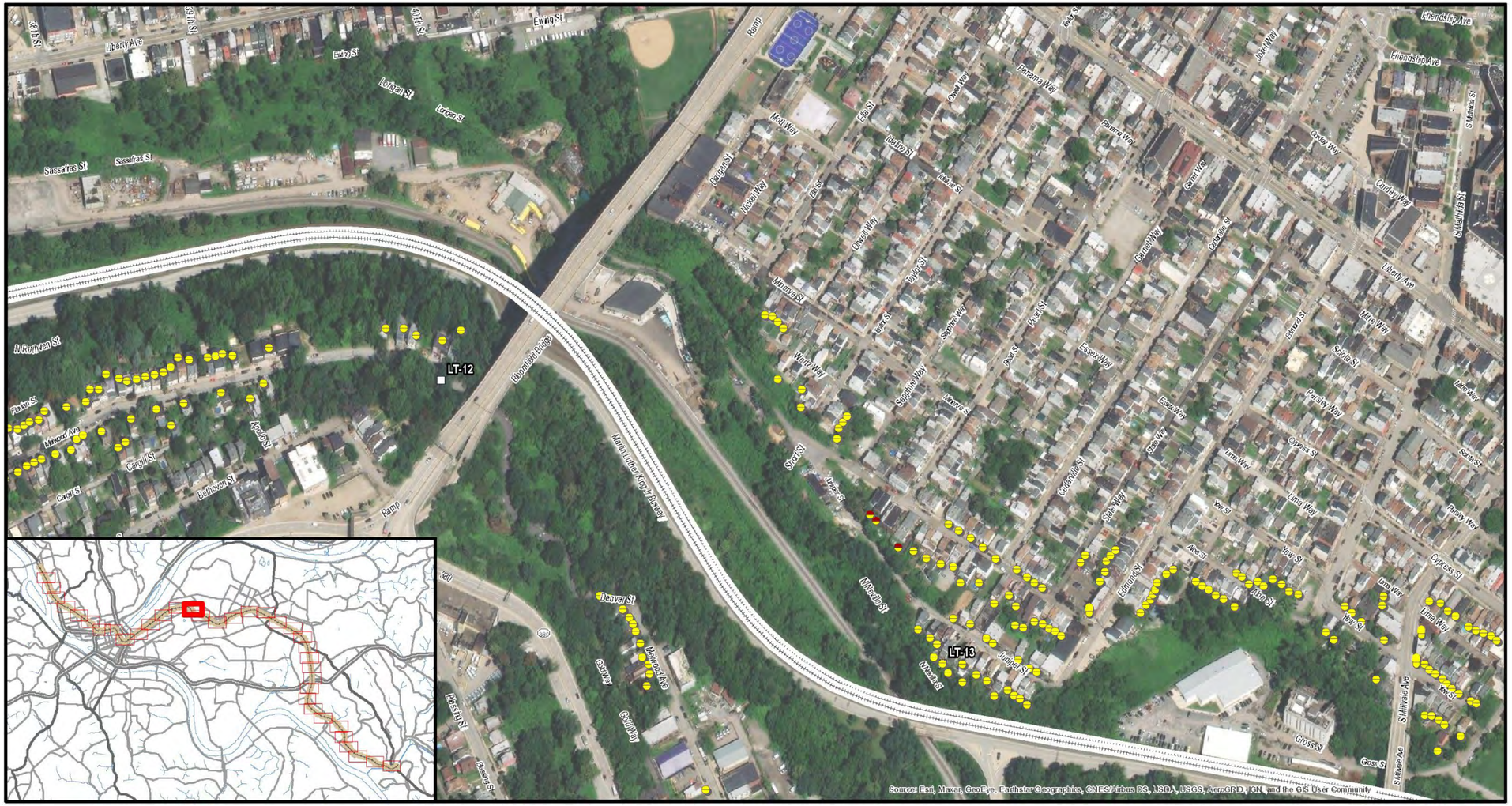

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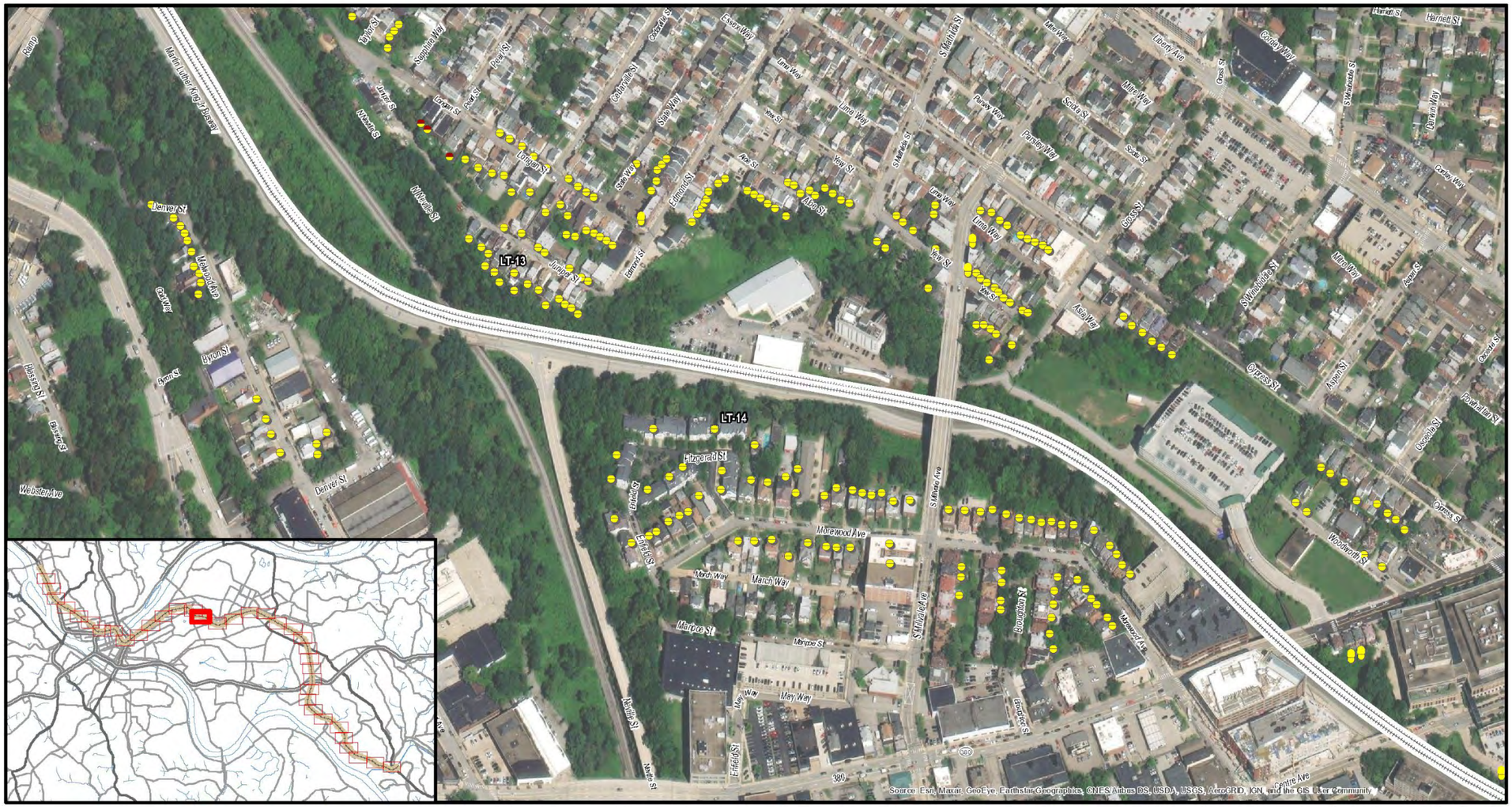
Figure 20. Low-Growth Scenario Noise and Vibration Assessment Map 15



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building*

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Figure 21. Low-Growth Scenario Noise and Vibration Assessment Map 16

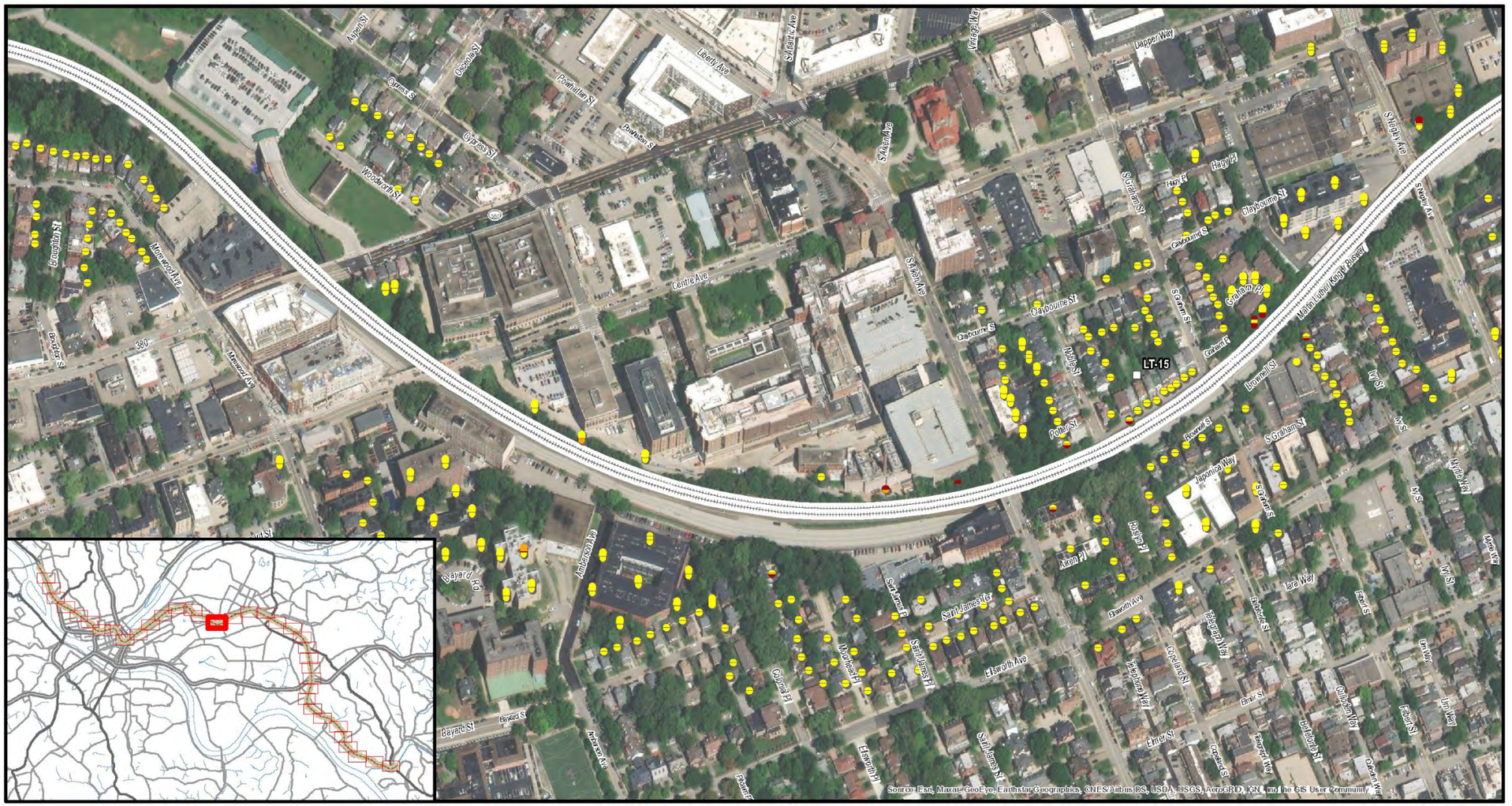

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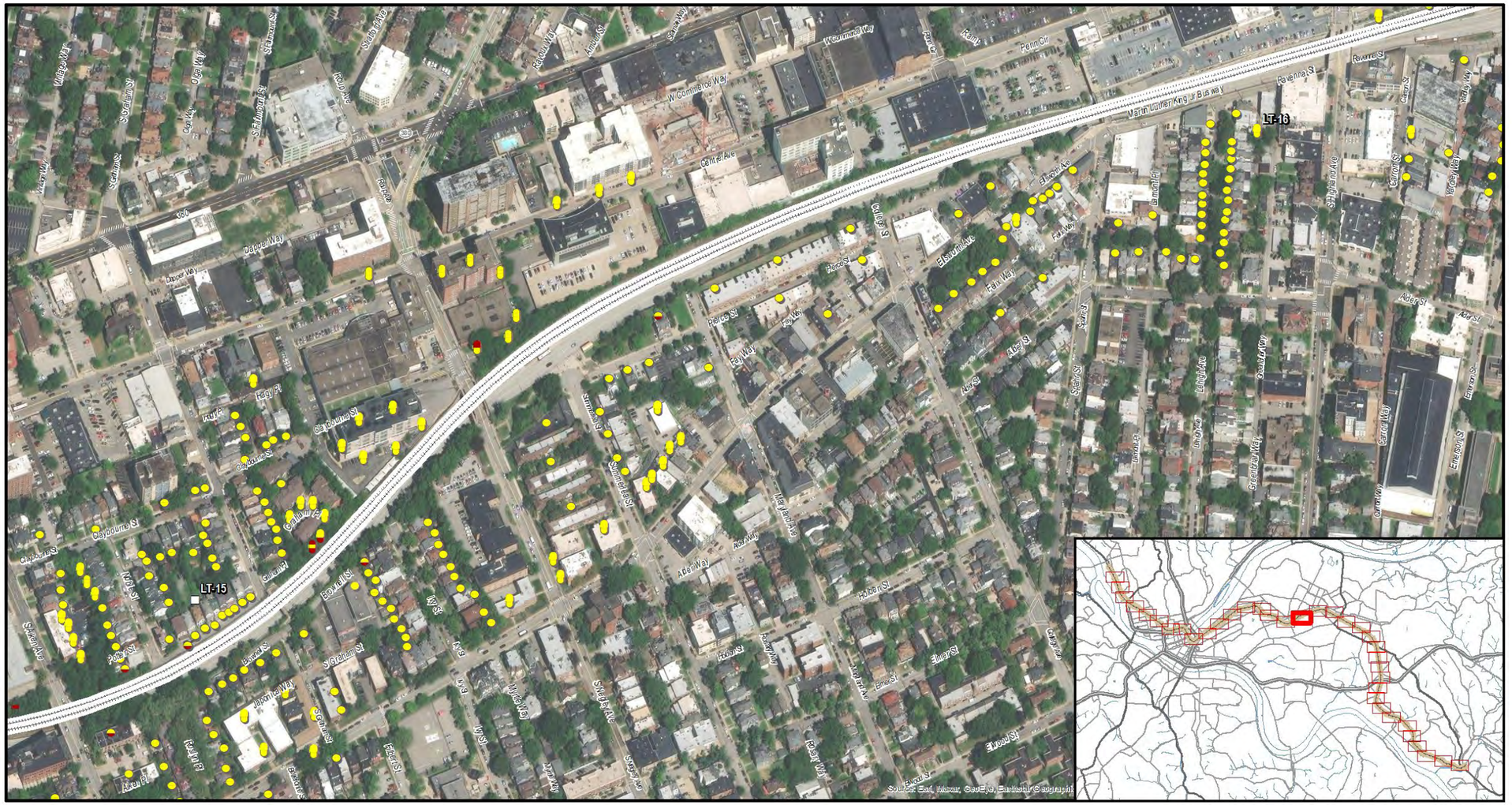
Figure 22. Low-Growth Scenario Noise and Vibration Assessment Map 17



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

0 100 200 400 Feet

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Figure 23. High-Growth Scenario Noise and Vibration Assessment Map 18

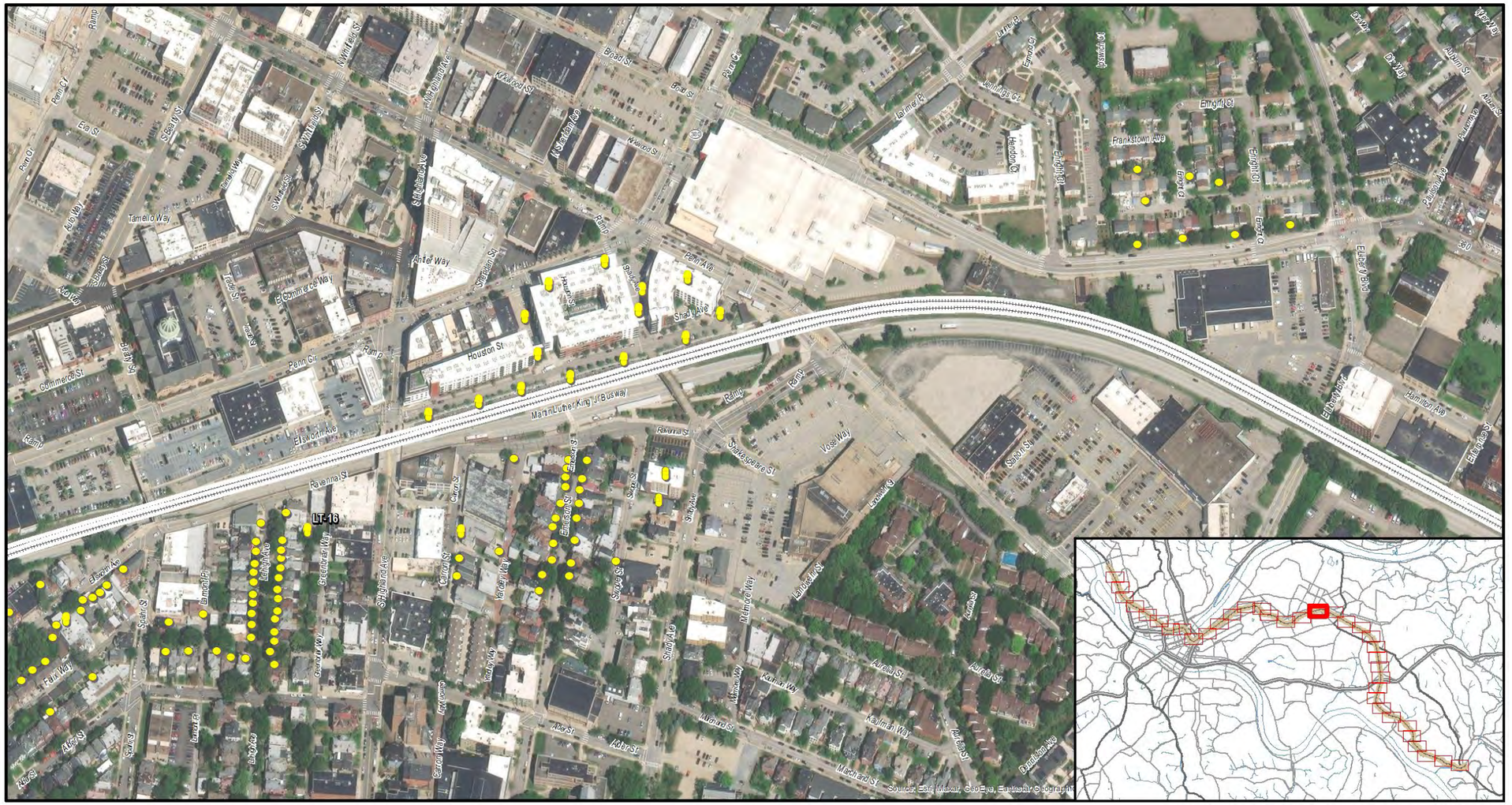

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Figure 24. Low-Growth Scenario Noise and Vibration Assessment Map 19

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Figure 25. Low-Growth Scenario Noise and Vibration Assessment Map 20

Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

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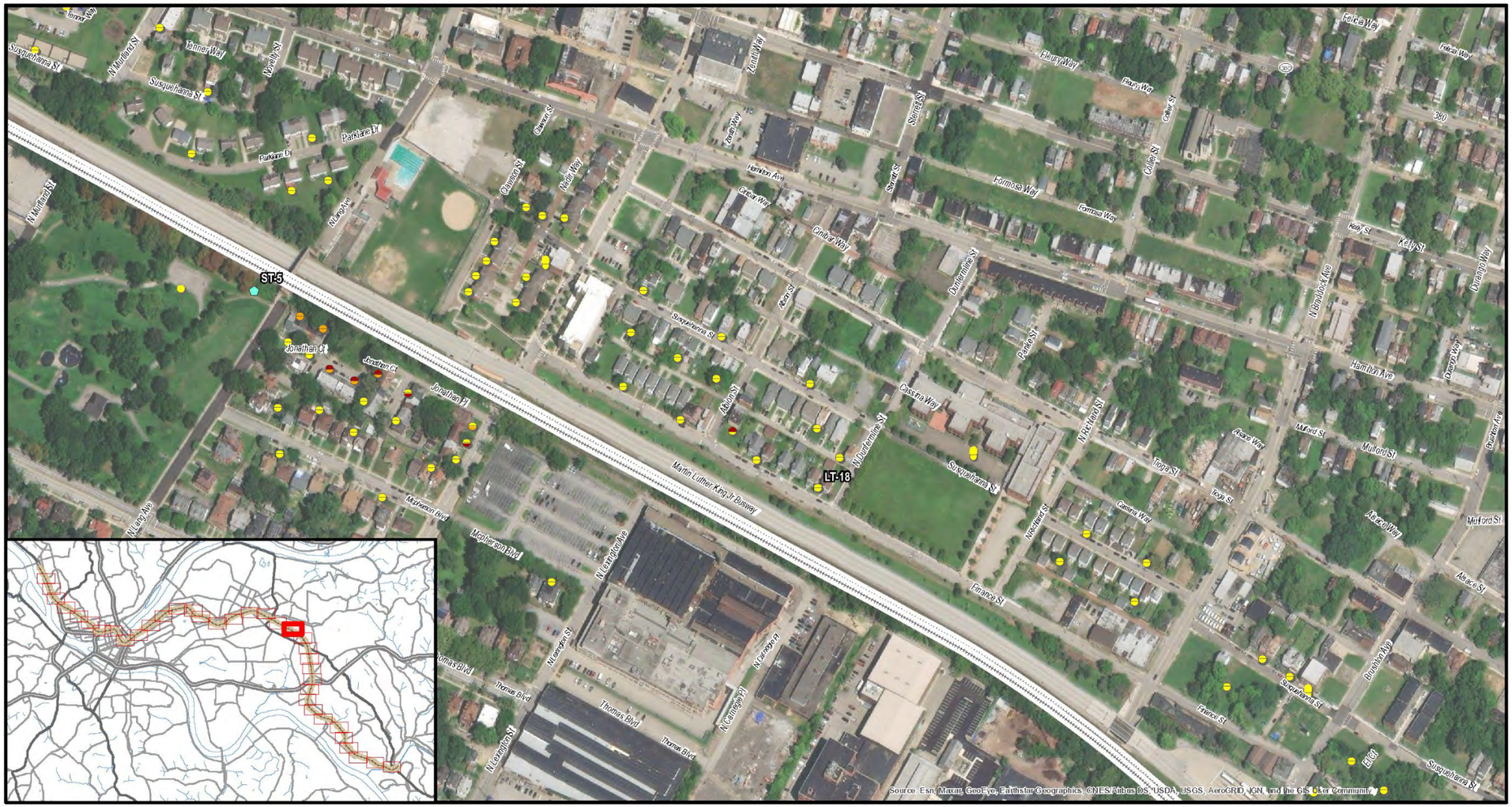
Figure 26. Low-Growth Scenario Noise and Vibration Assessment Map 21



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building*

0 100 200 400 Feet

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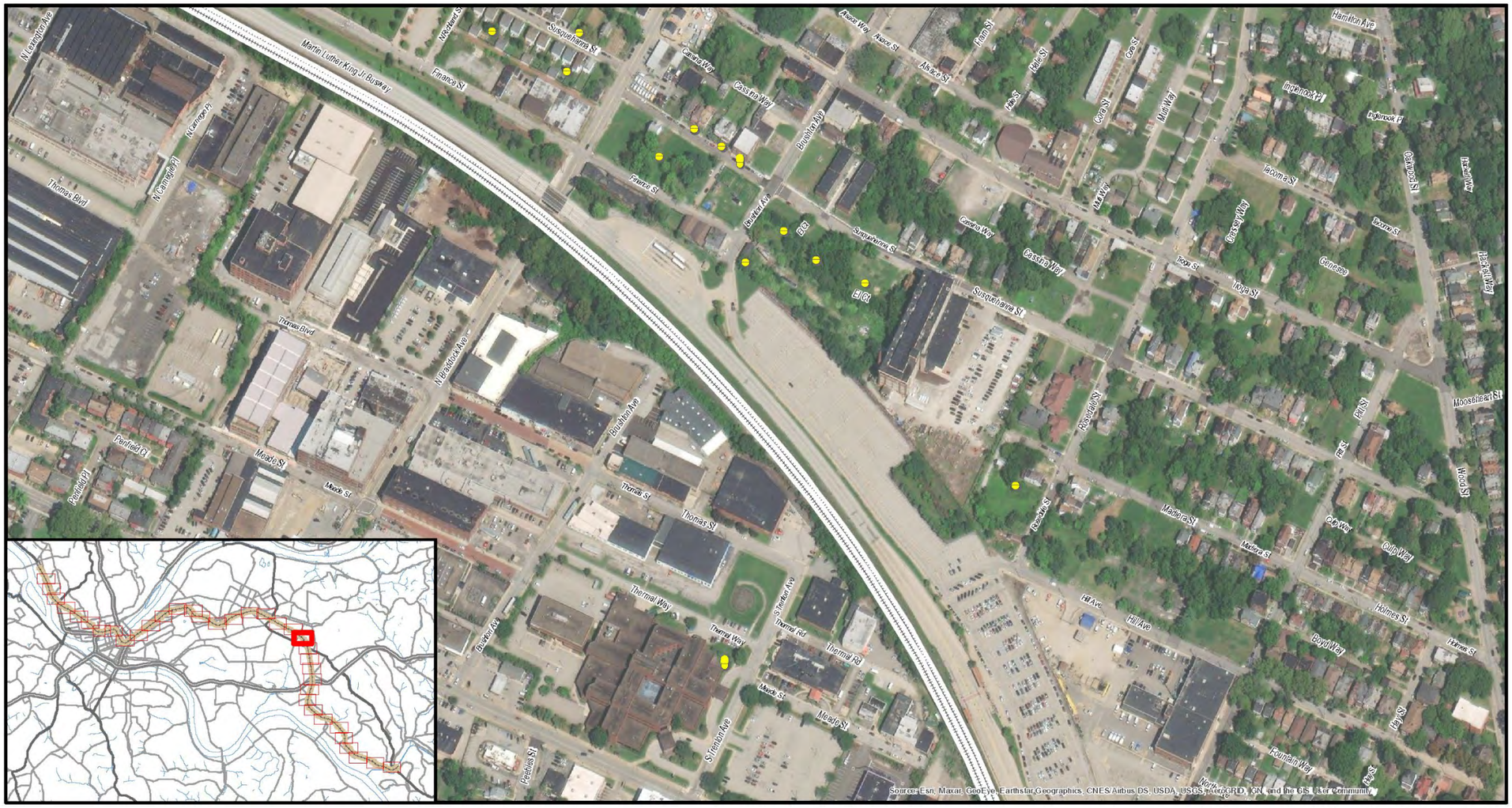
Figure 27. Low-Growth Scenario Noise and Vibration Assessment Map 22



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

Feet
0 100 200 400

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

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Figure 28. Low-Growth Scenario Noise and Vibration Assessment Map 23

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Figure 29. Low-Growth Scenario Noise and Vibration Assessment Map 24

Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
Dual colors = 2 Story Building
Triple colors = Multiple Story Building

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Figure 30. Low-Growth Scenario Noise and Vibration Assessment Map 25

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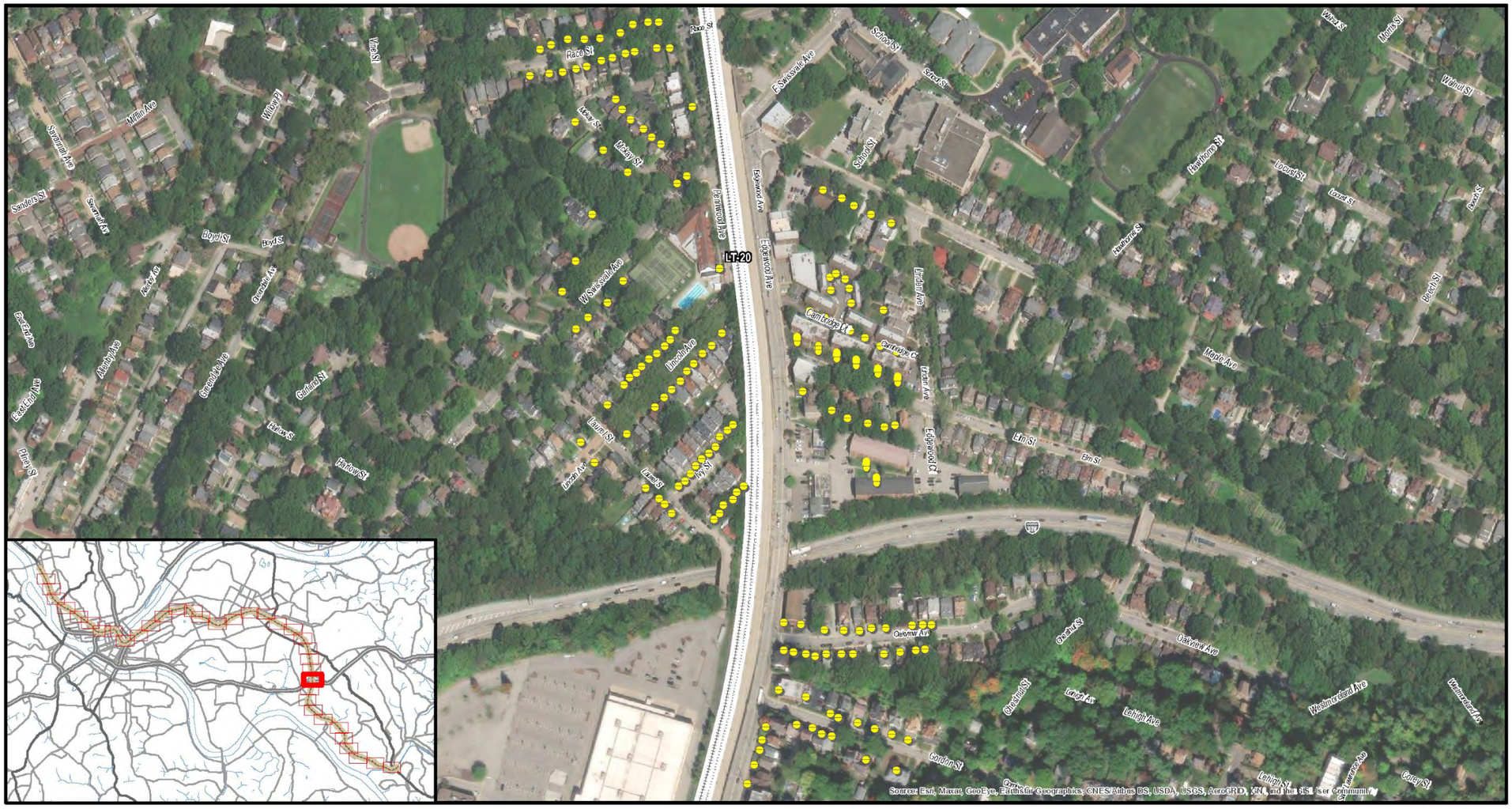
Figure 31. Low-Growth Scenario Noise and Vibration Assessment Map 26



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
*Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building*

0 100 200 400 Feet

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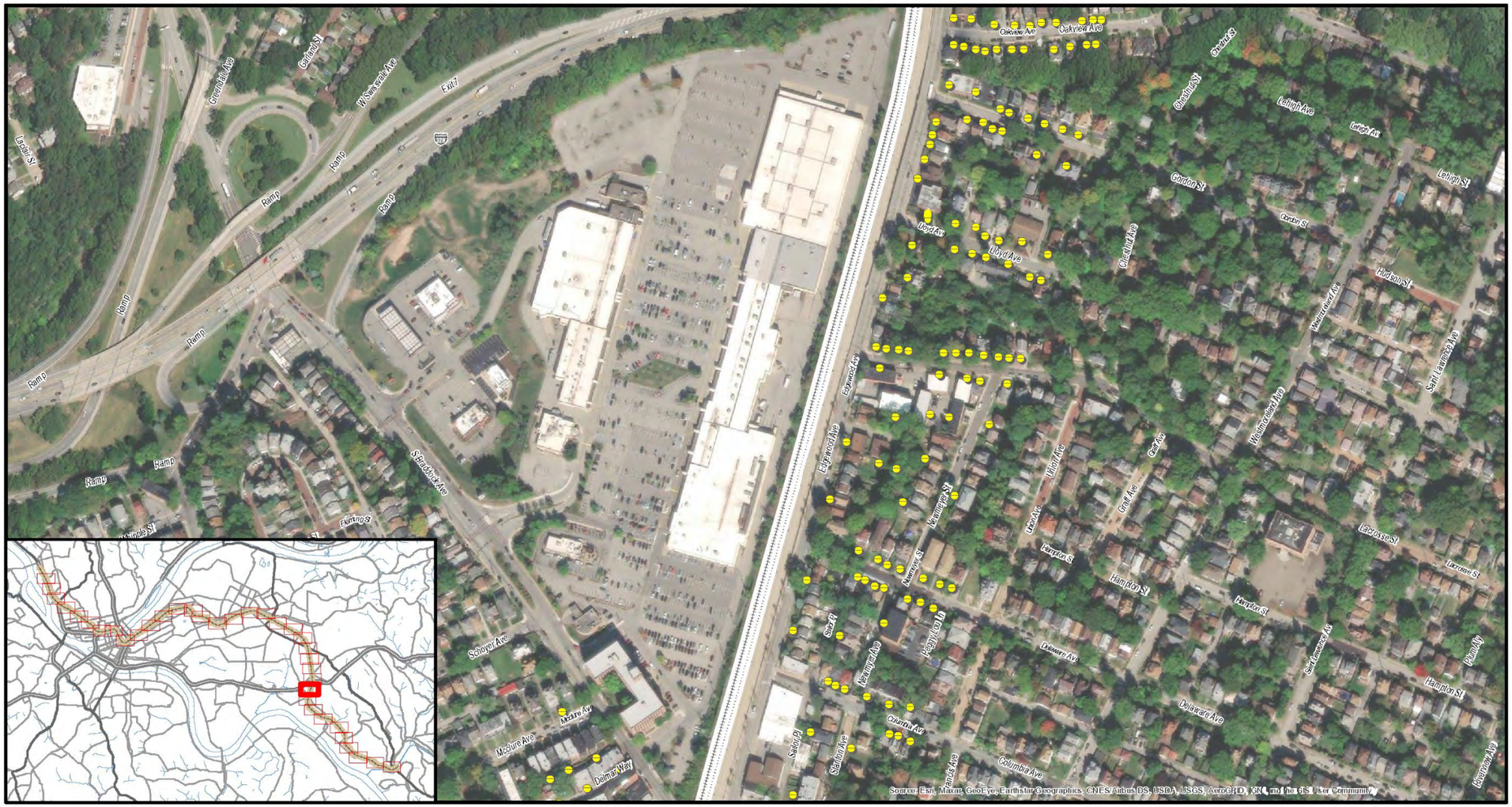
Figure 32. Low-Growth Scenario Noise and Vibration Assessment Map 27



- Long-Term Noise Measurement
- Long-Term Nosie and Short-Term Vibration Measurement
- Short-Term Noise Measurement
- Short-Term Noise and Vibration Measurement
- Short-Term Vibration Measurement

0 100 200 400 Feet

- Existing Rail
- Would not Exceed STB Threshold(s)with or without the Projects
- Would Exceed STB Threshold(s) with or without Projects
- Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result

* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building*

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Figure 33. Low-Growth Scenario Noise and Vibration Assessment Map 28

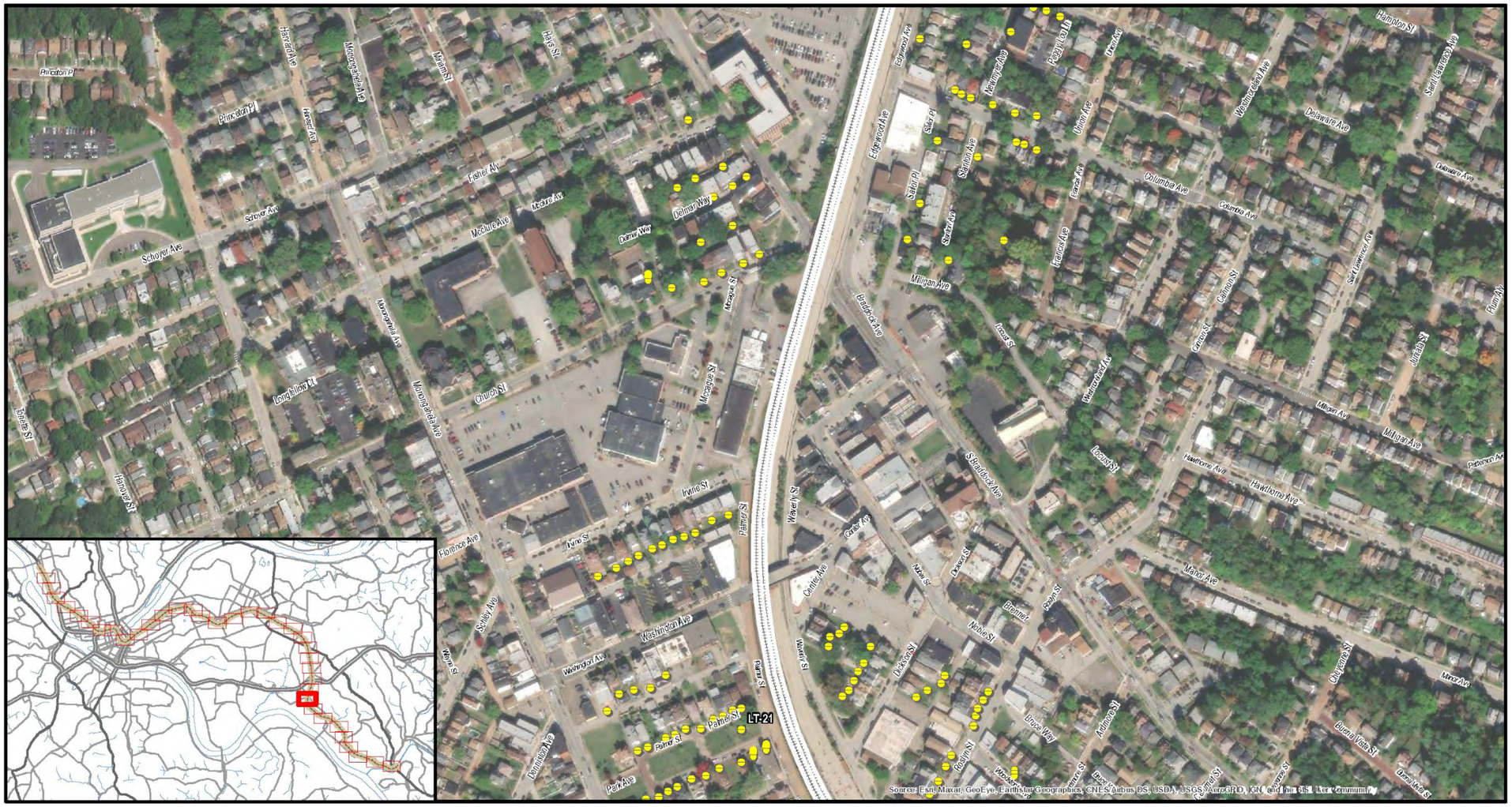

Figure 34. Low-Growth Scenario Noise and Vibration Assessment Map 29

Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result

* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

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Figure 35. Low-Growth Scenario Noise and Vibration Assessment Map 30

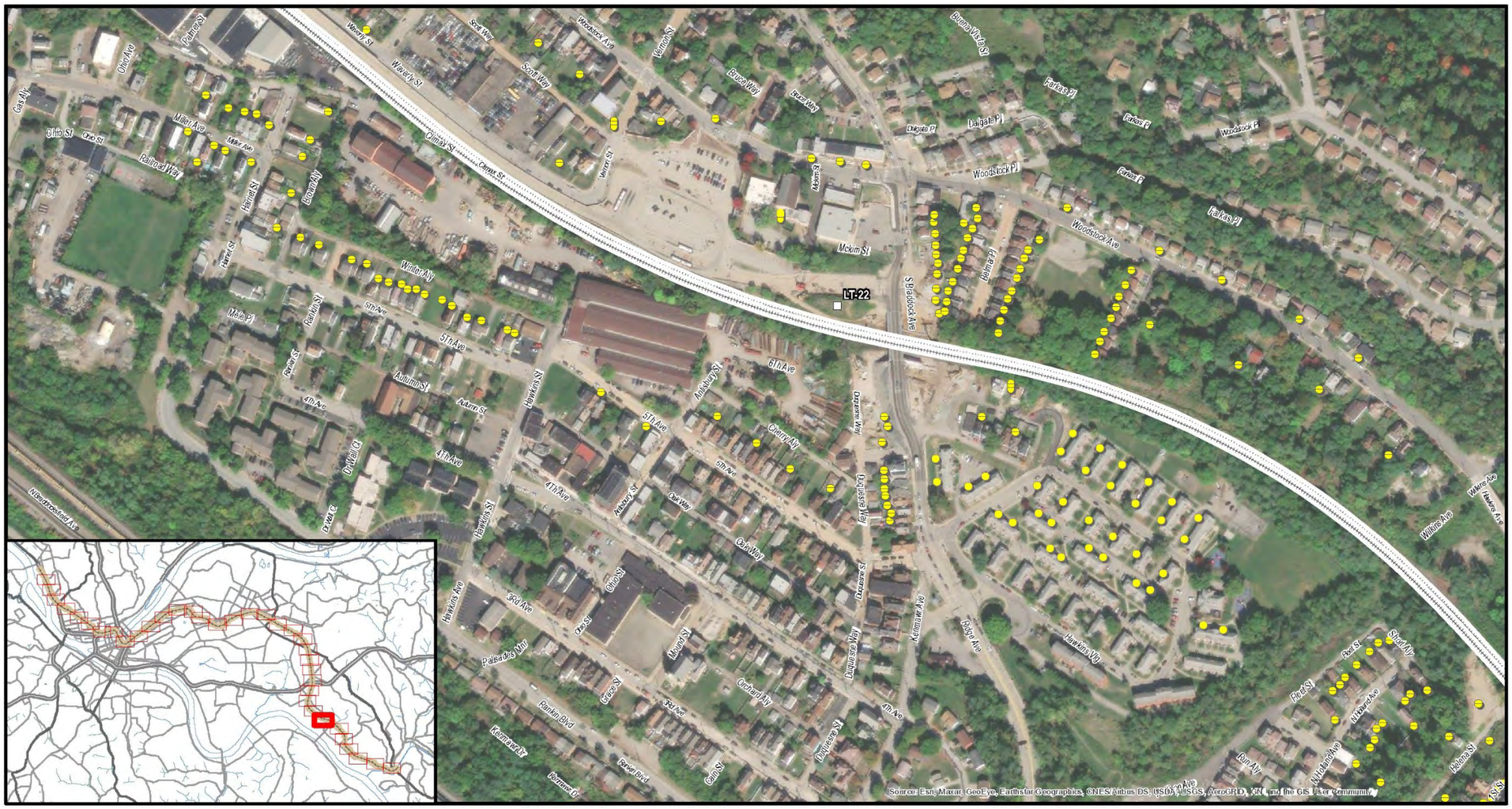

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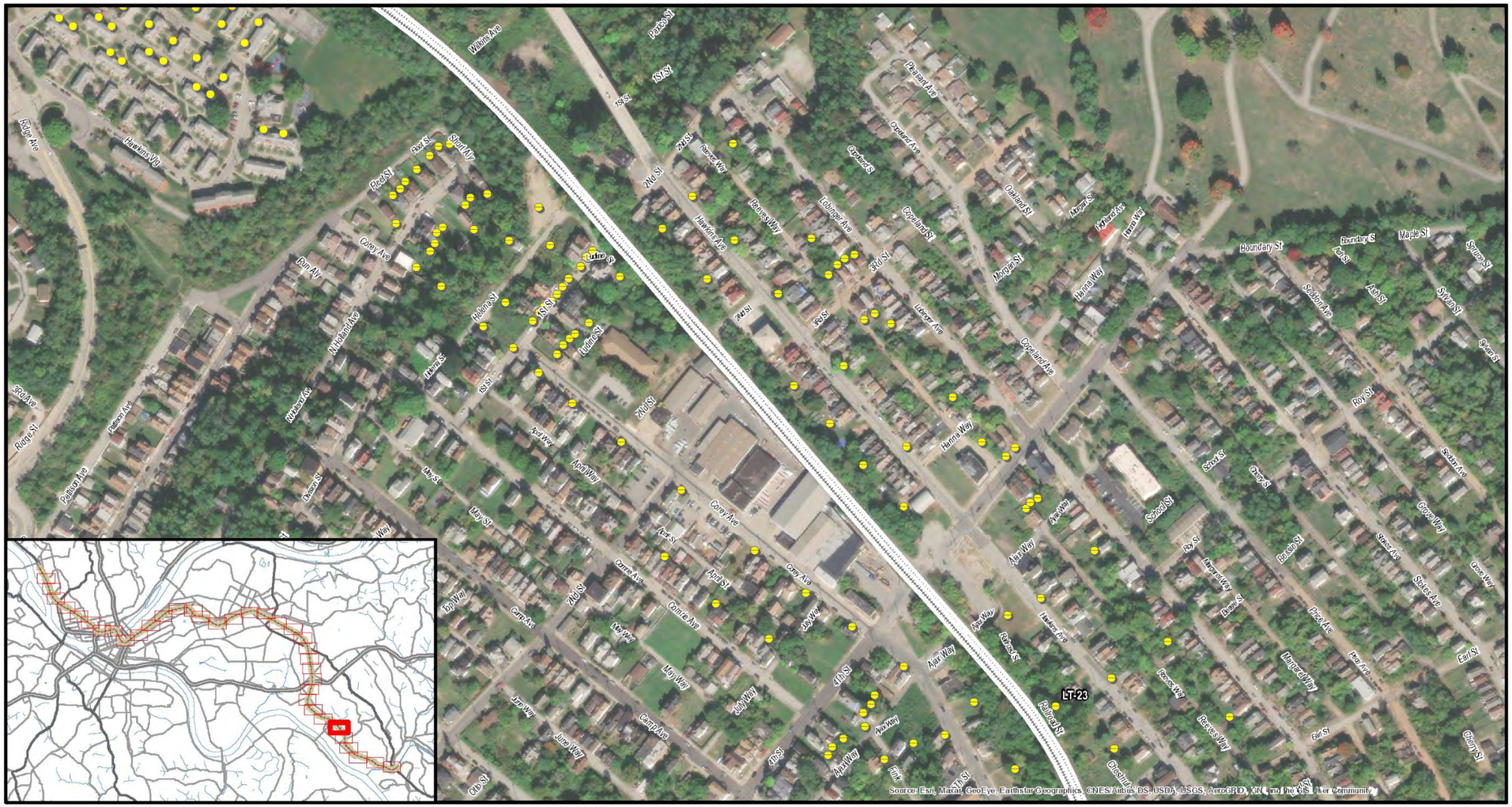
Figure 36. Low-Growth Scenario Noise and Vibration Assessment Map 31



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building*

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Figure 37. Low-Growth Scenario Noise and Vibration Assessment Map 32

Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

0 100 200 400 Feet

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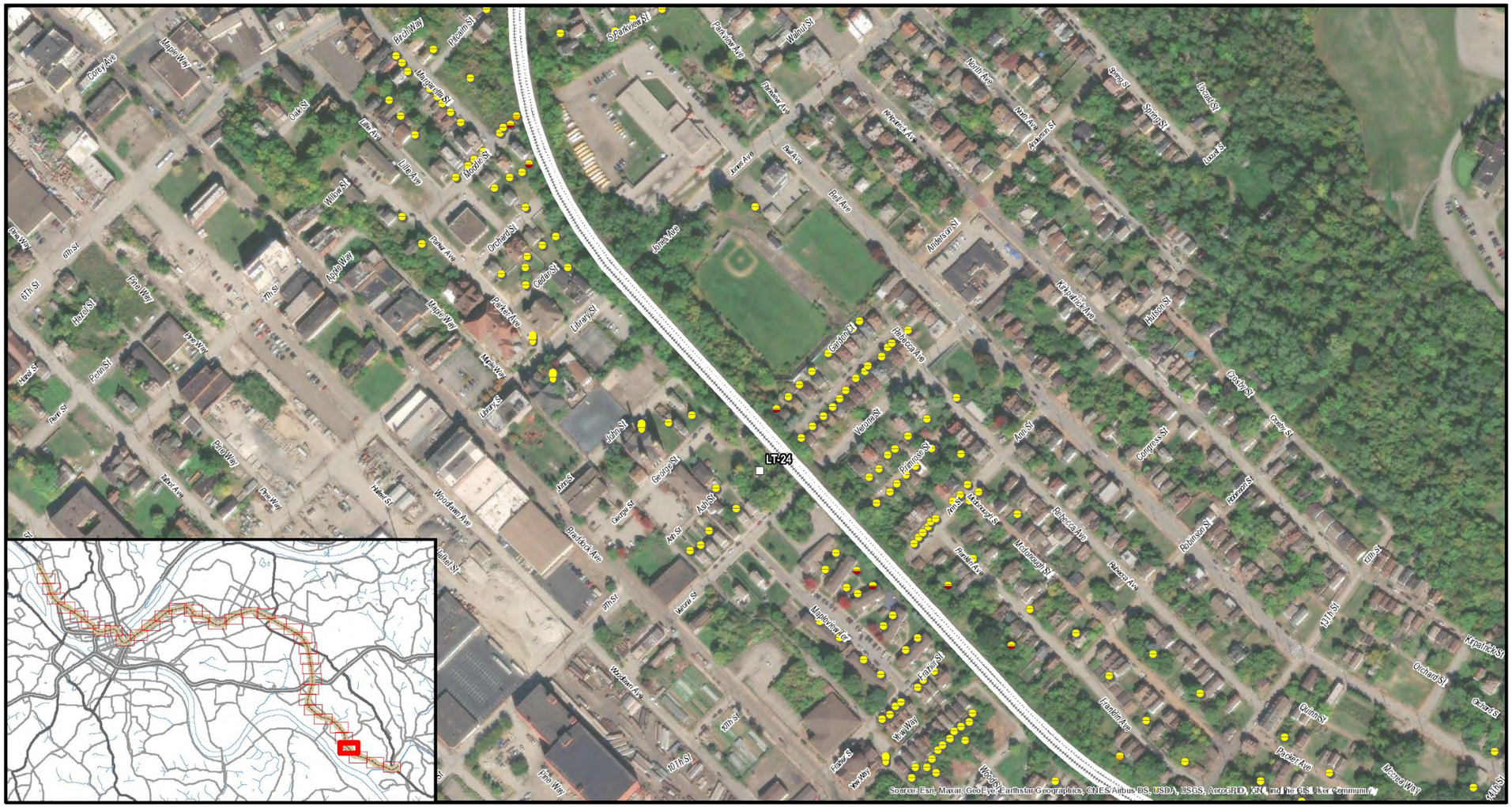
Figure 38. Low-Growth Scenario Noise and Vibration Assessment Map 33



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

Feet
0 100 200 400

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

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Figure 39. Low-Growth Scenario Noise and Vibration Assessment Map 34

Figure 40. Low-Growth Scenario Noise and Vibration Assessment Map 35

- Long-Term Noise Measurement
- Long-Term Nosie and Short-Term Vibration Measurement
- Short-Term Noise Measurement
- Short-Term Noise and Vibration Measurement
- Short-Term Vibration Measurement

0 100 200 400 Feet

- Existing Rail
- Would not Exceed STB Threshold(s)with or without the Projects
- Would Exceed STB Threshold(s) with or without Projects
- Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result

* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

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Figure 41. Low-Growth Scenario Noise and Vibration Assessment Map 36

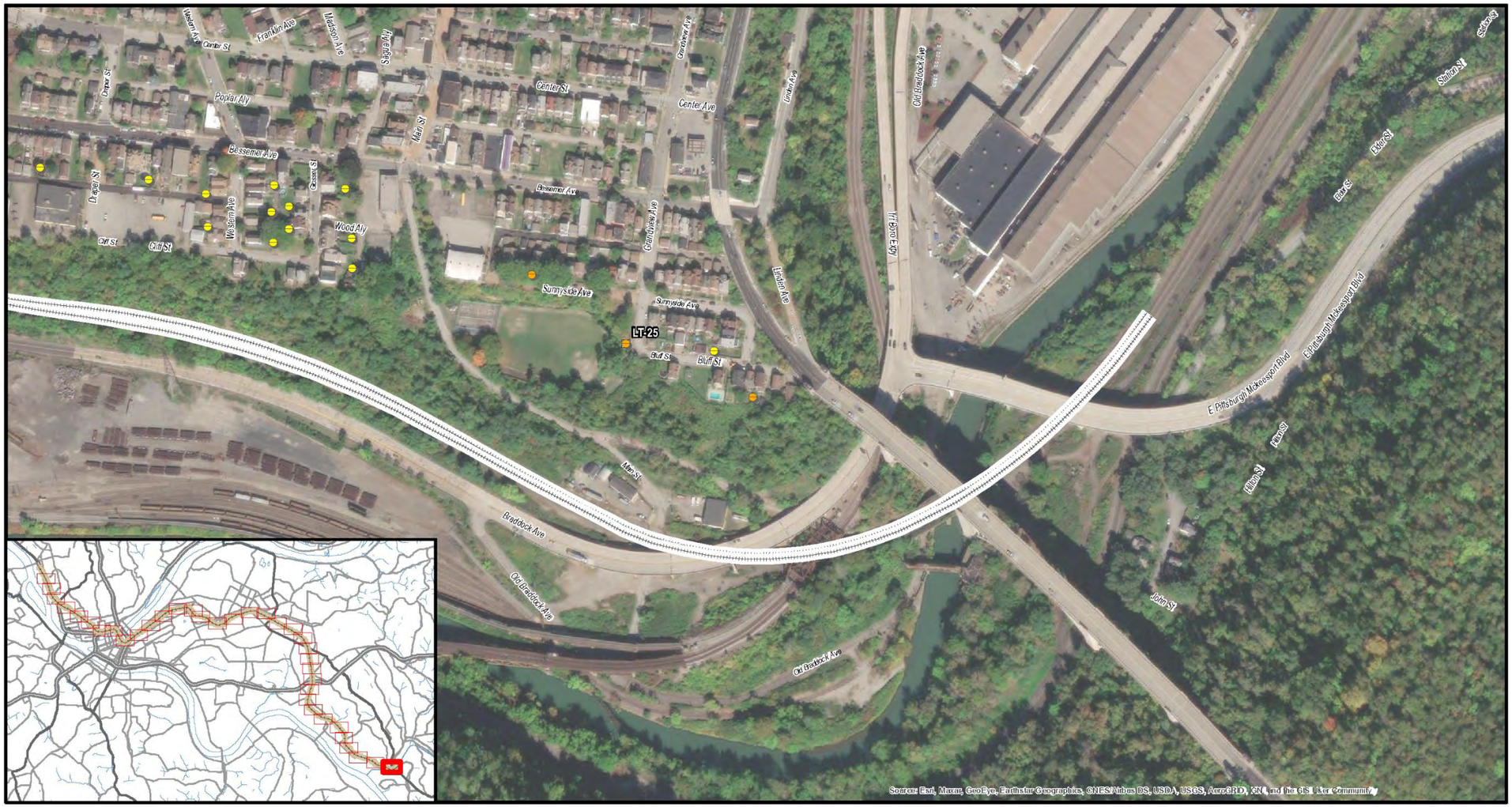

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Figure 42. High-Growth Scenario Noise and Vibration Assessment Map 1

Figure 43. High-Growth Scenario Noise and Vibration Assessment Map 2

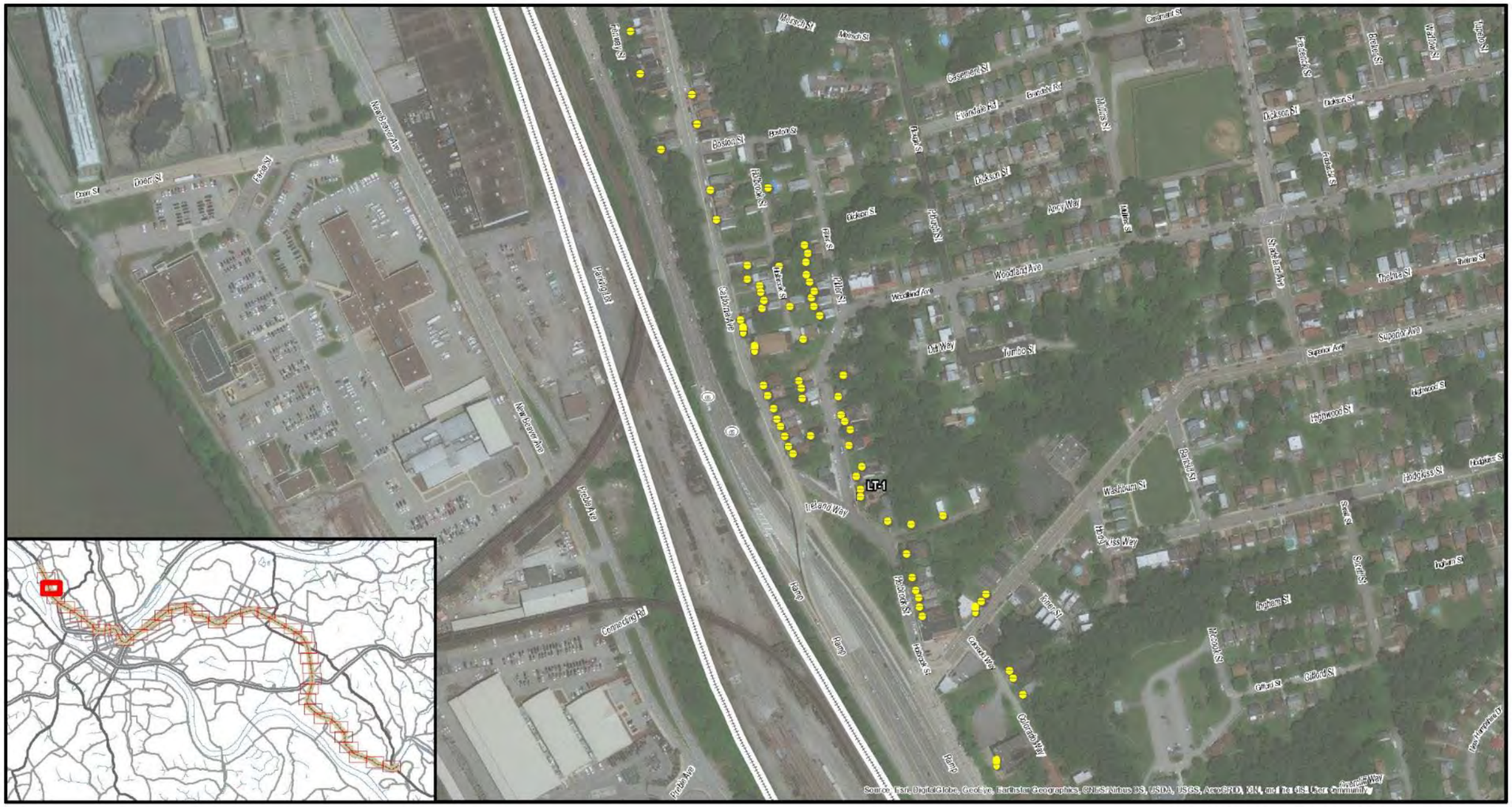

Figure 44. High-Growth Scenario Noise and Vibration Assessment Map 3

Figure 45. High-Growth Scenario Noise and Vibration Assessment Map 4

Figure 46. High-Growth Scenario Noise and Vibration Assessment Map 5

Figure 47. High-Growth Scenario Noise and Vibration Assessment Map 6

Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building *
* Triple colors = Multiple Story Building *

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Figure 48. High-Growth Scenario Noise and Vibration Assessment Map 7

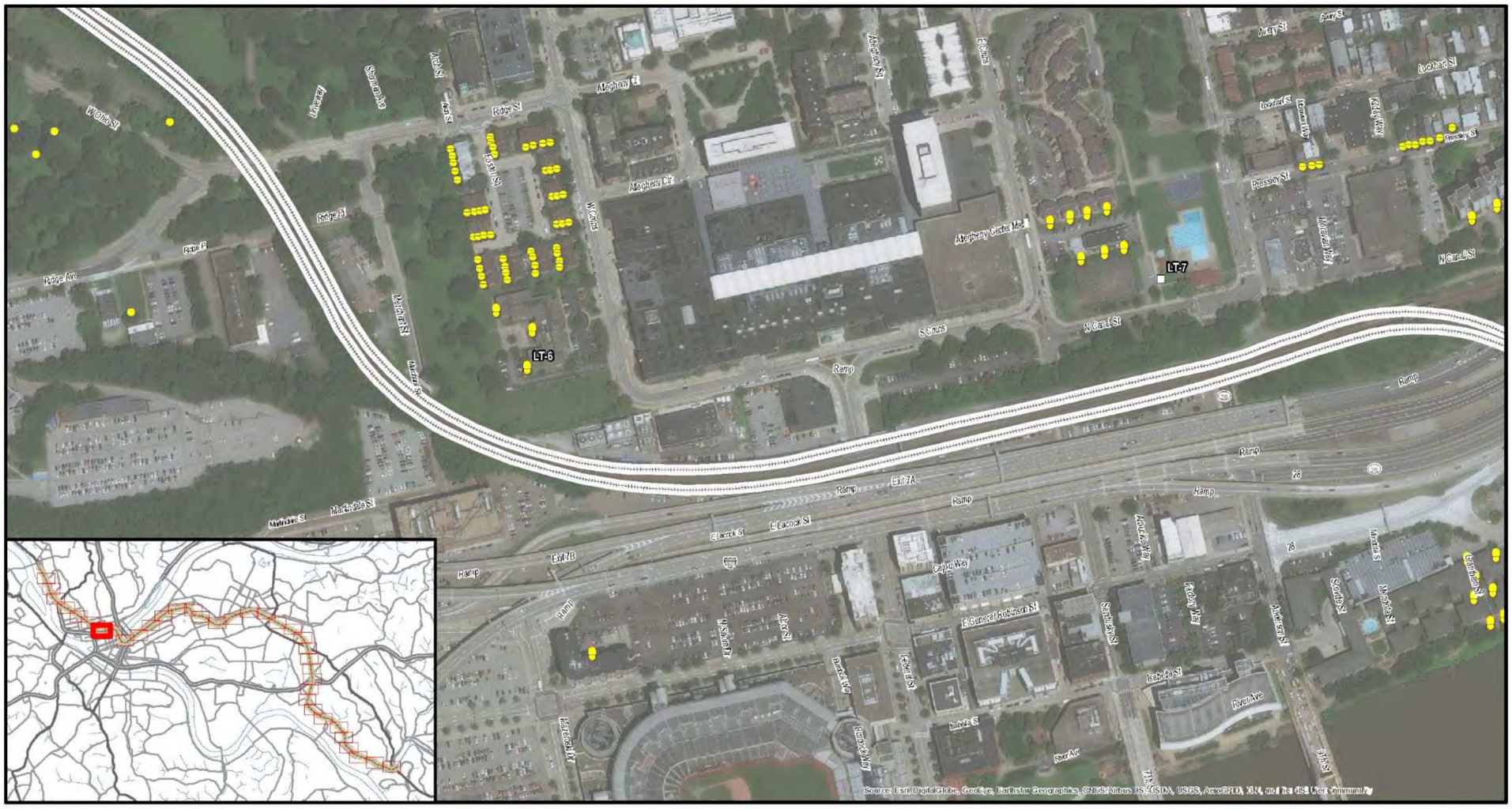

Figure 49. High-Growth Scenario Noise and Vibration Assessment Map 8

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Figure 50. High-Growth Scenario Noise and Vibration Assessment Map 9

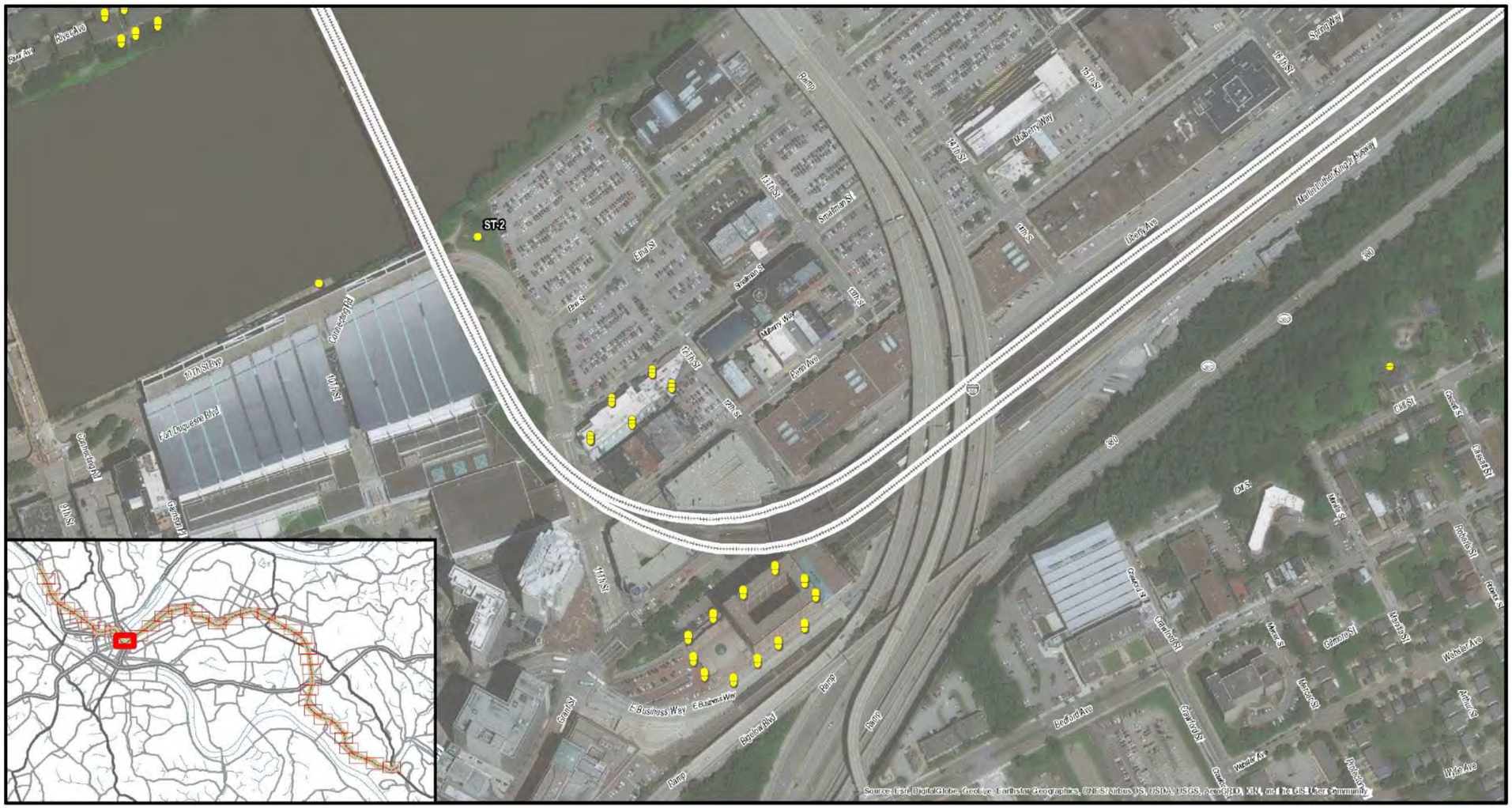
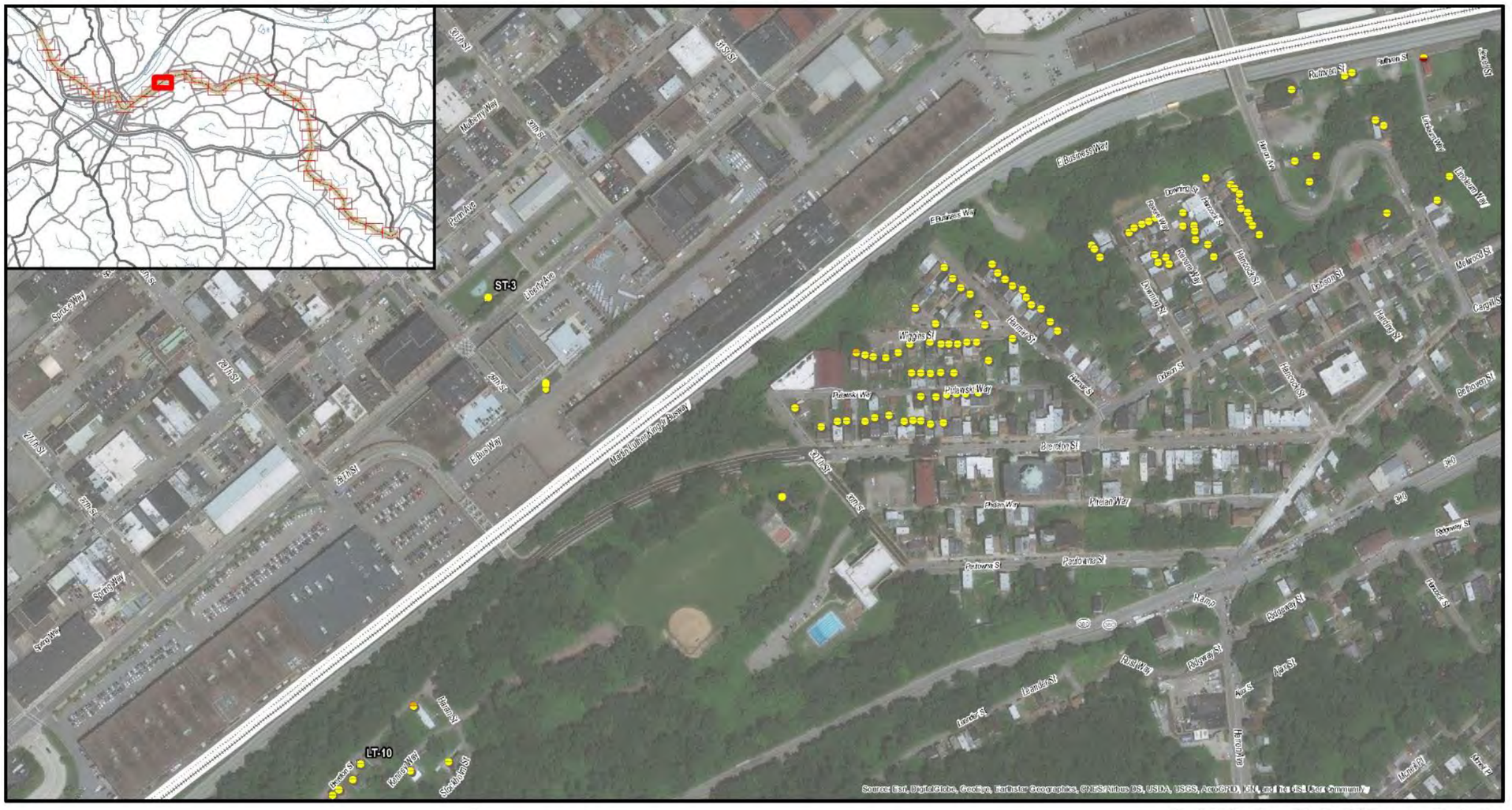


Figure 51. High-Growth Scenario Noise and Vibration Assessment Map 10

Figure 52. High-Growth Scenario Noise and Vibration Assessment Map 11

Figure 53. High-Growth Scenario Noise and Vibration Assessment Map 12



- Long-Term Noise Measurement
- Long-Term Noise and Short-Term Vibration Measurement
- Short-Term Noise Measurement
- Short-Term Noise and Vibration Measurement
- Short-Term Vibration Measurement

0 100 200 400 Feet

- Existing Rail
- Would not Exceed STB Threshold(s)with or without the Projects
- Would Exceed STB Threshold(s) with or without Projects
- Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result

* Dual colors = 2 Story Building*
* Triple colors = Multiple Story Building*

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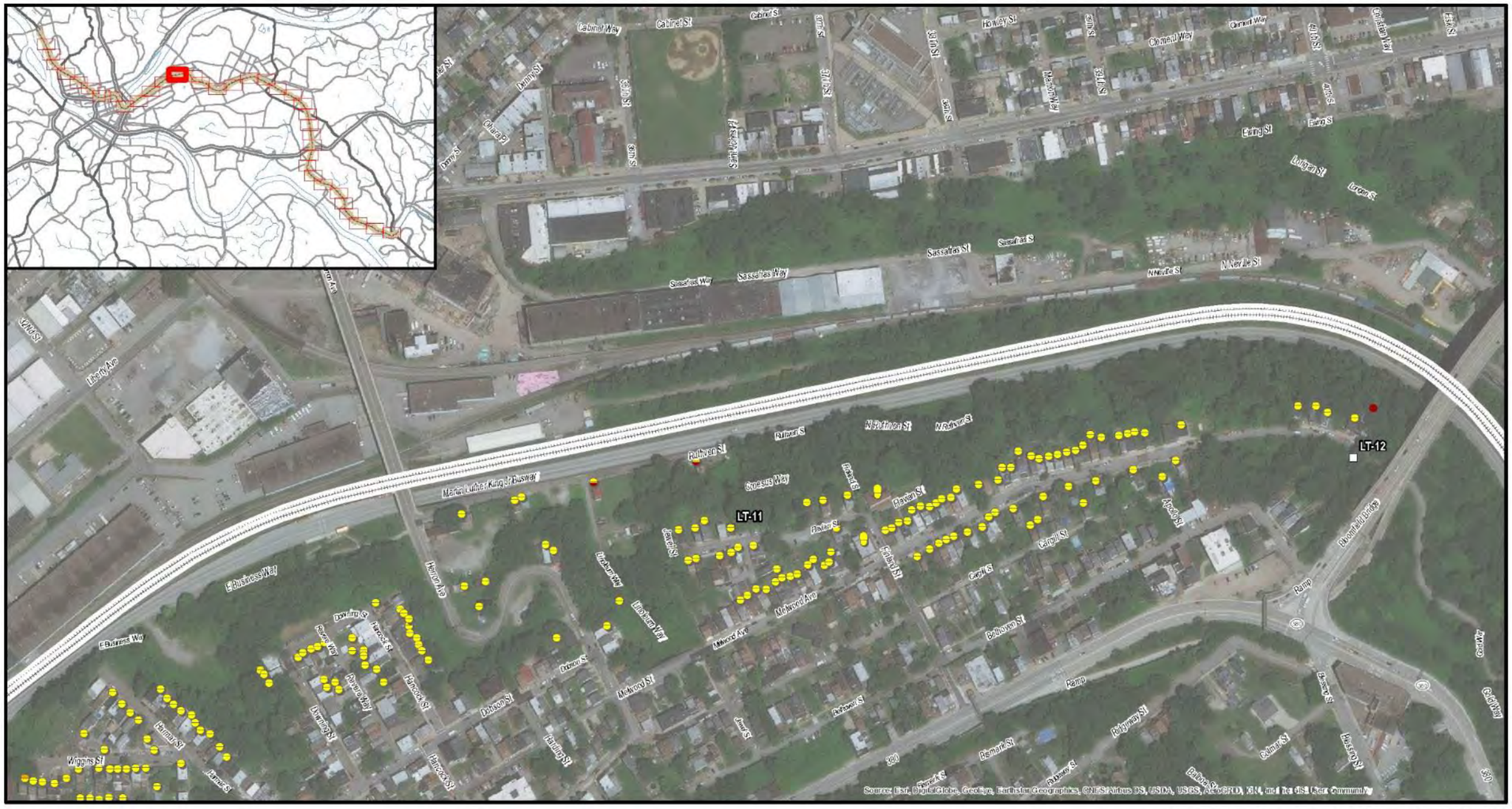
Figure 54. High-Growth Scenario Noise and Vibration Assessment Map 13



Long-Term Noise Measurement
Long-Term Noise and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building*
* Triple colors = Multiple Story Building*

0 100 200 400 Feet

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Figure 55. High-Growth Scenario Noise and Vibration Assessment Map 14

Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building*
* Triple colors = Multiple Story Building*

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Figure 56. High-Growth Scenario Noise and Vibration Assessment Map 15

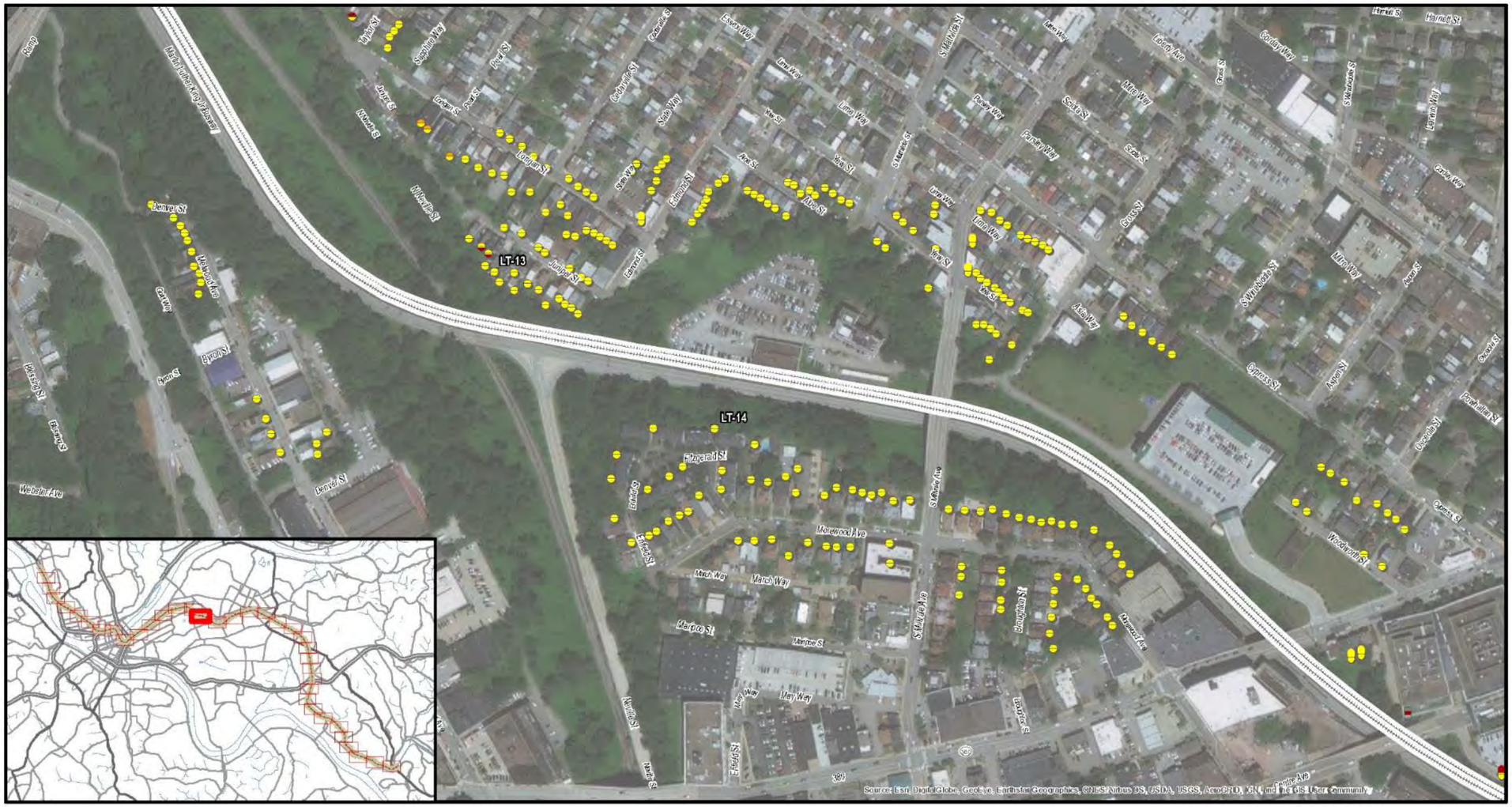

Figure 57. High-Growth Scenario Noise and Vibration Assessment Map 16

Figure 58. High-Growth Scenario Noise and Vibration Assessment Map 17

Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building*
* Triple colors = Multiple Story Building*

0 100 200 400 Feet

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Figure 59. High-Growth Scenario Noise and Vibration Assessment Map 18

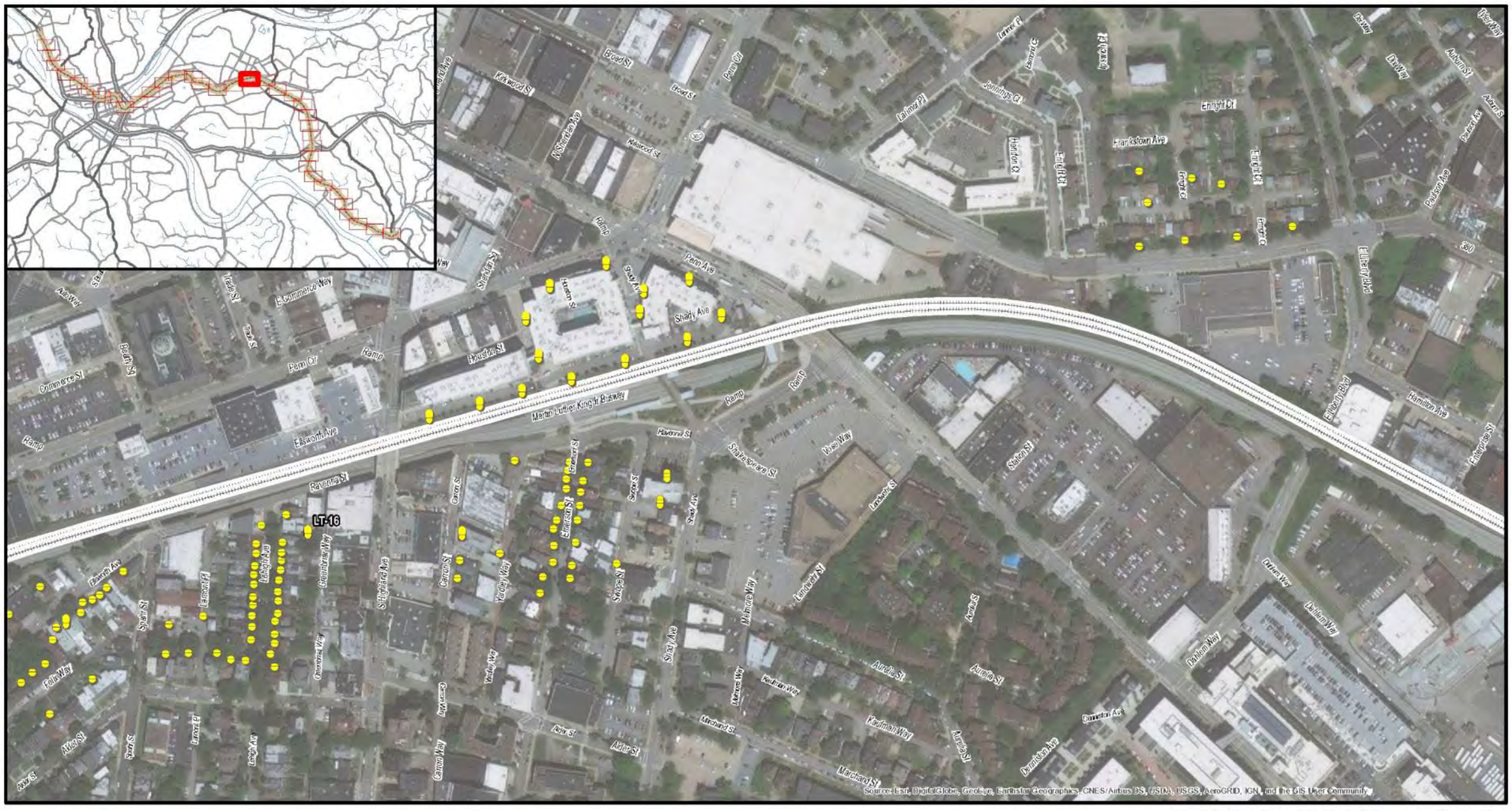

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Figure 60. High-Growth Scenario Noise and Vibration Assessment Map 19

Figure 61. High-Growth Scenario Noise and Vibration Assessment Map 20

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Figure 62. High-Growth Scenario Noise and Vibration Assessment Map 21

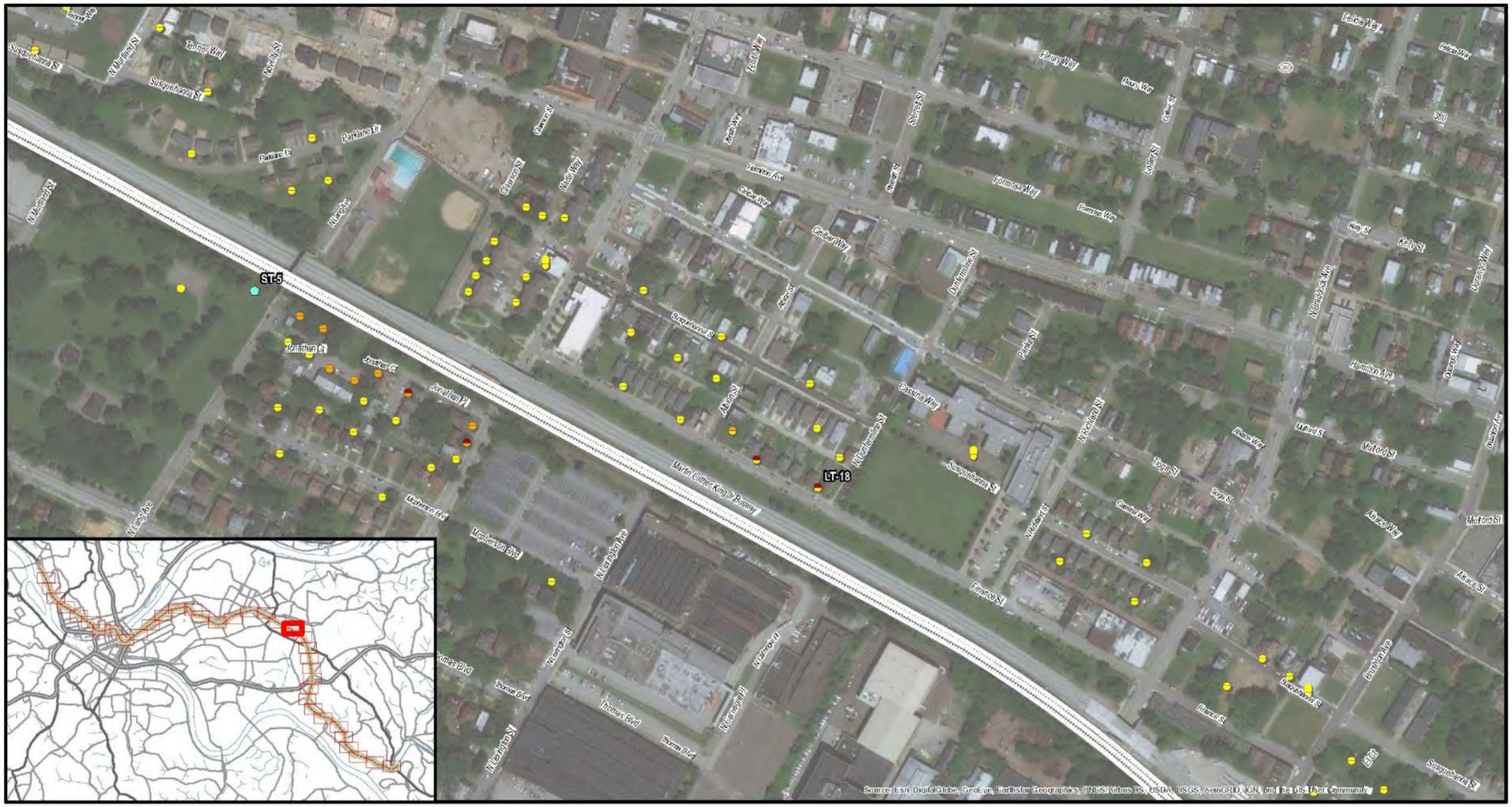

Figure 63. High-Growth Scenario Noise and Vibration Assessment Map 22

Figure 64. High-Growth Scenario Noise and Vibration Assessment Map 23

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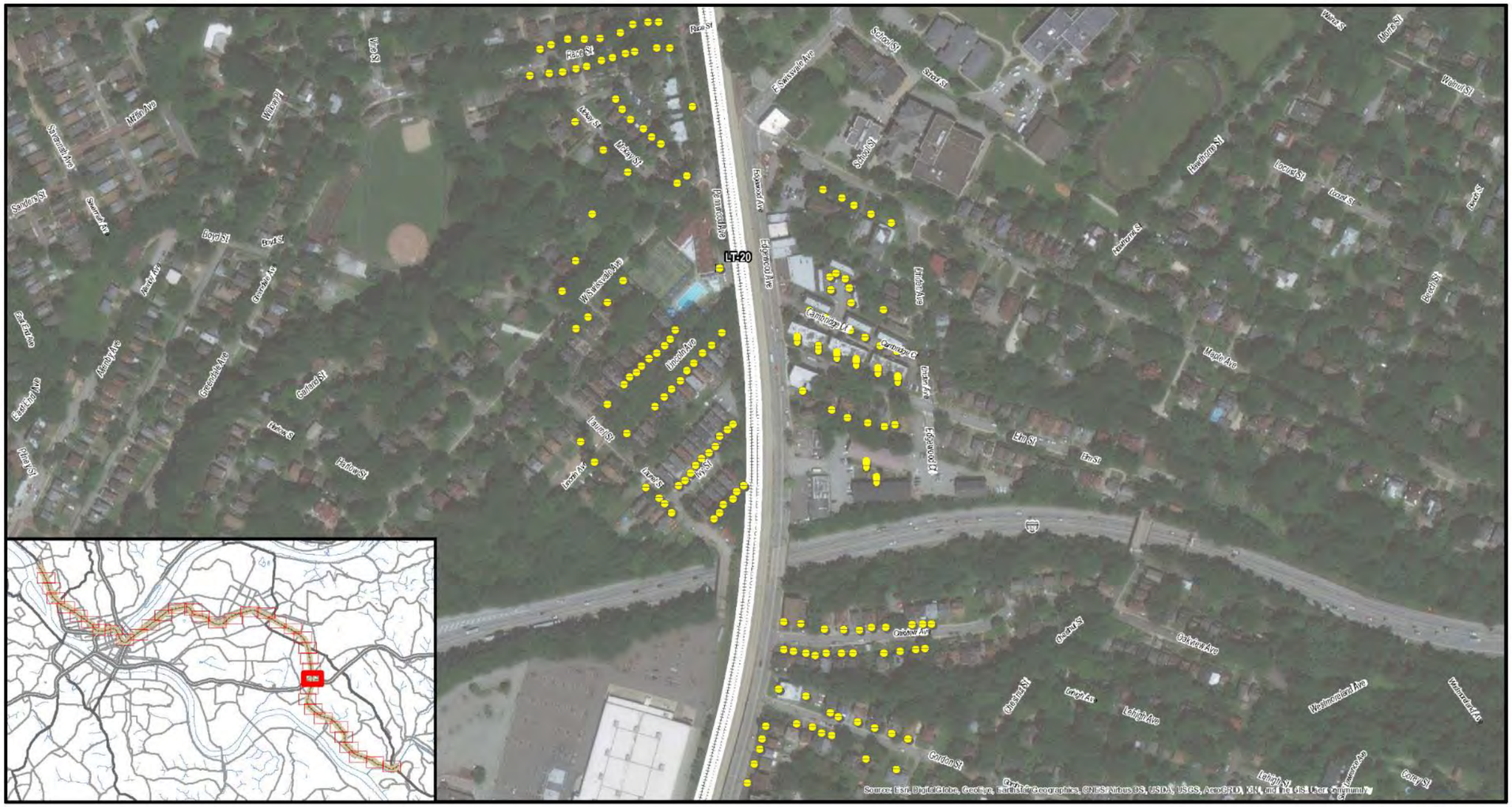
Figure 65. High-Growth Scenario Noise and Vibration Assessment Map 24

Figure 66. High-Growth Scenario Noise and Vibration Assessment Map 25

Figure 67. High-Growth Scenario Noise and Vibration Assessment Map 26



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building*
* Triple colors = Multiple Story Building*

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Figure 68. High-Growth Scenario Noise and Vibration Assessment Map 27

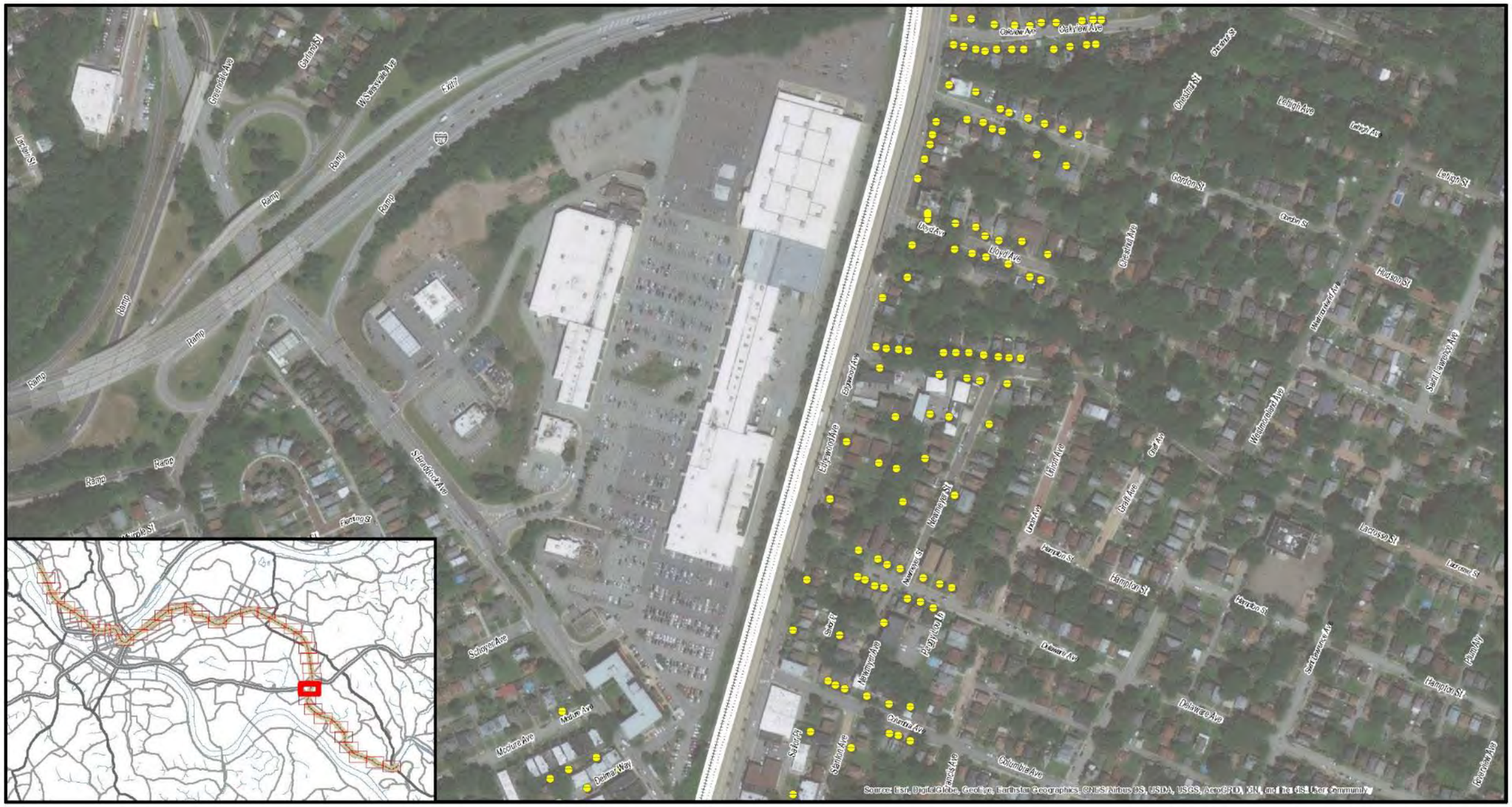

Figure 69. High-Growth Scenario Noise and Vibration Assessment Map 28

Figure 70. High-Growth Scenario Noise and Vibration Assessment Map 29

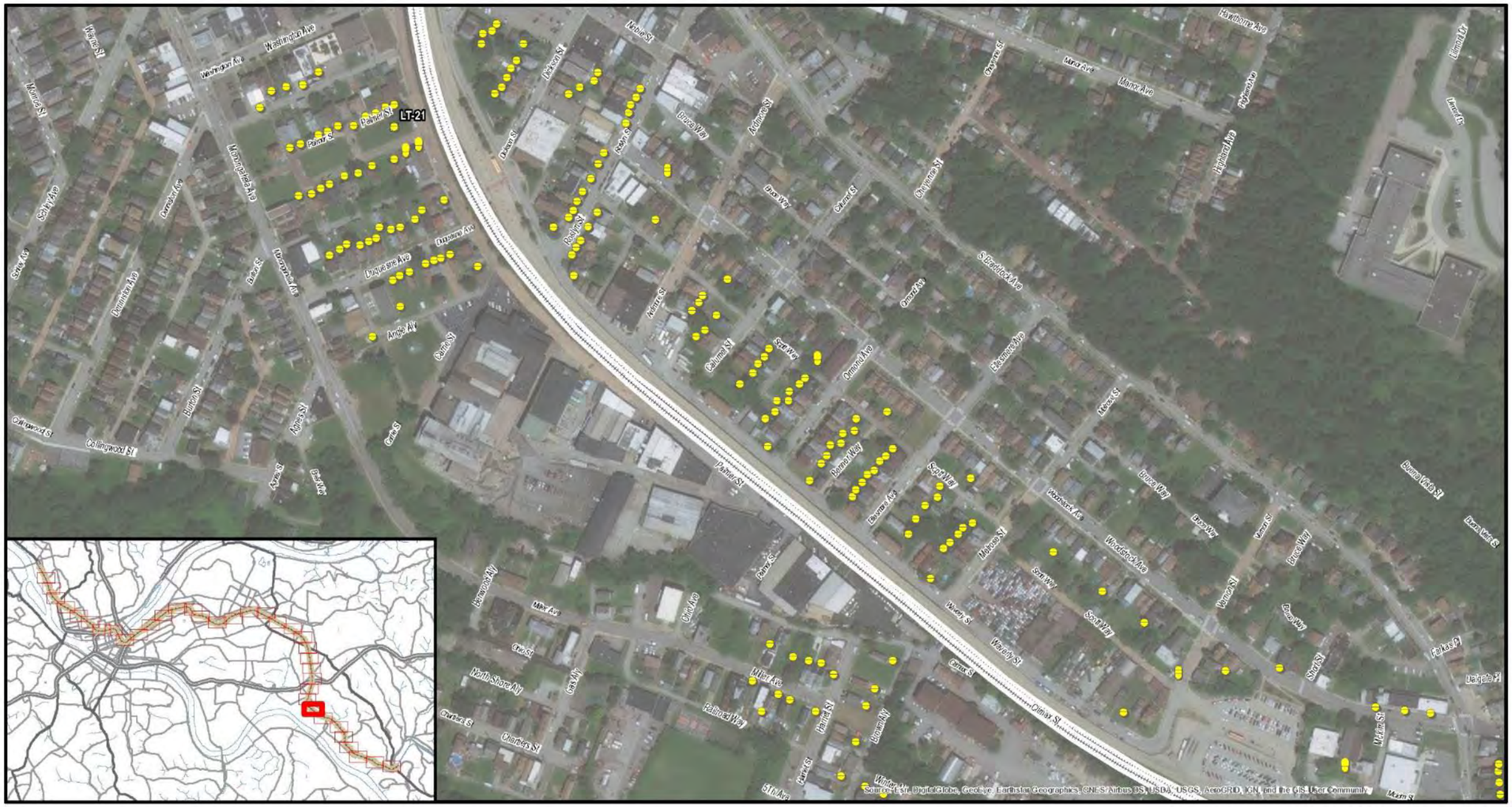

Figure 71. High-Growth Scenario Noise and Vibration Assessment Map 30

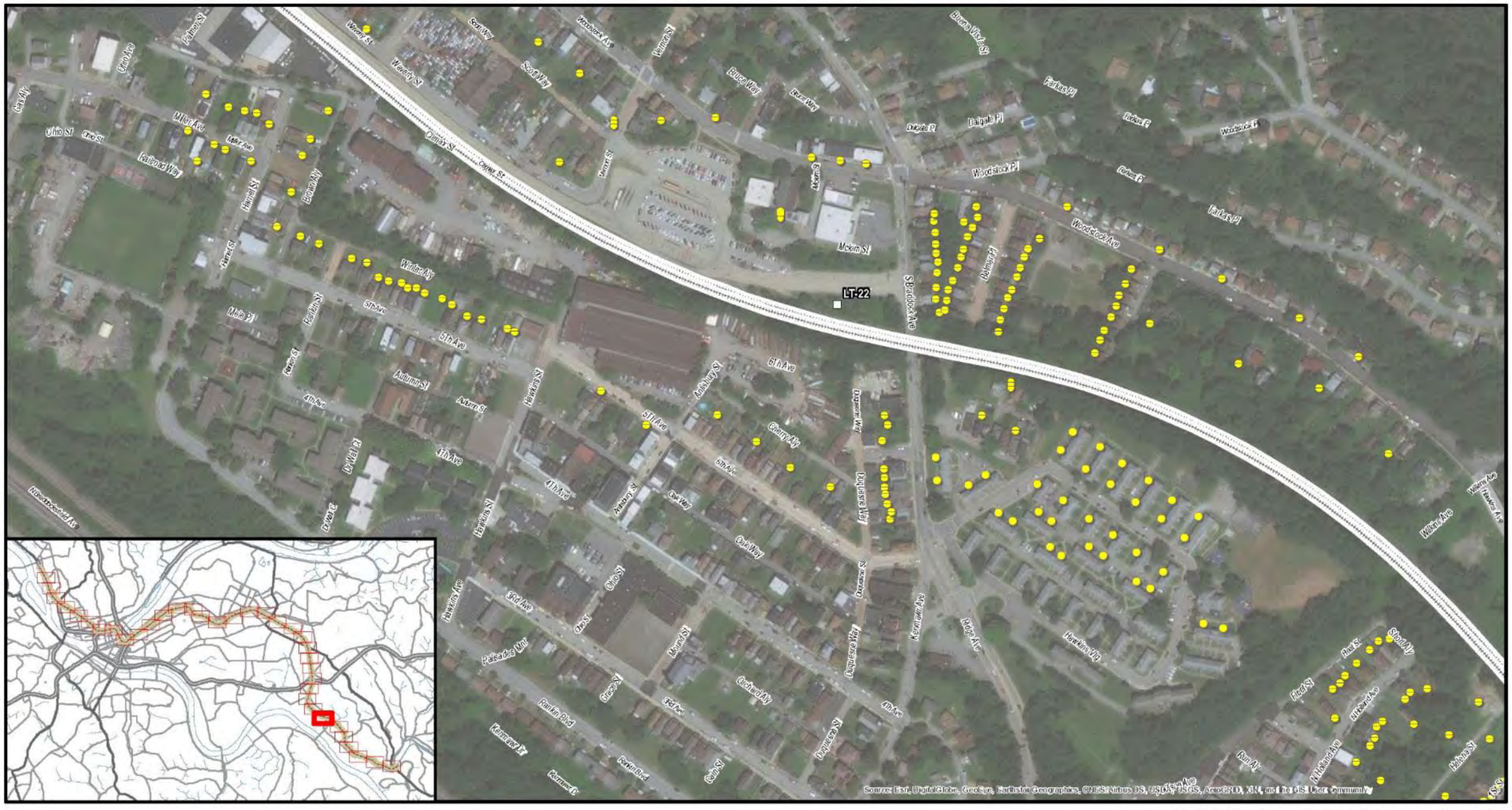

Figure 72. High-Growth Scenario Noise and Vibration Assessment Map 31

Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

0 100 200 400 Feet

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building*
* Triple colors = Multiple Story Building*

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Figure 73. High-Growth Scenario Noise and Vibration Assessment Map 32

Figure 74. High-Growth Scenario Noise and Vibration Assessment Map 33

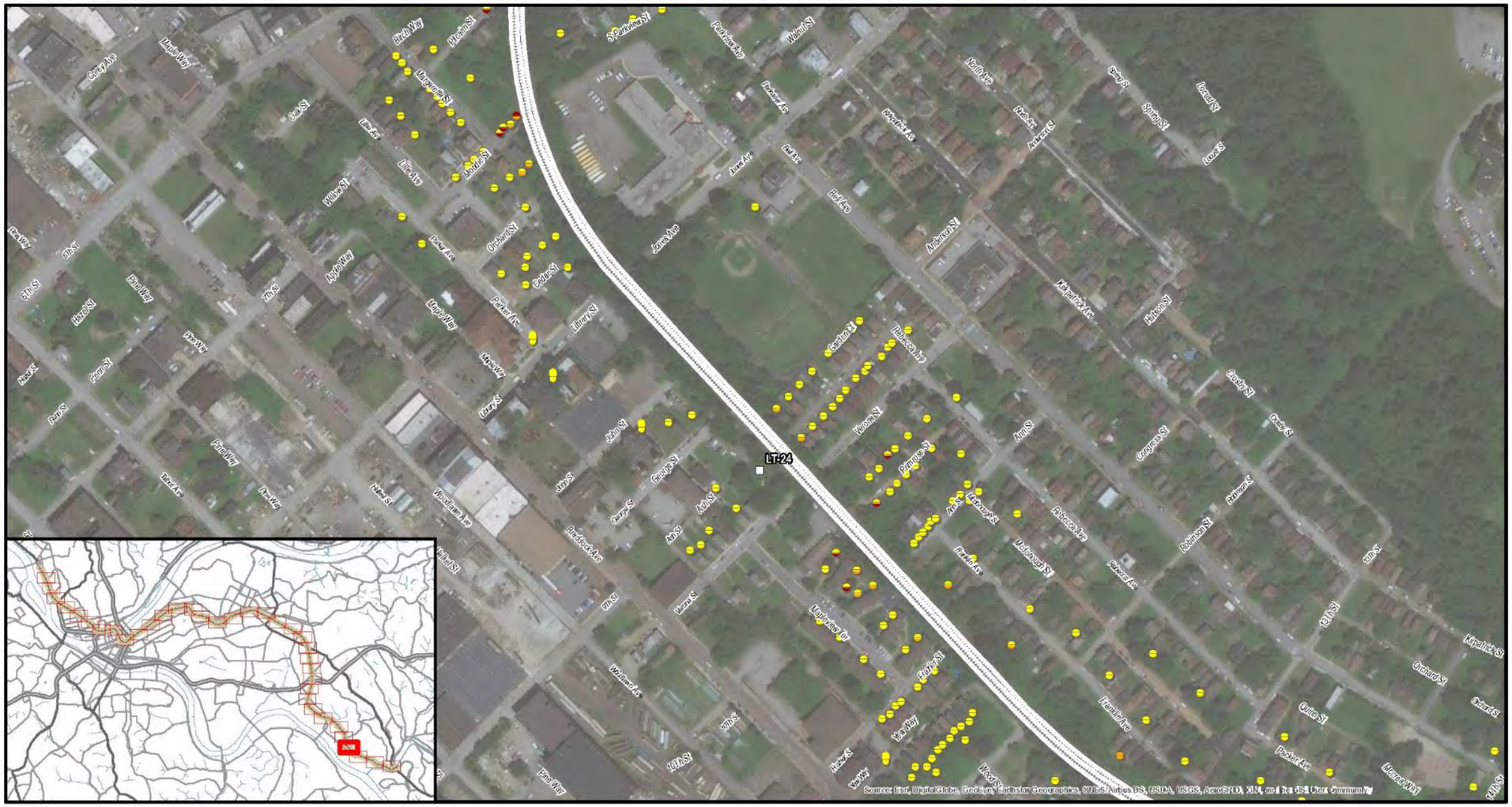

Figure 75. High-Growth Scenario Noise and Vibration Assessment Map 34

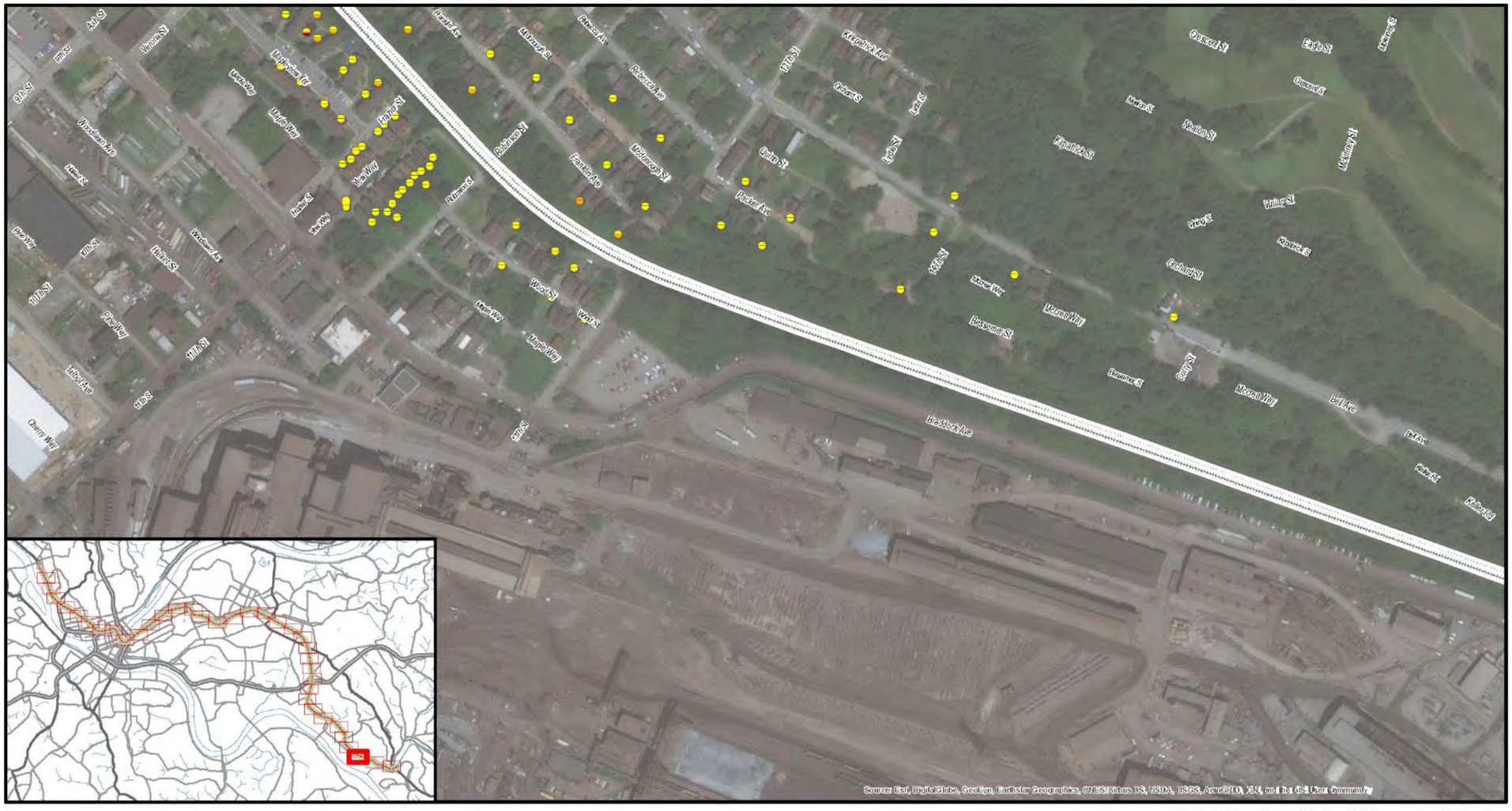

Figure 76. High-Growth Scenario Noise and Vibration Assessment Map 35

- Long-Term Noise Measurement
- Long-Term Nosie and Short-Term Vibration Measurement
- Short-Term Noise Measurement
- Short-Term Noise and Vibration Measurement
- Short-Term Vibration Measurement

Feet
0 100 200 400

- Existing Rail
- Would not Exceed STB Threshold(s)with or without the Projects
- Would Exceed STB Threshold(s) with or without Projects
- Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result

* Dual colors = 2 Story Building*
* Triple colors = Multiple Story Building*

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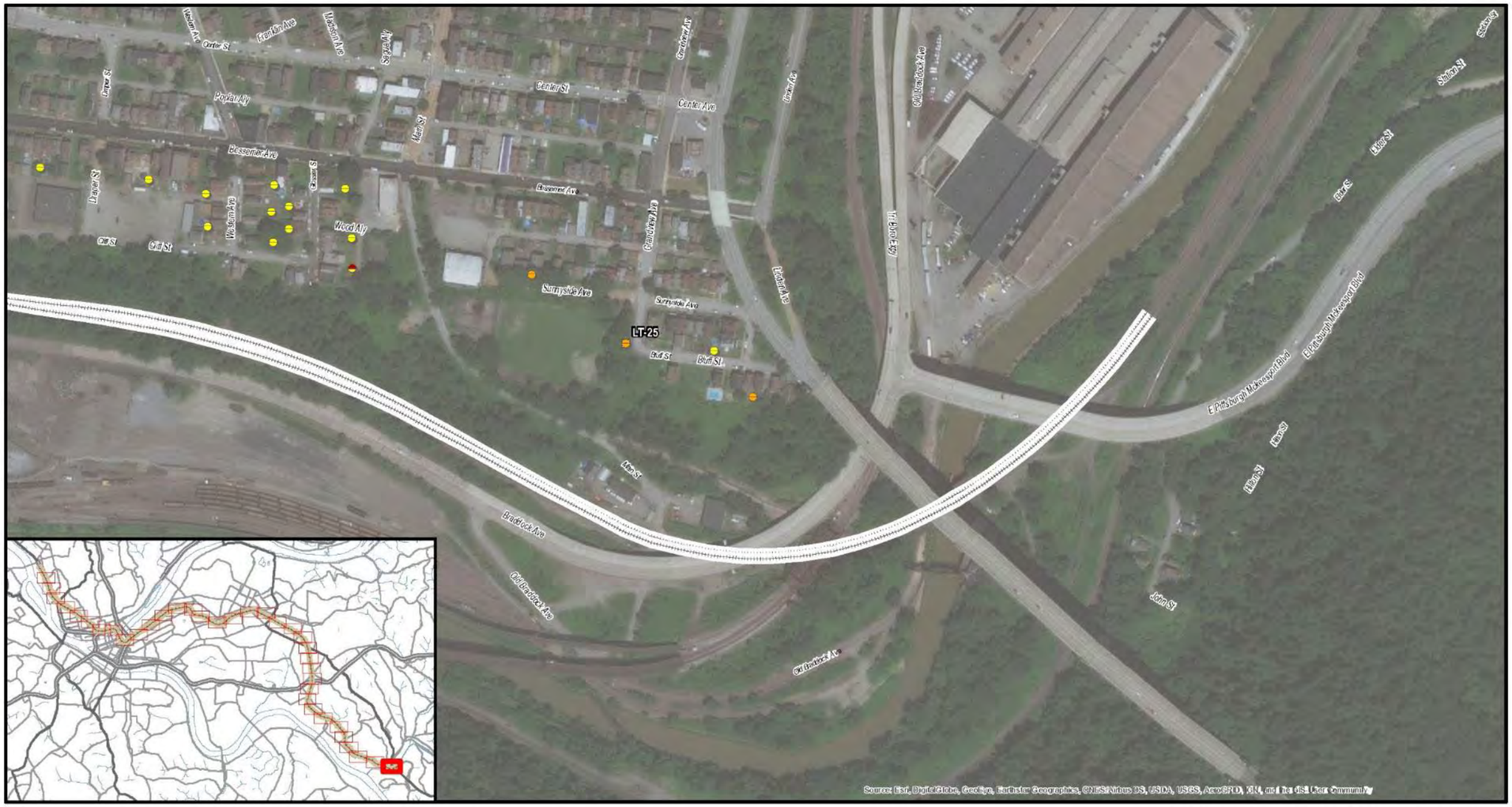
Figure 77. High-Growth Scenario Noise and Vibration Assessment Map 36



Long-Term Noise Measurement
Long-Term Nosie and Short-Term Vibration Measurement
Short-Term Noise Measurement
Short-Term Noise and Vibration Measurement
Short-Term Vibration Measurement

Existing Rail
Would not Exceed STB Threshold(s)with or without the Projects
Would Exceed STB Threshold(s) with or without Projects
Would Exceed STB Threshold(s) Only without Projects

Top Floor Noise Prediction Result
Bottom Floor Noise Prediction Result
* Dual colors = 2 Story Building*
* Triple colors = Multiple Story Building*

0 100 200 400 Feet

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Appendix A Measurement Site Photographs

A.1 Long- and Short-Term Noise Measurement Locations

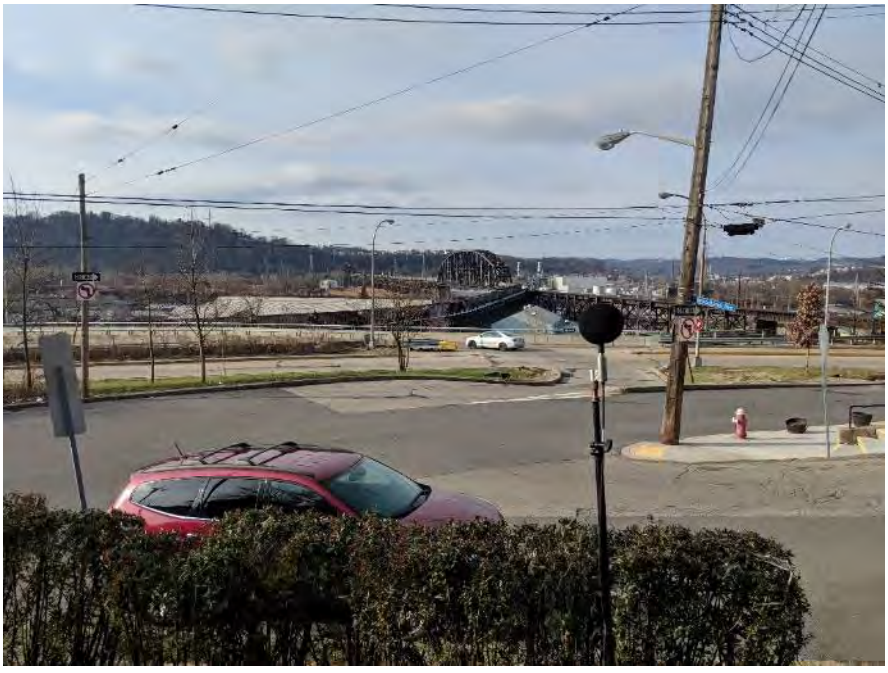

Figure A-1A. Site LT-1: 2462 California Avenue

Figure A-1B. Site LT-1: 2462 California Avenue

Figure A-2. Site LT-2: 1234 Sunday Street

Figure A-3. Site LT-3: 1907 Fulton Street

Figure A-3A. Site LT-3: 1907 Fulton Street

Figure A-4. Site LT-4: 1016 N. Franklin Street

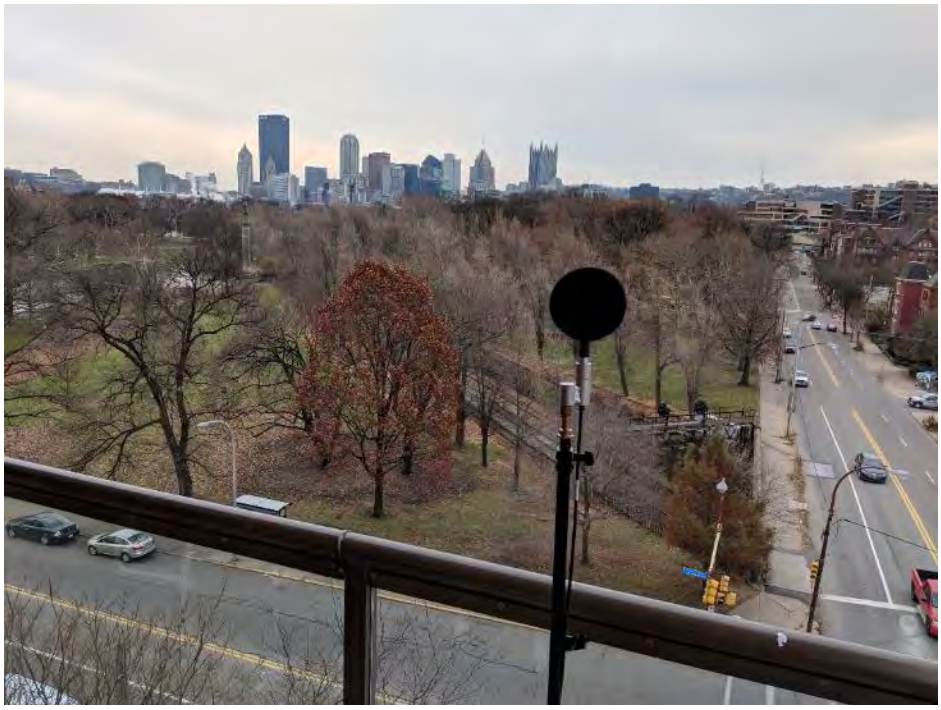

Figure A-5. Site LT-5: 710 W. North Avenue

Figure A-6. Site LT-6: 401 W. Commons

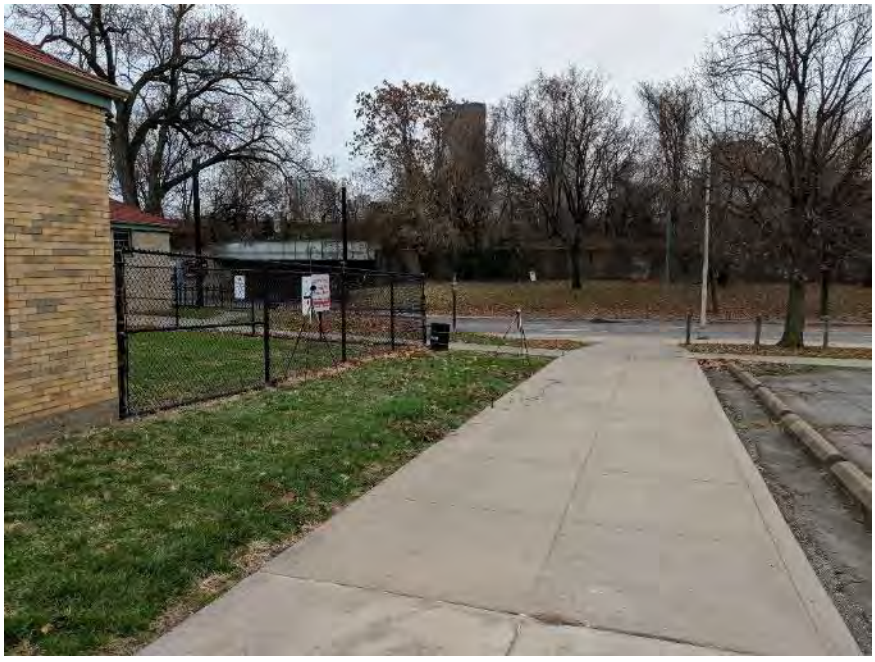

Figure A-7. Site LT-7: 301 Cedar Avenue

Figure A-8. Site LT-8: 100 Anderson Street

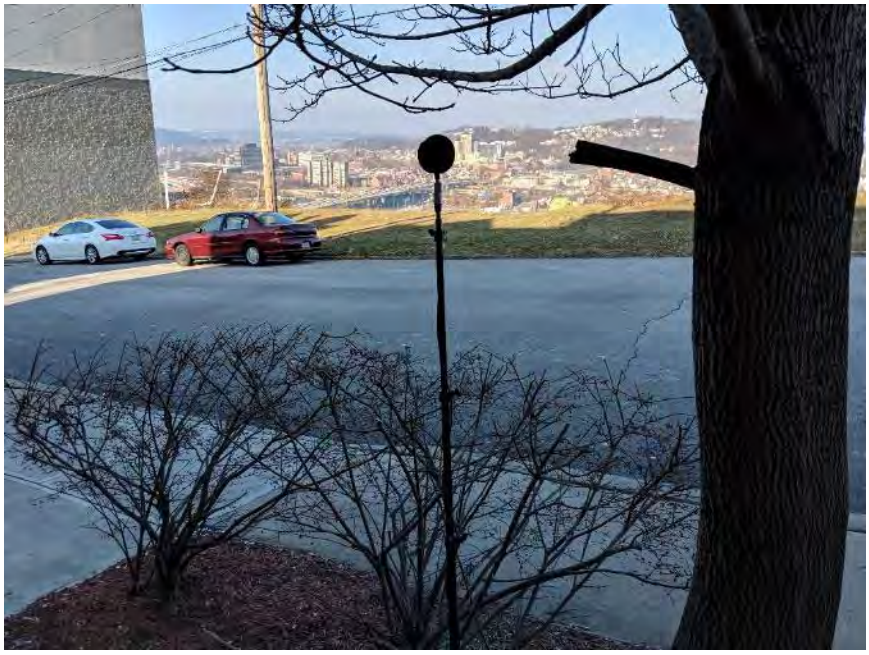

Figure A-9. Site LT-9: 1846 Arcena Street

Figure A-10. Site LT-10: 2630 Brereton Street

Figure A-11. Site LT-11: 3415 Flavian Street

Figure A-12. Site LT-12: 3811 Fleetwood Street

Figure A-13. Site LT-13: 4732 Juniper Street

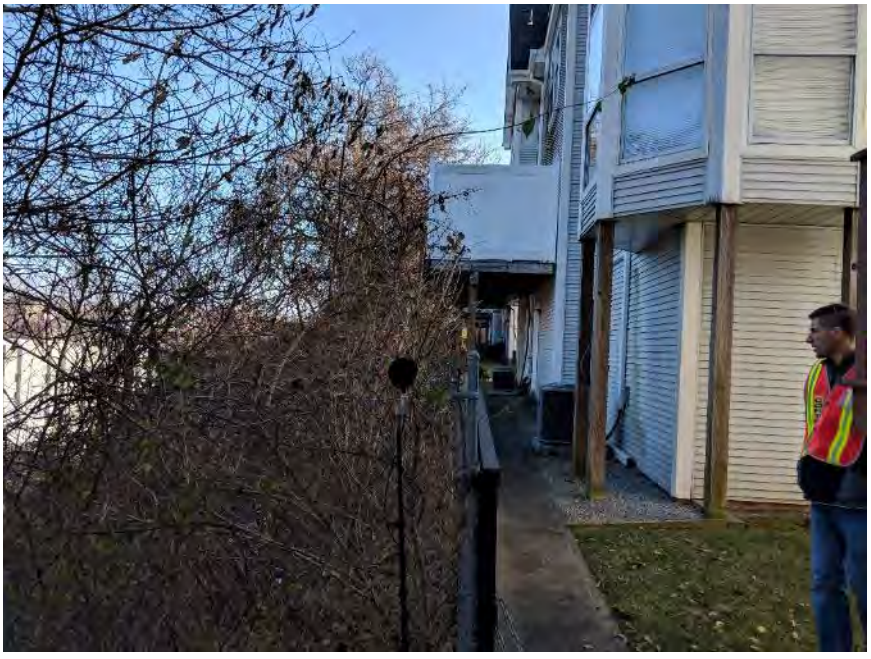

Figure A-14. Site LT-14: 15 Hemingway Street

Figure A-15. Site LT-15: 5445 Potter Street

Figure A-16. Site LT-16: 205 Lehigh Avenue

Figure A-17. Site LT-17: 6736 Simonton Street

Figure A-18. Site LT-18: 7357 Finance Street

Figure A-19. Site LT-19: 444 Ross Avenue

Figure A-20. Site LT-20: 1 Pennwood Avenue

Figure A-21. Site LT-21: Park Avenue

Figure A-22. Site LT-22: McKim Street

Figure A-23. Site LT-23: 504 Hawkins Avenue

Figure A-24. Site LT-24: 431 Verona Street

Figure A-25. Site LT-25: 300 Main Street

Figure A-26. Site ST-2: 1000 Ft. Duquesne Boulevard

Figure A-27. Site ST-3: 2901 Liberty Avenue

A.2 Vibration Measurement Locations

Figure A-4A. Site LT-4: 1016 N. Franklin Street

Figure A-15A. Site LT-15: 5445 Potter Street

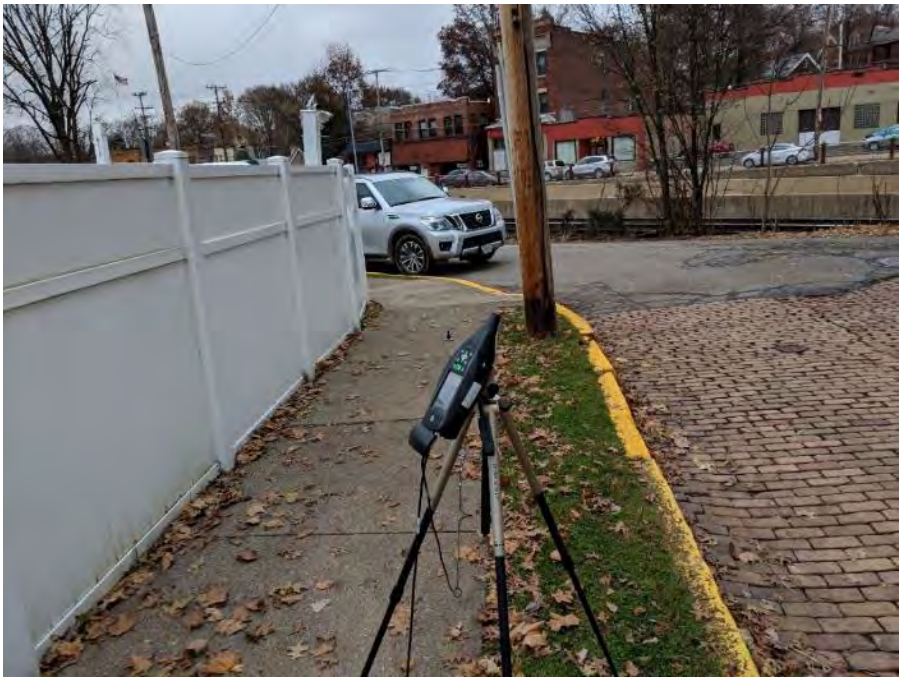

Figure A-20A. Site LT-20: 1 Pennwood Avenue

Figure A-21A. Site LT-21: Park Avenue

Figure A-24A. Site LT-24: 431 Verona Street

Figure A-26A. Site ST-02: 1000 Ft. Duquesne Boulevard

Figure A-28. Site ST-06: 7051 Thomas Boulevard

Figure A-29. Site ST-26: Iron Deer Playground at Allegheny Commons Park West

Appendix B Long Term Noise Measurement Data

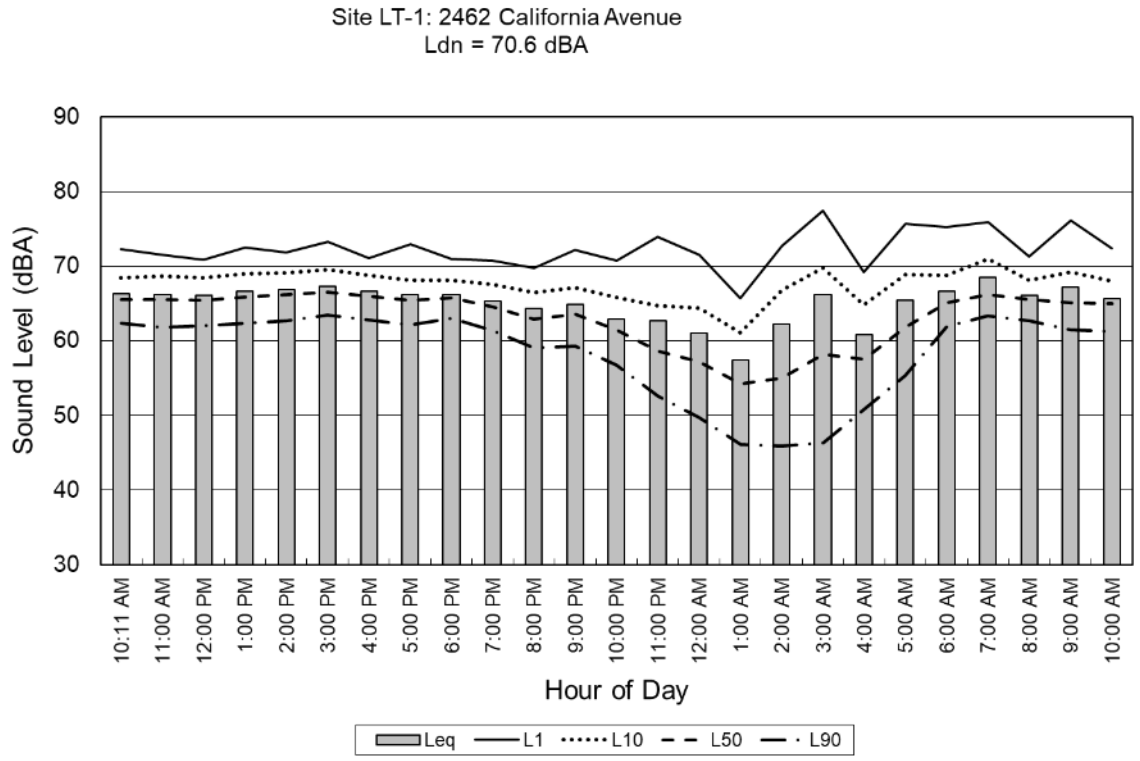

Figure B-1. Site LT-01 Time History Chart

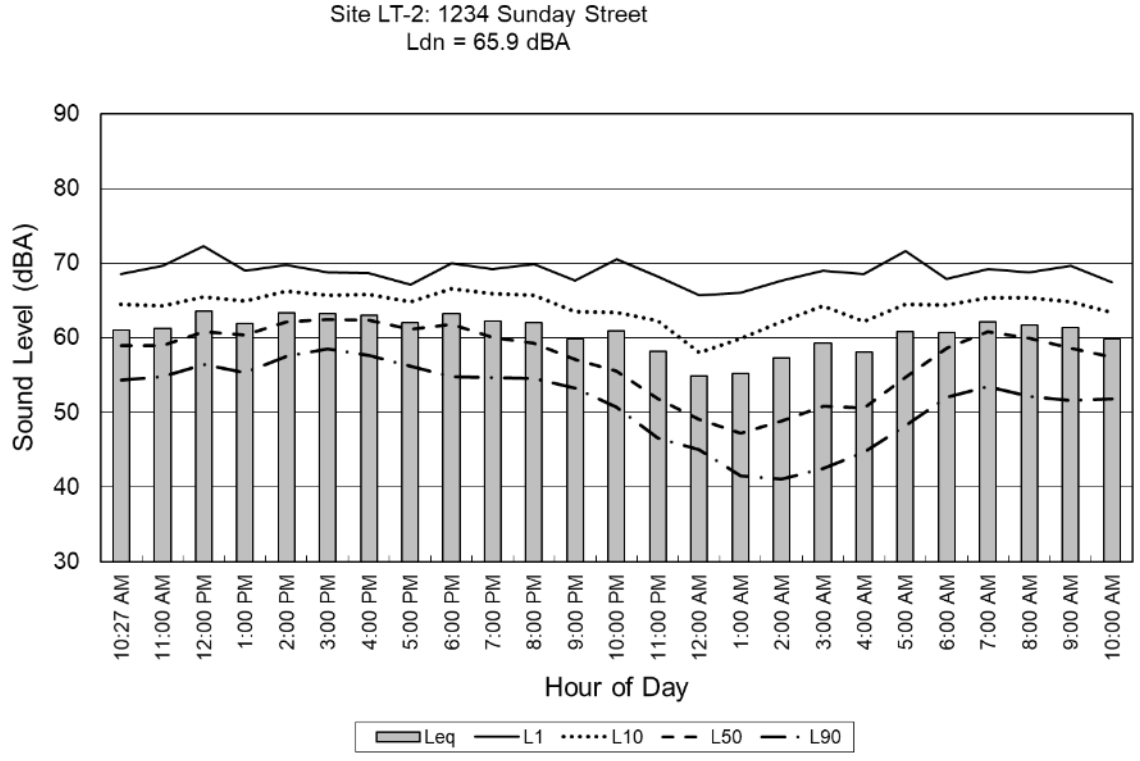

Figure B-2. Site LT-02 Time History Chart

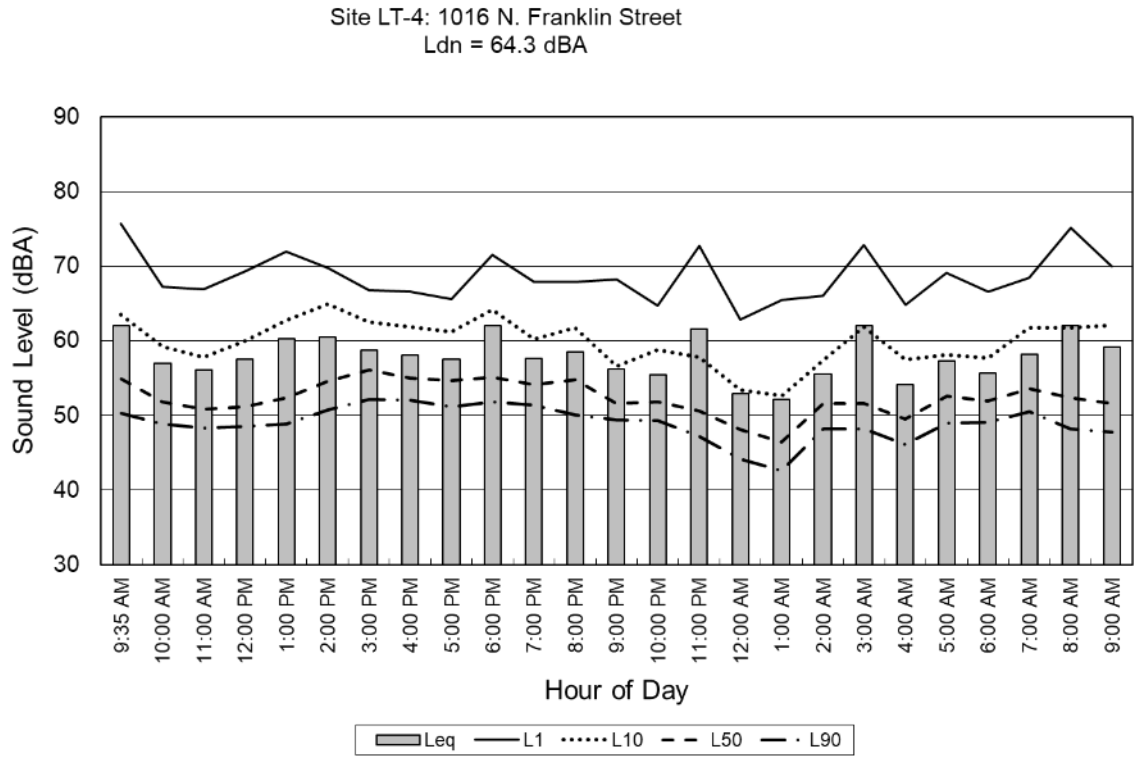

Figure B-3. Site LT-04 Time History Chart

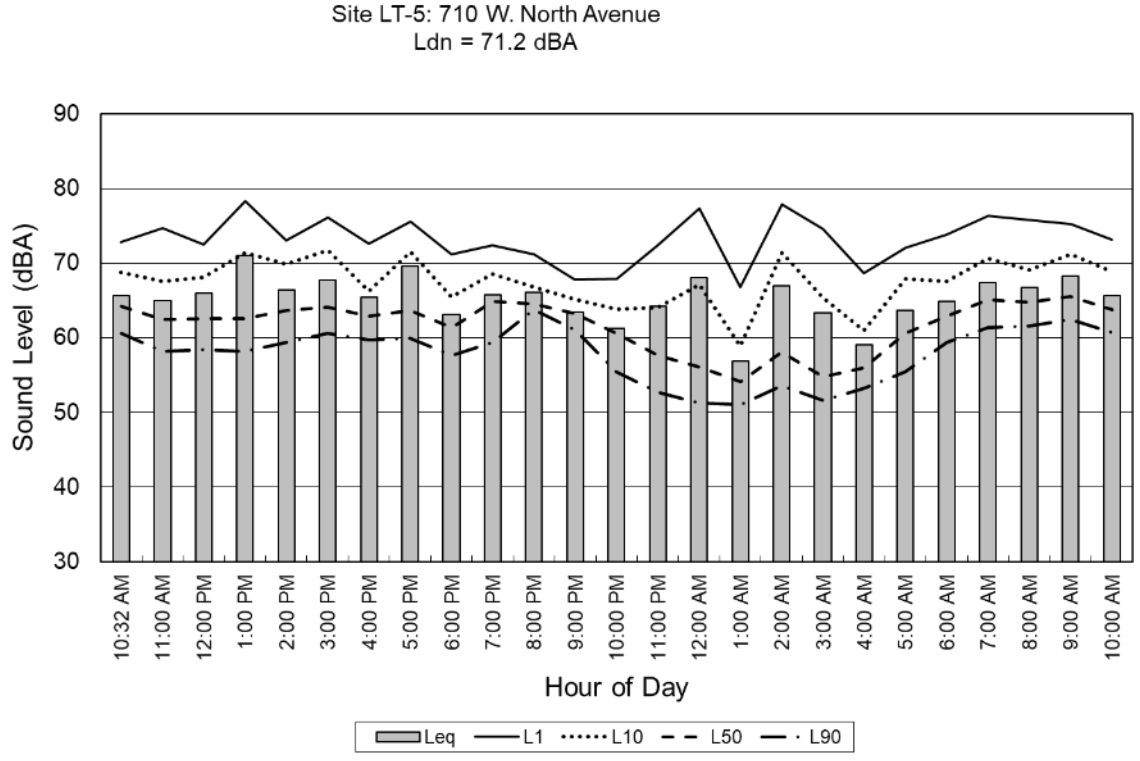

Figure B-4. Site LT-05 Time History Chart

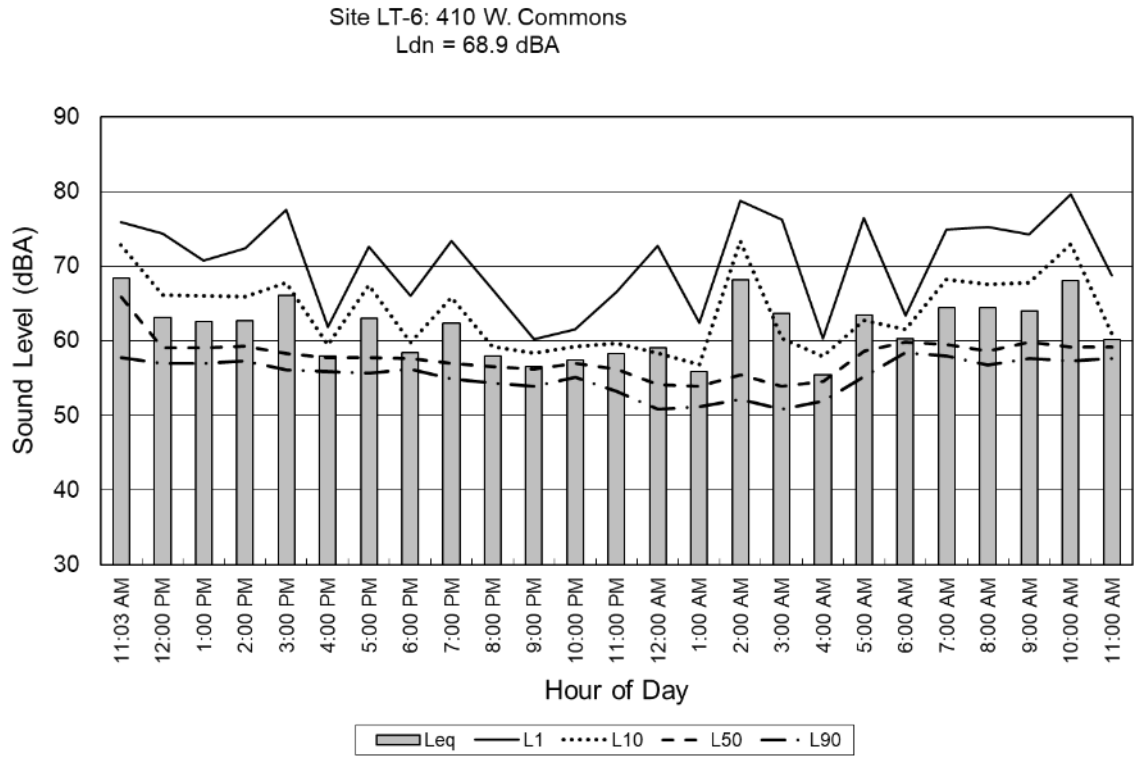

Figure B-5. Site LT-06 Time History Chart

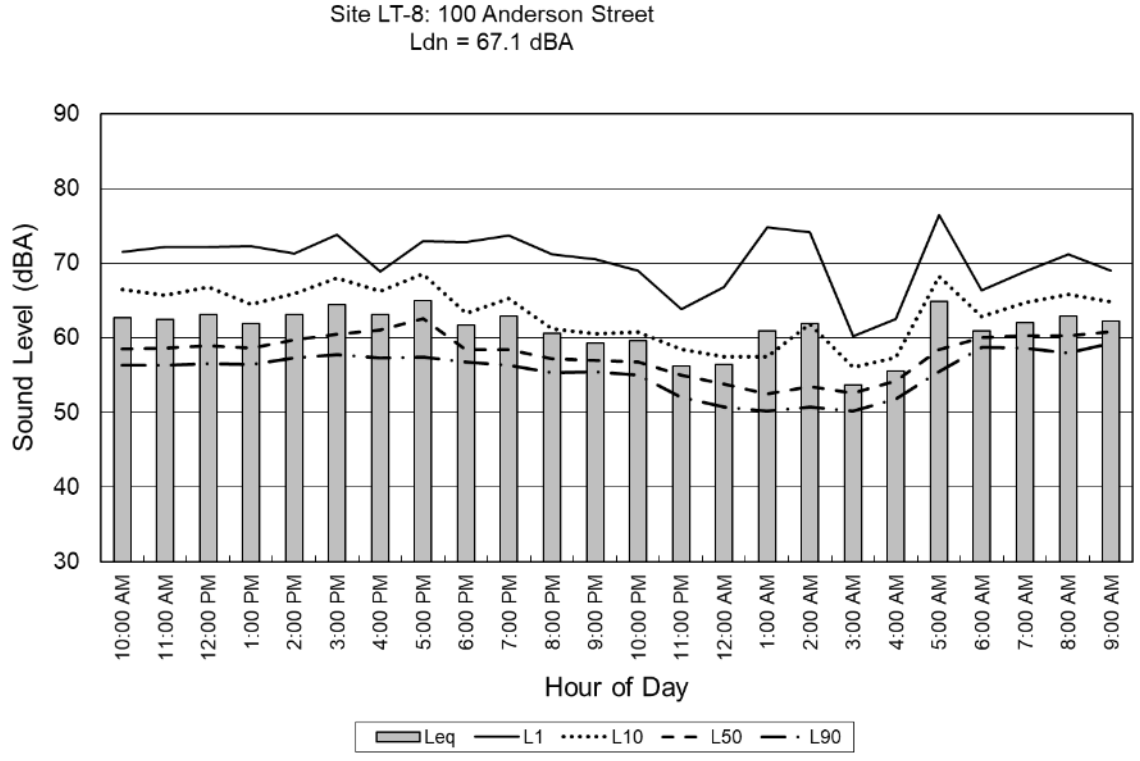

Figure B-6. Site LT-08 Time History Chart

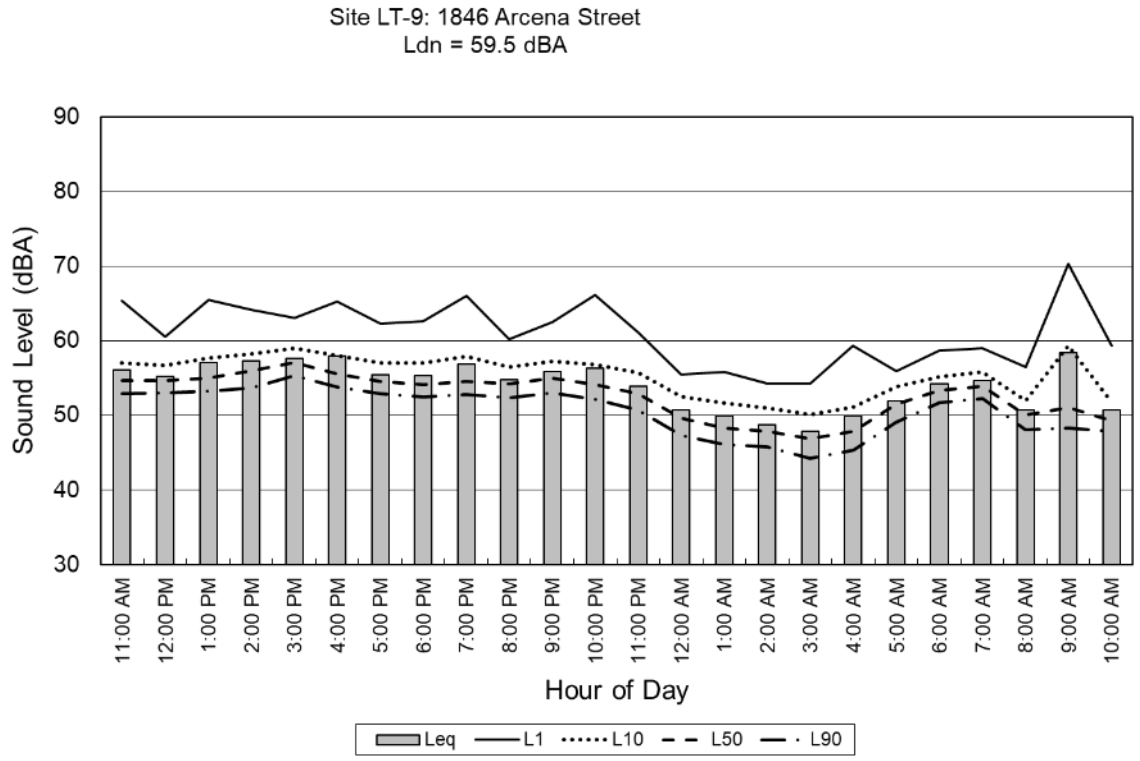

Figure B-7. Site LT-09 Time History Chart

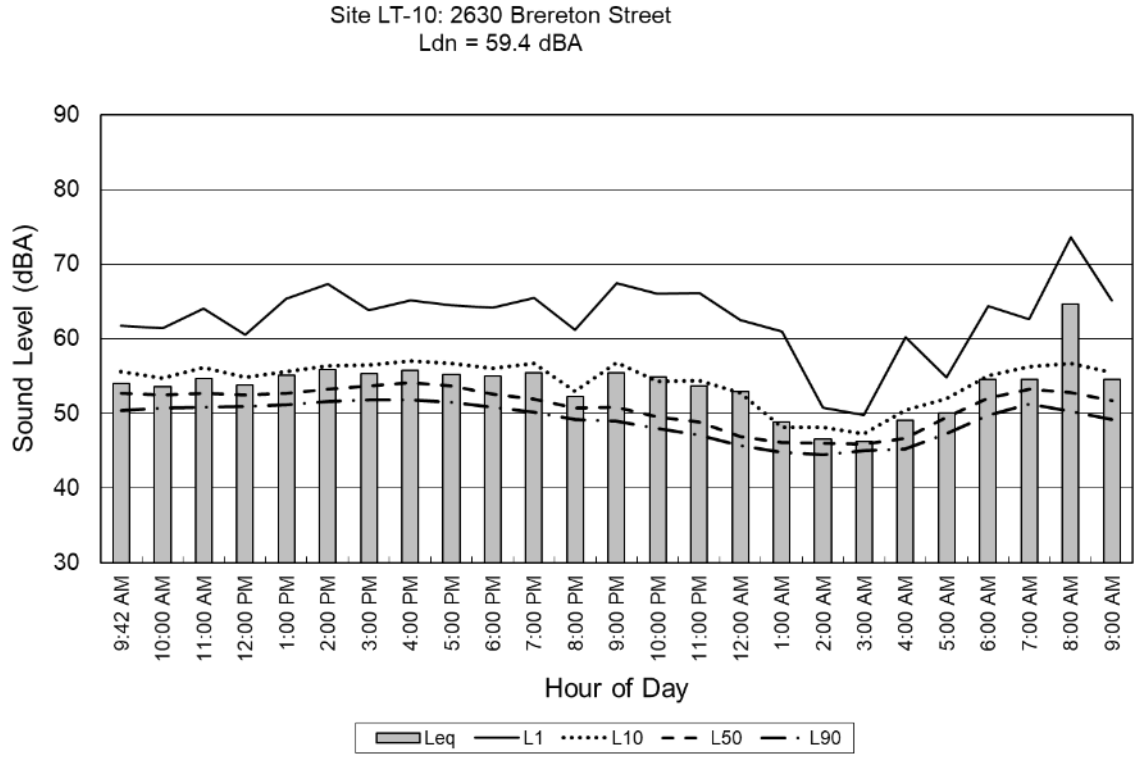

Figure B-8. Site LT-10 Time History Chart

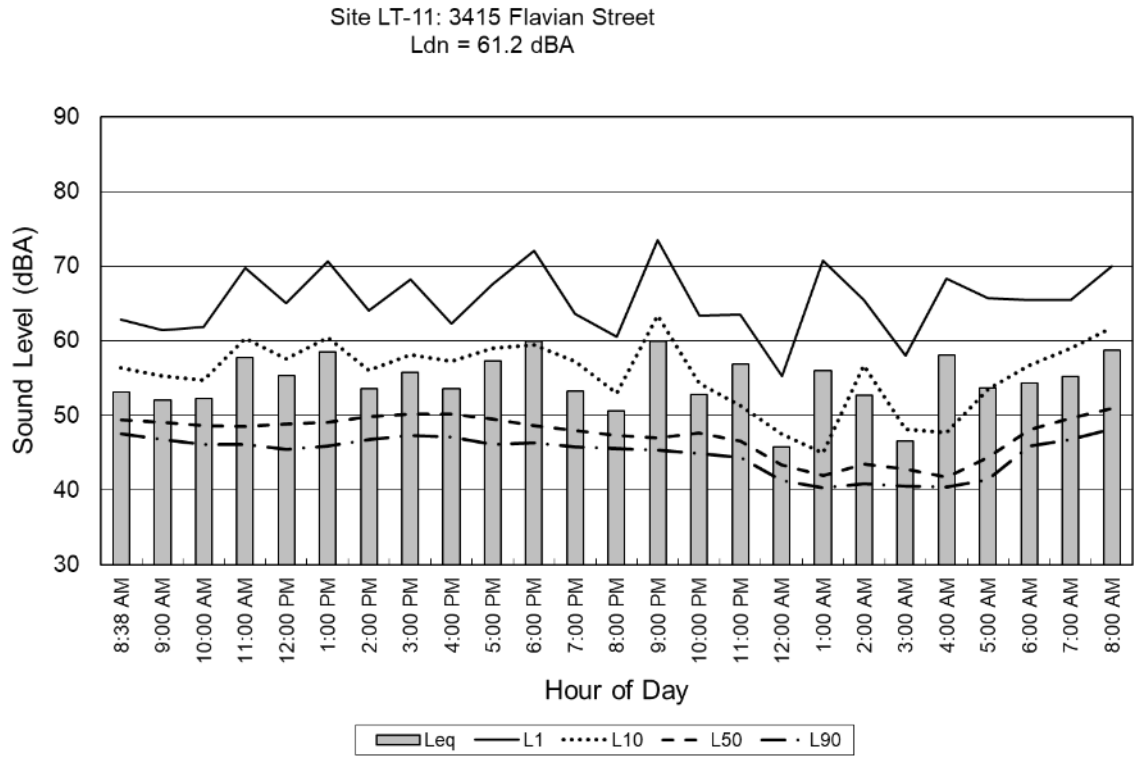

Figure B-9. Site LT-11 Time History Chart

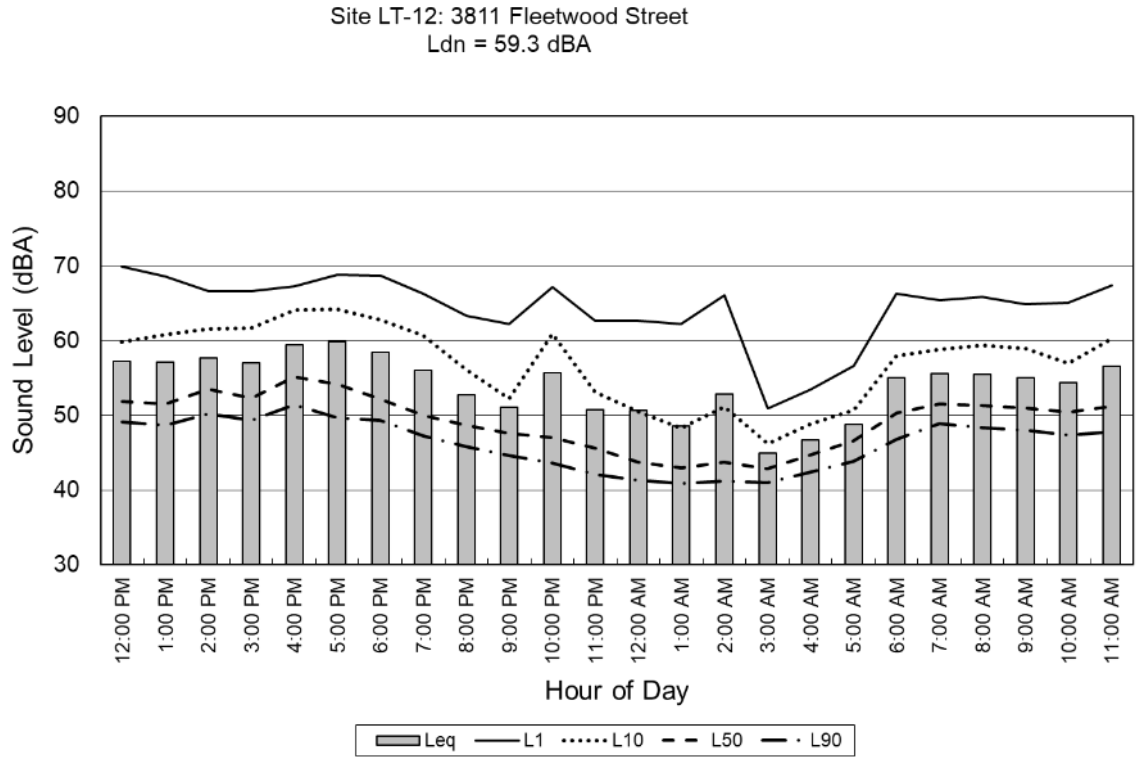

Figure B-10. Site LT-12 Time History Chart

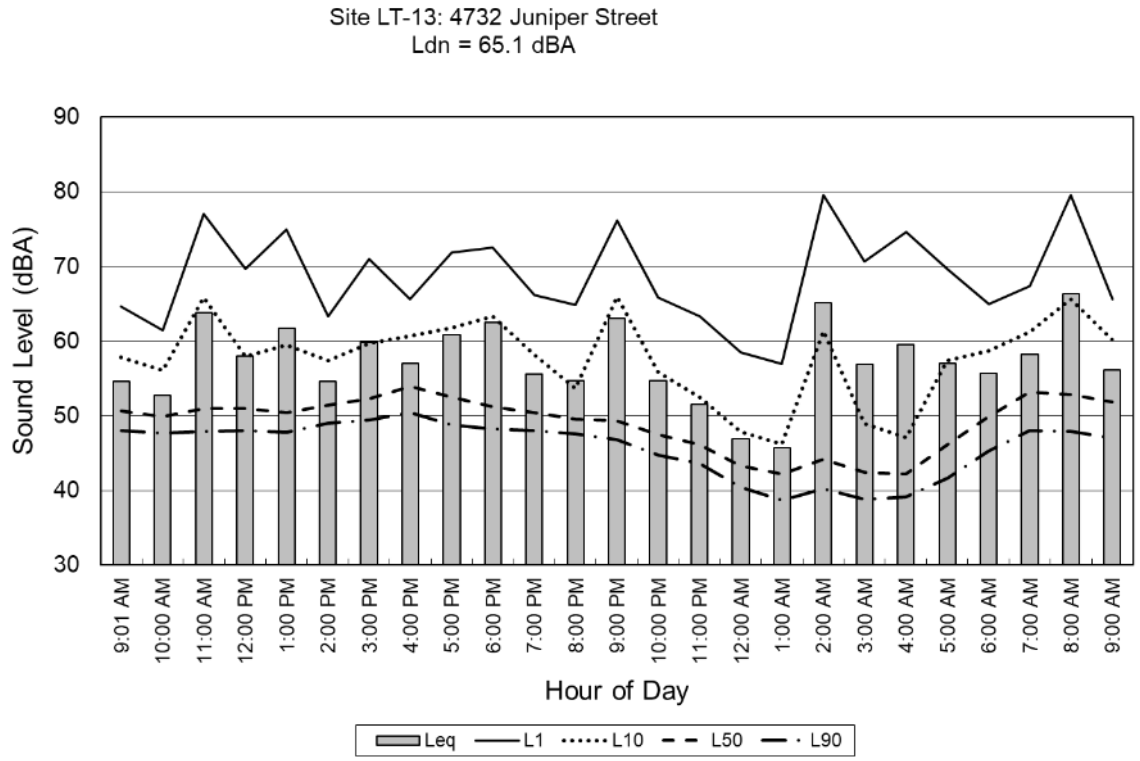

Figure B-11. Site LT-13 Time History Chart

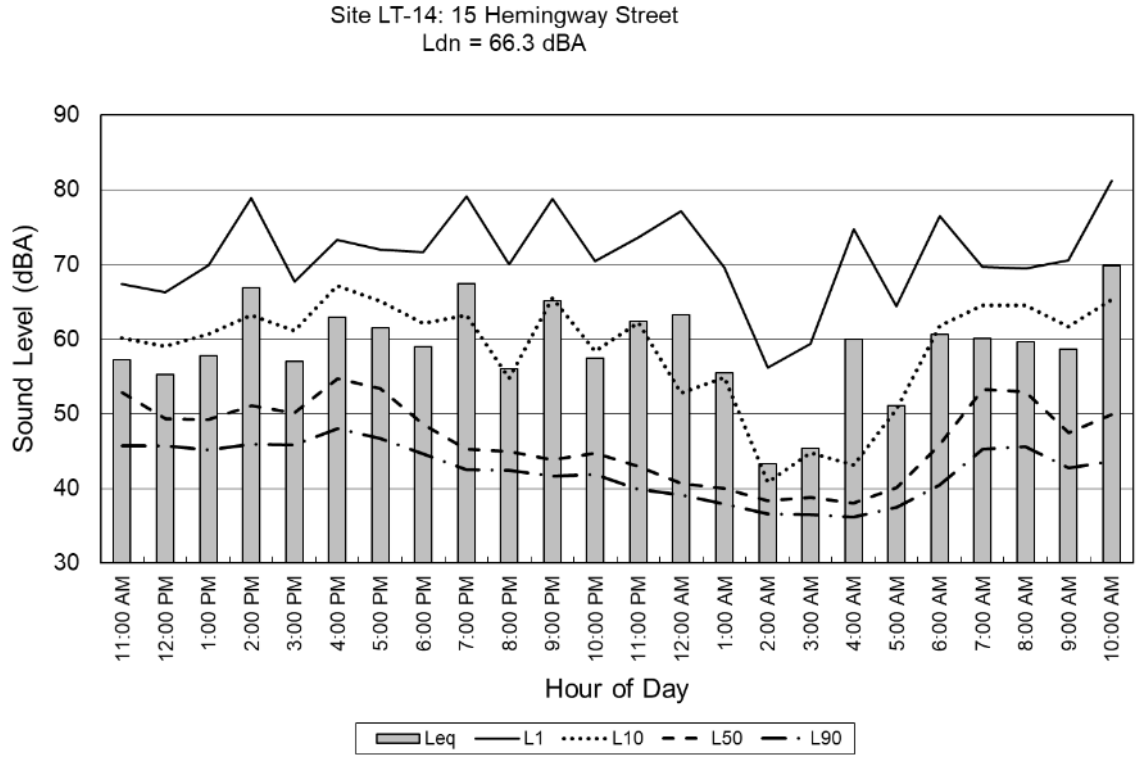

Figure B-12. Site LT-14 Time History Chart

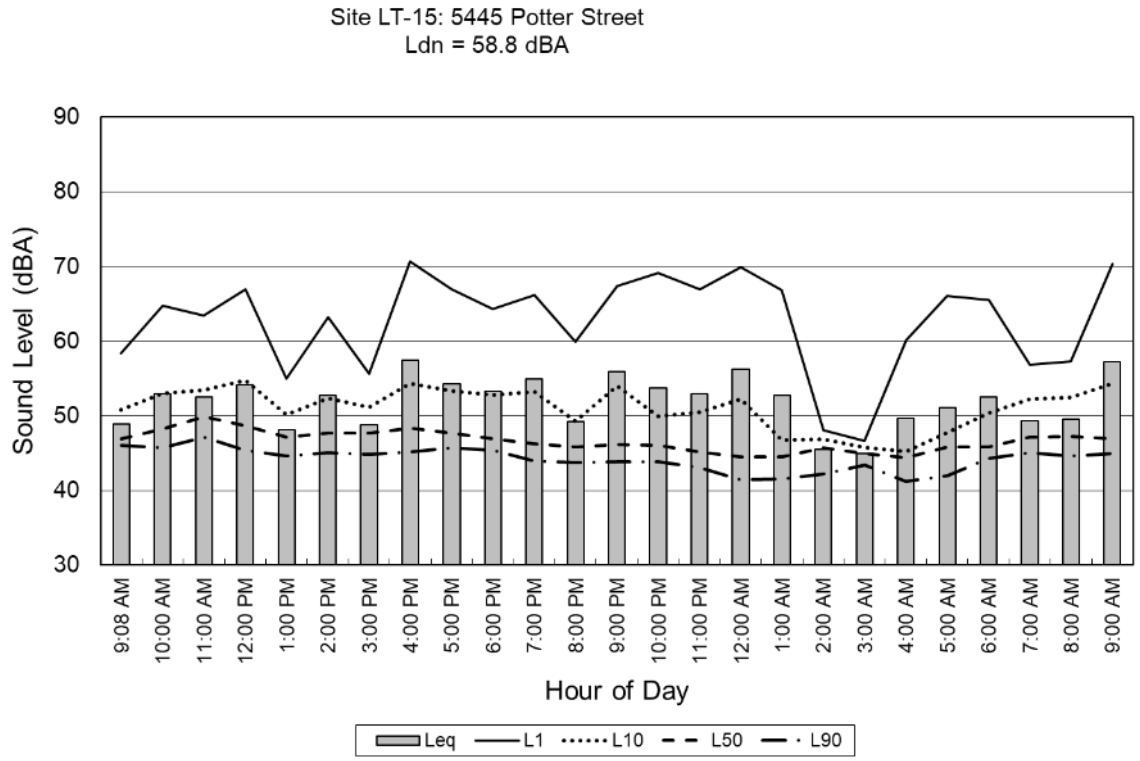

Figure B-13. Site LT-15 Time History Chart

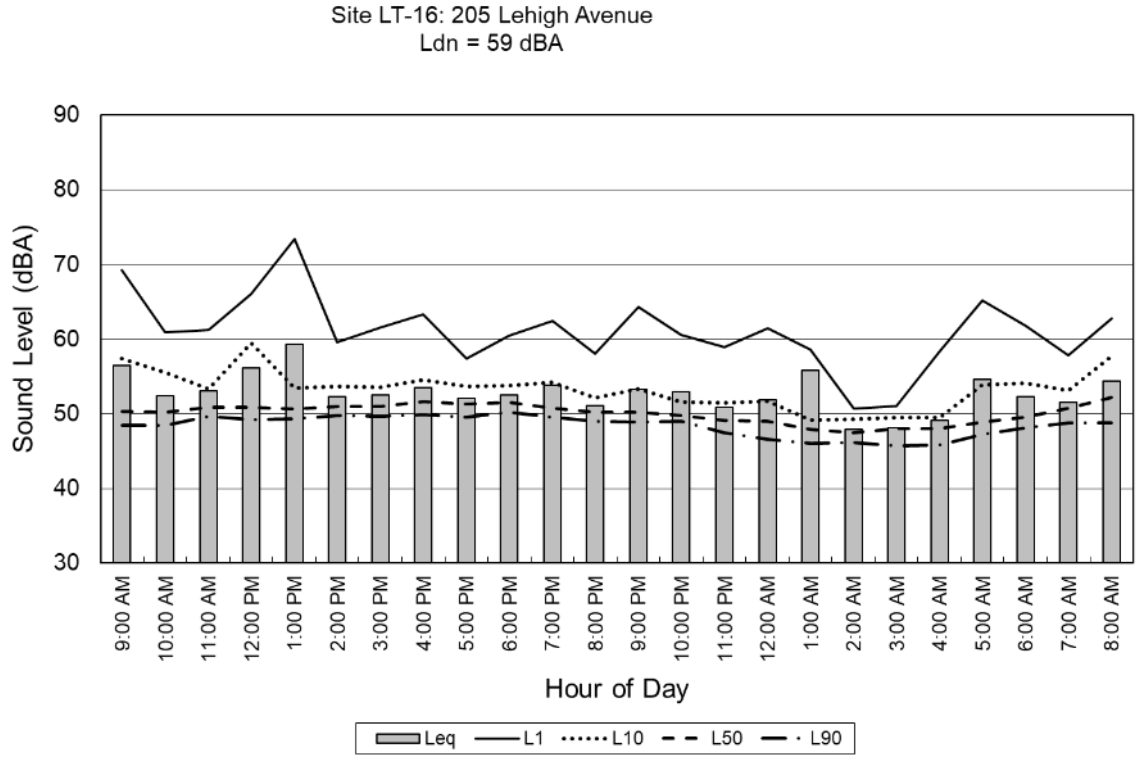

Figure B-14. Site LT-16 Time History Chart

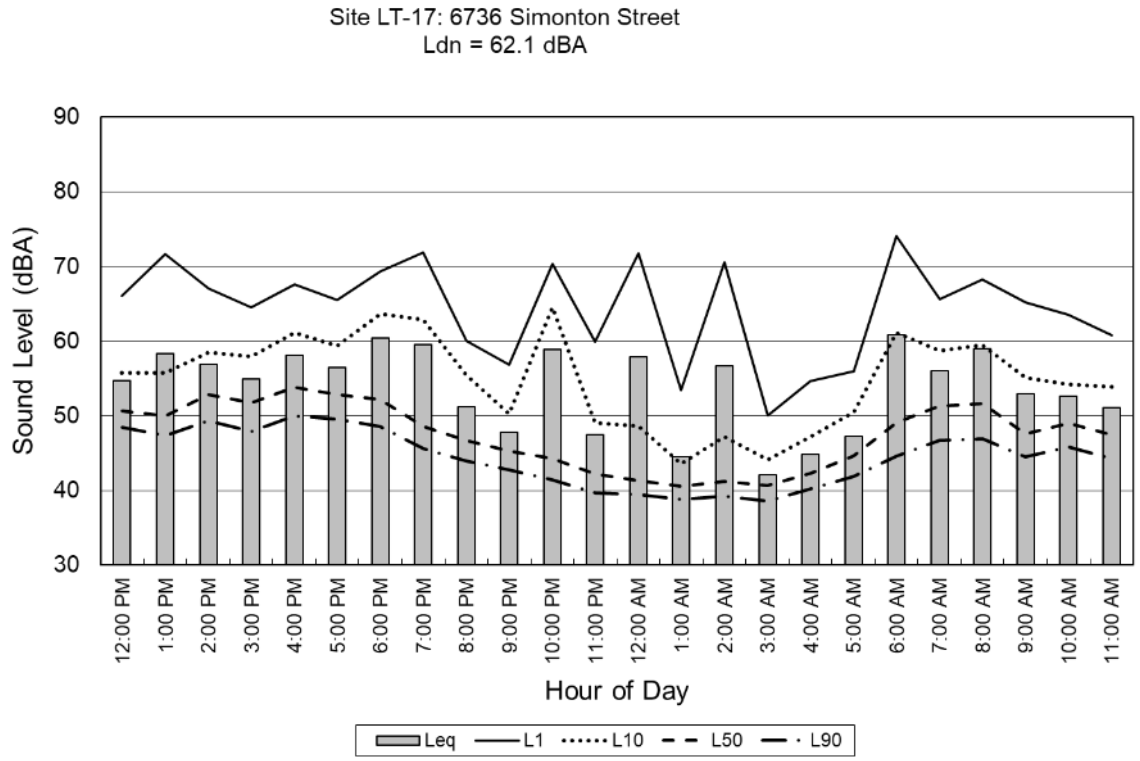

Figure B-15. Site LT-17 Time History Chart

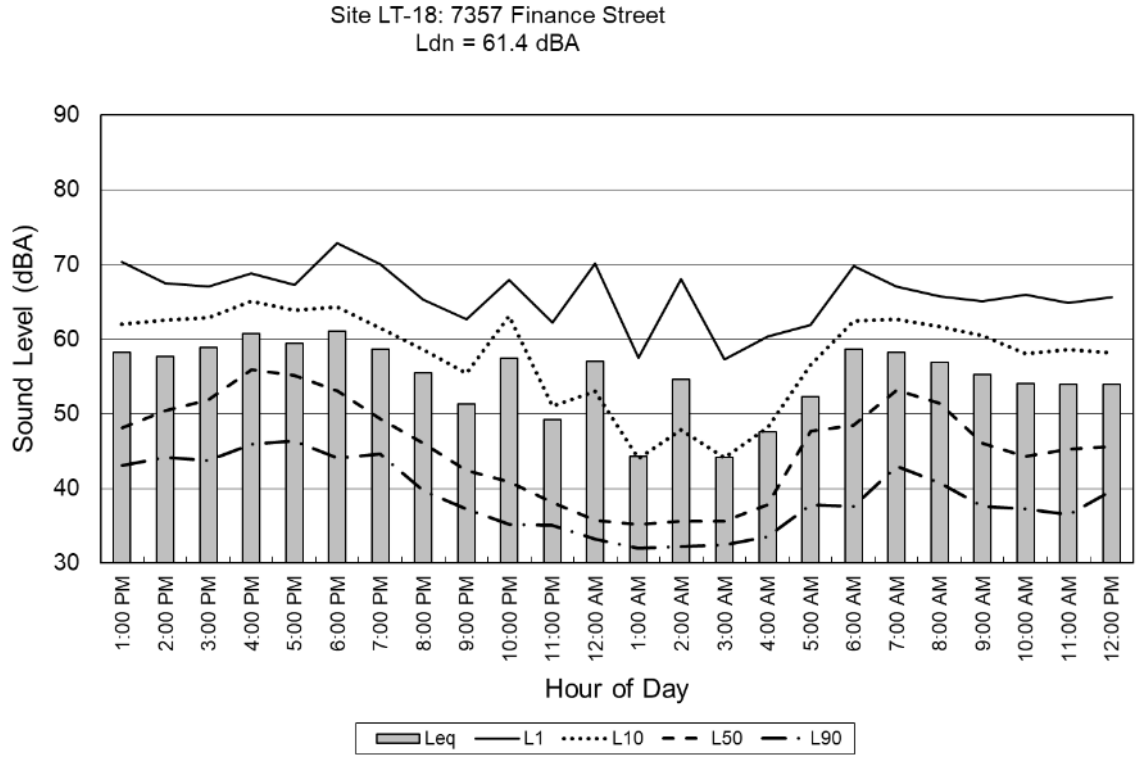

Figure B-16. Site LT-18 Time History Chart

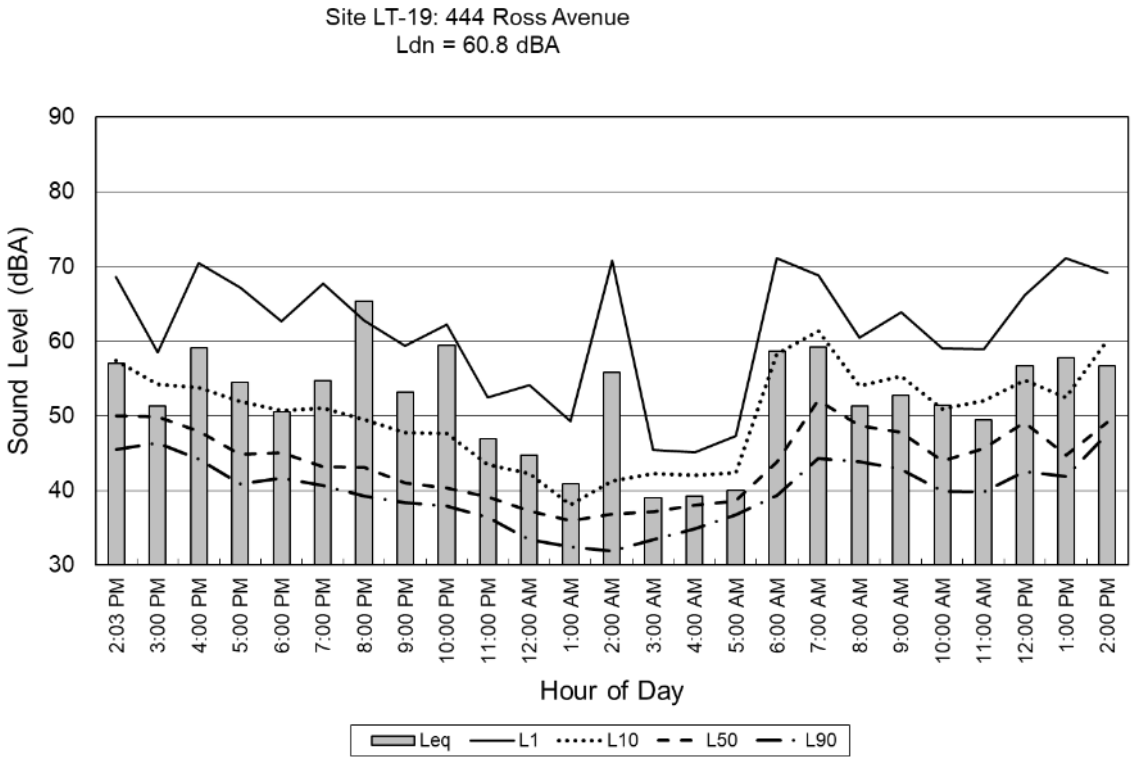

Figure B-17. Site LT-19 Time History Chart

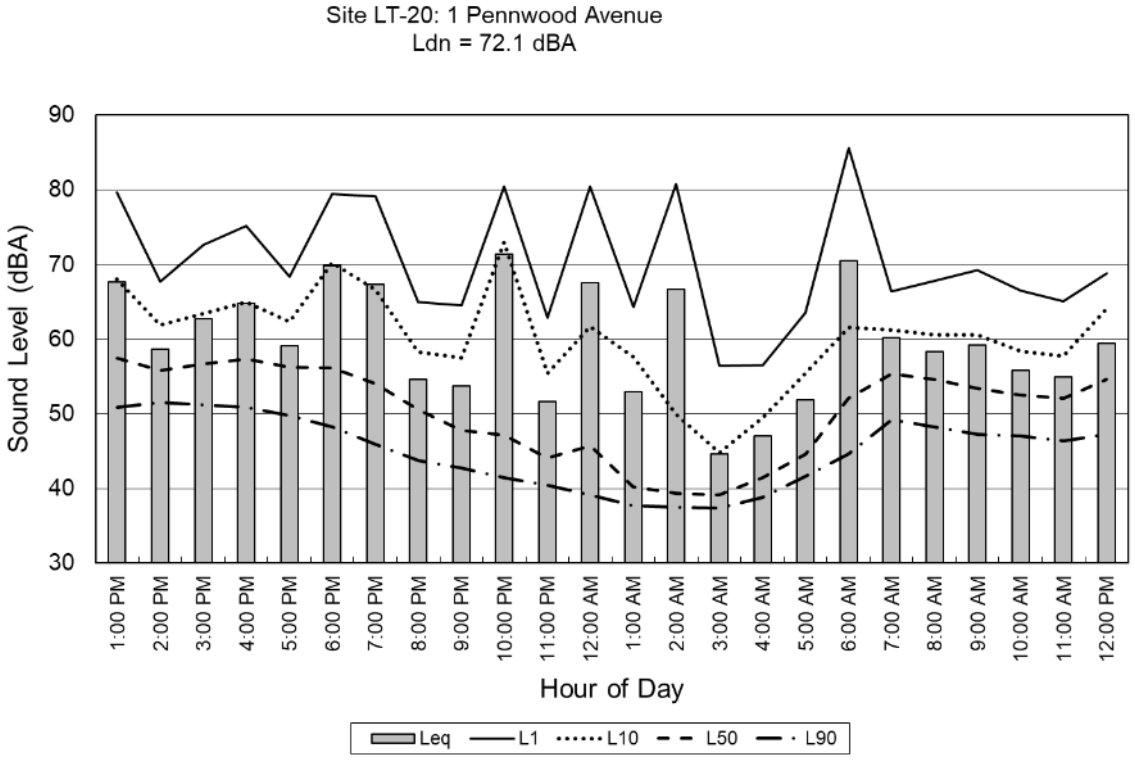

Figure B-18. Site LT-20 Time History Chart

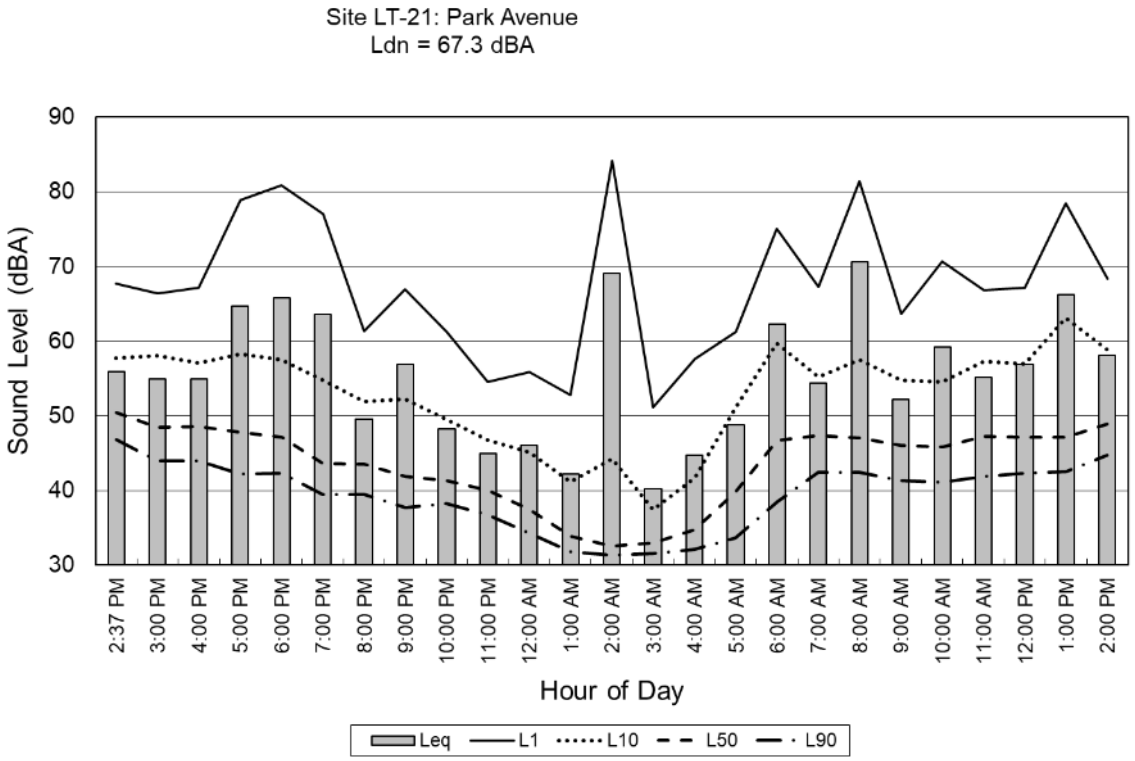

Figure B-19. Site LT-21 Time History Chart

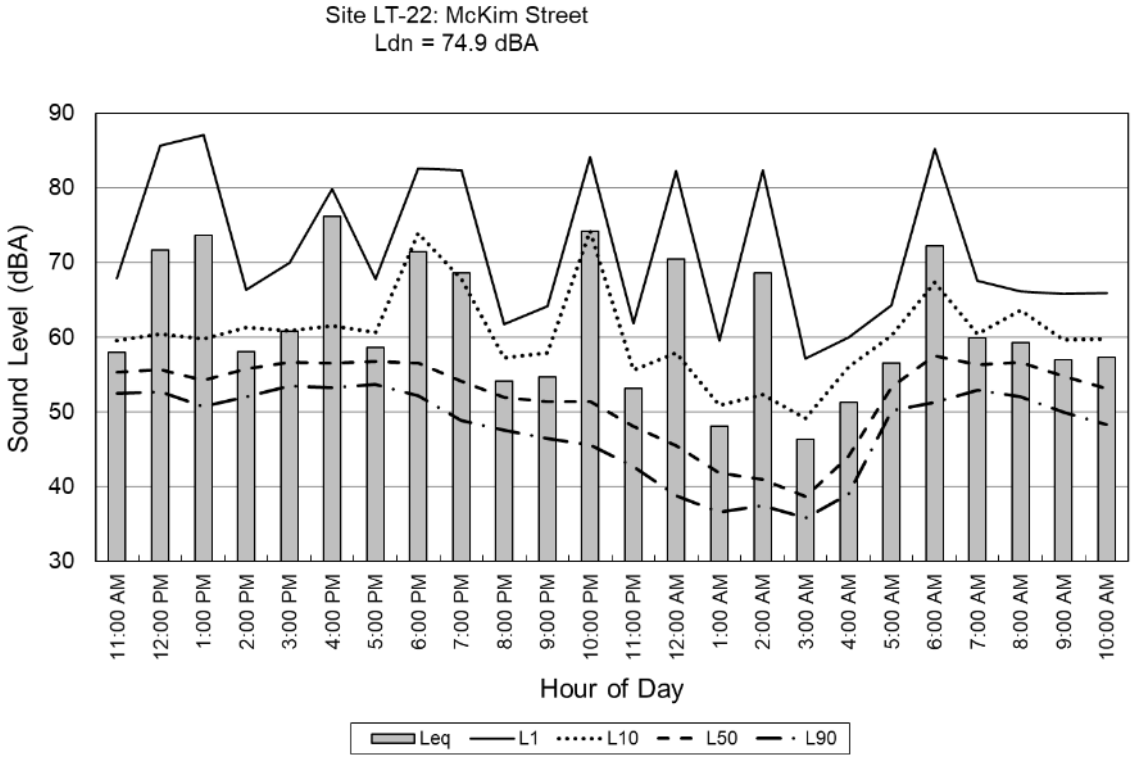

Figure B-20. Site LT-22Time History Chart

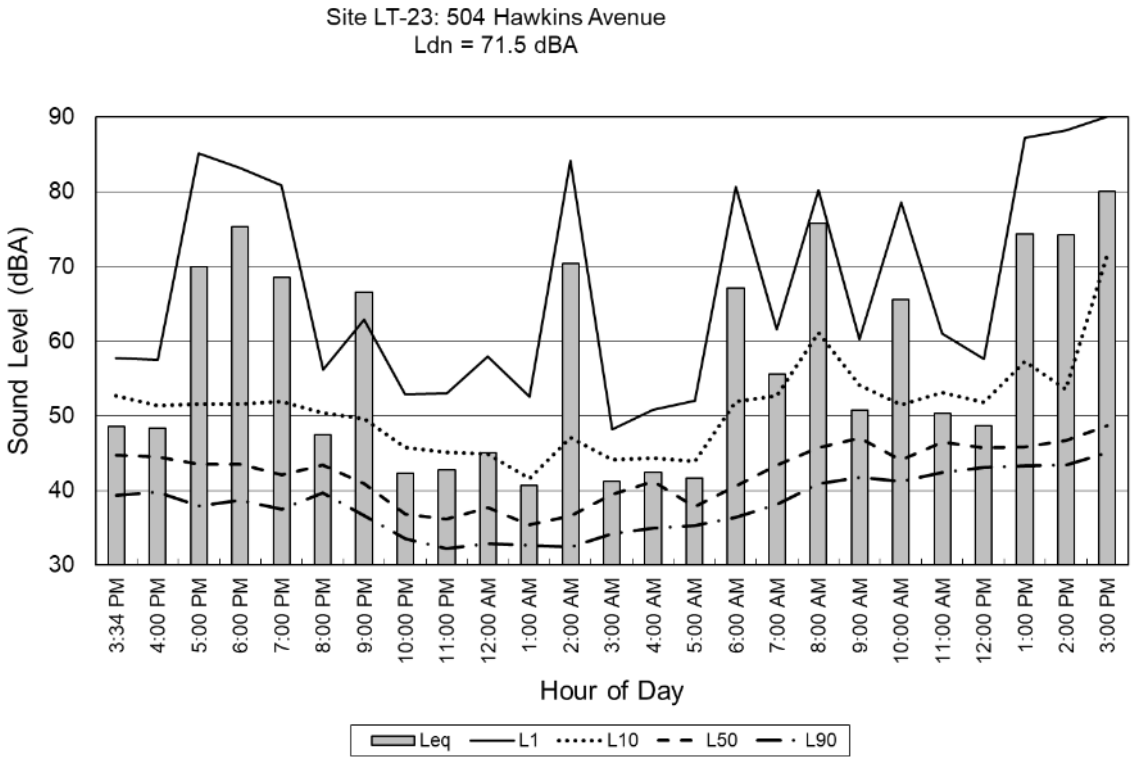

Figure B-21. Site LT-23 Time History Chart

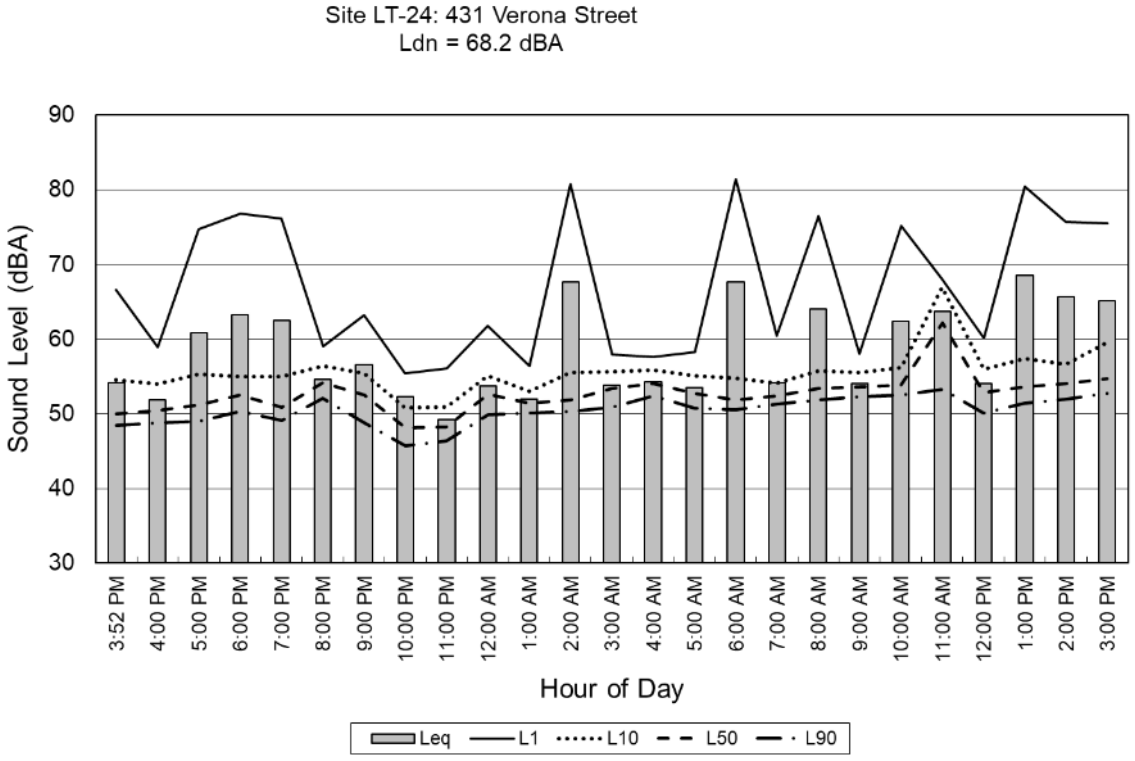

Figure B-22. Site LT-24 Time History Chart

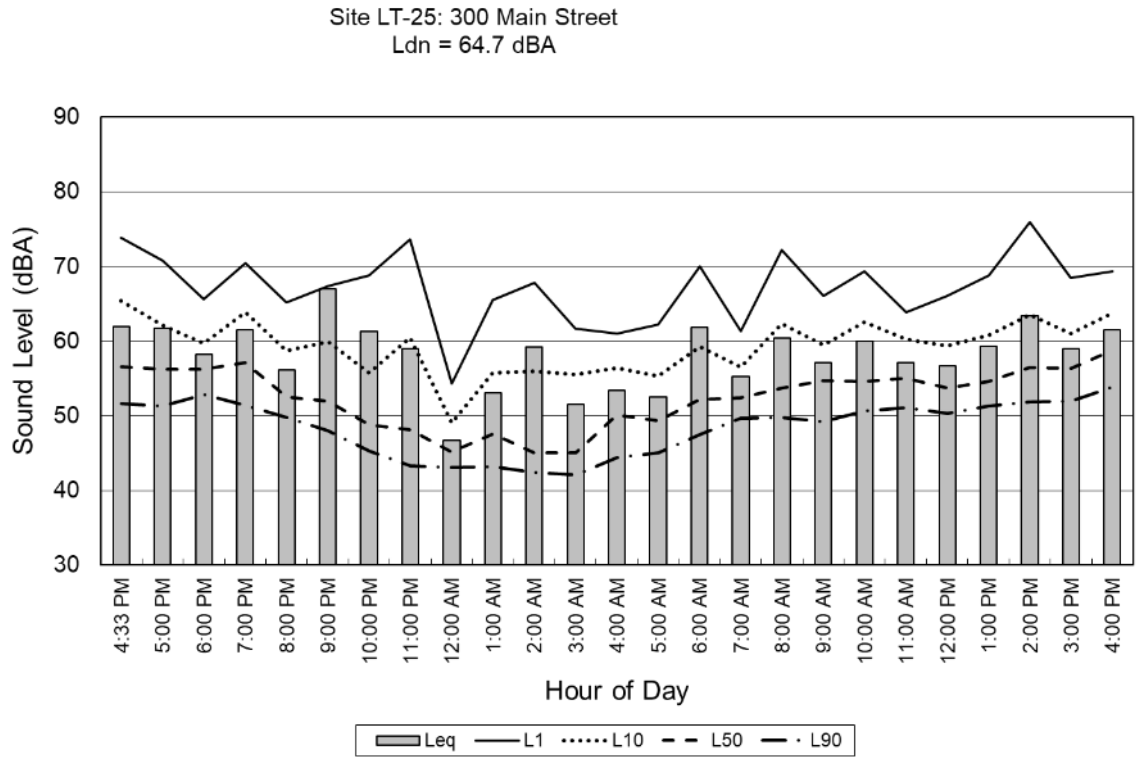

Figure B-23. Site LT-25 Time History Chart

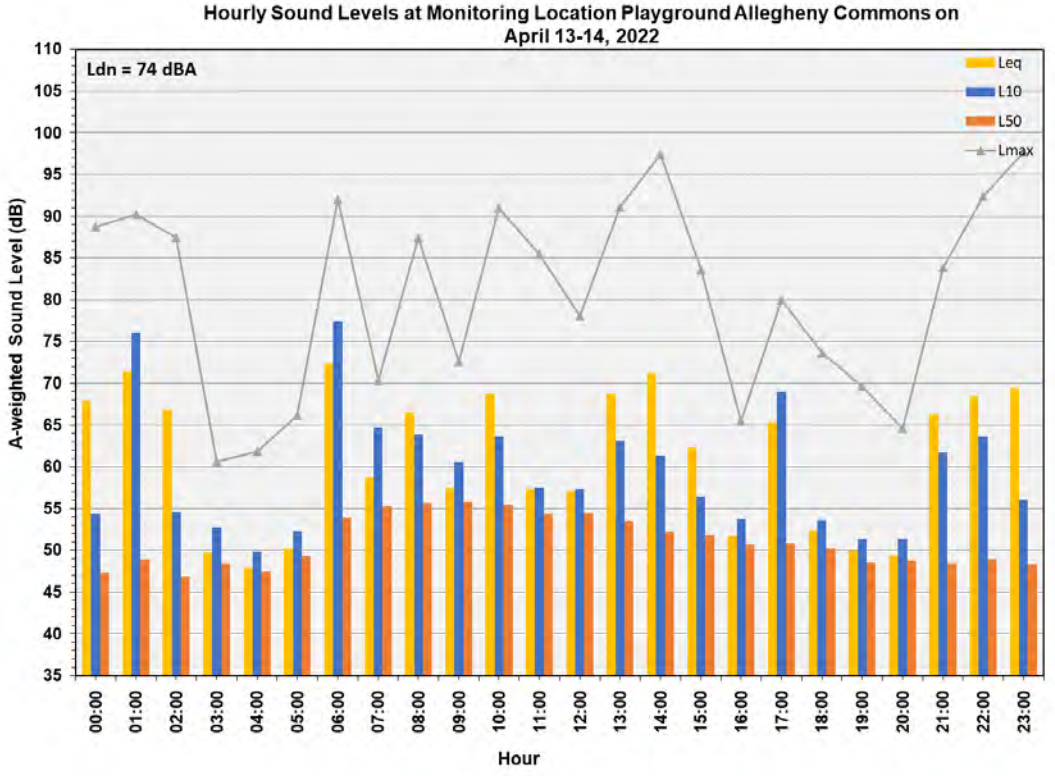

Figure B-24. Site LT-26 Time History Chart