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Newark Liberty International Airport AirTrain Replacement Program

FINAL EA APPENDICES (VOLUME 1)

May 2021

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Appendix A

Appendix A: Detailed Project Description

Appendix A—Detailed Project Description

A detailed list of components of the Proposed Action is provided below.

A.1 Maintenance and Control Facility (MCF)

The MCF would be located northeast of the existing Rail Link Station in the existing Airline employee parking lots (Lot 757 and 777) (**Figure A-1**). The building would have a footprint of approximately 43,500 square feet (SF) and a total square footage (TSF) of approximately 55,900 SF. The proposed MCF would be accessed using existing roadways and paved areas. No new roadways or impervious areas would be necessary for access.

The MCF would house the operation and maintenance-related functional space required for the AirTrain. This space is required for inspection, maintenance, and testing of automated people mover (APM) vehicles and other system equipment, as well as for tool parts and storage, administrative functions, and personnel support. The following key functional areas would be required within the MCF:

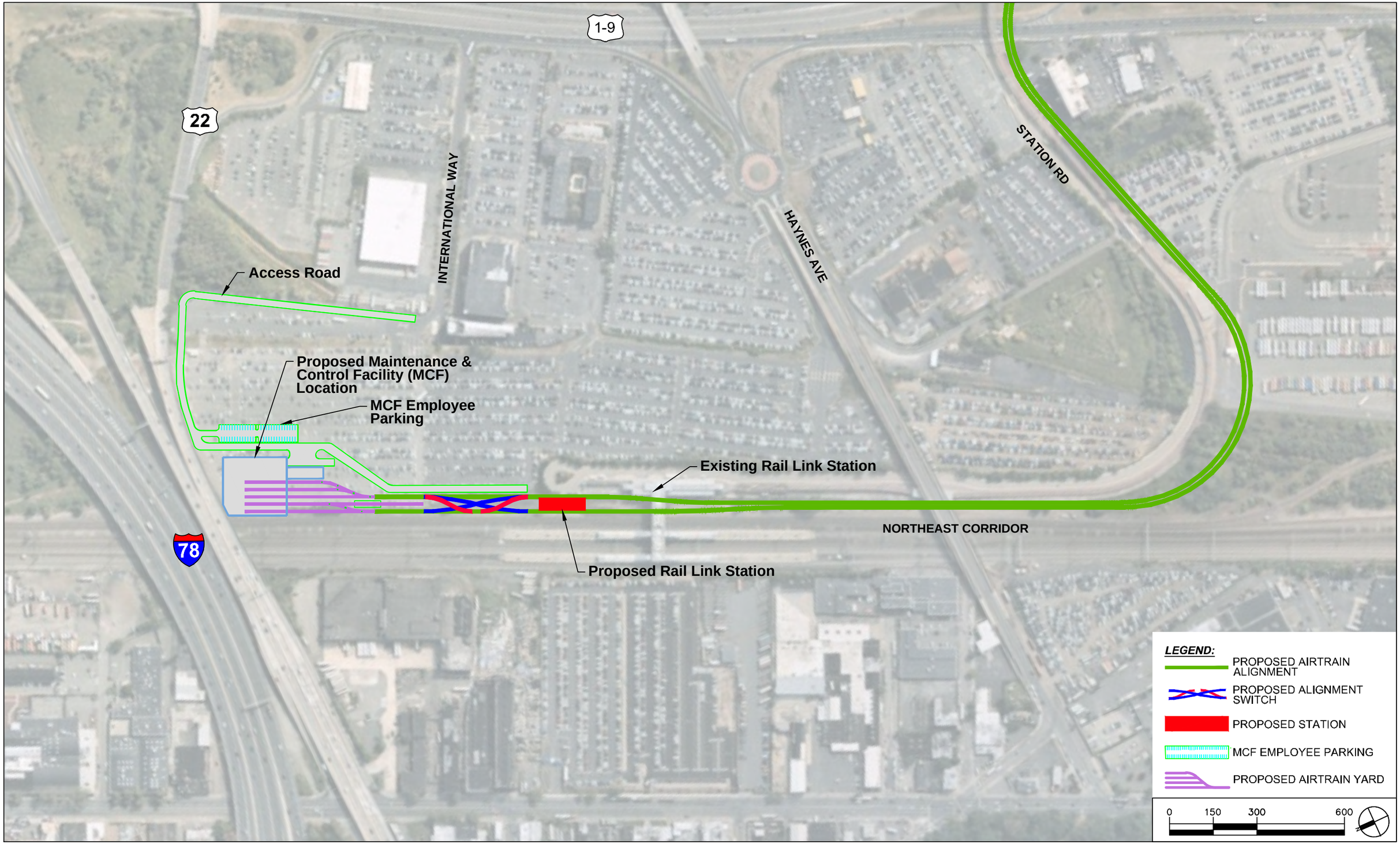
- Light maintenance tracks with car interior and undercar access
- Heavy maintenance tracks with enough vertical clearance to raise the car body
- Machine/mechanical/pneumatic shop
- Electrical/electronics shop
- Tool storage
- Spare parts storage (including flammable material storage)
- Receiving and loading area
- Administrative offices, conference room, and other spaces
- Personnel support spaces (restrooms, lockers, showers, break room, and training room)
- Yard (a grouping of train storage tracks that are used for maneuvering trains)

The MCF would house the Central Control Facility for monitoring and control of the system operation. Additionally, the facility would include train storage positions, a test track for performing departure and maintenance tests, and an APM car wash. A traction power substation (used to power the maintenance building, yard, and spur tracks) would be located either in the yard or within the MCF building. An emergency generator will be installed at this facility.

A.2 Elevated Guideway

As shown in **Figure 2-6**, the proposed AirTrain guideway would run parallel to the existing AirTrain guideway between the Rail Link Station and the P4 Station, but then diverges from the existing alignment and will be installed adjacent to the Peripheral Ditch.

The distance between the two guideways of the proposed AirTrain is expected to be approximately 50 feet at the stations and approximately 16 feet in stretches between stations. The separation of the guideways in the area near the existing rental car facility is proposed to be 60 feet to allow the construction of an additional



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Source: Aerial Imagery by NearMap, 09/20/2019.

PROPOSED MAINTENANCE & CONTROL FACILITY (MCF)

Figure A-1

station, labeled as Future Station 2, to accommodate the future replacement for Terminal B. For the purposes of this report, it was assumed that the replacement for Terminal B would be located along the same general north-south alignment as Terminal C and new Terminal One.

The elevated guideway structure would include the structural components to support the train (foundations, substructure (piers, columns, bents, caps) and superstructure (beams/girders, deck slab, parapet walls, equipment supports, emergency and maintenance walkways, etc.)). The guideway elevation would likely vary between 5 to 75 feet above grade with track separations from 17 to 60 feet. Alignment switches will be provided along the guideway so that a train may travel along the opposite guideway in the event a section of guideway is taken out of service, a train is stuck on a section of track, or an obstacle needs to be avoided.

A.3 Stations

Stations will have level boarding platforms for riders to embark and disembark the trains, as well as elevators, escalators, and stairwells. Between stations there would be emergency walkways between the dual track girders to allow for safe rider egress to the nearest station in the event of a system malfunction.

Expanded Rail Link Station (Station 4)

The existing Rail Link Station has limited capacity. It has one elevator and no escalators to grade, forcing riders to walk down a staircase with their luggage to access the alternate busing service when the existing AirTrain is not operational. The Proposed Action would expand the existing Rail Link Station to the north and would include construction of a new enclosed, climate-controlled, center platform for riders, located between the two new guideways. To the south of the new platform would be an enclosed two-story space that houses an APM equipment room, a new substation, a mechanical room, and an electrical room. An emergency generator will be installed at this facility. The existing Rail Link Station will remain open for passengers passing through and to provide access to the street level.

Expanded rider circulation space (escalators, stairs, and elevators) would be provided to transfer riders from the Rail Link Station platform up to the existing pedestrian connector where riders can cross over to the NJ Transit and Amtrak platforms. The expanded Rail Link Station would have a footprint of approximately 13,000 SF and a TSF of approximately 18,000 SF.

At the north end of the existing building, an existing stairway would be replaced with two escalators, one elevator and a staircase to ground level to facilitate the transfer of riders between the existing station and a proposed bus pick up and drop off area. This vertical circulation and bus operation would be used during AirTrain outages of both the existing and the replacement AirTrain. After the existing AirTrain is out of service, the existing platform and the APM equipment rooms would be repurposed.

Station 3

Station 3 would be located at the approximate midpoint of the Replacement AirTrain guideway. The building would stand to the east of P4 and southwest of Terminal C. This station would serve Parking Garage P4, Terminals C and B, and hotel shuttle buses. Riders would access these facilities by way of elevated concourse-

level pedestrian connectors constructed within the CTA. The connectors are shown in **Figure 2-6** and are described in more detail in **Section A4**.

Station 3 would be the largest of the proposed stations because it would be used by riders accessing more than one terminal (B and C) as well as Parking Garage P4. The proposed footprint would be approximately 13,000 SF and the total area would be approximately 29,000 TSF. The station platform would lie between the dual guideways and would be a climate-controlled space with two elevators, four escalators, and a stairwell to connect the station platform to the concourse level below it. The concourse level would house an equipment room, mechanical room, and an electrical room, as well as restrooms. There would be an emergency stairwell and one elevator to access the grade level.

Also, at the concourse level, riders would be able to connect to the P4 Parking Garage, Terminal C and Terminal B by way of connectors with walk distances of approximately 250 feet, 1,200 feet and 2,200 feet, respectively. The connector to Terminal B is anticipated to be 2,200 feet and would have moving walkways. The connector to Terminal B could ultimately be removed depending on whether or not plans are advanced for a new Terminal Two to replace Terminal B. The pedestrian connectors are described in **Section A4**.

The construction of Station 3 and the adjacent valet area would require the reconfiguration of Pitcairn Road in the vicinity of the P4 garage toll booths. Pitcairn Road would be diverted around Station Road as much as 30 feet to accommodate the station and the guideway foundations. As a result, the intersection of Pitcairn Road and Martin Road will be reconfigured as well, providing dedicated turning lanes.

Future Station 2

If a new terminal to replace Terminal B is located west of Terminal B, then a new AirTrain station would be constructed near the current Hertz rental car facility to provide service to the new terminal. Currently there are no plans for the construction of a new terminal to replace Terminal B; therefore, the structure for Future Station 2 will not be constructed as part of the Proposed Action. However, in this area, the guideway foundations and support structure for the current Proposed Action would allow enough space between the guideways to accommodate Future Station 2. A mechanical equipment room is proposed to be constructed at grade in this location to house APM system equipment for support of the proposed replacement AirTrain. The system equipment will be needed at this location regardless of future construction.

Station 1

Station 1 would anchor the southern end of the proposed alignment and would serve Terminal One and the CONRAC facility. The enclosed, climate-controlled building would be comprised of three levels, and would include rider areas and support facilities (a substation, electrical and mechanical rooms). Station 1 would have a footprint of approximately 12,000 SF and a TSF of approximately 22,000 SF. The station platform would be the highest level and would have two elevators and three escalators at the north end of the platform to provide circulation to the station's concourse level and the Terminal One pedestrian connector below. Stairs on the opposite end of the platform and under the escalators provide emergency egress to grade.

A.4 Pedestrian Connectors

The Proposed Action would include construction of four pedestrian connectors that link terminals and other facilities to the proposed replacement AirTrain. The proposed pedestrian connectors are depicted in **Figure 2-6** and described in **Table A-1**. The connectors would be elevated above existing roadways and bridges, providing safe and climate-controlled passageways. Each connector would be supported by steel or concrete columns in locations to minimize disruption to parking and traffic patterns. All connectors longer than 1,000 feet would include moving walkways. The proposed connectors have a 25-foot minimum interior width and vary from 20 feet to 50 feet above grade.

Table A-1 Pedestrian Connectors Included in Proposed Action

Areas Connected	Description
Station 3 to/from P4 Garage	A proposed 250-foot long connector would link the Station 3 concourse level and level 4 of P4 Parking Garage. Once inside the P4 Parking Garage, riders would walk 100 feet to the existing elevator lobby for access to all levels of the garage, valet parking at grade level, and hotel shuttles at grade level.
Station 3 to/from Terminal C	A proposed 1,200-foot connector would link Station 3 concourse level and Terminal C. The connector would connect to the terminal at a new level above existing Level 3. Additional escalators and elevators would be added to the terminal for riders to access all levels of the terminal.
Station 3 to/from Terminal B	A proposed 2,200-foot connector would link Station 3 concourse level and Terminal B. The Terminal B pedestrian connector would tie into the northern Terminal B façade above the terminal's Level 3. A small landing would be created at the connector's terminus that would house two elevators and two escalators to provide access to the terminal and the pedestrian connector between Terminals B and C. As discussed in **Section A2**, Terminal B may be replaced with a new Terminal 2 in the future. Therefore, the connector to Terminal B may be considered interim depending on whether or not plans for a new Terminal Two are advanced.
Terminal B to/from Terminal C	Passenger movement between Terminals B and C is the most heavily traveled segment of the existing AirTrain. The proposed action accommodates these passengers with a 1,025-foot long pedestrian connector that would link Terminals B and C at Level 3. Vertical circulation would include two escalators and one elevator for bridge access at Terminal B. No additional vertical circulation is proposed for Terminal C. The enclosed pedestrian connector would be above grade and provide weather protection, climate control, and moving walkways for rider convenience.

Source: EWR AirTrain Planning Team

A.5 Demolition of Existing AirTrain

Once the Proposed Action is tested and commissioned, portions of the existing AirTrain would be decommissioned and demolished. This would include removal of all rail cars; demolition of the existing MCF, P2 and P3 Stations; partial demolition of the P4 and existing Rail Link Stations; and demolition of the existing guideway outside the CTA. All guideway, foundations and structures within the CTA from the western end of Terminal A to the western end of Terminal C would remain in place in order to minimize disruption to airside and terminal operations. Stations located within Terminals A, B, and C would remain in place with a possible repurpose that has not been determined at the time of this report. The elevators and escalators within those stations would be taken out of service if the space is not repurposed. The remaining guideway, structures, and stations may be demolished as part of future projects. In that case, those projects would identify and evaluate the impacts of that demolition as part of their own planning and NEPA processes.

A.6 Land Acquisition

The proposed AirTrain would be located primarily on Airport property. For the portion of the Proposed Action to be located off-Airport property, the PANYNJ anticipates acquiring 14 acres of private property (acquisition, lease, or easements) adjacent to the northern segment of the guideway, and 28 acres of temporary construction easements (**Figure 2-7**). The 14 acres of land proposed for acquisition would accommodate permanent structures to support the proposed AirTrain (e.g., a maintenance and control facility, guideway infrastructure, etc.). The general areas considered for acquisition are either currently vacant or used for airline employee parking, hotel patrons, and truck/trailer parking. No residential or business relocations would result from the proposed acquisitions. **Table A-2** presents parcel information for lands proposed for acquisition and temporary construction easements.

Table A-2 Summary of Proposed Land Acquisition and Temporary Construction Easements

Property Owner	Land Use	Block	Lot	Temporary Construction Easement	Permanent Acquisition
International Way, LLC	Vacant	5088	169	2	1
Hartz Mountain Waver	Vacant	5088	126.01	7	6
Ownership TBD	Vacant	5088	126.01	1	1
Hartz Mountain Waver	Vacant	5090	1.05	4	1
Ownership TBD	Vacant	5090	1.05	1	1
Anheuser-Busch	Parking Lot and Weigh Station	5090	44.01	3	2
BK Ventures, LLC	Vacant	5090	28	1	1
NJDOT ROW	Vacant	NA	NA	9	1
Proposed AirTrain				***28***	***14***

Source: Lea+Elliott, Inc. 2019.

Appendix B

Appendix B: Natural Resources Technical Environmental Study, September 2020, prepared by NV5, Inc.

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Newark Liberty International Airport (EWR)
AirTrain Replacement Program

NATURAL RESOURCES TECHNICAL ENVIRONMENTAL STUDY

REV. 6

September 16, 2020

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AVI-15-032

NEWARK LIBERTY INTERNATIONAL AIRPORT
AIRTRAIN REPLACEMENT PROJECT
NATURAL RESOURCES TECHNICAL ENVIRONMENTAL STUDY

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1.0 BACKGROUND AND PROJECT DESCRIPTION

1.1 Introduction

This Natural Resource Technical Environmental Study (TES) evaluates the potential environmental impacts of a proposed project to replace the Newark Liberty International Airport (EWR) AirTrain. The project would be undertaken by the Port Authority of New York and New Jersey (PANYNJ) as the Project Sponsor. The TES evaluates the impacts to those environmentally sensitive areas for each of the basic alignment alternatives. It then quantifies the anticipated environmental impacts to each of them. This impact quantification is used to help finalize the final proposed action.

1.2 Background

1.2.1 Newark Liberty International Airport

EWR (or the Airport) is operated by the PANYNJ and is located in the southeastern portion of the City of Newark in Essex County and the northeastern section of the City of Elizabeth in Union County, near Newark Bay, as shown on Figure 1 - 1. It is 12 miles by highway from Lower Manhattan in New York City, and is comprised of 2,027 acres[1]. The PANYNJ owns the portion of the airport located in Elizabeth and leases the portion of the airport located in Newark from the City of Newark[2].

In 1973, EWR's original Central Terminal Area (CTA) opened, housing Terminals A, B, and C[3].

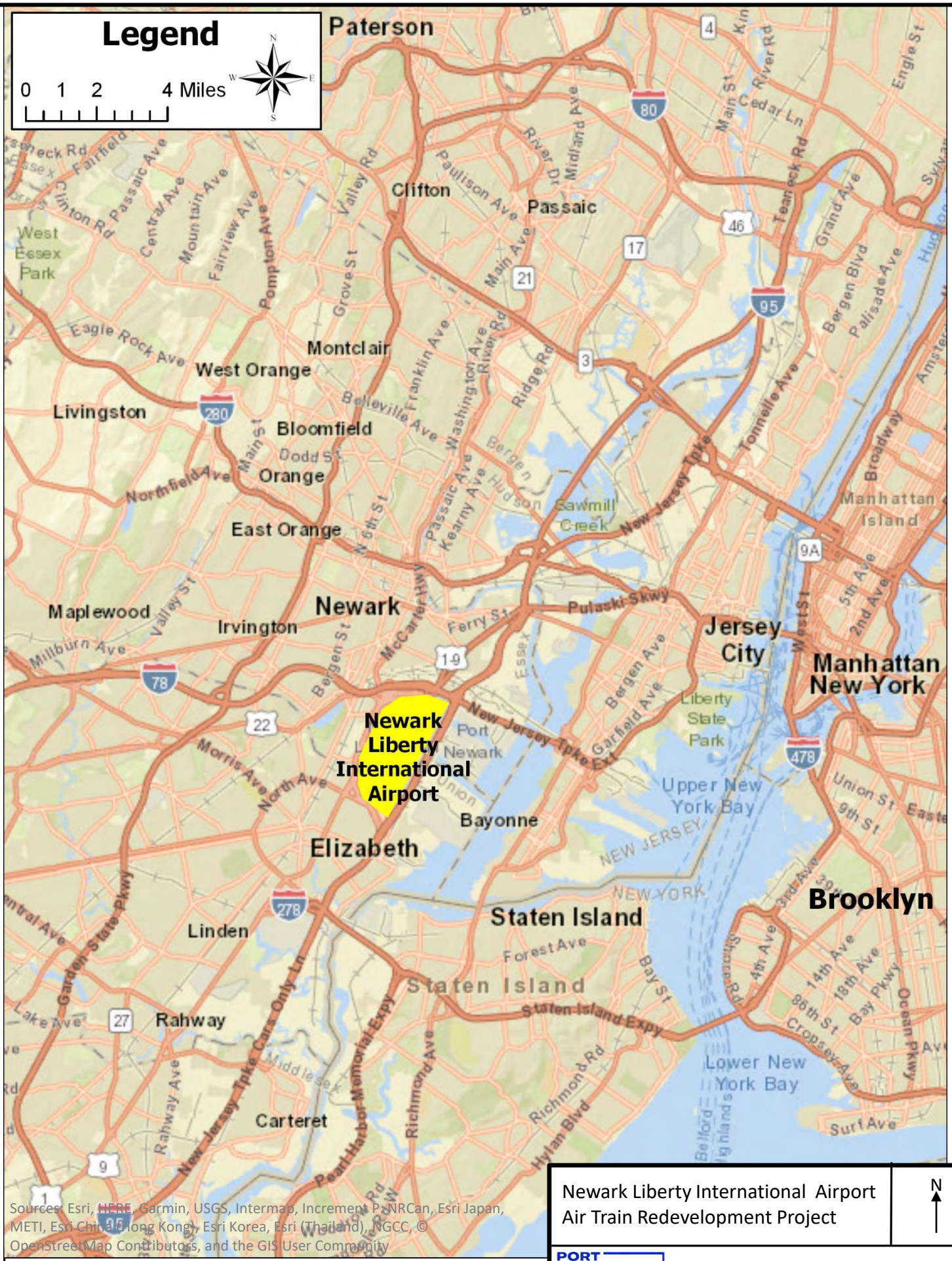
Based on passenger enplanements, EWR is the second busiest airport in the New York-New Jersey metropolitan area and the 14th busiest airport in the nation[4]. The Airport serves as a hub for one of the leading carriers in the New York market, United Airlines, along with 33 other scheduled carriers. In 2019, the airport handled more than 46 million annual domestic and international air passengers.

Over the last fifteen years, the PANYNJ has made significant efforts to modernize and redevelop the passenger terminals at EWR to respond to the evolving needs of airlines and passengers. Currently, the PANYNJ is replacing Terminal A with the construction of Terminal One and a Consolidated Rental Car Facility (ConRAC). Planning efforts were recently authorized and launched with regard to replacement of existing Terminal B with a new Terminal 2 currently under construction. Timing and scope definition of this project is still under development.

1.2.2 Newark Liberty International Airport AirTrain

Originally put into service in 1996, the AirTrain[5] services Terminals A, B, and C, the existing rental car facility, and patron parking lots at EWR. In 2001, AirTrain service was extended to the "Rail Link Station" to provide passengers with a connection to Amtrak and NJ TRANSIT regional rail service on what is known as the "Northeast Corridor" rail line[6]. Today the AirTrain EWR system serves seven stations, operates

[1] PANYNJ. Terminal A Redevelopment Program Newark Liberty International Airport Final Environmental Assessment. PANYNJ, 2017.
[2] PANYNJ. Property Owned or Leased by The Port Authority. Port Authority New York New Jersey, 16 Jan. 2015, www.panynj.gov/about/pdf/property-owned-leased-port-authority.pdf.
[3] PANYNJ. AirTrain EWR Replacement Planning FAA Briefing. 2017, AirTrain EWR Replacement Planning FAA Briefing.
[4] PANYNJ. Terminal A Redevelopment Program Newark Liberty International Airport Final Environmental Assessment. PANYNJ, 2017
[5] "Newark International Airport Redevelopment Program Environmental Assessment," US Department of Transportation, Federal Aviation Administration. FONSI December 11, 1989.
[6] "Final Environmental Impact Statement for the Newark International Airport Ground Access Monorail Northeast Corridor Connection Project," US Department of Transportation, Federal Aviation Administration. January, 1996 (FONSI/ROD January 23, 1996).



Sources: Esri, HERE, Garmin, USGS, Intermap, Increment P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap Contributors, and the GIS User Community

Newark Liberty International Airport
Air Train Redevelopment Project

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Map 1-1 : Regional Location Map

B-4

24 hours per day 365 days per year (with the exception of one overnight maintenance shutdown on a monthly basis), and averages 33,000 riders daily. The AirTrain EWR allows for eco-friendly transportation for air passengers and airport employees to and from EWR. The AirTrain connects all terminals (A, B, and C), allowing them to function as a single terminal while connecting to airport parking lots, hotel shuttles, and rental car facilities[7,8]. The AirTrain's connection to the Northeast Corridor Line also provides access to various points in New Jersey, New York, Boston, Philadelphia, and Washington, D.C.

The existing AirTrain is a fully automated, driverless, rubber-tired system operating on a grade-separated guideway. The infrastructure includes nearly three miles of dual-lane, steel box-beam guideway. The guideway is supported by 227 steel columns on pile supported foundations. The system includes 15 electrically-powered, 6-car monorail trains that are 100-feet long. The seven passenger stations have automatic platform screen doors that are synchronized with the monorail trains for passenger egress and safety. Each train has a design capacity of up to 78 passengers and the passenger stations are designed to support the full boarding and deboarding of the trains.

The existing AirTrain operates under three service modes: peak, off-peak, and nightly maintenance. Peak service is provided between 11:00 am - 8:00 pm with 12 trains in operation. Off-peak service is provided between 5:00 am - 11:00 am and 8:00 pm - 12:00 am with nine trains running in a full loop. Nightly maintenance is provided between 12:00 am - 5:00 am with three trains running in a synchronized shuttle configuration that requires passengers to transfer between multiple trains to reach the Rail Link Station. This service allows for routine maintenance of the system. The system has four-minute headways during peak hours, fifteen-minute headways during off-peak hours, and fifteen-minute headways during nightly maintenance with vehicles traveling at speeds up to 27 miles per hour (mph)[9].

The system was specified to accommodate 2,600 passengers per hour per direction (pphpd) during peak periods. Due to changes in train operations such as increasing the design station dwells from 20 seconds to 45 to 60 seconds and decreasing the operating speed by 10%, the current capacity of the existing AirTrain is approximately 1,200 pphpd and is operating at or near full capacity between noon and 6pm. Passenger demand currently exceeds capacity.

The existing AirTrain system complies with the requirements of the American Disabilities Act of 1990. The emergency walkway, located between the dual track girders, allows for repairs and safe passenger egress to the nearest station in the event of a system malfunction.

The existing AirTrain was originally designed and installed by Von Roll Transport, with their "Mk III" vehicle system, representing Von Roll's latest monorail technology at the time. Earlier installations of the similar "Mk II" monorail opened in 1986 in Vancouver, Canada and in the Gold Coast, Australia. Other installations of the Mk II and Mk III opened in Singapore and throughout Australia, but all have been decommissioned due to life-expired equipment or declining patronage. The AirTrain Newark is one of the last – or the last remaining Mk II or Mk III generation monorail systems still in passenger service. The existing AirTrain system is nearing the end of its original design life, resulting in delays, passenger evacuations, and costly repairs. The "systems" components of the existing AirTrain had a 10 to 25-year design life, and the "infrastructure" had a 50-year design life[10].

[7] The Port Authority of NY & NJ. "EWR Newark Liberty International Airport." The Port Authority of NY & NJ, The Port Authority of NY & NJ, https://www.panynj.gov/airports/ewr-facts-info.html

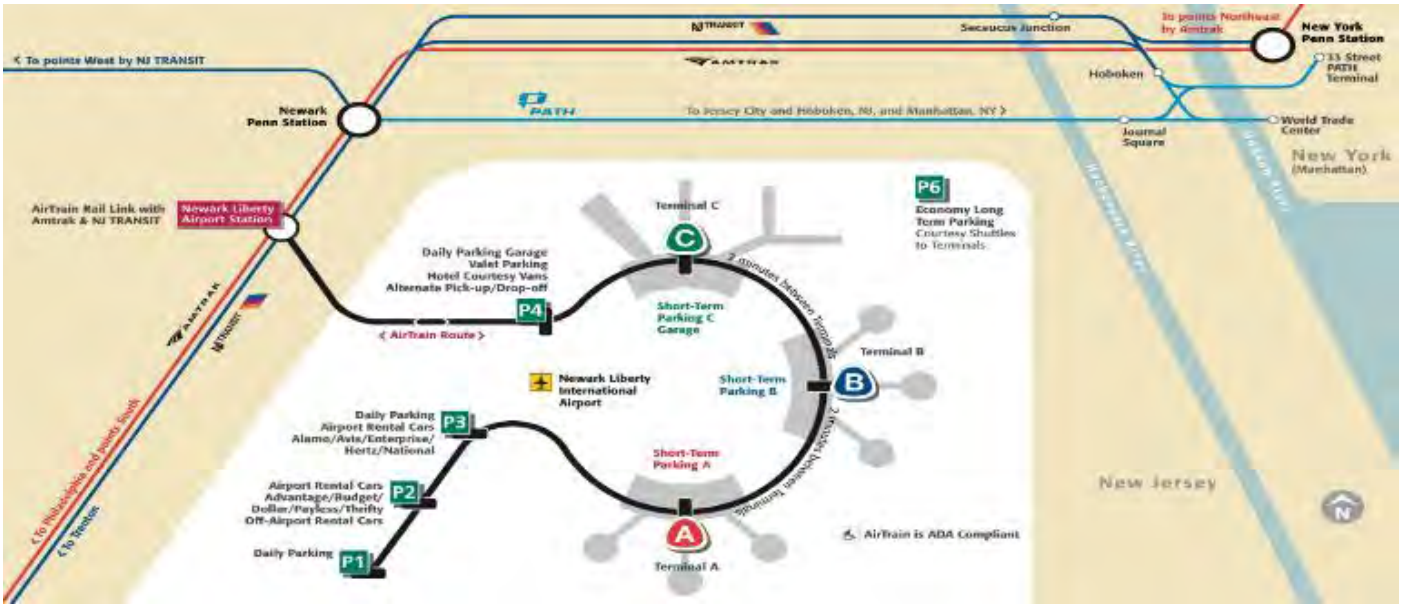
[8] The Port Authority of NY & NJ. "EWR Newark Liberty International Airport." The Port Authority of NY & NJ, The Port Authority of NY & NJ, https://www.panynj.gov/airports/ewr-airtrain.html

[9] PANYNJ. AirTrain Newark Pamphlet 2017.

[10] Design and Constriction of Automated People Mover (APM), PA Contract EWR-114.001, December 1990.

As an enabling project for the construction of the future rental car facility. ConRAC facility next to the future Terminal 1, it was necessary to decommission the existing AirTrain P1 Station platform and adjacent AirTrain guideway. Until the replacement AirTrain is complete, the existing AirTrain will continue to provide transport to terminals, the existing rental car area, the new ConRAC, patron parking lots, and the connection to the Northeast Corridor (Rail Link Station).

Map 1 - 2 EWR AirTrain Map with Regional Connections



SOURCE: Port Authority of New York and New Jersey, http://www.panynj.gov/airports/pdf/ewr-airtrain-brochure-english.pdf (accessed December 2017).

1.3 Project Description

The AirTrain system is nearing the end of its useful life and the PANYNJ has begun planning for its replacement. The project recommends replacing the existing system with a contemporary automated people mover (APM) that will accommodate the future growth and redevelopment anticipated at EWR. This replacement system will enhance capacity, provide service between existing and future airport facilities, and maintain the connection to the existing Rail Link Station. The new EWR AirTrain will serve Terminals B, C, and new Terminal 1 as well as parking areas (with hotel shuttle transportation), a rental car facility, and the Rail Link Station.

The proposed replacement AirTrain system will be an approximately 2 to 3 mile dual guideway system located primarily on PANYNJ property. Some property acquisition will be required for the permanent construction and for temporary construction easements. These properties are located off airport and west of U.S. Route 1/9 (adjacent to the existing AirTrain alignment) and near the existing Rail Link Station. Small areas of property owned by Hartz Mountain, Anheuser-Busch, and the City of Newark adjacent to the Rail Link Station are under study for potential acquisition. These properties are currently vacant or being used for vehicle parking.

Two potential “Build” alignments were evaluated for the replacement of the current EWR AirTrain: the Loop Alignment and the Linear Alignment, which are outlined in detail in Chapter 2 of The Port Authority

of New York & New Jersey Newark Liberty International (EWR) AirTrain Replacement Project Environmental Assessment (June 2020).

The Linear Alignment was ultimately chosen as the Proposed Action (see Figure 3). This Natural Resources TES therefore reviews anticipated Natural Resources impacts associated with both the Loop Alignment and the Proposed Action.

The Proposed Action will include the construction of all facilities and infrastructure for the replacement of the AirTrain system, including stations, circulation space, elevated pedestrian walkway, utilities, and a maintenance and control facility (MCF). The existing AirTrain is expected to remain operational until the replacement AirTrain begins passenger service.

2.0 AFFECTED ENVIRONMENT AND ECOLOGICAL/ENVIRONMENTAL CONSEQUENCES

This Technical Environmental Study (TES) describes the currently existing (2020) environmental conditions and then evaluates and presents the environmental impacts of each of the proposed alternatives to provide a clear basis for selecting the Proposed Action. The topography of the region is shown in Figure 1, and Figure 2 shows the project location on a street map. To indicate the general characteristics of the region, a land use map is included in Figure 4. ***It should be noted that the impacts discussed in Section 2.0, except where indicated, are based on direct impacts to the resources in question. PANYNJ's proposed Construction Access and Staging Plan primarily utilizes existing roadways, parking areas and disturbed areas for construction access and material and equipment storage and staging. Given that factor and given the approach that all areas temporarily impacted by construction will be restored to their pre-construction condition, no significant adverse indirect impacts associated with indirect construction-related impacts are anticipated. PANYNJ's Concept Design included the worst case in terms of vehicle loads and other factors.***

2.1 Geology and Soils

Existing Conditions

Newark Airport is located in the Piedmont Physiographic Province. The Piedmont is generally a low rolling plain divided by a series of higher ridges. It makes up approximately one-fifth of the state, including all of Essex and Union Counties.

Surficial geology (refer to Figure 5A) at the site consists predominantly of salt-marsh and estuarine deposits (Qmm) with minor components of Late Wisconsinan Glacial Delta Deposits (Qwde). Qmm are Holocene deposits comprised of brown, dark-brown, gray, black silt, sand, peat, and clay with loam, with minor pebble gravel. They contain abundant organic matter and are typically 100 feet thick, although up to 300 feet in the Hudson Valley. These were deposited in salt marshes, estuaries, and tidal channels during Holocene sea-level rise. Qwde can be 150 feet thick and lithology is characterized of yellowish brown, reddish brown, light gray sand, pebble-to-cobble gravel, and minor silt. They were deposited during the late Wisconsinan glaciation in deltas and other ice-contact landforms in glacial lakes.

The New Jersey Department of Environmental Protection's (NJDEP) NJ-GeoWeb mapping program was reviewed to determine geological characteristics at the site. According to NJDEP GeoWeb, local bedrock geology consists of the consolidated layer that lies beneath unconsolidated material. The site is underlain by Passaic Formation Mudstone facies (JTrpms). Lithology for JTrpms is described as sandy mudstone. A

small portion of the greater airport property is underlain by a different bedrock unit: Passaic Formation (JTrp). The AirTrain project site does not encroach into this area. Bedrock geology is shown in Figure 5B.

The United States Department of Agriculture (USDA) National Resource Conservation Service (NRCS) Web Soil Survey was reviewed to characterize soils within the project study area. As shown in Figure 6, the site is underlain primarily by the following soils:

- Urban Land, Bigapple substratum, 0-8% slopes (URBHGB) – The typical profile for URBHGB soils consists of impervious material (asphalt, pavements, concrete, buildings, etc.) from 0 to 12 inches, gravelly sands from 12-26 inches, loamy sand from 26-38 inches, and 38-60 inches of gravelly loamy sand;

- Bigapple, Urban land, Bigapple substratum complex, 0-3% slopes (BhguA) – The soil profile typically consists of 0-3 inches of loamy sand, 3-26 inches of gravely sand, 26-38 inches of loamy sand, and 38-60 inches of gravelly loamy sand. This soil is somewhat excessively drained, strongly to moderately acid, and the water table is greater than six feet deep; and

- Udorthents, organic substratum, 0-8% slopes (UdoB) – This is a well-drained soil characterized by 0-36 inches of sand, followed by 36-60 inches of muck.

- Smaller portions of the site contain: Urban Land, loamy fill substratum, 0-8% slopes (URKTTB) – Generally the soil profile consists of 0-12 inches of pavement, concrete, buildings, and other structures; clay loam from 12-41 inches; and silty clay from 41-61 inches. Soils are acidic and the depth to water table ranges between 48 to 122 inches; and Udorthents, Dunellen substratum, 0-8% slopes (UddunB).

It should be noted that the entire area of both Newark Liberty International Airport and Port Newark-Elizabeth Marine Terminal are mapped as areas of historic fill (see Figure 7). Said historic fill may have structural properties different from those described above. Historic fill typically also includes contaminated material such as metals, and polycyclic aromatic hydrocarbons (PAHs). **Both geotechnical and environmental sampling is recommended when working in these areas.**

No-Action Alternative Impacts

Under the No-Action Alternative, no significant direct impacts to soils or geology are anticipated.

Loop Alternative Impacts

Given the highly developed nature of the Airport in general, much of the site has already been disturbed by previous development. From a soils and surficial geology perspective, much of the impact associated with the proposed AirTrain improvements will take place on areas already covered with impervious surface. This is particularly true where the Loop Alternative extends up near the Terminals in the CTA. Construction of the supporting infrastructure, which will include driving piles and placing pile caps on top of the piles to support the AirTrain foundations and supporting guideway piers, is not anticipated to having any direct or indirect significant adverse impact to either soils, surficial geology or bedrock geology since the piles are essentially closed cells and the overall piles/pile cap/foundation installations are relatively small in size. Given that greater than one (1) acre of soil disturbance is proposed, an NJPDES Permit for Construction Stormwater will be required prior to construction.

Proposed Action Alternative Impacts

Given the highly developed nature of the Airport in general, much of the site has already been disturbed by previous development. Nearly the entire length of the Proposed Action would be constructed on mapped historic fill. From a soils and surficial geology perspective, much of the impacts associated with the proposed AirTrain improvements will take place on either already disturbed areas, including areas already covered with impervious surface. This is particularly true from north of future Station 2 to its terminus near Terminal 1, near the Rail Link Station terminus, and the MCF. As previously stated for the "No Action" and "Loop" Alternatives, construction of the supporting infrastructure, which will include driving piles and placing pile caps on top of the piles to support the AirTrain foundations and supporting guideway piers, is not anticipated to having any significant adverse impact to either soils, surficial geology, or bedrock geology because the piles are essentially closed cells and the overall piles/pile cap/foundation installations are relatively small in size. Given that greater than one (1) acre of soil disturbance is proposed, an NJPDES Permit for Construction Stormwater will be required prior to construction.

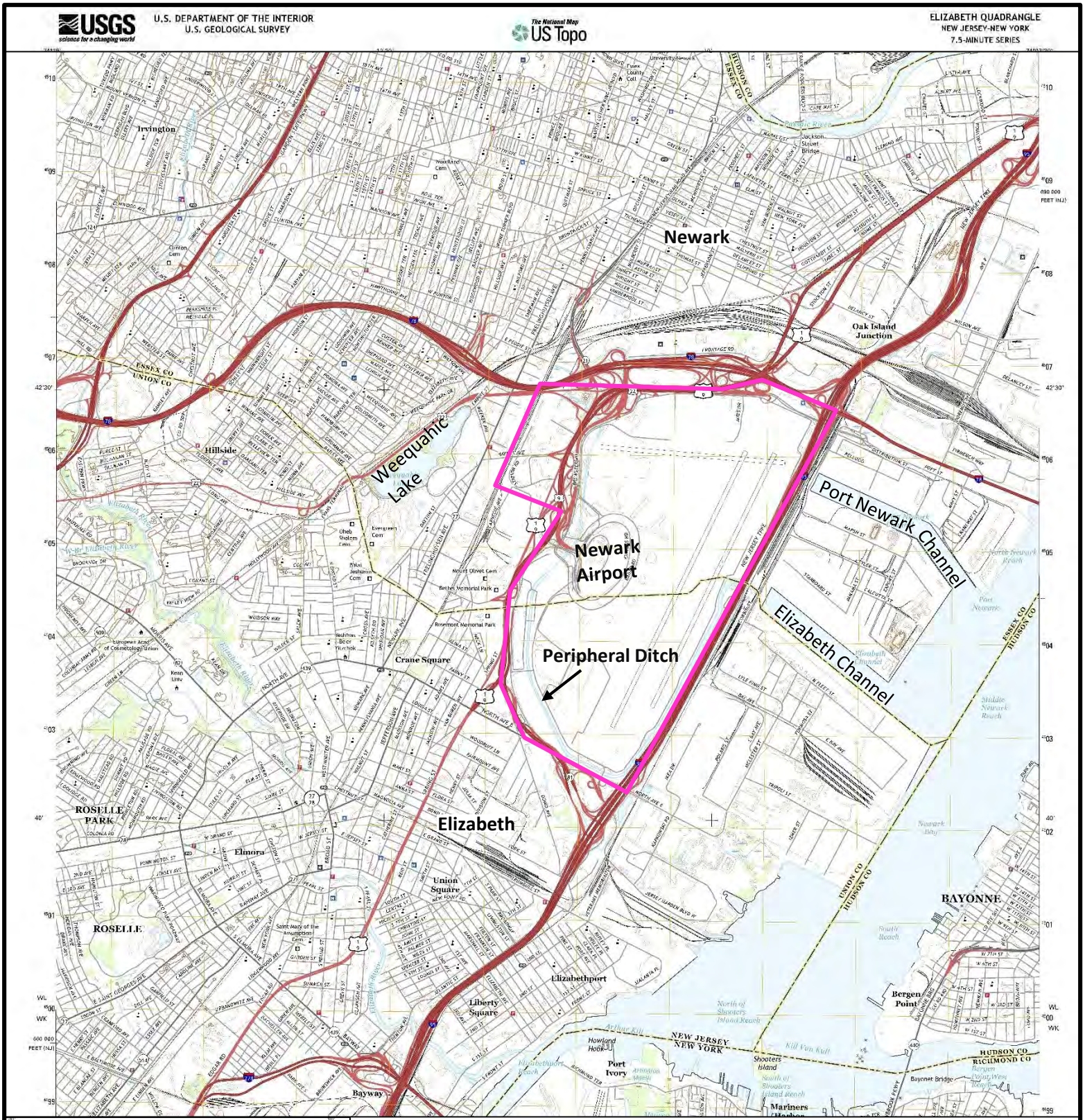


Figure 1 – USGS Site Map

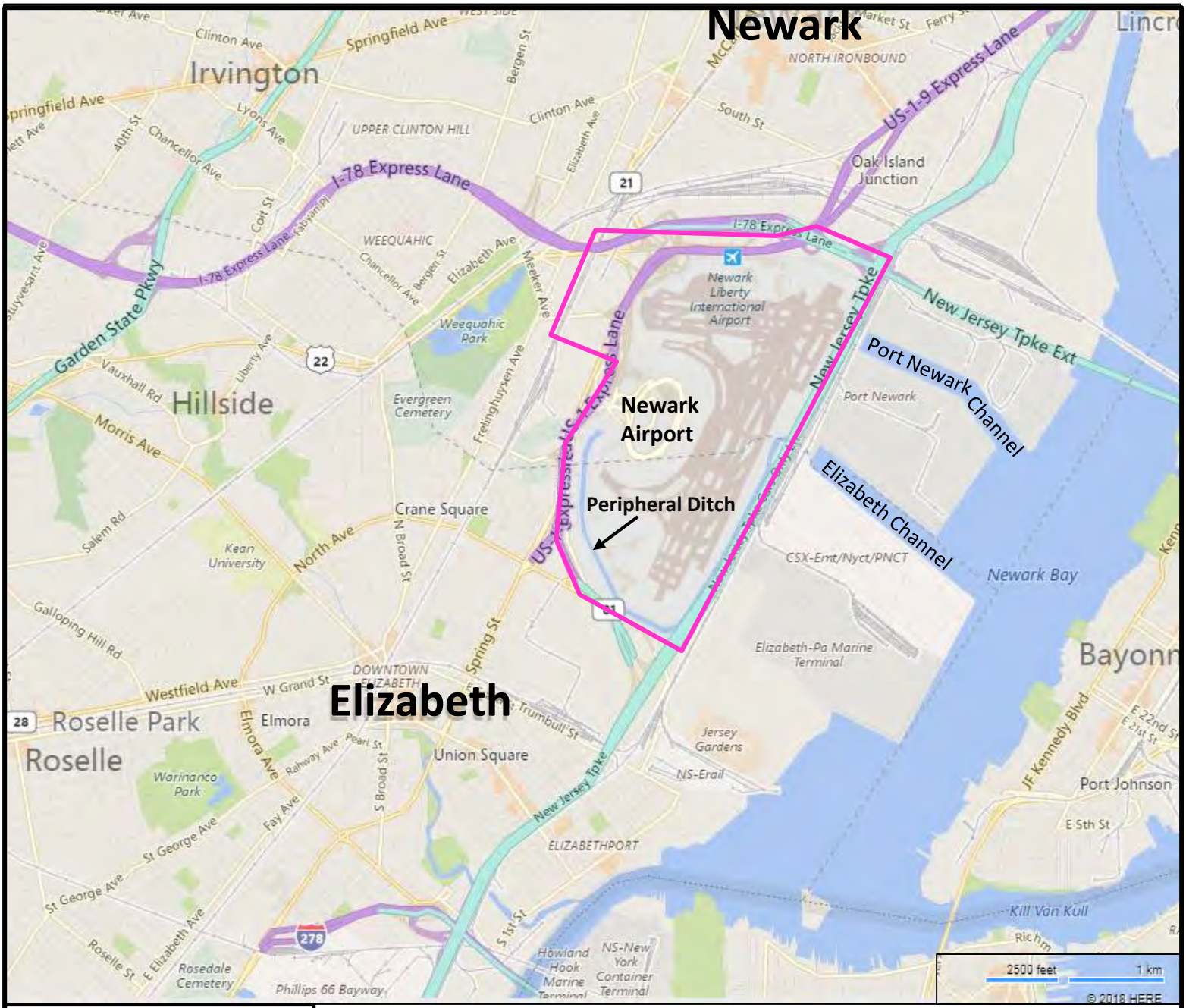
Newark Liberty International Airport
Air Train Replacement Project

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Approximate Site Boundary

B-10

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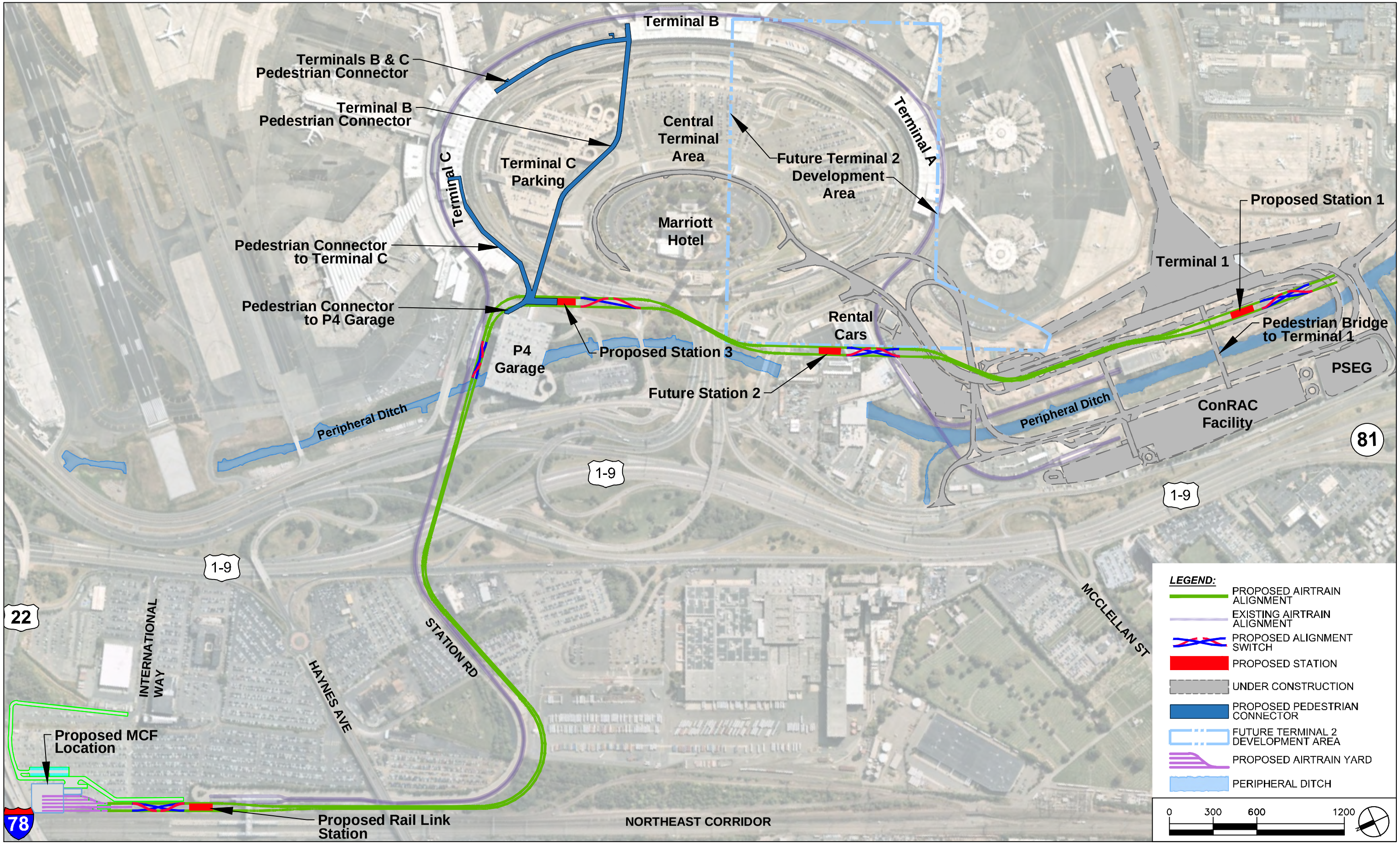
Approximate Site Boundary

Figure 2 – Street Map

Newark Liberty International Airport
Air Train Replacement Project

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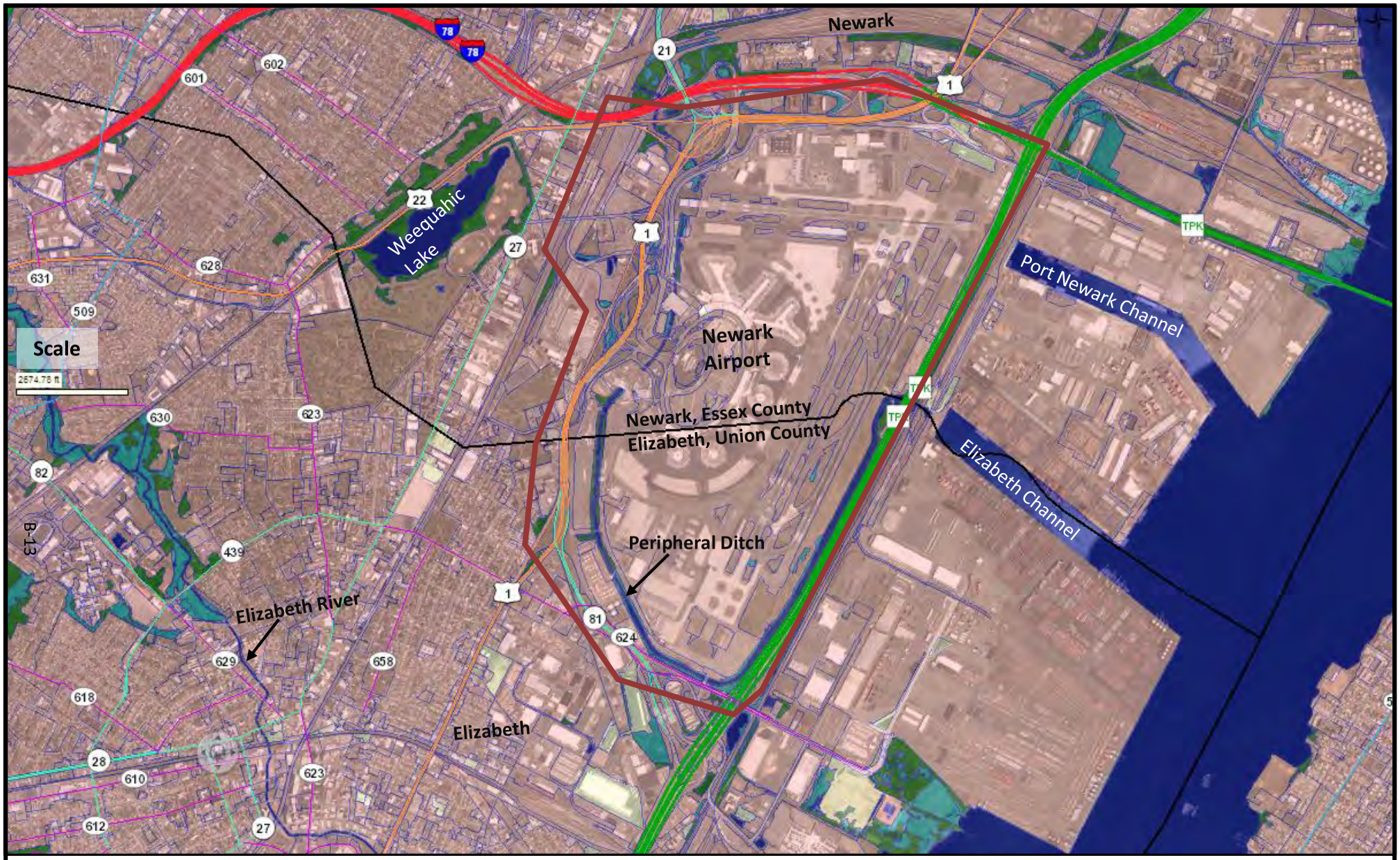
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AIR LAND RAIL SEA



PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

PROPOSED ACTION

Figure 3


Newark
Weequahic Lake
Newark Airport
Port Newark Channel
Elizabeth Channel
Newark, Essex County
Elizabeth, Union County
Peripheral Ditch
Elizabeth River
Elizabeth
Scale
2674.76 ft
B-13
Urban
Water
Wetland
Forest
Barren Land
Approximate Site Boundary
Figure 4 – Land Use Map
Newark Liberty International Airport
Air Train Replacement Project
N
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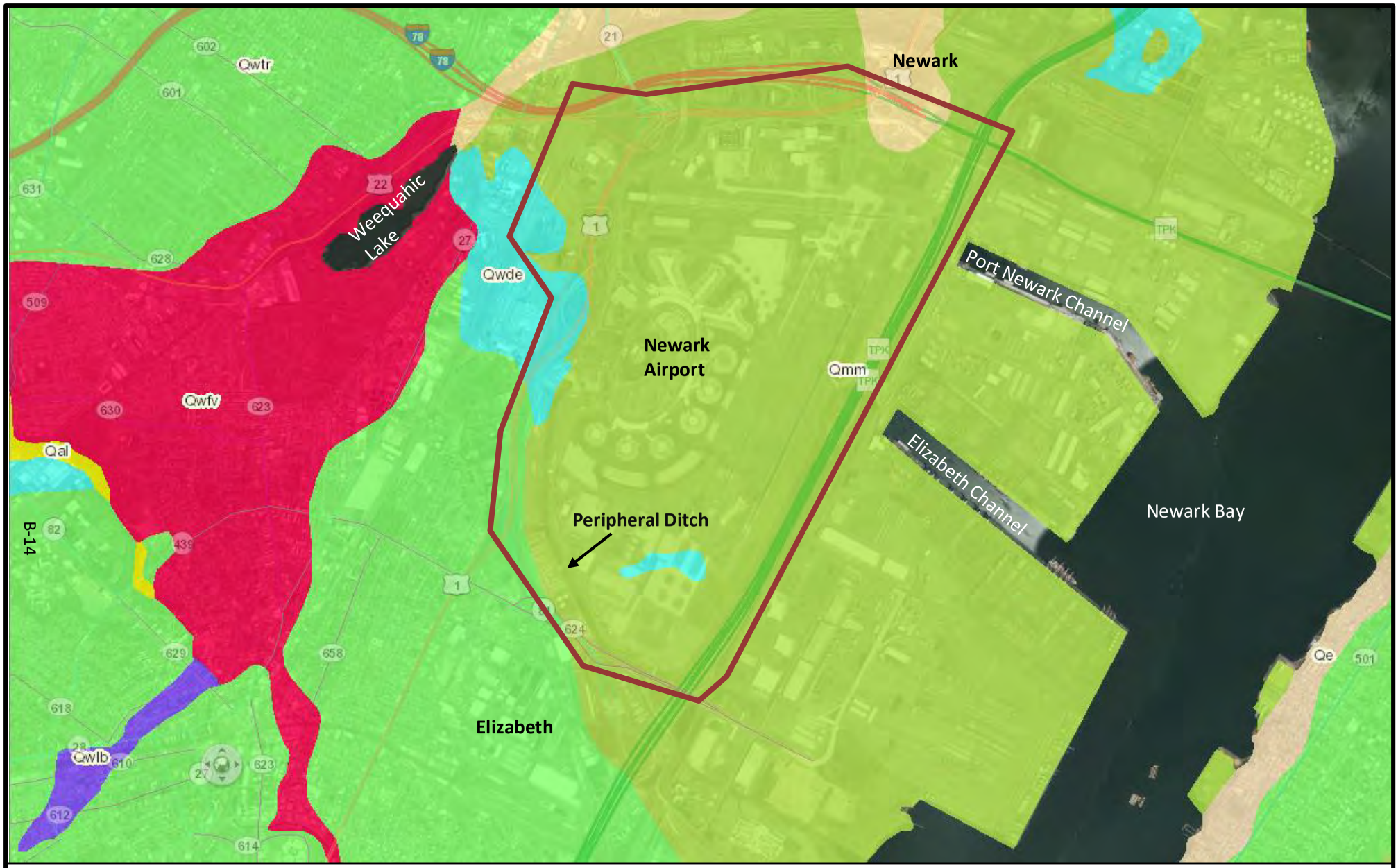


Figure 5A – Surficial Geology Map

Newark Liberty International Airport
Air Train Replacement Project

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- Passaic Formation Mudstone facies (JTrpms)
- Passiac Formation (JTrp)
- Lockatong Formation Arkosic Sandstone Facies (Tria)
- Lockatong Formation (Tri)
- Jurassic Diabase (JD)

Approximate Site Boundary

Figure 5B – Bedrock Geology Map

Newark Liberty International Airport
Air Train Replacement Project

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Figure 6 – USDA NRCS Soil Map

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Air Train Replacement Project

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Historic Fill

No Fill

Approximate Site Boundary

Figure 7 – Historic Fill Map

Newark Liberty International Airport
Air Train Replacement Project

N

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2.2 Water Resources

Existing Conditions

Surface Water

The Peripheral Ditch is the only major watercourse within the project area, and is shown in Figure 8A. The Peripheral Ditch is a man-made stream created in 1964 in anticipation of the redevelopment of the airport. At that time, Bound Creek, Woodruff's Creek, Adams Ditch, Dead Creek, and Peddie Canal were relocated to the perimeter of the airport and renamed Peripheral Ditch. The stream is approximately 4.5 miles long, traveling around the eastern, southern, and western perimeter of the airport. It empties into the Elizabeth Channel through a tide gate located just west of the NJ Turnpike and operated by the City of Newark. The Peripheral Ditch is culverted for approximately 750 feet just west of the Central Terminal Area, and varies in bottom width from 80 to 120 feet. While NJDEP's Surface Water Quality Classification, as shown on their present GIS-mapping, classifies the waterway as SE3 waters (Saline/Estuarine), NJDEP has previously confirmed, via a Letter of Interpretation (LOI) completed for the Terminal 1 Redevelopment Project, that the current Surface Water Classification is FW2-NT (freshwater, non-trout) and that the Peripheral Ditch in the area of Terminal 1 was considered a State Open Water. As mentioned above, the GIS-mapped Surface water classification currently shown is SE3, which is reflected in Figure 8B of this document. It should also be noted that the current NJDEP GIS-mapping does not show a "Head of Tide" designation just east of the NJ Turnpike and just west of Elizabeth Channel itself, even though a tide gate is visible in the aerial photographic basemap. Given the more recent NJDEP LOI correspondence and the current Surface Water Classification referenced in that letter, however, it is likely that the GIS-mapping has not been updated yet to reflect the more recent revised Surface Water Classification of FW2-NT. The FW2-NT reflects current conditions due to the presence of the tide gate referenced above and is therefore assumed to be the actual Surface Water Quality Classification. Coordination with NJDEP's Bureau of Tidelands was initiated to determine if there are any current Tideland Conveyance concerns associated with the Project (see Figure 11A and 11B). Based upon conveyance mapping supplied by NJDEP's Bureau of Tidelands, it appears that the "lands formerly flowed by the tide" that are located within the Proposed Action limits are covered by existing conveyances, primarily grants. Coordination will continue with NJDEP's Bureau of Tidelands during the post-NEPA permitting phase and if it is determined that any additional conveyances would be required, PANYNJ will obtain those tidelands conveyances during the permitting phase of the project, prior to the start of construction.

S*tormwater*

Stormwater runoff from the site is conveyed to the Peripheral Ditch via surface swales and a subsurface network of drains and pipes. The Peripheral Ditch also receives stormwater from surrounding highways and roadways around the airport and from land areas immediately north and west of the airport. These areas north and west of the airport also contribute runoff and combined sewer overflows via tributary swales, drains and pipes, and direct outfalls from storm sewer connections at Peddie Street in Newark, and Alina Street and Adams Avenue in Elizabeth (see Figure 2). In total, the Peripheral Ditch drains an area of approximately 11.8 square miles (7,552 acres) in and around Newark Airport. A series of outfall and cross-ditch booms are in use at the airport to entrap debris and floating pollutants that end up in the ditch.

Newark Airport has previously been issued a New Jersey Pollutant Discharge Elimination System (NJPDES) General Permit NJG0003824 lists 67 Discharge Serial Numbers, labeled DSN001 – DSN067, and eight other discharges labeled R1 – R8 for the airport. The discharges to the Peripheral Ditch from the 75

outlets are regulated by NJDEP, under the NJPDES Permit Program. As required by the NJPDES permit, monthly water samples are collected from three locations on the airport. Sampling points are designated by NJDEP as being representative of industrial activity on the airport, primarily fueling operations and aircraft deicing. The airport is in compliance with its NJPDES permit. While the AirTrain Project, which does not require a NJPDES similar to the one referenced above since it has no discharge, it will likely only require a general NJPDES Permit for Construction Stormwater since disturbance associated with the project is anticipated to exceed one acre.

Groundwater

The airport is underlain by the Brunswick Aquifer, which is not a sole source aquifer (SSA). USEPA defines a sole source aquifer as one where the aquifer supplies at least 50 percent of the drinking water for its service area and there are no reasonably available alternative drinking water sources should the aquifer become contaminated. Designation as a SSA establishes a review area in which the USEPA may review proposed projects that both are located within the review area and receive federal funding. It should be noted that, per NJDEP's GeoWeb environmental constraints mapping, that the groundwater within the Project Area limits is included under a Classification Exception Area (CEA) due to the presence of groundwater contaminants.

Water Resources No-Action Alternative Impacts

Under the No-Action Alternative, no significant direct impacts to environmentally regulated water resources are anticipated.

Water Resources Loop Alternative Impacts

No significant adverse impacts to water resources are anticipated under the Loop Alternative. Should installation of the pile caps and foundations require excavation below the seasonal groundwater table elevation, dewatering using a sediment filter bag may be required and must be done in accordance with all State and Federal regulatory requirements. Impacts to State open waters are anticipated to be 0.008 acres and are associated with installation of piles, pile caps and foundations that will support the AirTrain and its associated infrastructure.

Surface Water

The proposed AirTrain alignment will result in crossing the Peripheral Ditch at a slightly different location then currently exists. NJDEP authorization for this slightly relocated crossing will be required since the proposed new foundation locations would slightly impact both the 100-year coastal floodplain and the NJDEP regulated riparian zone associated with the Peripheral Ditch. Potentially a very small part of the NJDEP regulated fluvial floodway may be impacted due to a portion of a proposed pier extending into the floodway of the Peripheral Ditch, which may require an NJDEP FHA Flood Hazard Area Hardship Exception. This would necessitate meeting design requirements of the Flood Hazard Area Control Act (N.J.A.C. 7:13-2.16). The crossings themselves would have to meet the requirements of the Freshwater Wetlands Protection Act Rules for open water crossings (N.J.A.C. 7:7A). Significant adverse impacts to the existing stream hydraulics of the Peripheral Ditch are not anticipated to result from the Loop Alternative. Relevant permits will be obtained prior to construction.

Stormwater

The Port Authority would continue to comply with the requirements of its current NJPDES stormwater discharge permit under the Loop Alternative. The Loop Alternative would not significantly alter the location or type of impervious surfaces since it is a replacement. As such, the project will not adversely impact the quantity or quality of stormwater runoff at the airport. Stormwater runoff volume and velocity would not change significantly because of the Loop Alternative since the existing impervious foundations for the current AirTrain will be removed during the demolition phase of the project. A minor adjustment to the location of catch basins and storm sewer lines in the Project Area may be required due to the slight relocation of the AirTrain alignment, but in general, the storm sewer system at the airport would continue to collect and convey stormwater as it does currently

Groundwater

Construction and operation of the AirTrain replacement is not expected to significantly impact groundwater resources. Stormwater runoff will be collected and treated in accordance with the airport's NJPDES permit and in compliance with all applicable regulations. The project does not propose to draw on groundwater resources during any phase of construction or operation.

Water Resources Proposed Action Alternative Impacts

As is the case with the Loop and Linear Alternatives, no significant adverse impacts to water resources are anticipated under the Proposed Action. No significant impacts are anticipated to groundwater resources under the Proposed Action. Should installation of the pile caps and foundations require excavation below the seasonal groundwater table elevation, dewatering using a sediment filter bag may be required and must be done in accordance with all State and Federal regulatory requirements. Impacts to surface waters are anticipated to be 0.001 acre and are associated with installation of piles, pile caps and foundations that will support the AirTrain and its associated infrastructure.

Surface Water

The proposed AirTrain alignment would cross the Peripheral Ditch at a slightly different location then currently exists. NJDEP authorization for this slightly relocated crossing will be required since the proposed new foundation locations would slightly impact both the 100-year floodplain and the NJDEP regulated riparian zone associated with the Peripheral Ditch. This would necessitate meeting design requirements of the Flood Hazard Area Control Act (N.J.A.C. 7:13-2.16). The crossings themselves would have to meet the requirements of the Freshwater Wetlands Protection Act Rules for open water crossings (N.J.A.C. 7:7A). Significant adverse impacts to the existing stream hydraulics of the Peripheral Ditch are not anticipated to result from the Proposed Action. Relevant permits will be obtained prior to construction.

Stormwater

The Port Authority would continue to comply with the requirements of its current NJPDES stormwater discharge permit under the Proposed Action. The Proposed Action would not significantly alter the location or type of impervious surfaces since it is a replacement. As such, the project will not adversely impact the quantity or quality of stormwater runoff at the airport. Stormwater runoff volume and velocity would not change significantly because of the Proposed Action. A minor adjustment to the location of catch basins and storm sewer lines in the Project Area may be required due to the slight relocation of the

AirTrain alignment, but in general, the storm sewer system at the airport would continue to collect and convey stormwater as it does currently.

Groundwater

Under the Linear Alternative, construction and operation of the AirTrain replacement is not expected to significantly impact groundwater in any way. Stormwater runoff will be collected and treated in accordance with the airport's NJPDES permit and in compliance with all applicable regulations. The project does not propose to draw on groundwater resources during any phase of construction or operation. Should installation of the pile caps and foundations require excavation below the seasonal groundwater table elevation, dewatering using a sediment filter bag may be required and must be done in accordance with all State and Federal regulatory requirements.

2.3 Floodplains

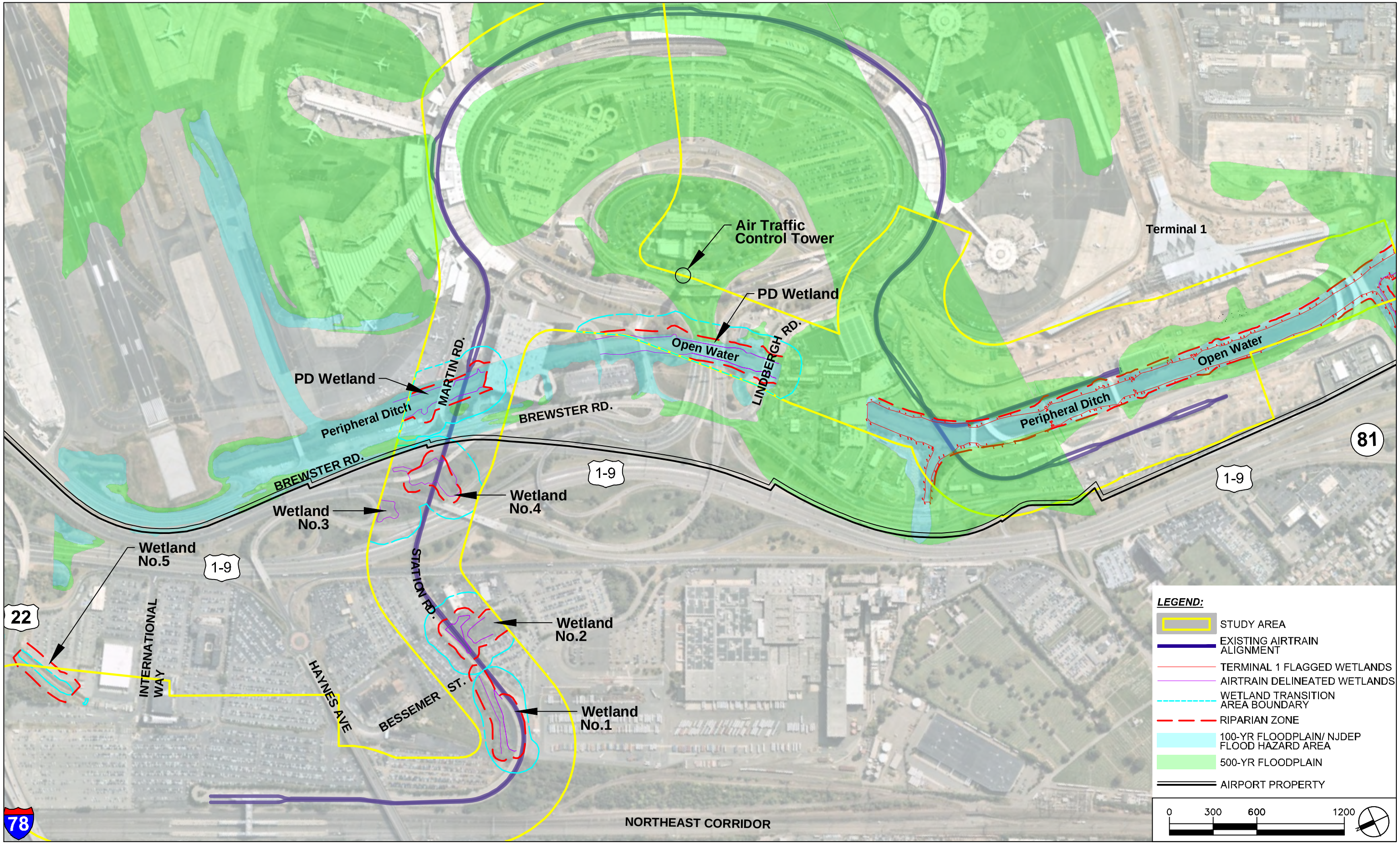
Existing Conditions

According to the effective 2007 FEMA Preliminary Flood Insurance Rate Maps (FIRMs) for the airport and the surrounding area (dated April 9, 2015), the area primarily in and adjacent to the Peripheral Ditch is located in the 100-year coastal AE zone, with a larger area located within the limits of the 500-year coastal floodplain. As shown in Figure 9A, Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplain where base flood elevations have been determined. At Newark Airport, the 100-year coastal AE Zone is at elevation 9. The NJDEP Flood Hazard Area is equivalent to the coastal AE Zone. At Newark Airport, the 100-year floodplain is controlled by the 100-year tidal elevation in Newark Bay. Shaded Zone X is an area of moderate risk and is described as an area of 500-year flood (0.2% annual chance), an area subject to 100-year flooding with average depths less than 1 foot, an area where the contributing drainage area is less than 1 square mile, or an area protected by levees from the base flood. The remaining area (unshaded Zone X) has minimal flood risk and is described as an area located outside the 0.2% annual chance floodplains. Portions of the Project Area are located in Zone AE (1% annual chance flood) of Peripheral Ditch. FEMA defines a floodway as the portion of the 100-year floodplain within a channel or stream, plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. There are no delineated FEMA floodway boundaries mapped within the Project Area. However, NJDEP may regulate the Open water areas of the ditches as floodways since there would be more than 50 acres draining to it. Estimated displacement volumes are included in Appendix 2, and are not anticipated to result in any regulatory issues.

In addition to the current 2007 FEMA firm maps, an appeal resolution to 2014/2015 preliminary flood maps, which have not yet been adopted, were also reviewed. While the 2007 maps show a 1% annual chance base flood elevation of 9.0, the appeal resolution maps a 1% annual chance base flood elevation of 11.0 and 12.0 within portion of the project limit. While ground and vegetation disturbance limits/ impacts would remain the same under either sets of mapping, the appeal resolution maps would be used during the final design process to ensure that critical design components (i.e. electrical connections/power supplies, flood sensitive infrastructure etc.) would be installed above the higher flood elevation.

Floodplains No-Action Alternative Impacts

Under the No-Action Alternative, no significant direct impacts to environmentally regulated floodplains are anticipated.



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Source: NJDEP Wetlands; Aerial Imagery by NearMap, 09/20/2019.

WATER RESOURCES

Figure 8A



FW2-NT
SE3*

Approximate Site Boundary

***SE3 designation is per NJDEP mapping. Studies for Terminal 1 reconstruction indicate its designation is FW2-NT**

Figure 8B – Surface Water Quality Classification Map

Newark Liberty International Airport
Air Train Replacement Project

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Floodplains Loop Alternative Impacts

Portions of the Loop Alternative would be constructed within a FEMA coastal floodplain (see Figure 8). Pursuant to Executive Order 11988, Floodplain Management, all Federal agencies are required to avoid impacts on floodplains to the degree practicable and to minimize impacts that cannot be avoided. When it is not practicable to avoid developing within a floodplain, the USDOT Order 5650.2, Floodplain Management and Protection, prescribes policies and procedures to implement Executive Order 11988.

Since the Loop Alternative would have to cross the Peripheral Ditch to access the terminals, no practicable alternative exists that would allow the floodplains to be completely avoided. The AirTrain travels on an elevated guiderail, so impacts on the floodplain are limited to the placement of foundations for the guide rail. The proposed pilings, pile caps and foundations would disturb approximately 0.145 acres within the FEMA Special Flood Hazard Area of the Loop Alignment. This would be compensated for, at least partially, by the removal of the existing AirTrain guideway infrastructure after the new AirTrain has been constructed. The AirTrain maintenance and control structure would be located outside of the regulated areas.

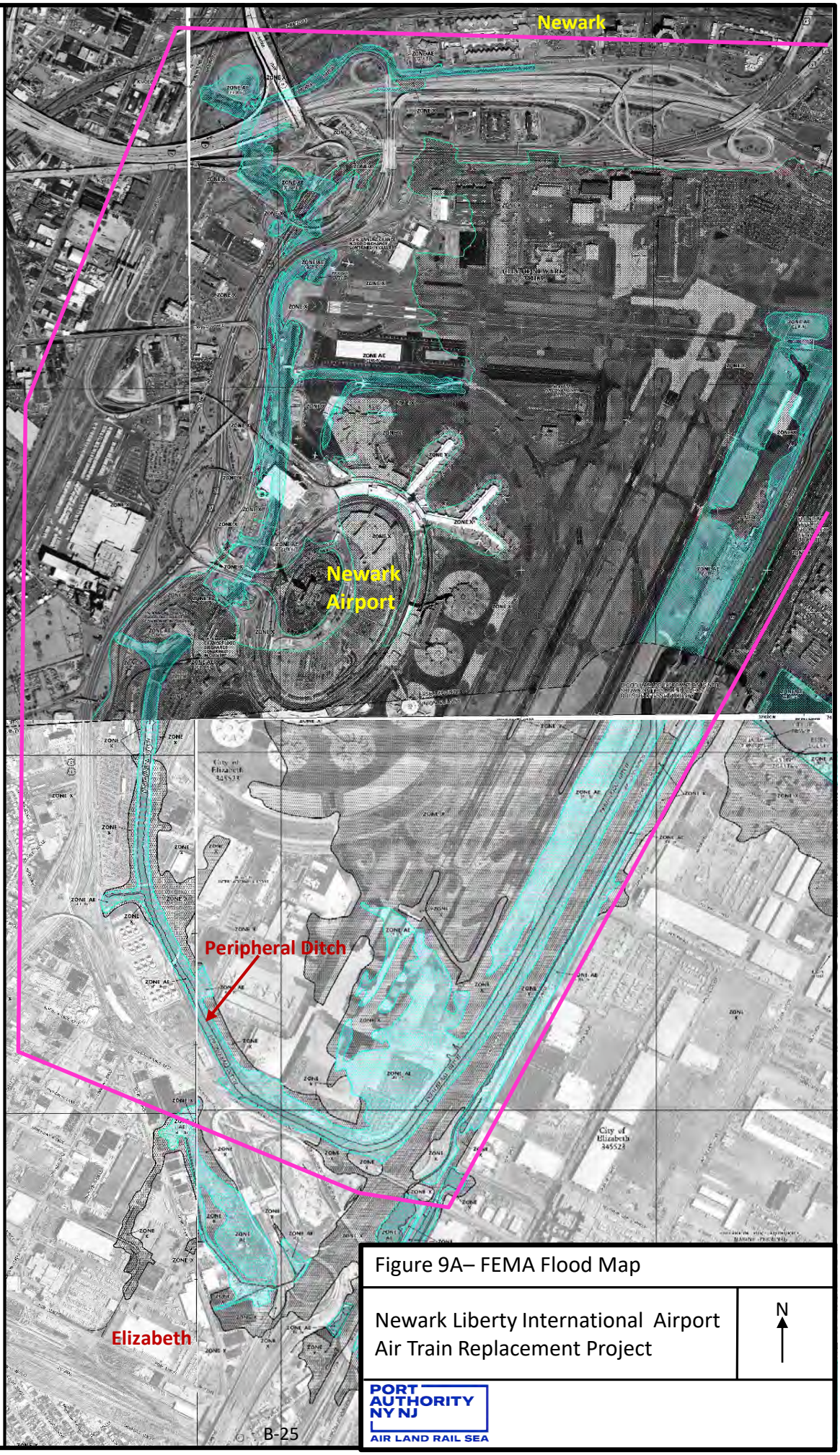
Given that all the alignments considered are crossing a coastal floodplain, net fill requirements do not apply. The 100-year water surface elevation of the Peripheral Ditch would comply with the applicable NJDEP and Flood Hazard Area Control Act (N.J.A.C. 7:13) criteria and therefore would not create significant adverse impacts to the surrounding floodplain provided that no impacts to the fluvial floodway occurs. If a minor floodway impact does occur (ex. portions of an AirTrain guideway foundation is within the floodway), an NJDEP FHA Hardship Exception may be required.

Floodplains Proposed Action Impacts

Portions of the Proposed Action would be constructed within a coastal FEMA floodplain (see Figure 9A). Pursuant to Executive Order 11988, Floodplain Management, all Federal agencies are required to avoid impacts on floodplains to the degree practicable and to minimize impacts that cannot be avoided. When it is not practicable to avoid developing within a floodplain, the USDOT Order 5650.2, Floodplain Management and Protection, prescribes policies and procedures to implement Executive Order 11988.

Since the Proposed Action would have to cross the Peripheral Ditch to access the terminals, no practicable alternative exists that would allow the floodplains to be completely avoided. The AirTrain travels on an elevated guiderail, so impacts on the floodplain are limited to the placement of foundations for the guide rail. The proposed pilings, pile caps and foundations would disturb approximately 0.164 acres within the FEMA Special Flood Hazard Area of the Proposed Action. This would be compensated for, at least partially, by the removal of the existing AirTrain guideway infrastructure after the new AirTrain has been constructed. The AirTrain maintenance and control structure would be located outside of the regulated areas.

Given that all the alignments considered are crossing a coastal floodplain, net fill requirements do not apply. The 100-year water surface elevation of the Peripheral Ditch would comply with the applicable NJDEP and Flood Hazard Area Control Act (N.J.A.C. 7:13) criteria and therefore would not create significant adverse impacts to the surrounding floodplain provided that no impacts to the fluvial floodway occurs. If a minor floodway impact does occur (ex. portions of an AirTrain guideway foundation is within the floodway), an NJDEP FHA Hardship Exception may be required.



Approximate Site Boundary

1" = 500'

Figure 9A– FEMA Flood Map

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Air Train Replacement Project

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B-25

2.4 Riparian Buffers

Existing Conditions

As required by the NJDEP Flood Hazard Area (FHA) regulations, regulated riparian buffers are required around all naturally occurring watercourses and waterbodies. While the Peripheral Ditch is man-made, NJDEP's FHA regulations do not exempt man-made ditches from the buffer requirement if the overall drainage area to the watercourse is over 50 acres. The drainage area for the Peripheral Ditch, as noted earlier, is 11.8 square miles (7,552 ac.). No protected species which are critically water dependent are mapped as being located within the Project Area and, therefore, it is anticipated that a 50' wide riparian buffer will be required around the Peripheral Ditch (see Figure 8A). It should be noted that within riparian buffer limits, only impacts to ***vegetated*** riparian buffers areas are considered impacts from a regulatory perspective. In addition to the Peripheral Ditch, there are open water areas associated with Wetlands 1, 2, 4 and 5 where it is unclear if they are man-made or man-altered. Given recent NJDEP policy, it is anticipated that they will require riparian buffers around these open water areas as well and therefore riparian buffers are shown around these areas.

Riparian Buffers No-Action Alternative Impacts

Under the No- Action Alternative, no significant direct impacts to environmentally regulated riparian buffers areas are anticipated.

Riparian Buffers Loop Alternative Impacts

The Loop Alternative does route the AirTrain alignment across and within the riparian buffer. However, since the AirTrain guideway will be elevated, the only structures proposed within the buffer are the foundations for the guideway. These foundations would disturb approximately 0.263 acres of the riparian buffer, of which 0.113 acres are currently vegetated. Given the relatively small impact acreage, it is anticipated that no significant adverse impact to riparian buffers will occur as a result of the Loop Alternative. Riparian mitigation in the form of new or supplemental plantings may be required.

Riparian Buffers Proposed Action Impacts

The Proposed Action does route the AirTrain alignment across and within the riparian buffer. However, since the AirTrain guideway will be elevated, the only structures proposed within the buffer are the foundations for the guideway. These foundations would disturb approximately 0.289 acres of the riparian buffer, of which 0.228 acres are currently vegetated. Given the relatively small impact acreage, it is anticipated that no significant adverse impact to riparian buffers will occur as a result of the Proposed Action. Riparian mitigation in the form of new or supplemental plantings may be required.

2.5 Wetlands and Wetland Transition Areas

Existing Conditions

In early 2018, a wetlands delineation was performed to determine the extent of jurisdictional wetlands and open waters in the Project Area and to identify and flag wetlands that may be impacted by the project (see Figures 8A and 9B). Said delineation was done in accordance with NJDEP's current methodology (i.e. 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands). An area within 150 feet of the Project Area limits was investigated to account for any wetland transition areas associated with

wetlands outside of the Project Area. Vegetation, soils, and hydrology were considered in the characterization of wetlands. The wetland boundary flags were survey-located under the direction of a New Jersey licensed surveyor. It should be noted that a substantial portion of the site has been disturbed as part of the initial work for the Terminal A Redevelopment (Terminal 1) Project. This work included disturbances within portions of the Peripheral Ditch, much of which was closed from access due to the ongoing construction. Given that factor, the wetland delineation completed by AECOM in 2011 and approved by NJDEP in 2012 was used for this area.

Wetlands associated with the Project Area were located along the Peripheral Ditch and at four (4) wetland/pond complexes, a number of which are located within the Routes 1&9 right of way (ROW), that appear to be functioning as stormwater retention basins. The Peripheral Ditch consists of an open water ditch bordered in certain areas by palustrine emergent wetland dominated by Common Reed (*Phragmites australis*). The area examined along the ditch was located just west of the 7- Eleven at 100 Lindbergh Road to the helipad near Brewster Road and Martin Road.

An open water pond and a man-made ditch, both with a palustrine shrub/scrub wetland fringe, are present between the cemetery/monument and the existing AirTrain monorail and southwest of Bessemer Street. Common Reed was predominant at the southern end and tree species bordered the wetland/upland boundary. This area is associated with Wetland No. 1.

An L-shaped retention basin near the Holiday Inn on US Route 1/9 was characterized as a palustrine scrub/shrub wetland and palustrine emergent wetland. The majority of the area consisted of typically low, woody vegetation while the northern end consisted of common reed. Riprap bordered the water filled retention basin. This area was associated with Wetland Area No. 2

Adjacent to the L-shaped retention basin near the Newark Airport Park Plus Parking facility is an oval-shaped retention basin characterized as palustrine forested wetland along the northern, eastern, and southern boundary and a palustrine emergent wetland along the eastern border. Riprap was present in upland areas while sandy loam surrounded the existing basin. These areas are associated with Wetland Area Nos. 3 and 4.

A fifth wetland complex, Wetland Area No. 5, was also noted just north of International Way. This area was originally wooded, with the majority of the area lying outside the original wetland study area. This area has since been impacted by a third party for what apparently is a drainage related project.

Due to the presence of protected species, primarily avian species, it is anticipated that NJDEP will classify the wetland areas within the proposed project area as Exceptional Resource Wetlands, with an associated 150’ wide wetland transition area. Segments of the Peripheral Ditch area that have narrow wetland fringes also have an associated wetland transition area while segments that are considered State Open Water do not. The entire Peripheral Ditch has an associated riparian buffer.

Wetlands and Wetland Transition Areas No- Action Alternative Impacts

Under the No-Action Alternative, no significant direct impacts to environmentally regulated wetland and wetland transition areas are anticipated.

Wetlands and Wetland Transition Areas Loop Alternative Impacts

The Loop Alternative routes the AirTrain alignment across and within wetlands and wetland transition areas (buffers). Since the AirTrain guideway will be elevated, the only structures proposed within the buffers are the foundations for the guideway, which would disturb approximately 0.493 acres of the wetland transition area. Approximately 0.049 acres of freshwater wetlands are anticipated to be affected by the Loop Alternative, primarily due to construction of the monorail pier foundations and underlying piles. Given the relatively small impact acreage, it is anticipated that no significant adverse impact to wetlands and wetland transition areas will occur as a result of the Loop Alternative. The exact level of disturbance is subject to minor change as the proposed design is further refined. It is anticipated that compensatory wetland mitigation will be required.

Wetlands and Wetland Transition Areas Proposed Action Impacts

The Proposed Action routes the AirTrain alignment across and within wetlands and wetland transition areas. Since the AirTrain guideway will be elevated, the only structures proposed within the wetlands and wetland transition area are the foundations for the guideway, including the underlying piles and pile cap(s). Approximately 0.071 acres of freshwater wetlands and 0.636 acres of wetland transition. Given the relatively small impact acreage, it is anticipated that no significant adverse impact to wetland transition areas will occur as a result of the Proposed Action. The exact level of disturbance is subject to minor change as the proposed design is further refined. It is anticipated that compensatory wetland mitigation will be required.

Proper soil erosion control measures and Best Management Practices (BMPs) would be implemented during project construction to minimize sedimentation into nearby waterbodies and freshwater wetlands. The erosion control measures would be implemented throughout the construction process until the site is permanently stabilized to ensure the protection of any exposed soils and downstream areas.

Water pollution control measures, including those contained in FAA Advisory Circular 150/5370-10F, *Standards for Specifying Construction of Airports* (September 30, 2011), would be enforced during proposed construction activities so that any potential construction material spills are minimized. Specifically, construction material would not be stockpiled in or near any waterbodies. If materials require stockpiling for significant durations, they would be covered with an impermeable liner to eliminate runoff and leachate during precipitation.



Wetlands (2012)

Approximate Site Boundary

Figure 9B – NJDEP Mapped Wetlands Map

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2.6 Biological Resources

Existing Conditions

Biological resources include the following: vegetation, wildlife and wildlife habitat, and threated and endangered species and their habitat (specific wetland, wetland transition area, and State open water impact are described above).

Vegetation

In general, the airport and the land surrounding it is highly developed, with significant amounts of transportation-related infrastructure improvements, as well as commercial, industrial, retail, and residential land uses. The existing undeveloped lands have been reduced to small, isolated areas that no longer resemble the original undeveloped landscape.

Mowed lawn, paved surfaces, and buildings occupy most of the Project Area. The major exception to these land uses is the Peripheral Ditch. The airport property has been disturbed to varying extents and contains little intact native vegetation.

The area located along the Peripheral Ditch is dominated by typical hydrophytic vegetation, such as Common Reed (*Phragmites australis*) and Thoroughwort (*Eupatorium serotinum*) in palustrine herbaceous areas. The palustrine scrub-shrub wetlands contain primarily Groundsel-Bush (*Baccharis halmifolia*), Common Elderberry (*Sambucus canadensis*), and Northern Bayberry (*Myrica pensylvanica*). The small forested wetlands along the Peripheral Ditch tributary at Basilone Road consists of Red Maple (*Acer rubrum*), American Elm (*Ulmus Americana*), Sweet Gum (*Liquidambar styraciflua*), and Silver Maple (*Acer saccharinum*).

Most of the upland vegetative communities in the Project Area consist of landscaped mowed turf and small areas of grasslands and scrub/shrub communities. There are some areas of upland species paralleling the Peripheral Ditch, consisting of sporadic upland trees and shrubs.

Wildlife

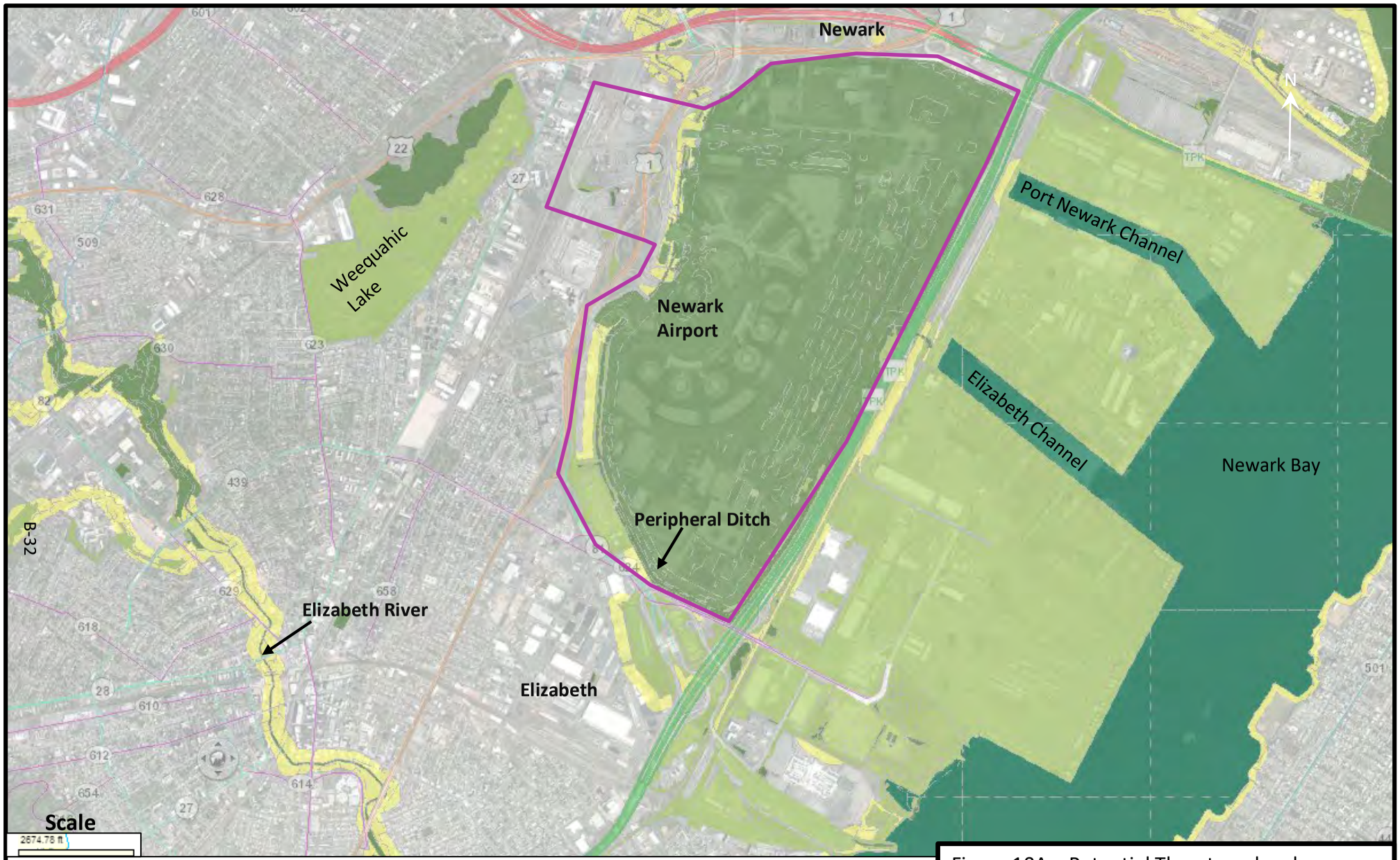
The commercial and airport-related development in the vicinity of the Project Area provides low quality habitat for wildlife; however, various species of birds and small mammals have been identified. The Peripheral Ditch is primarily surrounded by Common Reed, which provides cover for small mammals and songbirds. In addition, the Peripheral Ditch holds water year round, and provides habitat for various waterfowl species. According to the *Wildlife Hazard Assessment for Newark Liberty International Airport (January 2010 – December 2010)*, broods of Canada geese and gadwall (*Anas strepera*) were observed along the Peripheral Ditch. The referenced Wildlife Hazard Assessment also referenced a Least Tern colony on the Airport. This was also mentioned in the original NEPA document for the existing AirTrain. Said colony was located in the southern portion of the Airport, outside of the project area, on an area that was previously a paved parking lot. The pavement had been removed to provide more permeable surface and the sandy soil under the parking lot provided suitable nesting habitat. The current Project Area does not have suitable nesting/breeding habitat for Least Tern as it does not include any sandy open areas, mudflats or other suitable factors required for Least Tern nesting .

A pair of red-tailed hawks (*Buteo jamaicensis*) was reported to have been nesting near the Air Traffic Control tower. Killdeer (*Charadrius vociferus*) nesting was observed in gravel areas between the asphalt service roads and short grass areas. Small mammals have been observed on all parts of the airport operations area, including house mice (*Mus musculus*), meadow voles (*Microtus pennsylvanicus*), Norway rats (*Rattus norvegicus*), and muskrats (*Ondatra zibethicus*). Double-crested cormorants (*Phalacrocorax auritus*) and hooded mergansers (*Lophodytes cucullatus*) have been observed hunting for fish in the Peripheral Ditch along the Patrol Road. During wetland field investigations, species observed included red-tailed hawks (*Buteo jamaicensis*), peregrine falcons (*Falco peregrinus)*, kestrel (*Falco sp*.) merlin (*Falco columbarius)*, Cooper's Hawk (*Accepiter cooperii*), Norway rats (*Rattus norvegicus*), and muskrat (*ondatra zibethicus*).

Threatened and Endangered Species

Based on NJDEP's Landscape Project 3.3 database and the US Fish and Wildlife Service's Information, Planning and Consultation system (IPaC) there are three state-endangered bird species, five state-threatened bird species, one state-threatened butterfly species and four bird species of special concern that have been identified in the vicinity of the Study Area. There are no records of any rare plants or ecological communities located on or within ¼ mile of the site nor are there records of any federally listed species. **NJDEP's Natural Heritage Program's database search response letter dated March 6, 2020 listed the species outlined in Table 1 below, with the exception of Bald Eagle, Long-eared owl, Red-headed Woodpecker, and Wood thrush, which were listed in US Fish and Wildlife Service's IPaC database dated December 11, 2019.**

Figure 10A presents known faunal biotic resources habitat areas located within the Project Area. The data from NJDEP's Landscape Project (Version 3.3) combines documented wildlife locations with NJDEP aerial photo-based land use/land cover data to delineate imperiled and special concern species habitat within New Jersey. The information is intended to be used for planning purposes before any action, such as proposed development, occurs. Grassland habitat is primarily located on the eastern portion of the airport property, in areas between the runways and taxiways and provides habitat for the Upland Sandpiper and Savannah Sparrow. An area of wetland habitat adjacent to and including the Peripheral Ditch provides foraging habitat for several State threatened bird species. Based upon a review of NJDEP's Landscape Project 3.3 mapping within the study limits of the Proposed Action, the following was noted: In Wetland 1 (see Figure 10A), which is comprised of an open water area and a scrub shrub wetland area, Landscape Project 3.3 data shows foraging habitat for Black-crowned night heron, Little blue heron, Least Tern, Snowy Egret and Glossy Ibis in the open water area and foraging habitat for Black-crowned night heron in the scrub shrub wetland area. Near Wetland Area No. 2, which is comprised of open water area and deciduous wooded wetlands, Landscape Project 3.3 data lists the open water areas as foraging habitat for Black-crowned night heron, Little blue heron, Least Tern, Snowy egret and Glossy ibis. It also lists the deciduous wooded wetland as foraging habitat for Cattle Egret. At Wetland Area No. 3, which is a deciduous scrub shrub wetland, Landscape Project 3.3 data shows foraging habitat for Cattle Egret and Black-crowned night heron. At Wetland No. 4, which is listed as a Phragmites-dominated emergent wetland (though it shows some open water area on aerials), the Landscape Project 3.3 data shows foraging habitat for Black-crowned night heron and Snowy egret. Along the eastern side of the Peripheral Ditch, Landscape Project 3.3 mapping shows foraging habitat for both Rank 3 and Rank 4 species. Along the southern and eastern portions of the airport, within the runway portion of the airport, Landscape Project 3.3 mapping does list breeding area for Savannah sparrow, Upland sandpiper and Least tern as well as the Checkered White butterfly. The locations do agree with other online sources, which state that breeding habitat for those species is in the southeastern portion of the Airport. A Least tern colony has been specifically referenced in online



Rank 1 – Habitat Specific Requirements
Rank 2 – Special Concern
Rank 3 – State Threatened
Rank 4 – State Endangered
Ranke 5 – Federal Listed

Approximate Site Boundary

Figure 10A – Potential Threatened and Endangered Protected Species Map

Newark Liberty International Airport
Air Train Replacement Project

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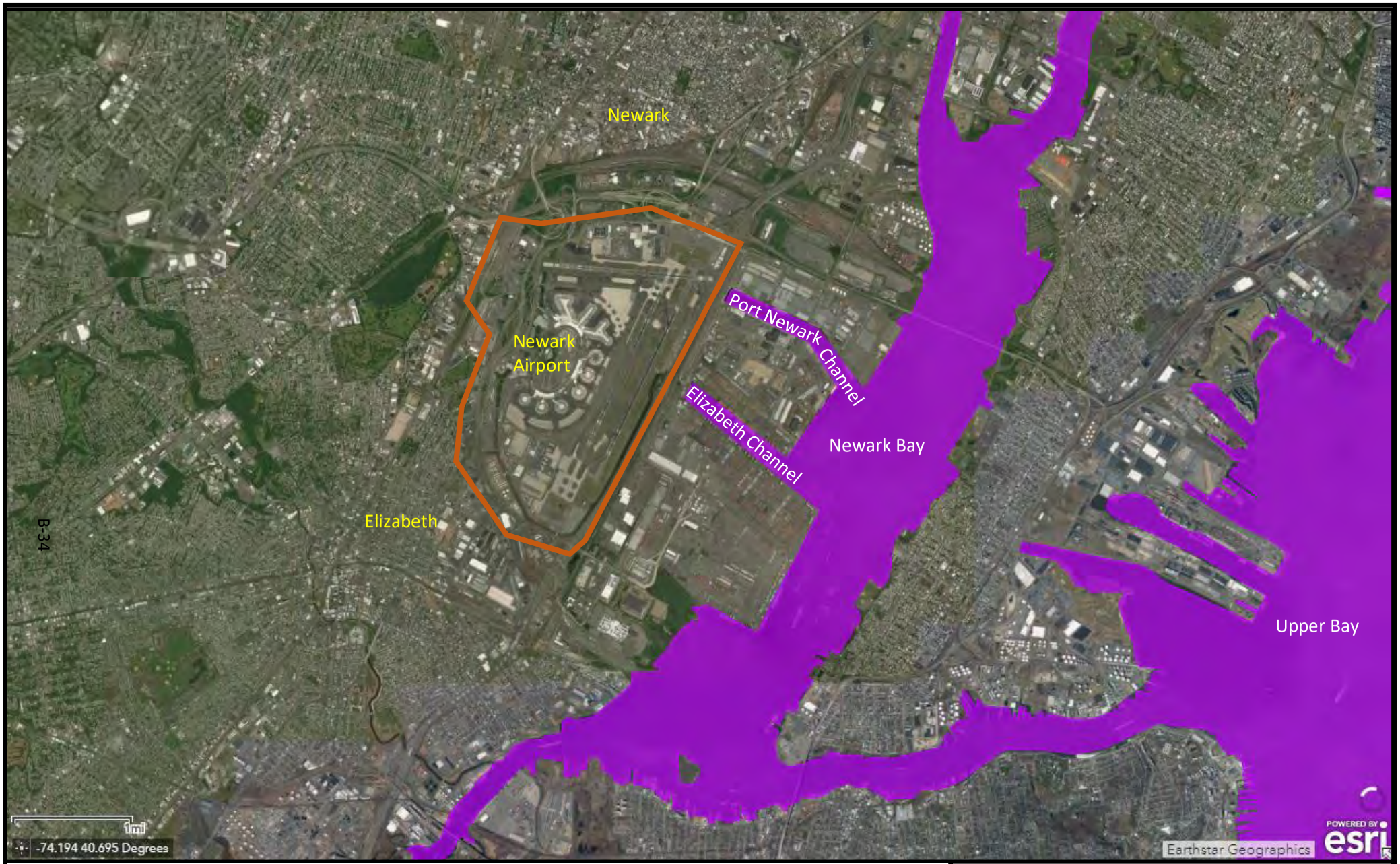
PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

literature as being located within a former parking lot where the pavement had been removed to provide more permeable area. The Least tern nesting population was documented as nesting on the sand/gravel mix that underlaid the former parking area. Online literature also indicates that there is a fenced in area along the eastern side of the airport runways that encompasses Checkered White habitat as well as references to recurring sightings of the Checkered White butterfly at the Airport's Economy Parking Lot(s). Based on the information obtained from both Landscape Project 3.3 data as well as other online literature sources, the Proposed Action does not extend into areas previously identified/referenced as breeding habitat.

Correspondence from the National Marine Fisheries Service (NMFS) associated with other recent Newark International Airport projects indicated that there are no federally threatened, endangered or candidate species under their jurisdiction known to occur within the Peripheral Ditch. The current project study area is located upstream of the existing tide gate as well as the (tidal) Greater Newark Bay Complex; therefore, the Peripheral Ditch is non-tidal. This was further confirmed via documentation by the Corps of Engineers that the Peripheral Ditch was not classified as Section 10 Waters (ie. navigable waters). Based upon a preliminary IPaC review, and given that all wetlands within the Project area limits are non-tidal, freshwater wetlands/waters, it is not anticipated that any federally protected marine or estuarine species are present within the current project study area. While there is essential fish habitat (EFH) in the Newark Bay complex, given that there are no tidal waters, estuarine waters or estuarine wetlands associated with the project, and given that all required soil erosion control measures and associated best management practices (BMP's) are required to be implemented, there will be no impacts on EFH associated with the AirTrain project.

The Peripheral Ditch does not provide habitat for any federally threatened, endangered, or candidate species under the jurisdiction of the NMFS or USFWS. Neither the Loop Alternative, Linear Alternative, Proposed Action nor the "No Action" Alternative would have any adverse impact to any fish species of concern or designated essential fish habitat (EFH) within the mixing zone of the Hudson-Raritan Estuary, including Newark Bay. Figure 10B shows mapped EFH in the region.

Per the USFWS, there are no known federally listed species of flora or fauna known to exist in the vicinity of the Project Limits. See Appendix **1** for coordination correspondence with **USFWS, NMFS, NJDEP (including NJDEP's Bureau of Tidelands).**



Mapped Essential Fish Habitat

Approximate Site Boundary

Figure 10B - NOAA Essential Fish Habitat

Newark Liberty International Airport
Air Train Redevelopment Project

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PORT AUTHORITY NY NJ
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Table 1. NHP Listed Species Located Within Study Area

Common Name	Scientific Name	State Status	Global Status	State Rank
Bald Eagle	*Haliaeetus leucocephalus*	E(Br)/T(NBr)	G5	S1B,2SN
Black-crowned night-heron	*Nycticorax nycticorax*	T	G5	S2B,S3N
Cattle egret	*Bubulcus ibis*	T	G5	S3B,S3N
Glossy ibis	*Plegadis falcinellus*	SC/S	G5	S3B,S4N
Least tern	*Sterna antillarum*	E	G4	S1B,S1N
Little blue heron	*Egretta caerulea*	SC/SC	G5	S3B,S3N
Long-eared Owl	*Asio otus*	T	G5	S2B,S2N
Red-headed Woodpecker	*Melanerpes erythrocephalus*	T	G5	S2B,S2N
Savannah sparrow	*Passerculus sandwichensis*	T	G6	S2B, S4N
Snowy egret	*Egretta thula*	SC/S	G5	S3B,S4N
Upland sandpiper	*Bartramia longicauda*	E	G5	S1B,S1N
Wood Thrush	*Hylocichla mustelina*	SC	G4	S3B
Checkered white butterfly	*Pontia protodice*	T	G4	S3B,S4N

Br = Breeding Season

NBr = Non-Breeding

Source: USFWS, NJDEP Natural Heritage Database, 2016 and 2020.

* The following four species, Bald eagle, Long-eared owl, Red-headed woodpecker, and Wood thrush included as they are State listed threathened, endangered, or species of special concern.

NJDEP's Geoweb mapping identified emergent wetlands and grasslands within the current project study area that may be areas critical to dependent species. These areas, adjacent to the Peripheral Ditch, are a small percentage of the primarily developed Project Area. As described above, there are several State-listed bird species and one (1) listed butterfly species identified in the vicinity of the Project Area (see short description of species and common habitat below).

• **Bald Eagle** [*Haliaeetus leucocephalus*; Endangered (Breeding)/Threatened (Non-Breeding)] is a large, predatory bird distinguished by its white head and tail (adult plumage). They are typically found in forests near open water. Bald eagles are opportunistic predators that primarily consumes fish and aquatic invertebrates. They build large nests that can reach 10 feet across. Nests are generally located in tall trees away from human disturbance.

• **Black-crowned night heron** (*Nycticorax nycticorax;* State-threatened) is a medium-sized wading bird with a short neck, short legs and a stout, straight, pointed bill. Typical habitat includes marshes, swamps, wooded streams, mangroves, shores of lakes, ponds, and lagoons, saltwater, brackish water, and freshwater areas. Eggs are laid in a platform nest in groves of trees near coastal marshes or on marine islands, swamps, marsh vegetation, clumps of grass on dry ground, orchards, and in many other habitats.

• **Cattle egret** (*Bubulus ibis;* State special concern) is a small white heron, mostly found in pastures and along roadsides. Typical habitat includes wet pastureland and marshes, freshwater and brackish habitat, dry fields, agricultural areas (especially irrigated ones), and garbage dumps. Cattle egrets nest in trees on islands, in lakes, swamps, along watercourses, in mangrove cays, and marshes.

• **Glossy ibis** (*Plegadis falcinellus;* State special concern) is a dark wading bird with a long, down-curved bill. Typical habitat includes marshes, swamps, lagoons, pond margins, lakes, flooded pastures; freshwater, brackish, and salt water. They usually nest with herons or other water birds, on the ground in marshes or in small trees or bushes such as *Baccharis*, *Iv*a, and *Myrica* near wateralong the U.S. Atlantic coast.

• **Least tern** (*Sterna antillarum;* State-endangered) is the smallest North American tern and is commonly found nesting on sandy beaches along the southern coasts of the United States and along the major river systems. Breeding typically occurs on seacoasts, beaches, bays, estuaries, lagoons, lakes, and rivers (AOU 1983). The least tern also utilizes sandy beaches, mudflats, and salt-pond dikes (Stiles and Skutch 1989). Nests are commonly found in shallow depressions on level ground on sandy or gravelly beaches and banks of rivers or lakes, typically in areas with sparse or no vegetation. Good nesting areas tend to be well beyond the high tide mark, have shell particles, stones, and/or debris for egg camouflage (Burger and Gochfeld 1990), are out of the way of off-road vehicles and public recreation areas, not subject to unusual predation pressure, and are adjacent to plentiful sources of small fishes. Interior populations nest mainly on riverine sandbars or salt flats that become exposed during periods of low water (Hardy 1957). According to the airport's recent *Wildlife Hazard Assessment*, least terns have a history of nesting at the airport and did so in 2010. This colony chose an area that originally was asphalt, but was excavated in the fall of 2009 to meet requirements for permeable grass surface area. However, into the spring of 2010 colonization by the terns continued.

• **Little blue heron** (*Egretta caerulea;* State special concern) is a small heron of the southeastern United States. The little blue heron breeds in various freshwater and estuarine habitats.

• **Long-eared Owl** (*Asio otus;* Threatened) is a slender, dark medium-sized bird (about crow-sized) with tuffs of feathers, resembling ears, atop its head. This species requires wooded and open habitats. Nesting and roosting sites require dense foliage to provide camouflage and protection from the elements. Open areas (fields, marshes) are generally used for hunting.

• **Red-headed woodpecker** (*Melanerpes erythrocephalus;* Threatened) is distinguished by its red head, nape, and throat; white belly and rump; and black wings and tail. Habitat consists of upland and wetland open woods with limited undergrowth and dead/dying trees.

• **Savannah Sparrow** (*Passerculus sandwichensis*; Threatened) is a small sparrow with a white underbelly and throat; dark brown streaking on its back, nape, and crown; streaking on its breast and sides; and a beige wing bar. It has a short notched tail, a white crown stripe, and adults have a yellow lore. The bill has a light pinkish color. The savannah sparrow is found in open habitats such as meadows, grasslands, pastures, fields, and airports. They also occur in areas with early woody growth.

• **Snowy egret** (*Egretta thula;* State special concern) is a small, active white heron that is found in small ponds, as well as along the ocean shore.

• **Upland sandpiper** (*Bartramia longicauda;* State-endangered) is a shorebird of grasslands and inhabits native prairie and other open grassy areas in North America. During the recent *Wildlife Hazard Assessment*, standardized surveys were conducted at routine locations around the airfield three to four times per month. Upland sandpipers were rarely observed during these surveys. These observations were made only during migratory periods; therefore, it can be deduced that residential or breeding populations of Upland sandpipers do not exist at the airport at this time.

• **Wood Thrush** (*Hylocichla mustelina*; State special concern) is a song bird with reddish brown head, nape, and back; white belly; spotted breast; and white eyering. Habitat includes deciduous and mixed forests with large trees, moderately dense understory, and ample leaf litter.

• **White checkered butterfly** (*Pontia protodice;* State-threatened) is found in a wide variety of sites including dry weedy areas, vacant lots, fields, pastures, sandy areas, railroad beds and roads. In the past, white-checkered butterflies have been observed at the airport along the Peripheral Ditch near the Turnpike and portions of the airfield have been classified as suitable habitat for the butterflies. The project will be conducted outside of the areas that have been designated as white-checkered butterfly habitat and should have no effect on the butterfly populations.

Migratory Birds

The December 2019 USFWS IPaC database all indicated that the following migratory bird species might be found on site:

Bald eagle- Bald eagles prefer living in areas close to bodies of water, as their favorite prey is fish. They can be found in wetlands, on the coasts, near lakes or rivers, and in marshes. When perching, roosting, and nesting, bald eagles prefer hardwoods, like oak trees, or coniferous, like pine trees. They appear to select trees based on height and sturdiness.

Blue-winged warbler- The Blue-winged Warbler is often heard in brushy overgrown fields and thickets in the East during the summer. Although the bird is not especially shy, it can be a challenge to observe as it

forages actively in the dense brush. In recent decades this species has been expanding its range northward, encroaching on the territory of its close relative, the Golden-winged Warbler. The two species often interbreed. In recent decades this species has been expanding its range northward, encroaching on the territory of its close relative, the Golden-winged Warbler. The two species often interbreed. Brushy hillsides, bogs, overgrown pastures, stream and woodland edges. Breeds in dry uplands in low shrubbery, brier patches, weed-grown fencerows, and bushy thickets; often in neglected fields or at the border of woods. Occasionally in deep swamp wood Brushy hillsides, bogs, overgrown pastures, streams and woodland edges. Breeds in dry uplands in low shrubbery, brier patches, weed-grown fencerows, and bushy thickets; often in neglected fields or at the border of woods. Occasionally in deep swamp wood.

Eastern whip-poor will- Habitat is leafy woodlands. Breeds in rich moist woodlands, either deciduous or mixed; seems to avoid purely coniferous forest. Winter habitats are also in wooded areas. Forages at night, especially at dusk and dawn and on moonlit nights. Forages by flying out from a perch in a tree, or in low, continuous flight along the edges of woods and clearings; sometimes by fluttering up from the ground. Numbers appear to have decreased over much of the east in recent decades. Reasons for the decline are not well understood, but it could reflect a general reduction in numbers of large moths and beetles umbers appear to have decreased over much of the east in recent decades. Reasons for the decline are not well understood, but it could reflect a general reduction in numbers of large moths and beetles

King rail- A chicken-sized marsh bird, the largest of US rails. Nesting in fresh-water marshes of the east, the King Rail has become an uncommon species as many wetlands have been drained. It remains locally common near the Atlantic and Gulf coasts, where it is not especially shy, often stalking about at the marsh edge in full view of observers. Closely related to the Clapper Rail, and may interbreed with it in zones where salt and fresh marshes meet. Fresh and brackish marshes, rice fields, swamps. Sometimes salt marshes in winter. Will use a variety of habitats with shallow fresh or brackish water and dense cover. Important plants include cattails, bulrushes, spartina, and others. May be in brushy swamps with many willows, or in flooded rice fields. Fresh and brackish marshes, rice fields, swamps. Sometimes salt marshes in winter. Will use a variety of habitats with shallow fresh or brackish water and dense cover. Important plants include cattails, bulrushes, spartina, and others.

Long-eared owl- This medium-sized owl is widespread but not particularly well known in North America. It seems to call less often or less conspicuously than many of our other owls, so it may be overlooked in some areas where it nests. In winter, sometimes groups of a dozen or more may be found roosting together in groves of conifers, willows, mesquites, or other trees. Woodlands, conifer groves. Favored habitat includes dense trees for nesting and roosting, open country for hunting. Inhabits a wide variety of such settings, including forest with extensive meadows, groves of conifers or deciduous trees in prairie country, streamside groves in desert. Generally avoids unbroken forest. Woodlands, conifer groves. Favored habitat includes dense trees for nesting and roosting, open country for hunting. Inhabits a wide variety of such settings, including forest with extensive meadows, groves of conifers or deciduous trees in prairie country, streamside groves in desert. Generally avoids unbroken forest.

Prairie warbler- Not a bird of open prairies, this warbler nests mainly in young second growth scrub and densely overgrown fields in eastern North America. Such habitats are often temporary, and colonies may shift around from year to year. In Florida, more permanent populations are found in coastal mangroves. Prairie Warblers usually stay low, moving about actively in the brush and flicking their tails. In Florida, more permanent populations are found in coastal mangroves. In all of these sun-drenched habitats, the thin buzzy song of the male seems suited to the glare of hot summer days. Prairie Warblers usually stay

low, moving about actively in the brush and flicking their tails. Breeds in dry old clearings, edges of forest, and sandy pine barrens with undergrowth of scrub oaks, especially on ends of slopes and ridges. Likes thick second-growth of hickory, dogwood, hazel, or laurel with blackberry vines. In Florida, breeds in mangrove swamps. Found in flat, grassy lands with scattered trees and bushes in the South in the winter.

Red-headed woodpecker- This striking and unmistakable bird was a favorite of early ornithologists such as Alexander Wilson and Audubon. Often conspicuous because of its strong pattern, harsh calls, and active behavior in semi-open country, it tends to occur in small colonies. Although it migrates only short distances, little groups of migrants may be noticeable in early fall and late spring. Once a very common bird in eastern North America, the Red-headed Woodpecker is now uncommon and local in many regions. Groves, farm country, orchards, shade trees in towns, large scattered trees. Avoids unbroken forest, favoring open country or at least clearings in the woods. Forest edges, orchards, open pine woods, groves of tall trees in open country are likely habitats. Winter habitats influenced by source of food in fall, such as acorns or beechnuts.

Rusty blackbird- In migration and winter it is usually in swampy places, wading in very shallow water at the edges of wooded streams. In summer it retires to northern spruce bogs; no other blackbird has such a northerly breeding distribution. The name "Rusty" applies to the colors of fall birds, but it could also describe the rusty-hinge sound of the creaking song. River groves, wooded swamps; muskeg in summer. Breeds in the muskeg region, in wet northern coniferous forest with many lakes and bogs. During migration and winter, favors areas with trees near water, as in wooded swamps and riverside forest; will also forage in open fields and cattle feedlots with other blackbirds.

Wood thrush- Seemingly not as shy as the other brown thrushes, not as bold as the Robin, the Wood Thrush seems intermediate between those two related groups. It sometimes nests in suburbs and city parks, and it is still common in many eastern woodlands, mainly deciduous woodlands. Breeds in the understory of woodlands, mostly deciduous but sometimes mixed, in areas with tall trees. More numerous in damp forest and near streams than in drier woods; will nest in suburban areas where there are enough large trees. In migration, found in various kinds of woodland. Winters in understory of lowland tropical forest.

Biological Resources No-Action Alternative Impacts

Under the No-Action Alternative, no significant impacts to biological resources (vegetation, wildlife and wildlife habitat, or threatened and endangered species and their habitat) are anticipated.

Biological Resources Loop Alternative Impacts

It is not anticipated that there will be any significant adverse direct impacts to vegetation, wildlife and wildlife habitat, and/or threatened and endangered species and their habitat under the Loop Alternative. There will be some direct impact due to construction of the permanent guideway foundations. There is also potential for temporary construction-related indirect impacts to State protected and migratory avian species utilizing habitat near the project area for foraging. Based on review of Landscape Project 3.3 data and other related online literature, the Loop Alternative would not extend into known breeding areas. These potential indirect impacts are associated with both construction access as well as noise and vibration due to the pile driving required for the new supporting piles/foundations. This indirect impact will be addressed via timing restrictions associated with the previously identified protected species as well as Best Management Practices (BMP's) to limit construction access disturbance. The replacement of the AirTrain and its associated infrastructure, in areas where there is actual habitat, will be in close proximity

to the existing AirTrain alignment on one side or the other. Given that factor and given that the current AirTrain infrastructure will be demolished during the demolition phase of the project and the areas previously impacted by the existing foundations restored to their pre-construction condition, no significant/long-term adverse impacts to existing habitat are anticipated. It should be noted that the area further east within the Loop Alternative are heavily developed and mostly covered with impervious surface.

Impacts associated with the Loop Alternative are primarily related to the installation of piles and pile caps and construction of foundations on top of said piles/pile caps. Given (1) the relatively small size of the pier foundations limits, which would be larger than the underlying pile cap diameter and (2) the location of the majority of foundation locations within or immediately adjacent to the existing foundations and in areas of minimal vegetation and habitat, the overall impacts are minor. Given that the AirTrain guide rail will be elevated and much of the disturbance is within already developed areas, there is very little vegetated habitat being disturbed. Given the developed nature of much of the Project Area and the relatively small footprints of disturbance associated with the supporting foundations and underlying piles, it is not anticipated that there will be any significant adverse/long-term impacts to wildlife populations, particularly given that the existing AirTrain will be demolished during the demolition phase of the project and its previously impacted areas restored to their pre-construction condition.

Biological Resources Proposed Action Impacts

It is not anticipated that there will be any significant adverse direct impacts to vegetation, wildlife and wildlife habitat, and/or threatened and endangered species and their habitat under the Proposed Action. There will be some direct impact due to construction of the permanent guideway foundations. There is also potential for temporary construction-related indirect impacts to State-protected and migratory avian species utilizing habitat near/within the Project area for foraging. Based on review of Landscape Project 3.3 data and other related online literature, the Proposed Action would not extend into known breeding areas. These potential indirect impacts are associated with both construction access as well as noise and vibration due to the pile driving required for the new supporting piles/foundations. This indirect impact would be addressed via timing restrictions associated with the previously identified protected species as well as Best Management Practices (BMP's) to limit construction access disturbance. Like the Linear Alignment, the Proposed Action does not enter the CTA and comes within closer proximity to existing habitat associated with the Peripheral Ditch near proposed Station 3 than the Loop Alternative. The replacement of the AirTrain and its associated infrastructure will be in close proximity to the existing AirTrain alignment on one side or the other. Given that the existing AirTrain alignment has already impacted those habitat areas to some degree, the slight shift in the footprint between the existing alignment and Proposed Action is anticipated to have minimal impact to the above listed environmental resources. Where the Proposed Action occurs west of the CTA, impacts generally occur within close proximity to disturbed areas. Overall, it is not anticipated the Proposed Action will have significantly greater impacts than the existing condition, particularly given that the existing AirTrain will be demolished during the demolition phase of the project and its previously impacted areas restored to their pre-construction condition.

Impacts associated with the Proposed Action are primarily related to the installation of piles and construction of pier foundations on top of said piles. Given (1) the relatively small size of the pier foundations limits, which would be larger than the underlying pile diameter and (2) the location of the majority of foundation locations within or immediately adjacent to the existing foundations and in areas

of minimal vegetation and habitat, the overall impacts are very minor. Given that the AirTrain guide rail will be elevated and much of the disturbance is within already developed areas, there is very little vegetated habitat being disturbed. Given the highly developed nature of the site and the relatively small footprints of disturbance, it is not anticipated that there will be any significant adverse impacts to wildlife populations.

For both alternatives (Loop and Proposed Action), there is a potential that Black-crowned Night-Herons returning from foraging to their rookeries, could potentially become temporarily dis-oriented by the new AirTrain alignment. It is possible that this could result in an occasional bird-strike to the AirTrain. This potential situation is anticipated to be both low-probability, since the proposed alignment is, for the most part, close to the original alignment and temporary, since any herons returning to their rookeries would become used to the slightly different location.

2.7 Coastal Resources

Coastal areas in New Jersey are managed through the federal Coastal Zone Management Act of 1972. This law authorizes individual states to develop plans that incorporate the strategies and policies they will employ to manage development and use of coastal land and water areas. Each Coastal Zone Management Plan, which must be approved by the National Oceanic and Atmospheric Administration, must contain enforceable policies (i.e., state policies that are legally binding and by which a state exerts control over coastal uses and resources). In New Jersey, the enforceable policies are contained in the Coastal Zone Management rules at N.J.A.C. 7:7, among other regulations.

There are three (3) major state laws are implemented through the Coastal Zone Management rules: the Waterfront Development Law, N.J.S.A. 12:5-3, the Wetlands Act of 1970, N.J.A.C. 13:9A, and the Coastal Area Facility Review Act (CAFRA), N.J.S.A. 13:19.

Existing Conditions

While current NJDEP GIS mapping indicates that the Peripheral Ditch has a surface water classification of FW2-NT/SE3, due to the presence of tide gates west of the New Jersey Turnpike, the Peripheral Ditch is no longer tidal and is significantly more than 500 feet away from the closest mean high water line (see Figures 11A and 11B). Given that factor, the proposed project improvements do not lie within the jurisdictional limits of the Waterfront Development Law. Since the proposed AirTrain project lies outside of the CAFRA Zone as well, the proposed project is not subject to the Coastal Zone Management Rules.

Given the existence of the tide gate referenced above, there are no tidal waters present within or impacted by the proposed project. While coordination with NJDEP Bureau of Tidelands is currently ongoing, additional coordination may be required to determine if there will be any areas “formerly flowed by the tide” that do not have a current tidelands conveyance (i.e. grant, lease, or license) associated with them. It is not anticipated that there will be any significant impacts to coastal resources, assuming all stormwater and erosion control measures are met. If, after final coordination with NJDEP’s Bureau of Tidelands, it is determined that there are several “areas formerly flowed by the tide” that would be impacted by the proposed pier foundations but do not have currently have a tidelands conveyance, then a Tidelands Conveyance (i.e. grant, lease, or license) will be required (this may require preparation of an NJDEP Waterfront Development Permit as part of obtaining any remaining tidelands conveyances).

Coastal Resources No-Action Alternative Impacts

Given that there are (a) no tidal waters associated with the Peripheral Ditch due to the presence of tide gates downstream and (b) provisions for adequate stormwater management controls in place to prevent sediment and pollutants from moving downstream through the tide gates, it is not anticipated that there will be any significant impacts to Coastal Resources associated with the No-Action Alternative.

Coastal Resources Loop Alternative Impacts

Given that there are (a) no tidal waters associated with the Peripheral Ditch due to the presence of tide gates downstream and (b) provisions for adequate stormwater management controls in place to prevent sediment and pollutants from moving downstream through the tide gates, it is not anticipated that there will be any significant impacts to Coastal Resources associated with the Loop Alternative.

Coastal Resources Proposed Action Impacts

Given that there are (a) no tidal waters associated with the Peripheral Ditch due to the presence of tide gates downstream and (b) provisions for adequate stormwater management controls in place to prevent sediment and pollutants from moving downstream through the tide gates, it is not anticipated that there will be any significant impacts to Coastal Resources associated with the Proposed Action.

2.8 Natural Resources and Energy Supply

Existing Conditions

The existing AirTrain is an electrically powered, fully automated monorail system that runs along an elevated center beam guideway on rubber-mounted tires. The existing AirTrain, which was constructed in 1996 is reaching the end of its design service life. The AirTrain system currently serves the three terminals, two parking lot stations, a rental car station as well as the Newark Airport Rail Link Station, which allows riders access to the Northeast Corridor (NEC) rail line. It currently serves approximately 33,000 people a day and runs 18 trains of 6 cars each (Bombardier Innovia Monorail cars) 24 hours a day, 365 days per year (not counting unanticipated outages).

The energy system operating the AirTrain is dated and not as efficient as current monorail systems. Given that Executive Order 13123*, Greening the Government through Efficient Energy Management*, requires federal agencies to reduce petroleum use, total energy use, and associated air emissions as well as water consumption in their facilities, the efficiency of the AirTrain's energy systems and any associated air emissions, must be addressed as part of the replacement project.

Natural Resources and Energy Supply No-Action Alternative Impacts

The "No Action" Alternative it is not expected to result in increased energy consumption. The only foreseeable exception is the possible addition of busing to accommodate future AirTrain ridership demand, which could result in an increase in fuel consumption.

Natural Resources and Energy Supply Loop Alternative Impacts

The proposed AirTrain replacement is intended to be as energy efficient a system as is practicable in order to avoid significant maintenance costs as well as provided more efficient service. The associated

energy efficiency would be the same for any alignment chosen. Given that one of the primary goals is to design and construct a more energy efficient system than the current AirTrain system with the new AirTrain replacement using the same power grid as the existing system. It is not anticipated that natural resources or the energy supply would be impacted by the Loop Alternative.

Natural Resources and Energy Supply Proposed Action Impacts

The proposed AirTrain replacement is intended to be as energy efficient a system as is practicable in order to avoid significant maintenance costs as well as provided more efficient service. The associated energy efficiency would be the same for any alignment chosen. Given that one of the primary goals is to design and construct a more energy efficient system than the current AirTrain system with the new AirTrain replacement using the same power grid as the existing system. It is not anticipated that natural resources or the energy supply would be impacted by the Proposed Action.

As mentioned above, the proposed replacement AirTrain Monorail system is anticipated to use the most up-to-date energy systems currently available. This includes updated electrical substations that are also proposed to be more energy efficient. The proposed AirTrain Replacement Project takes in to account the currently existing ridership. Given the more energy efficient trains/cars in use today, the AirTrain Replacement Project is anticipated to provide more energy efficient service and thus comply with Executive Order 13123.

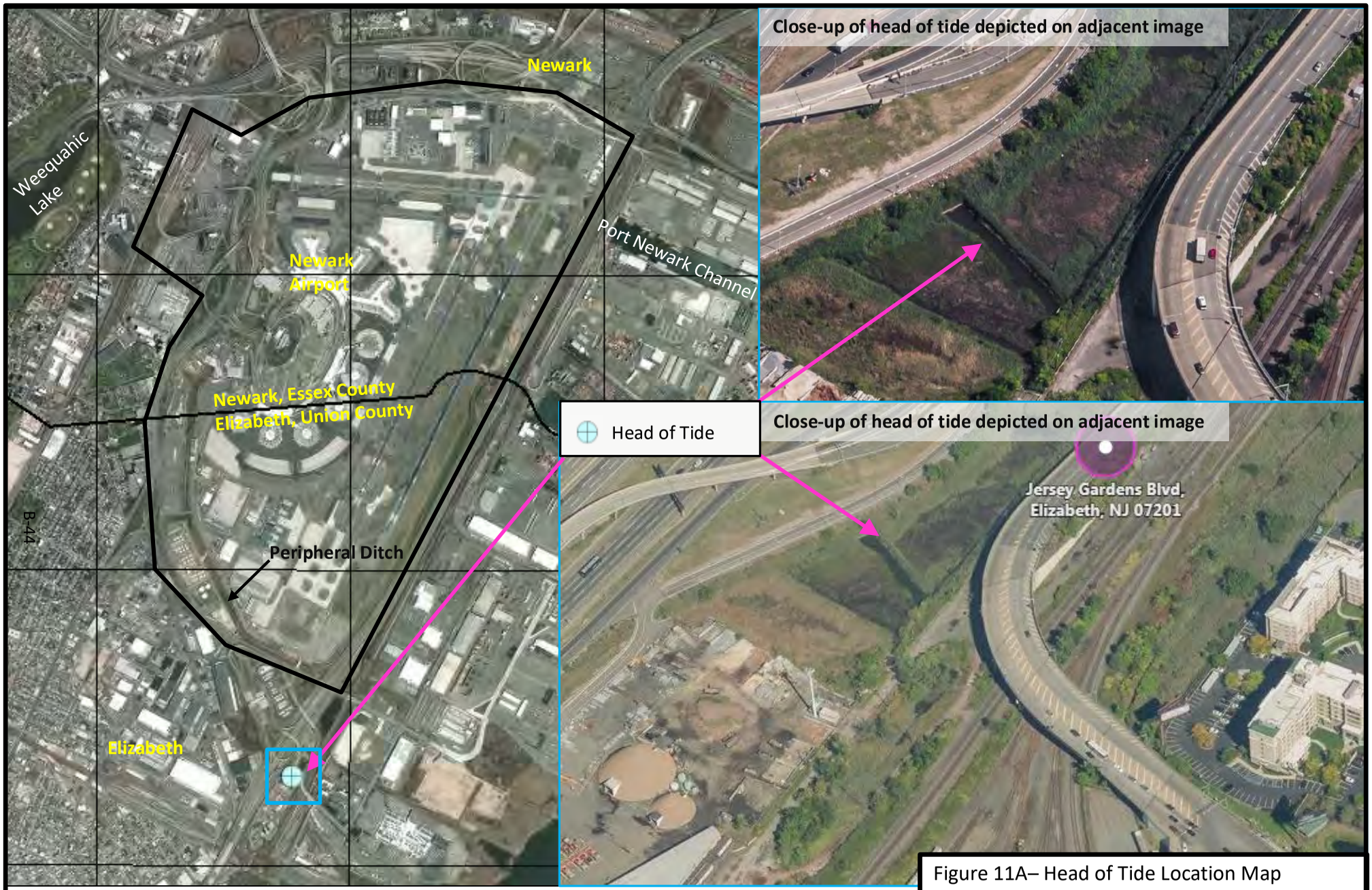
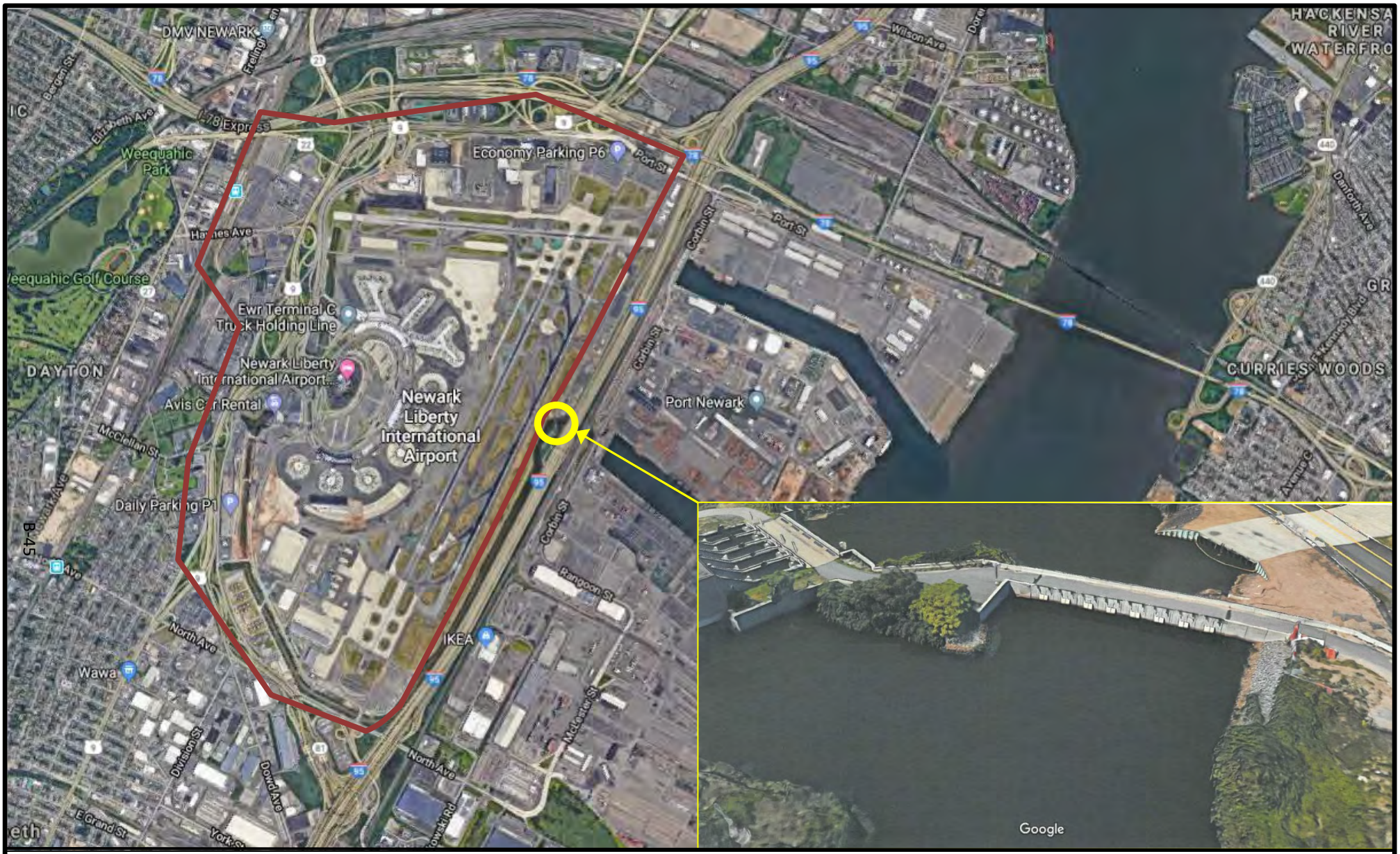


Figure 11A– Head of Tide Location Map

Newark Liberty International Airport
Air Train Replacement Project

PORT AUTHORITY NY NJ
AIR LAND RAIL SEA



Approximate Site Boundary

Figure 11B– Tide Gate Map

Newark Liberty International Airport
Air Train Replacement Project

N

PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

2.9 Wild and Scenic Rivers

No wild or scenic rivers, as defined by the Wild & Scenic Rivers Act, are present near the airport. Therefore, there would be no wild or scenic river impacts associated with either the No-Build/No-Action Alternative, Loop Alignment, Linear Alignment, or Proposed Action are anticipated.

2.10 Summary of Impacts to Natural Resources

It is anticipated that the overall impact to Natural Resources by the AirTrain Replacement Project will be minimal. This is based on the substantial extent of already existing development at the Airport, the limited indirect impacts anticipated from construction access and staging and the relatively small impact disturbance footprint associated with the AirTrain replacement. As shown in Table 2 below, the total (temporary and permanent) natural resource impacts resulting from the Loop Alignment Alternatives, Linear Alignment Alternatives, and Proposed Action are minimal in degree and very similar in nature. These impact areas are based on the assumption that natural resource disturbance is limited to the foundation areas for the proposed Loop and Linear Alignments and Proposed Action. No significant vegetation impacts are anticipated to result from the AirTrain guideways given the elevated nature of the AirTrain and the large expanses of developed area that the AirTrain will be passing over.

Table 2: Natural Resources Impact Summary Table

Natural Resource Area	No Action	Loop Alignment	Proposed Action	MCF Facility
Wetlands	0.0 acre	0.049 acre	0.071 acre	0.0 acre
Waters	0.0 acre	0.008 acre	0.001 acre	0.0 acre
Wetlands Transition Areas	0.0 acre	0.493 acre	0.636 acre	0.0 acre
NJ Coastal Flood Hazard Area/FEMA 100 Year Coastal Floodplain	0.0 acre	0.145 acre	0.164 acre	0.0 acre
Riparian Buffers/ Vegetated Riparian Buffers	0.0 acre	0.263 ac./ 0.113 ac.	0.289 acre/ 0.228 ac.	0.0 acre
Total Impacts	0.0 acre	0.913 acre	1.161 acre	0.0 acre

Note: These impacts are immediately associated with piles, pile caps, and foundation placement and does not account for temporary and permanent construction related impacts.

No impacts to natural resources are anticipated to result from construction or operation of the MCF Facility. This is due to the high concentration of development at the proposed location for the facility. Similarly, no impacts would result from the “No Action” Alternative.

Table 3: Natural Resources New Construction and Demolition Cumulative Impact Summary

Water Resources	Size of Temporary Impacts from Demolition of Existing AirTrain (acres)	Size of Temporary Impacts from Construction of Proposed AirTrain (acres)	Size of Permanent Impact from Construction of Proposed AirTrain (acres)	Total Impacts (acres)
Wetlands	0.3	<0.1	0.1	0.4
Wetlands Transition Areas	0.3	0.3	0.3	1.0
State Open Waters	0	0	0	0
100-year floodplain / State Flood Hazard Area	N/A	0.1	0.1	0.2
Riparian Buffers/ Vegetated Riparian Buffers	0.2 0.2	0.1/ 0.1	0.2/ 0.1	0.5/ 0.4
Total Impacts	0.9	0.6	0.6	2.1

Note: These impacts are immediately associated with piles, pile caps, and foundation construction (Proposed Action) or demolition (Existing AirTrain)

3.0 ANTICIPATED PERMITS AND APPROVALS

Based on the currently proposed design alternatives and impact analysis presented in this document, the following permits/approvals are anticipated to be required or have the potential to be required:

- NJDEP Freshwater Wetlands Permit (Individual Freshwater Wetland Permit anticipated).
- NJDEP Flood Hazard Area Permit (for Riparian Buffer impacts).
- NJDEP 401 Water Quality Certification (typically included with the above listed permits).
- Potentially NJDEP Waterfront Development Permit if needed for Tidelands Conveyances (only if any remaining Tidelands Conveyance(s) are determined to be required).
- Potentially NJDEP Tidelands Conveyance(s) for crossing “land formerly flowed by the tide” (only if, after agency coordination, several conveyances are determined to be required).
- Coordination with the National Oceanic and Atmospheric Administration’s National Marine Fisheries Service (NOAA/NMFS) for Essential Fish Habitat (EFH) impact assessment (no impacts anticipated) if required during permitting phase.
- Hudson-Essex-Passaic and Somerset-Union Soil Conservation Districts Soil Erosion and Sedimentation Control Plan Approval.
- NJDEP General Permit for Construction Stormwater.

APPENDICES

APPENDIX 1

AGENCY CORRESPONDENCE

State of New Jersey
MAIL CODE 501-04
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF PARKS & FORESTRY
NEW JERSEY FOREST SERVICE
OFFICE OF NATURAL LANDS MANAGEMENT
P.O. BOX 420
TRENTON, NJ 08625-0420
Tel. (609) 984-1339 Fax (609) 984-0427

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

CATHERINE R. McCABE
Commissioner

March 6, 2020

Orielan Harrington
Radin Consulting, Inc.
One Gateway Center, Suite 960
Newark, NJ 07102

Re: AirTrain Replacement
Newark City, Essex County and Elizabeth City, Union County

Dear Orielan Harrington:

Thank you for your data request regarding rare species information for the above referenced project site.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.3) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Natural Heritage Data Request Form into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

We have also checked the Landscape Project habitat mapping and Biotics Database for occurrences of rare wildlife species or wildlife habitat in the immediate vicinity (within ¼ mile) of the referenced site. Additionally, the Natural Heritage Database was checked for occurrences of rare plant species or ecological communities within ¼ mile of the site. Please refer to Table 2 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented within the immediate vicinity of the site. Detailed reports are provided for all categories coded as 'Yes' in Table 2. These reports may include species that have also been documented on the project site.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Tables 1 and 2 (attached) to determine if any priority sites are located on or in the immediate vicinity of the site.

A list of rare plant species and ecological communities that have been documented from the county (or counties), referenced above, can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2010.pdf.

Beginning May 9, 2017, the Natural Heritage Program reports for wildlife species will utilize data from Landscape Project Version 3.3. If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive web application at the following URL,

NHP File No. 20-4007462-18872

https://njdep.maps.arcgis.com/apps/webappviewer/index.html?id=0e6a44098c524ed99bf739953cb4d4c7, or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

For additional information regarding any Federally listed plant or animal species, please contact the U.S. Fish & Wildlife Service, New Jersey Field Office at http://www.fws.gov/northeast/njfieldoffice/endangered/consultation.html.

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Robert J. Cartica
Administrator

e: NHP File No. 20-4007462-18872

Table 1: On Site Data Request Search Results (6 Possible Reports)

Report Name	Included	Number of Pages
1. Possibly on Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	No	0 pages included
2. Natural Heritage Priority Sites On Site	No	0 pages included
3. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Species Based Patches	Yes	1 page(s) included
4. Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.3	No	0 pages included
5. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Stream Habitat File	No	0 pages included
6. Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program	No	0 pages included

Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
Aves								
	Black-crowned Night-heron	Nycticorax nycticorax	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Cattle Egret	Bubulcus ibis	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Glossy Ibis	Plegadis falcinellus	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Least Tern	Sternula antillarum	Foraging	4	NA	State Endangered	G4	S1B,S1N
	Least Tern	Sternula antillarum	Nesting Colony	4	NA	State Endangered	G4	S1B,S1N
	Little Blue Heron	Egretta caerulea	Foraging	2	NA	Special Concern	G5	S3B,S3N
	Savannah Sparrow	Passerculus sandwichensis	Breeding Sighting	3	NA	State Threatened	G5	S2B,S4N
	Snowy Egret	Egretta thula	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Upland Sandpiper	Bartramia longicauda	Breeding Sighting	4	NA	State Endangered	G5	S1B,S1N
Insecta								
	Checkered White	Pontia protodice	Breeding/Courtship	3	NA	State Threatened	G5	S2

Table 2: Vicinity Data Request Search Results (6 possible reports)

Report Name	Included	Number of Pages
1. Immediate Vicinity of the Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	No	0 pages included
2. Natural Heritage Priority Sites within the Immediate Vicinity	No	0 pages included
3. Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Species Based Patches	Yes	1 page(s) included
4. Vernal Pool Habitat In the Immediate Vicinity of Project Site Based on Search of Landscape Project 3.3	No	0 pages included
5. Rare Wildlife Species or Wildlife Habitat In the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Stream Habitat File	No	0 pages included
6. Other Animal Species In the Immediate Vicinity of the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program	No	0 pages included

Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
Aves								
	Black-crowned Night-heron	Nycticorax nycticorax	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Cattle Egret	Bubulcus ibis	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Glossy Ibis	Plegadis falcinellus	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Least Tern	Sternula antillarum	Foraging	4	NA	State Endangered	G4	S1B,S1N
	Least Tern	Sternula antillarum	Nesting Colony	4	NA	State Endangered	G4	S1B,S1N
	Little Blue Heron	Egretta caerulea	Foraging	2	NA	Special Concern	G5	S3B,S3N
	Savannah Sparrow	Passerculus sandwichensis	Breeding Sighting	3	NA	State Threatened	G5	S2B,S4N
	Snowy Egret	Egretta thula	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Upland Sandpiper	Bartramia longicauda	Breeding Sighting	4	NA	State Endangered	G5	S1B,S1N
Insecta								
	Checkered White	Pontia protodice	Breeding/Courtship	3	NA	State Threatened	G5	S2

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
4 E. Jimmie Leeds Road, Suite 4
Galloway, New Jersey 08205-4465
Phone (609) 646-9310
http://www.fws.gov/northeast/njfieldoffice

IN REPLY REFER TO:
20-CPA-0121

William Laventhal, Program Manager
The Port Authority of New York and New Jersey
4 World Trade Center
150 Greenwich Street, 24th Floor
New York, New York 10007
wlaventhal@panynj.gov

FEB 06 2020

Reference: Air Train Newark Replacement Project, Elizabeth City, Union County; and City of Newark, Essex County, New Jersey

The U.S. Fish and Wildlife Service (Service) has reviewed the above-referenced proposed project pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) (ESA) ensuring the protection of federally listed endangered and threatened species. The following comments do not address all Service concerns for fish and wildlife resources and do not preclude separate review and comment by the Service as afforded by other applicable environmental legislation.

The Service has determined that no federally listed species occur within or in the vicinity of the proposed project site. Therefore, no further consultation pursuant the ESA is required. If additional information on federally listed species becomes available, or if project plans change, this determination may be reconsidered.

Please contact Carlo Popolizio at (609) 382-5271 should you have any questions or comments regarding this correspondence.

Reviewing Biologist: _____
Carlo Popolizio

Authorizing Supervisor: _____
Ron Popowski

no effect.doc 01/07/08

From: Karen Greene - NOAA Federal <karen.greene@noaa.gov>
Sent: Thursday, March 12, 2020 3:06 PM
To: Laventhal, William <wlaventhal@panynj.gov>
Cc: Edith Carson-Supino <edith.carson-supino@noaa.gov>; Jessie Murray - NOAA Federal <jessie.murray@noaa.gov>
Subject: Re: FW: EWR AirTrain Replacement Program - NMFS

CAUTION: This email originated from outside the Port Authority. Do not open attachments or click on links from unknown senders or unexpected emails.

My apologies for the delay, William,

We have received your January 23, 2020, letter requesting technical assistance regarding essential fish habitat in the vicinity of Newark Airport in Elizabeth City, Union County and the City of Newark, Essex County, New Jersey as part of the planning and National Environmental Policy Act (NEPA) process for the replacement of the existing AirTrain.

.

Magnuson-Stevens Fishery Conservation and Management Act - Essential Fish Habitat

Based upon the location map provided, essential fish habitat (EFH) may be designated in tidal, estuarine waterways and wetlands in the vicinity of the project area. Information on EFH and the consultation process can be found on our website at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/habitat-conservation/conserving-habitat-greater-atlantic-region.

Endangered Species Act

No federally listed or proposed threatened or endangered species under our jurisdiction are known to exist in the site of your proposed project. Based on this, we do not believe a consultation in accordance with section 7 of the Endangered Species Act is necessary. As such, no further coordination on this activity with the NOAA Fisheries Protected Resources Division is necessary at this time. Should project plans change or new information become available that changes the basis for this determination, further coordination should be pursued. Please contact me ((978) 282-8490 or Edith.Carson-Supino@noaa.gov), should you have any questions regarding these comments. You can also find information about the temporal and spatial distribution of species and their different life stages on our interactive species mapper. The mapper can be found on our website at https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=1bc332edc5204e03b250ac11f9914a27 .

Thank you.

Karen

Karen Greene
Mid-Atlantic Field Offices Supervisor
NOAA/National Marine Fisheries Service
Greater Atlantic Regional Fisheries Office
Habitat Conservation Division
James J. Howard Marine Sciences Laboratory
74 Magruder Rd.
Highlands, NJ 07732
732 872-3023 (office)

Patrick McHugh

From: Chitra Radin <cradin@radinconsulting.com>
Sent: Monday, June 8, 2020 10:08 AM
To: Patrick McHugh
Cc: Orielan Harrington
Subject: Fw: PANYNJ 2010 Wildlife Hazard Assessment Report for Newark Airport
Attachments: 2.0 EWR_WHA_Legal Authority.pdf; 3.0 EWR_WHA_Objectives.pdf; 4.0 EWR_WHA_Background.pdf; 5.0 EWR_WHA_Legal Status of Wildlife Species.pdf; 6.0 EWR_WHA_Wildlife Hazard Assessment Methods.pdf; 7.0 EWR_WHA_Results and Discussion.pdf; 8.0 EWR_WHA_Off Airport Attractants.pdf; 9.0 EWR_WHA_Recommendatons.pdf; 10.0 EWR_WHA_Literature Cited.pdf; Coverletter to FAA.pdf; EWR_WHA_Cover Page.pdf; EWR_WHA_Executive Summary.pdf; EWR_WHA_Table of Contents.pdf; 1.0 EWR_WHA_Introduction.pdf

Pat,

Pls see attached. Also, Melissa's email is important as it discussed the Least Tern nesting location.

Let me know if this is helpful and if we would need to add this to the EA Appendix. At this point, since the study is 10 years old, a footnote may suffice?

Best,
Chitra

From: Tollner, Lynda <ltollner@LeaElliott.com>
Sent: Monday, June 8, 2020 9:51 AM
To: Chitra Radin <cradin@radinconsulting.com>; Orielan Harrington <oharrington@radinconsulting.com>
Subject: FW: PANYNJ 2010 Wildlife Hazard Assessment Report for Newark Airport

See below email from Melissa and attached

From: Shaw, Melissa G <mczechowski@panynj.gov>
Sent: Monday, June 8, 2020 8:40 AM
To: Tollner, Lynda <ltollner@LeaElliott.com>
Cc: Ponce, Felix <fponce@LeaElliott.com>
Subject: RE: PANYNJ 2010 Wildlife Hazard Assessment Report for Newark Airport

Hi Lynda

attached is the last Wildlife Hazard Assessment (WHA) conducted at EWR in 2010. There is scant information on least terns in the WHA and no maps (Chpt. 4.0 & 9.0). However, I also received the following, a section from the airport's Wildlife Hazard Management Plan (WHMP), which describes the location where the least tern nest. There is no information on insect populations as that is outside the scope of the WHA and WHMP.

Per the WHMP:

Least Tern Nesting Colony

Least terns *(Sternula antillarum)* have formed a small nesting colony near the localizer antenna of Runway 22R. Least terns are a New Jersey State endangered species, which cannot be depredated. In the spring of 2011, the nesting area was reseeded with grass according to the guidelines set forth in the Port Authority Engineering Department's "Aviation Landscape and Sustainable Design Criteria." This reseeding project caused the nesting colony to move to a small patch of pavement directly in front of the 22R localizer. The birds nested in small cracks in the pavement that accumulated small amounts of sand and gravel. In 2012, vegetation in the pavement was cut and sprayed with herbicide and the cracks were sealed to help prevent nesting. In 2014 and 2015, the Port Authority used a series of tarps and structures with mylar tape to prevent the birds from nesting. These efforts prevented nesting. Similar efforts will continue until the birds no longer attempt to nest in this area. All activities are carried out in close coordination with the Endangered Species Unit of NJDEP.

Target Date for Completion: Ongoing

Melissa

From: Tollner, Lynda <ltollner@LeaElliott.com>
Sent: Tuesday, May 26, 2020 7:46 AM
To: Shaw, Melissa G <mczechowski@panynj.gov>
Cc: Ponce, Felix <fponce@leaelliott.com>
Subject: FW: PANYNJ 2010 Wildlife Hazard Assessment Report for Newark Airport

CAUTION: This email originated from outside the Port Authority. Do not open attachments or click on links from unknown senders or unexpected emails.

Melissa, any idea where we could obtain the subject document?

From: Chitra Radin <cradin@radinconsulting.com>
Sent: Monday, May 25, 2020 2:16 PM
To: Tollner, Lynda <ltollner@LeaElliott.com>; Ponce, Felix <fponce@LeaElliott.com>
Cc: Orielan Harrington <oharrington@radinconsulting.com>
Subject: PANYNJ 2010 Wildlife Hazard Assessment Report for Newark Airport

Lynda and Felix,

We are looking for the 2010 Wildlife Hazard Assessment Document for the Airport. Do you think you can get me a copy of it? Basically, we want it to see it the report has any mapping for the Least Tern colony and any documentation or a location map of the Checkered-White Butterfly colony location (it is supposedly by the Long-Term Parking Lot). If you can find it, can you send it to Orielan or me? We need to add a sentence or two about both these species in the EA.

Thanks,

Best,
Chitra

NOTICE: THIS E-MAIL AND ANY ATTACHMENTS CONTAIN INFORMATION FROM THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY AND AFFILIATES. IF YOU BELIEVE YOU HAVE RECEIVED THIS E-MAIL IN ERROR, PLEASE NOTIFY THE SENDER IMMEDIATELY, PERMANENTLY DELETE THIS E-MAIL (ALONG WITH ANY ATTACHMENTS), AND DESTROY ANY PRINTOUTS.

Patrick McHugh

From: Patrick McHugh
Sent: Monday, March 2, 2020 2:46 PM
To: 'Randy.Bearce@dep.nj.gov'
Cc: 'Chitra radin (cradin@radinconsulting.com)'; Orielan Harrington (oharrington@radinconsulting.com)
Subject: Tidelands Figure showing PANYNJ Airtrain Project Alignment and current claimed tidelands overlay
Attachments: 3-2-2020 FIGURE_Tidelands.pdf

Hi Randy,

I just wanted to follow up with you regarding our phone conversation this past Friday concerning potential Tidelands Conveyance issues at Newark Liberty International Airport. These potential Tidelands Conveyance issues are associated with the PANYNJ's proposed Airtrain Replacement Project. I have attached a figure showing the (NJ) Tidelands Claimed Areas overlay over the proposed project alignment/limits to this email. While it is clear that the Peripheral Ditch within the Airport property is not tidal due to tide gates down near Elizabeth Channel (which we have verified visually), it is currently unknown if the depicted Claimed Tidelands limits shown on the attached figure are now covered by subsequent Tidelands Conveyances to other entities or have been legalized in the past but were not updated on NJDEP's Geoweb. We would like to meet with you and/or your staff after you've reviewed this information in order to go over what Tidelands Conveyances issues the Bureau of Tidelands feels needs to be addressed and to confirm the procedures for doing so. Should you need any additional information and clarification on what is attached, please feel free to contact me at any time (contact info below). Thanks,

Patrick McHugh
Supervising Environmental Specialist
NV5, Inc.
(D): 973-946-5666
(C): 201-396-1491
Email: Patrick.McHugh@nv5.com

Patrick McHugh

From: Patrick McHugh
Sent: Monday, March 2, 2020 5:57 PM
To: 'Bearce, Randy'
Cc: 'Chitra radin (cradin@radinconsulting.com)'; Orielan Harrington (oharrington@radinconsulting.com)
Subject: RE: Tidelands Figure showing PANYNJ Airtrain Project Alignment and current claimed tidelands overlay

Thanks Randy, I appreciate it. Will wait to hear from you, thanks!

Pat McHugh

NV5 Inc.

From: Bearce, Randy <Randy.Bearce@dep.nj.gov>
Sent: Monday, March 2, 2020 2:43 PM
To: Patrick McHugh <Patrick.Mchugh@nv5.com>
Cc: 'Chitra radin (cradin@radinconsulting.com)' <cradin@radinconsulting.com>; Orielan Harrington (oharrington@radinconsulting.com) <oharrington@radinconsulting.com>; Bearce, Randy <Randy.Bearce@dep.nj.gov>
Subject: RE: Tidelands Figure showing PANYNJ Airtrain Project Alignment and current claimed tidelands overlay

I received the information and am having staff review the information and we will get back to you next week.

Randy Bearce, Manager
Division of Land Use Regulation
Bureau of Tidelands Management
P.O. Box 420 Code 501-02B
Trenton, NJ 08625-0420
Office Tel. # 609-292-2573
Work Cell # 609-422-7011
Fax # 609-777-3656
Randy.bearce@dep.nj.gov

New Jersey DEPARTMENT of ENVIRONMENTAL PROTECTION

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From: Patrick McHugh <Patrick.Mchugh@nv5.com>
Sent: Monday, March 2, 2020 2:46 PM
To: Bearce, Randy <Randy.Bearce@dep.nj.gov>
Cc: 'Chitra radin (cradin@radinconsulting.com)' <cradin@radinconsulting.com>; Orielan Harrington (oharrington@radinconsulting.com) <oharrington@radinconsulting.com>
Subject: [EXTERNAL] Tidelands Figure showing PANYNJ Airtrain Project Alignment and current claimed tidelands overlay

Hi Randy,

I just wanted to follow up with you regarding our phone conversation this past Friday concerning potential Tidelands Conveyance issues at Newark Liberty International Airport. These potential Tidelands Conveyance issues are associated with the PANYNJ's proposed Airtrain Replacement Project. I have attached a figure showing the (NJ) Tidelands Claimed Areas overlay over the proposed project alignment/limits to this email. While it is clear that the Peripheral Ditch within the Airport property is not tidal due to tide gates down near Elizabeth Channel (which we have verified visually), it is currently unknown if the depicted Claimed Tidelands limits shown on the attached figure are now covered by subsequent Tidelands Conveyances to other entities or have been legalized in the past but were not updated on NJDEP's Geoweb. We would like to meet with you and/or your staff after you've reviewed this information in order to go over what Tidelands Conveyances issues the Bureau of Tidelands feels needs to be addressed and to confirm the procedures for doing so. Should you need any additional information and clarification on what is attached, please feel free to contact me at any time (contact info below). Thanks,

Patrick McHugh
Supervising Environmental Specialist
NV5, Inc.
(D): 973-946-5666
(C): 201-396-1491
Email: Patrick.McHugh@nv5.com

Patrick McHugh

From: Patrick McHugh
Sent: Wednesday, March 11, 2020 3:22 PM
To: Bearce, Randy
Cc: 'Chitra radin (cradin@radinconsulting.com)'
Subject: Re: Tidelands Figure showing PANYNJ Airtrain Project Alignment and current claimed tidelands overlay

Hi Randy, thanks for sending these over, it is a huge help we will print out the files and compare them to all the proposed crossings of lands formerly flowed by the tide. If there's and formerly flowed areas not covered by a conveyance I'll let you know right away. Hopefully all the proposed crossings are covered by existing Grant's, leases or licenses. Thanks again for your help with this, it's much appreciated.

Sent from my Verizon, Samsung Galaxy smartphone

-------- Original message --------
From: "Bearce, Randy" <Randy.Bearce@dep.nj.gov>
Date: 3/11/20 3:11 PM (GMT-05:00)
To: Patrick McHugh <Patrick.Mchugh@nv5.com>
Cc: "'Chitra radin (cradin@radinconsulting.com)'" <cradin@radinconsulting.com>
Subject: RE: Tidelands Figure showing PANYNJ Airtrain Project Alignment and current claimed tidelands overlay

Pat,

Still checking records

I didn't see any record for the existing airtrain in general, however, it appears that much of Newark Airport and / or the airtrain ROW may be included within the grants highlighted in yellow below.

I provided a copy of the 2 conveyance maps that cover the area. Working on getting you copies of the grants.

Basically anything that crosses a current or former tidal creek that is not covered by an existing Tidelands instrument would need to obtain the appropriate Tidelands approval.

Will follow-up with the grants.

Conveyance maps 672-2130 & 679-2130

Grant to New York Port Authority 4/13/53 Liber P-3 page 25

Grant to City of Newark, 6/10/46 Liber W-2 page 117 (Granted with noted exceptions)

Grant to Hartz Mountain Industries 9/22/92 Liber J-8 page 177 File 90-0309-T

These are the other files referenced on the conveyance map without name. It doesn't appear any would be related to the airtrain.

0714-06-0005.1 TDG110001 pending grant to NJDOT for Rt 1 & 9

0714-13-0011.1 TDG130001 grant to Toler Place B 3520 L 46, Newark

0714-13-0009.1 TDG130001 grant to Frelinghuysen Avenue Associates, LLC B 3520 L 14, 16, Newark

0714-11-0001.1 TDG110001 grant to Zygal B 3520 Ls 18, 19, 20 & 66

Randy Bearce, Manager
Division of Land Use Regulation
Bureau of Tidelands Management
P.O. Box 420 Code 501-02B
Trenton, NJ 08625-0420
Office Tel. # 609-292-2573
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Fax # 609-777-3656
Randy.bearce@dep.nj.gov

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From: Patrick McHugh <Patrick.Mchugh@nv5.com>
Sent: Tuesday, March 10, 2020 5:29 PM
To: Bearce, Randy <Randy.Bearce@dep.nj.gov>

Patrick McHugh

From: Patrick McHugh
Sent: Thursday, March 19, 2020 3:41 PM
To: 'Bearce, Randy'
Cc: 'Chitra radin (cradin@radinconsulting.com)'; Orielan Harrington (oharrington@radinconsulting.com); Jim Brazel (Jim.Brazel@nv5.com)
Subject: FW: Newark Liberty International Airport-AirTrain Replacement Project- Tidelands Conveyances
Attachments: Tidelands Map.pdf

Hi Randy,

We have reviewed the Tidelands mapping and conveyance information you sent to us and marked up the previous figure I sent to you. It looks like most of the lands formerly flowed by the tide do have conveyances with the exception of two areas circled in yellow with question marks which we are unsure of. There may very well be conveyances associated with them but we were unable to tell as some of the conveyance mapping limits were unclear. Would your staff be able to look at the attached pdf figure to see if they know if there are conveyances issued for the two areas circled in yellow and to also let us know if they concur on the areas we did find conveyances for that are circled or outlined in black and have the grant holder in a text box highlighted in blue. Any information you can provide in this regard would be a big help. Thanks again for all your help in this matter and looking forward to hearing back from you. Thanks,

Pat McHugh
NV5

From: Jami Luckhardt <Jami.Luckhardt@nv5.com>
Sent: Thursday, March 19, 2020 3:26 PM
To: Patrick McHugh <Patrick.Mchugh@nv5.com>
Subject: AirTrain

Here you go.

Patrick McHugh

From: Patrick McHugh
Sent: Wednesday, April 8, 2020 11:22 AM
To: Bearce, Randy
Subject: Re: Newark Liberty International Airport- Airtrain Tidelands Conveyances

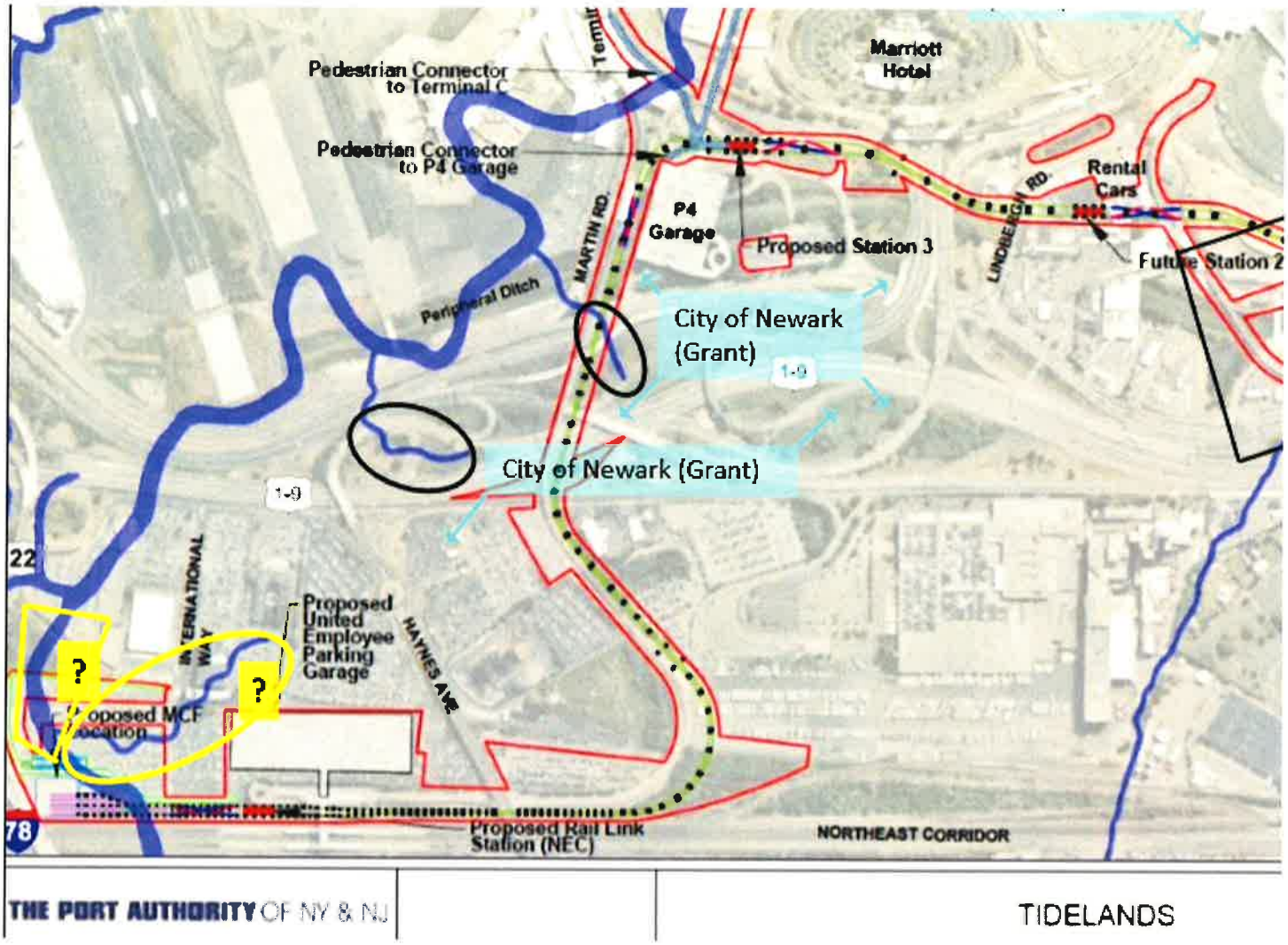
Hi Randy, yes, that is correct. The two segments in yellow are what we are unsure of. There are some conveyances along the formerly flowed main stem but I cant tell if it includes the 2 segments we circled in yellow.or not.

Sent from my Verizon, Samsung Galaxy smartphone

-------- Original message --------
From: "Bearce, Randy" <Randy.Bearce@dep.nj.gov>
Date: 4/8/20 11:09 AM (GMT-05:00)
To: Patrick McHugh <Patrick.Mchugh@nv5.com>
Subject: RE: Newark Liberty International Airport- Airtrain Tidelands Conveyances

To be clear, you believe there are tidelands conveyances that cover all the overlapping tidelands claim areas (blue water ways below) by the red outline?

And the two areas you have questions about are the areas inside the yellow circles below?



Randy Bearce, Manager
Division of Land Use Regulation
Bureau of Tidelands Management
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Office Tel. # 609-292-2573
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Randy.bearce@dep.nj.gov

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Patrick McHugh

From: Patrick McHugh
Sent: Wednesday, April 8, 2020 4:14 PM
To: 'Bearce, Randy'
Subject: RE: Newark Liberty International Airport- Airtrain Tidelands Conveyances

Hi Randy,

This helps a lot, thank you. A lot more clearer. If you could just confirm one thing, that parcel 0714_5088_126.01 is part of the grant to Hartz Mountain, that would be great. I think if that is the case then we have proof of conveyances for the entire project area. Thanks again for all of your help with this, I really appreciate it. If you can get a chance to send me over a confirmation of that parcel going to Hartz Mountain sometime tomorrow that would be great. Thanks,

Pat

From: Bearce, Randy <Randy.Bearce@dep.nj.gov>
Sent: Wednesday, April 8, 2020 3:54 PM
To: Patrick McHugh <Patrick.Mchugh@nv5.com>
Subject: FW: Newark Liberty International Airport- Airtrain Tidelands Conveyances

Pat,
Does this help? Do you need any of the documents referenced for more detail?

Randy Bearce, Manager
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Trenton, NJ 08625-0420
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From: Lashendock, Matthew <Matthew.Lashendock@dep.nj.gov>
Sent: Wednesday, April 8, 2020 3:20 PM

To: Bearce, Randy <Randy.Bearce@dep.nj.gov>
Cc: DeMilio, Kelly <Kelly.DeMilio@dep.nj.gov>
Subject: Re: Newark Liberty International Airport- Airtrain Tidelands Conveyances

Randy,

I've attached details of the area with the conveyance overlay shown. The second includes the parcels layer for reference. The third is a closeup of the notes that are in that area.

In this area:

Block 5088, Lot 138
Grant to the City of Newark, 10/6/1941, Liber o-2, page 229, Cons. $100.00, File: 6319

Block 5088, Lot 126.01
Grant to Hartz Mountain Industries, Inc., 9/22/1992, Liber J-8, page 177, Cons. $75,705.00, File: 90-0309-T

Block 5088 Lot 182
Note 11: Grant - File: 0714-13-0007.1, TDG130001, Liber H-13, Pg.129, etc.

Block 5088 Lot 131
Note 3: Grant to Newark International Plaza, 4/22/1977, Liber O-6, page 11, Cons. $25,500.00, File:73-307

Exception "A" to Grant File: 6853 covers Block 5088 Lots 131, 132, and 170

The locations in this grid (679-2130) are also part of the Newark-Elizabeth Meadowlands special conditions area.

Matt

From: Bearce, Randy <Randy.Bearce@dep.nj.gov>
Sent: Wednesday, April 8, 2020 11:34 AM
To: Lashendock, Matthew <Matthew.Lashendock@dep.nj.gov>
Cc: DeMilio, Kelly <Kelly.DeMilio@dep.nj.gov>
Subject: FW: Newark Liberty International Airport- Airtrain Tidelands Conveyances

Matt,
You previously did a look up on this for me. Can you check on the 2 areas in yellow below and advise on Tidelands status. Reach out to Kelly if you need any help.

Give me close up screen shot of the areas in yellow with the conveyance overlay, etc.

I will forward you the previous msgs about this site

Randy Bearce, Manager
Division of Land Use Regulation
Bureau of Tidelands Management

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From: Patrick McHugh <Patrick.Mchugh@nv5.com>
Sent: Wednesday, April 8, 2020 11:22 AM
To: Bearce, Randy <Randy.Bearce@dep.nj.gov>
Subject: [EXTERNAL] Re: Newark Liberty International Airport- Airtrain Tidelands Conveyances

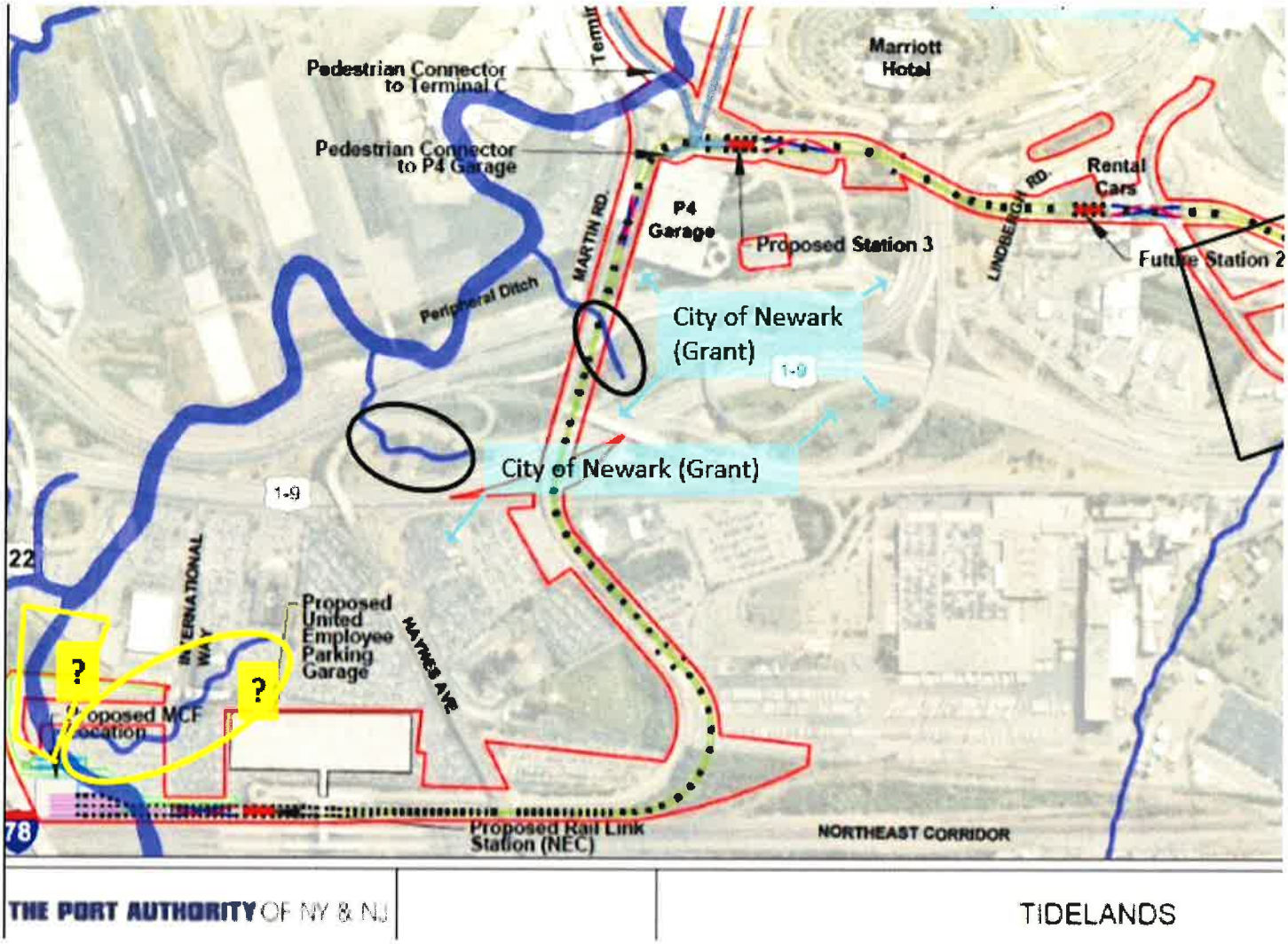
Hi Randy, yes, that is correct. The two segments in yellow are what we are unsure of. There are some conveyances along the formerly flowed main stem but I cant tell if it includes the 2 segments we circled in yellow.or not.

Sent from my Verizon, Samsung Galaxy smartphone

-------- Original message --------
From: "Bearce, Randy" <Randy.Bearce@dep.nj.gov>
Date: 4/8/20 11:09 AM (GMT-05:00)
To: Patrick McHugh <Patrick.Mchugh@nv5.com>
Subject: RE: Newark Liberty International Airport- Airtrain Tidelands Conveyances

To be clear, you believe there are tidelands conveyances that cover all the overlapping tidelands claim areas (blue water ways below) by the red outline?

And the two areas you have questions about are the areas inside the yellow circles below?



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Patrick McHugh

From: Patrick McHugh
Sent: Wednesday, April 8, 2020 5:00 PM
To: 'Bearce, Randy'
Subject: RE: Newark Liberty International Airport- Airtrain Tidelands Conveyances

Hi Randy,

Yes, that is the one. I wasn't sure if that was for that whole parcel I identified in my email or not. If it is, that encompasses one of the main stem segments I circled in yellow in my earlier email. If that's part of the grant, then I think we are covered, conveyance-wise, for the whole project.

Pat

From: Bearce, Randy <Randy.Bearce@dep.nj.gov>
Sent: Wednesday, April 8, 2020 4:56 PM
To: Patrick McHugh <Patrick.Mchugh@nv5.com>
Subject: RE: Newark Liberty International Airport- Airtrain Tidelands Conveyances

You are referring to this grant?

Block 5088, Lot 126.01
Grant to Hartz Mountain Industries, Inc., 9/22/1992, Liber J-8, page 177, Cons. $75,705.00, File: 90-0309-T

We will get you a copy of that grant. It may refer to an overall metes and bounds and might not define that specific lot.

Reminder, the conveyance maps all have a disclaimer that they are for reference only and to refer to the original grant document for legal descriptions/boundaries.

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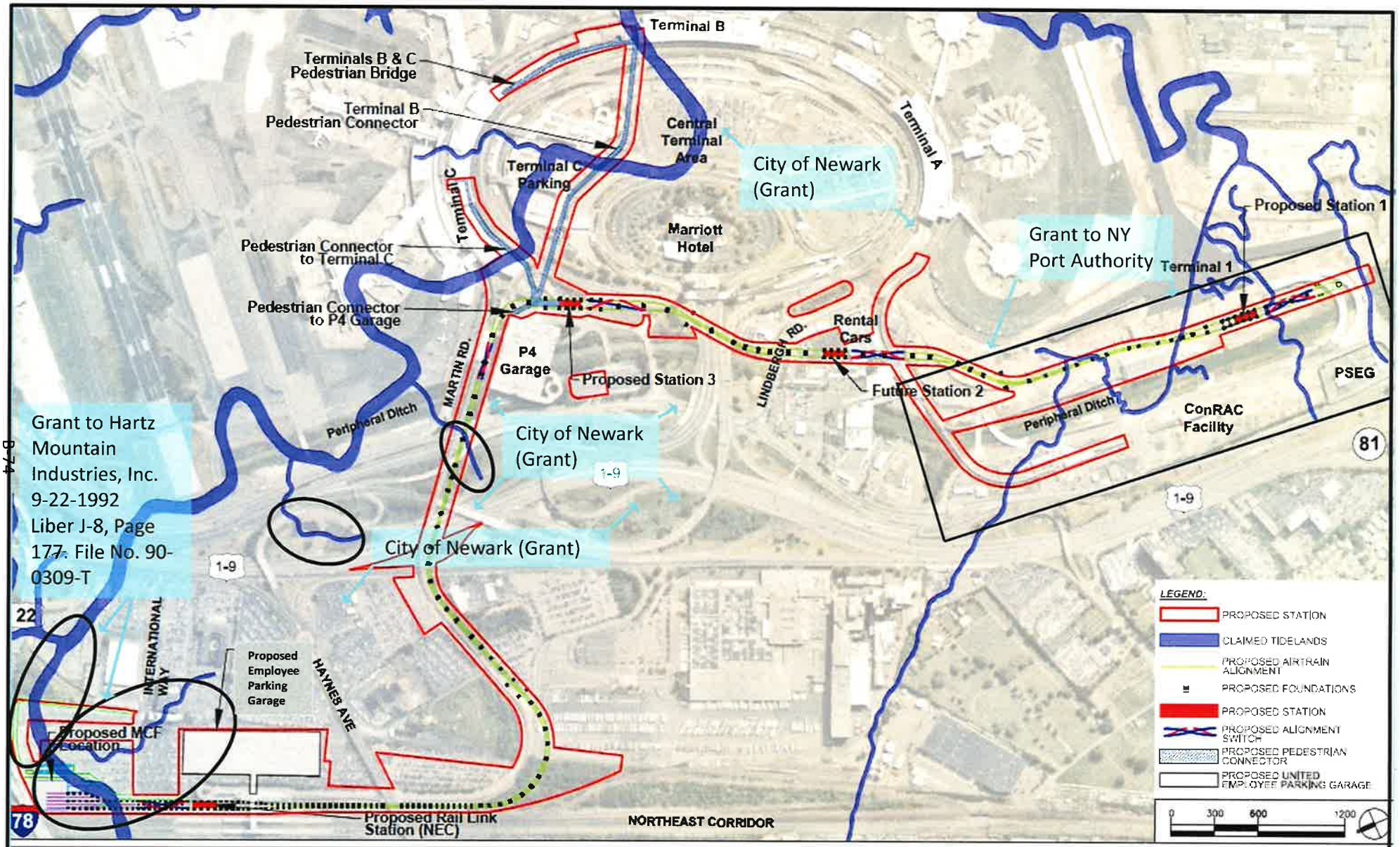
Patrick McHugh

From: Patrick McHugh
Sent: Wednesday, April 22, 2020 10:39 AM
To: 'Bearce, Randy'
Subject: 4-22-2020 rev updated Tidelands Map.pptx
Attachments: 4-22-2020 rev updated Tidelands Map.pptx

Hi Randy,

Attached is an updated copy of our previously submitted figure showing the additional conveyance to Hartz Mountain Industries. I believe that covers all of the areas we need conveyance information on but the PANYNJ would appreciate your staff reviewing this to see if you concur. Please feel free to contact me at any time if you need any additional information or clarification on anything on the drawing. You can always get a hold of me either via this email address, via my desk phone at 973-946-5666 or via my cell at 201-396-1491. Thanks,

Pat McHugh
NV5



THE PORT AUTHORITY OF NY & NJ		TIDELANDS	Figure X-X	

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APPENDIX 2

TES SUPPORTING DOCUMENTS

SOILS MAP AND INFORMATION


74° 14' 28" W
74° 6' 18" W
40° 43' 2" N
40° 39' 36" N
565000
566000
567000
568000
569000
570000
571000
572000
573000
574000
575000
4507000
4506000
4505000
4504000
4503000
4502000
78
95
1
22
BowrB
USBOOB
URBOOB
URDUNB
USBOOC
URKTTB
BhguA
UddunB
URBHGB
RkkcA
UdrkkB
USDUNB
DunB
TunkC
TunkE
TunkB
WATER
URBHGB
UdktB
BhgA
TunkD
UdtunB
TunudB
UR
BovB
UdrB
TrkAv
WhpAr
UdoB
BotB
Map Scale: 1:31,000 if printed on B landscape (17" x 11") sheet.
Meters
0 450 900 1800 2700
Feet
0 1500 3000 6000 9000
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

B-77

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at scales ranging from 1:12,000 to 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Essex County, New Jersey
Survey Area Data: Version 13, Oct 6, 2017

Soil Survey Area: Hudson County, New Jersey
Survey Area Data: Version 7, Oct 6, 2017

Soil Survey Area: Union County, New Jersey
Survey Area Data: Version 11, Oct 6, 2017

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 26, 2011—Sep 27, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BhgA	Bigapple loamy sand, 0 to 3 percent slopes	129.0	1.5%
BhguA	Bigapple - Urban land, Bigapple substratum complex, 0 to 3 percent slopes	571.2	6.7%
BotB	Boonton - Udorthents, Boonton substratum complex, red sandstone lowland, 0 to 8 percent slopes	39.3	0.5%
BowrB	Boonton - Urban land, Boonton substratum complex, red sandstone lowland, 0 to 8 percent slopes	6.0	0.1%
DunB	Dunellen sandy loam, 3 to 8 percent slopes	65.2	0.8%
RkkcA	Rikers loamy sand, 0 to 3 percent slopes	237.7	2.8%
TunkB	Tunkhannock fine sandy loam, 3 to 8 percent slopes	52.2	0.6%
TunkC	Tunkhannock fine sandy loam, 8 to 15 percent slopes	31.4	0.4%
TunkD	Tunkhannock fine sandy loam, 15 to 25 percent slopes	18.5	0.2%
TunkE	Tunkhannock fine sandy loam, 25 to 60 percent slopes	16.5	0.2%
TunudB	Tunkhannock - Udorthents, Tunkhannock substratum complex, 0 to 8 percent slopes	38.5	0.4%
UddunB	Udorthents, Dunellen substratum, 0 to 8 percent slopes	70.5	0.8%
UdkttB	Udorthents, loamy fill substratum, 0 to 8 percent slopes	53.2	0.6%
UdrkkB	Udorthents, Rikers substratum, 0 to 8 percent slopes	5.2	0.1%
UdtunB	Udorthents, Tunkhannock substratum, 0 to 8 percent slopes	85.5	1.0%
URBHGB	Urban land, Bigapple substratum, 0 to 8 percent slopes	2,099.9	24.5%
URBOOB	Urban land, Boonton substratum, 0 to 8 percent slopes, red sandstone lowland	119.8	1.4%

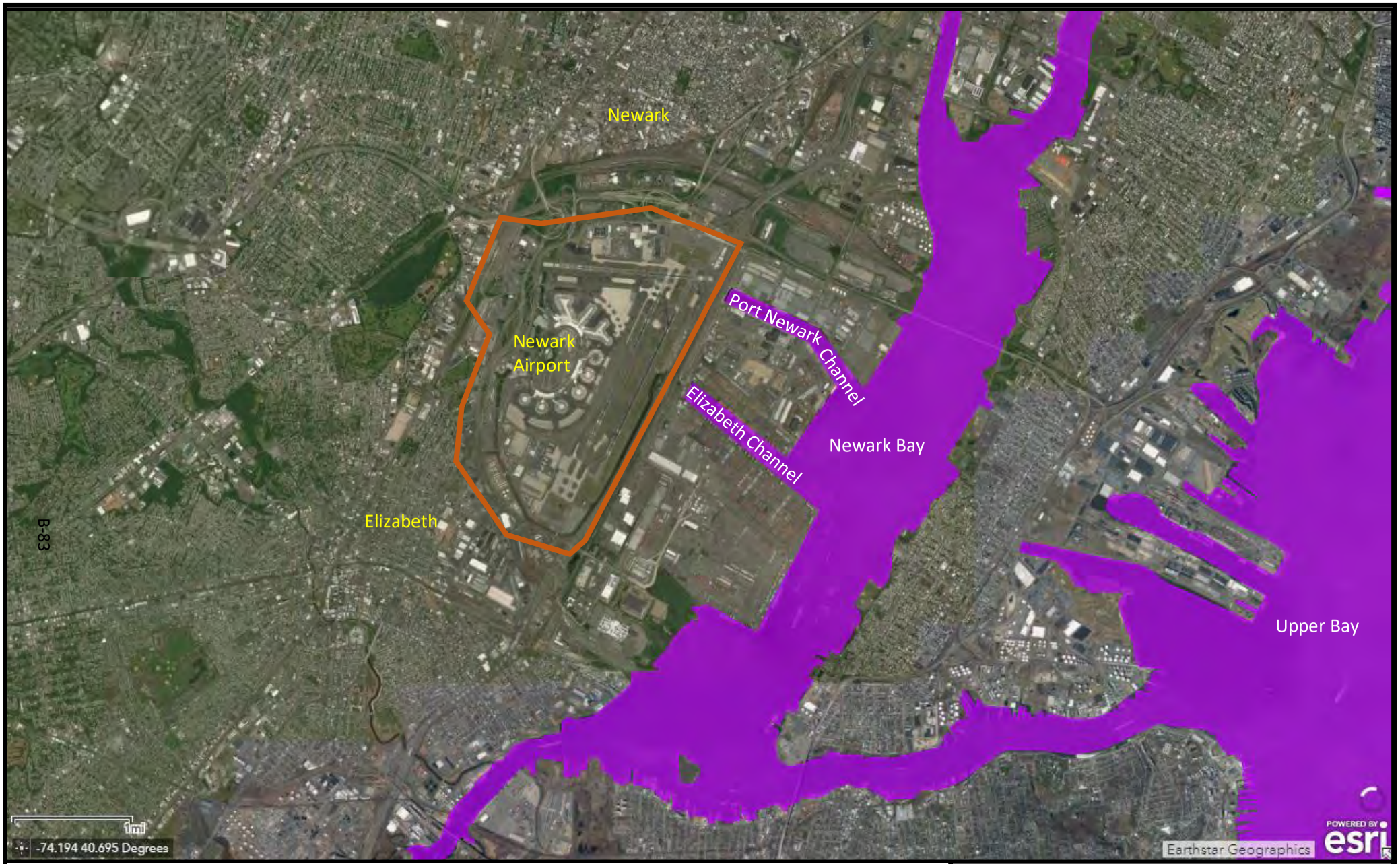
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
URDUNB	Urban land, Dunellen substratum, 0 to 8 percent slopes	313.3	3.7%
URKTTB	Urban land, loamy fill substratum, 0 to 8 percent slopes	162.8	1.9%
USBOOB	Urban land, Boonton substratum - Boonton complex, red sandstone lowland, 0 to 8 percent slopes	100.8	1.2%
USBOOC	Urban land, Boonton substratum - Boonton complex, red sandstone lowland, 8 to 15 percent slopes	58.5	0.7%
USDUNB	Urban land, Dunellen substratum - Dunellen complex, 0 to 8 percent slopes	71.8	0.8%
WATER	Water	406.6	4.7%
Subtotals for Soil Survey Area		**4,753.3**	**55.5%**
Totals for Area of Interest		**8,560.5**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
WATER	Water	132.9	1.6%
Subtotals for Soil Survey Area		**132.9**	**1.6%**
Totals for Area of Interest		**8,560.5**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BovB	Boonton-Urban land-Haledon complex, 0 to 8 percent slopes	10.3	0.1%
TrkAv	Westbrook, Ipswich, and Sandyhook soils, 0 to 2 percent slopes, very frequently flooded	16.6	0.2%
TunudB	Tunkhannock - Udorthents complex, 0 to 8 percent slopes	85.0	1.0%
UdoB	Udorthents, organic substratum, 0 to 8 percent slopes	892.1	10.4%
UdrB	Udorthents, refuse substratum, 0 to 8 percent slopes	30.1	0.4%
UR	Urban land	2,075.1	24.2%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
URBHGB	Urban land, bigapple substratum, 0 to 8 percent slopes	355.3	4.2%
URDUNB	Urban land, dunellen substratum, 0 to 8 percent slopes	0.9	0.0%
URKTTB	Urban land, loamy fill substratum, 0 to 8 percent slopes	11.1	0.1%
WATER	Water	165.2	1.9%
WhpAr	Whippany silt loam, 0 to 3 percent slopes, rarely flooded	32.6	0.4%
Subtotals for Soil Survey Area		**3,674.4**	**42.9%**
Totals for Area of Interest		**8,560.5**	**100.0%**

NOAA/NMFS ESSENTIAL FISH HABITAT MAPPING



Mapped Essential Fish Habitat

Approximate Site Boundary

Figure 10B - NOAA Essential Fish Habitat

Newark Liberty International Airport
Air Train Redevelopment Project

N

PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

TIDELANDS MAPPING AND

TIDE GATE PHOTOS


NORTH
LEGEND
Tidelands Claim Status
CLAIMED
0
500
1,000
Feet
2000

STATE OF NEW JERSEY
DEPARTMENT OF
ENVIRONMENTAL PROTECTION

TIDELANDS MAP 679-2130

THIS DOCUMENT PORTRAYS THE STATE'S TIDELANDS CLAIMS LINES AS SHOWN ON THE OFFICIAL AND ADOPTED NEWARK-ELIZABETH MAP, BUT AT A SCALE OF 1" = 200'. THE OFFICIAL NEWARK-ELIZABETH MAP IS AT SCALE OF 1" = 800'. THE OFFICIAL MAP HAS ALREADY BEEN FILED, SO THAT THE CLAIMS ON IT ARE NOT BARRED BY THE 1981 RIPARIAN CONSTITUTIONAL AMENDMENT. THIS DOCIMENT IS UNOFFICIAL AND HAS NOT BEEN FILED WITH THE DESIGNATED OFFICIALS AS PROVIDED IN N.J.S.A.13:1B-13.4. THIS UNOFFICIAL MAP IS NOT MEANT TO SUPERCEDE THE OFFICIAL MAP IN ANY WAY. SHOULD THERE BE ANY DISCREPANCIES BETWEEN THIS DOCUMENT AND THE OFFICIAL MAP, THE OFFICIAL MAP CONTROLS.

200 100 0 200 400 600 800 1,000

Feet

N
W E
S

PHOTOMAP FROM MARCH 2002 DIGITAL IMAGERY

Google Maps



Imagery ©2018 Google, Map data ©2018 Google 10 ft

B-87

Google Maps I-95

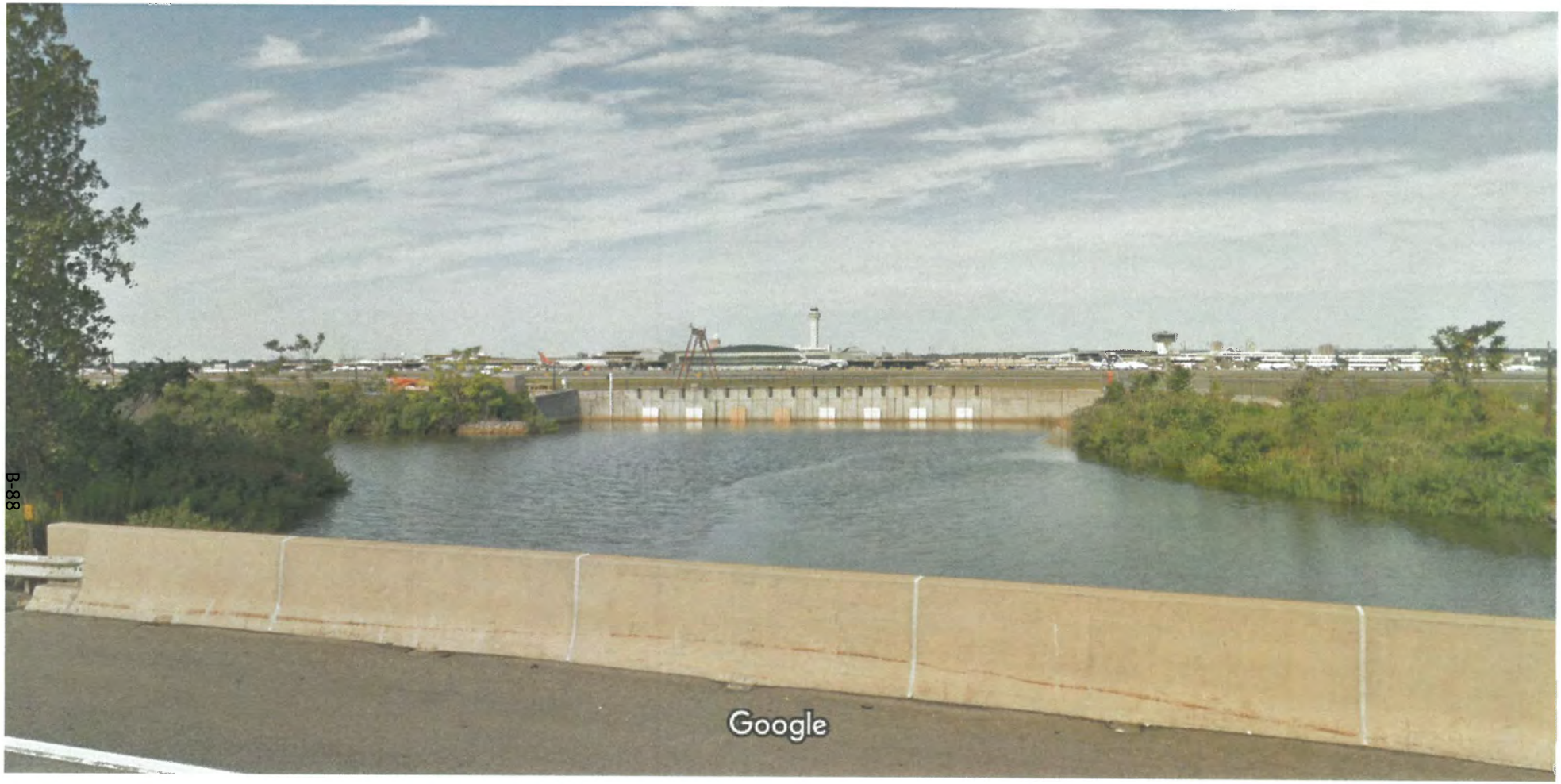


Image capture: Aug 2017 © 2018 Google

Newark, New Jersey

Google, Inc.

Street View - Aug 2017

FLOOD HAZARD AREA IMPACT QUANTITIES

FHA Displacement Volume

	Foundation No.	Flood Elevation (100-Year FEMA Tidal)(ft)	Average Ground Elevation (ft)	Depth (ft)	Area of Pile Cap Foundation (sq ft)	Flood Displacement Volume	
						(cu ft)	(cu yd)
Loop Alignment	1	8.5	6	2.5	571	1428	52.9
	2	8.5	3	5.5	600	3300	122.2
	3	8.5	7.5	1	273	273	10.1
	4	8.5	7.5	1	33	33	1.2
	5	8.5	5.5	3	300	900	33.3
	6	8.5	-2	10.5	273	2867	106.2
	7	8.5	5.5	3	273	819	30.3
	8	8.5	6.75	1.75	108	189	7.0
	Total:					**9808**	**363.3**
Linear Alignment	9	8.5	1	7.5	571	4283	158.6
	10	8.5	4	4.5	600	2700	100.0
	11	8.5	4	4.5	600	2700	100.0
	Total:					**9683**	**358.6**

APPEAL RESOLUTION TO FEMA 2014/2015 PRELIMINARY FLOOD INSURANCE RATE MAPS

FEMA

IN REPLY REFER TO: APPEAL RES ID 1559

February 12, 2016

Ms. Catherine Cronin
Manager, Physical Plant and Redevelopment
Newark Liberty International Airport
Building 1, Conrad Road
Newark, New Jersey 07114

Communities: City of Elizabeth and City of Newark,
Union and Essex Counties,
New Jersey
Community Nos.: 345523 and 340189

Dear Ms. Cronin:

This is in response to a submittal dated April 27, 2015, from you, on behalf of the Newark Liberty International Airport, Port Authority of New York and New Jersey, regarding the proposed Base (1-percent-annual chance) Flood Elevations (BFEs), Special Flood Hazard Area (SFHA) boundary, and zone designations for Newark Liberty International Airport and adjacent areas within the Cities of Elizabeth and Newark, in Union and Essex Counties, New Jersey, respectively. The airport within the limits of the City of Elizabeth is presented on the preliminary Flood Insurance Rate Maps (FIRMs) and in the preliminary Flood Insurance Study (FIS) report for Union County, New Jersey and Incorporated Areas, dated February 3, 2015. The airport within the limits of the City of Newark is presented in the preliminary FIS report and on the preliminary and revised preliminary FIRMs for Essex County, New Jersey and Incorporated Areas, dated May 30, 2014, and January 30, 2015, respectively. This submittal has been assigned tracking identification number 1559.

Please note that your request is considered an appeal because it satisfies the requirements defined in Title 44, Chapter I, Part 67 of the Code of Federal Regulations (44 CFR Part 67), and was submitted during the 90-day appeal period for your community.

The following scientific and/or technical data were submitted in support of this request:

- Report titled, "Appeal of the Newark Airport Preliminary Flood Insurance Rate Maps in Union and Essex Counties, NJ," dated April 23, 2015, prepared by ARCADIS U.S. Inc., on behalf of the Port Authority of New York and New Jersey, which contained:
  - Higher resolution Delft3D-FLOW model results and conclusions;
  - Digital Elevation Model used in the Delft3D-FLOW model; and
  - Revised and additional Wave Height Analysis for Flood Insurance Studies (WHAFIS) model transects.

We have reviewed the scientific and technical data provided and have determined that it does support revising the proposed BFEs, SFHAs, and zone designations in the vicinity of Newark Liberty International Airport and adjacent areas. More detailed topographic information incorporated into the Delft3D-FLOW model showed that a decrease in the 1-percent-annual-chance stillwater elevations for the airport property and surrounding area is

justified. The revised stillwater elevations were applied to WHAFIS transects to support revised SFHA boundaries, BFEs, and Limit of Moderate Wave Action (LiMWA).

We have resolved this appeal in accordance with the requirements of 44 CFR Part 67. We have determined that the proposed BFEs, SFHA boundary, and zone designations in the vicinity of Newark Liberty International Airport and adjacent areas within the limits of the City of Elizabeth shown on preliminary FIRM panels 34039C0025 and 34039C0026 for Union County, New Jersey and Incorporated Areas dated February 3, 2015, should be revised based on the submitted data. Additionally, we have determined that the proposed BFEs, SFHA boundary, and zone designations for the airport and adjacent areas within the limits of the City of Newark shown on the preliminary and revised preliminary FIRM panels 34013C0154, 34013C0156, and 34013C0158 for Essex County, New Jersey and Incorporated Areas dated May 20, 2014, and January 30, 2015, respectively, should also be revised based on the submitted data. Additionally, the LiMWA in both Essex and Union Counties has been adjusted based on the data provided. Please review the enclosed attachment to verify that the updated flood hazard data and LiMWA for this appeal resolution have been satisfactorily incorporated, where appropriate.

Please submit any comments regarding this appeal resolution within 30 days of the date of this letter. You may provide your comments in one of the following ways:

- Directly through your dashboard on the Region II Preliminary Flood Map Feedback Portal at https://feedback.region2coastal.com by selecting the 'Add Resolution Letter Comment' option for the tracking identification number listed above. Detailed guidance is provided in the enclosed fact sheet.

- By mail or email to the address below, including the tracking identification number referenced above. Please be advised that FEMA Region II is moving from 26 Federal Plaza to 1 World Trade Center as of March 1, 2016, although the mailing address will not change. Digital submissions may be handled more efficiently after that date.

Attention: Alan Springett, Senior Engineer
FEMA Region II
Mitigation Division
26 Federal Plaza, Room 1337
New York, NY 10278
Phone: (212) 680-8557
Alan.Springett@fema.dhs.gov

If you feel that the technical issues originally raised have not been adequately addressed by this resolution letter and that an acceptable resolution will not be feasible through the submittal of additional comments as outlined above, please note that FEMA makes Scientific Resolution Panels (SRPs) available to local communities to support the appeal resolution process. SRPs are independent panels of experts in hydrology, hydraulics, and other pertinent sciences established to review conflicting scientific and technical data and provide recommendations for resolution. An SRP is an option after FEMA and a local community have been engaged in a collaborative consultation process without a mutually acceptable resolution.

For additional information on the specific eligibility requirements for the SRP, a representative from either local community affected may contact Mr. Springett, contact information above, or refer to the enclosed SRP Fact Sheet. To request that an SRP review submitted scientific or technical data, a community official must complete the enclosed SRP Request Form and submit it to the address above within 30 days of the date of this letter.

Once all outstanding appeals and comments on the preliminary FIRM and FIS report have been resolved, we will finalize the FIRM and FIS report by issuing a Letter of Final Determination (LFD). The LFD will explain the adoption/compliance process and will state the date when the FIRM and FIS report will become effective.

We appreciate your comments and commitment to having the most accurate flood hazard information available reflected on the FIRM. If you have any questions regarding this matter, please contact Mr. Springett of my office.

Sincerely,

Michael J Moriarty

Michael Moriarty
Director
Mitigation Division
FEMA Region II

Enclosures:
Attachment: Appeal Resolution, ID: 1559 – Newark Airport, Essex and Union Counties, New Jersey
Commenting on a Resolution Letter Using the Preliminary Flood Map Feedback Portal
SRP Fact Sheet
SRP Request Form

cc: The Honorable J. Christian Bollwage, Mayor, City of Elizabeth
Raywant Sarran, Construction Official, City of Elizabeth
The Honorable Ras Baraka, Mayor, City of Newark
Phillip Scott, P.E., CME, Director of Engineering, City of Newark
Nathan Kimball, Aviation Technical Services
Alan Springett, P.E., Senior Engineer, FEMA Region II
John Moyle, P.E., CFM, State National Flood Insurance Program Coordinator, New Jersey Department of Environmental Protection (NJDEP)
Joseph Ruggeri, NJDEP

Appeal Resolution: Newark Liberty International Airport - The Port Authority of New York and New Jersey

FEMA Appeal Case ID: 1559

Elizabeth, Union County, New Jersey
Newark, Essex County, New Jersey

Appeal Resolution, ID: 1559 - Newark Airport, Essex County, New Jersey

Figure 1 of 8
Property Address: Near Newark Airport, Essex County, NJ
FIRM Panel: 34013C0152 & 34013C0154

Revised Preliminary Mapping



Appeal Resolution Mapping



Flood Hazard Boundaries
- 1 Pct Annual Chance Flood
- Floodway
- Zone D
- 0.2 Pct Annual Chance Flood
- Zone Break
- Limit of Floodway
- Limit of Study

Limit of Moderate Wave Action

Primary Frontal Dune

Coastal Transects

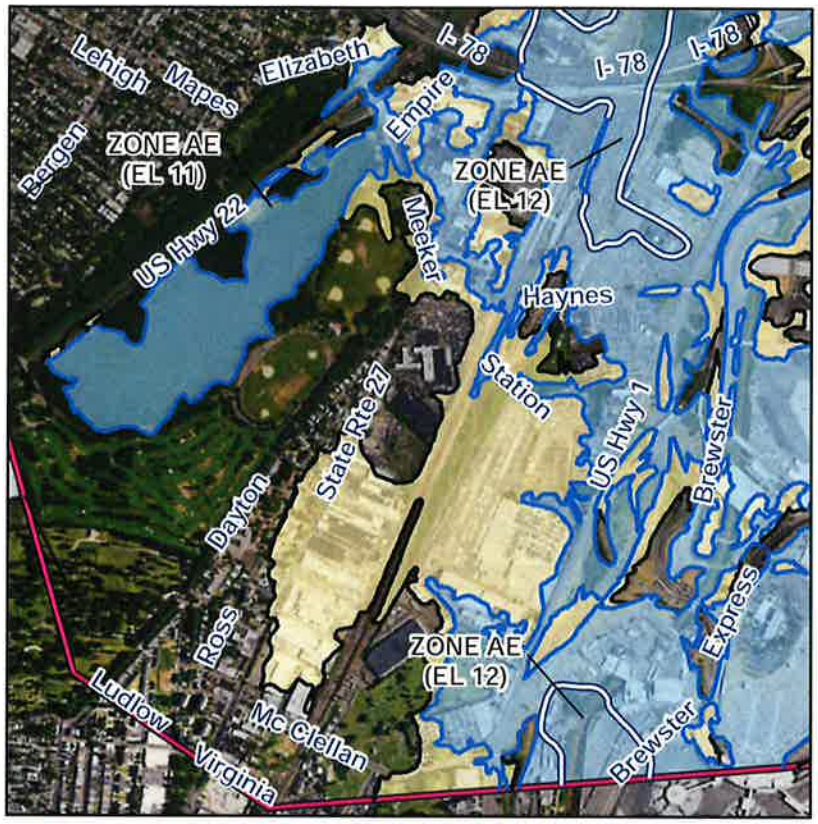
Flood Hazard Zones
- Zone A
- Zone AE
- Zone AO
- Zone D
- Zone VE
- Zone X - 0.2 Pct

Elevation information is provided in feet NAVD88.

0 650 1,300 2,600 3,900 5,200 Feet

Figure 2 of 8
Property Address: Near Newark Airport, Essex County, NJ
FIRM Panel: 34013C0154

Revised Preliminary Mapping



Appeal Resolution Mapping



Flood Hazard Boundaries
- 1 Pct Annual Chance Flood
- Floodway
- Zone D
- 0.2 Pct Annual Chance Flood
- Zone Break
- Limit of Floodway
- Limit of Study

Limit of Moderate Wave Action

Primary Frontal Dune

Coastal Transects

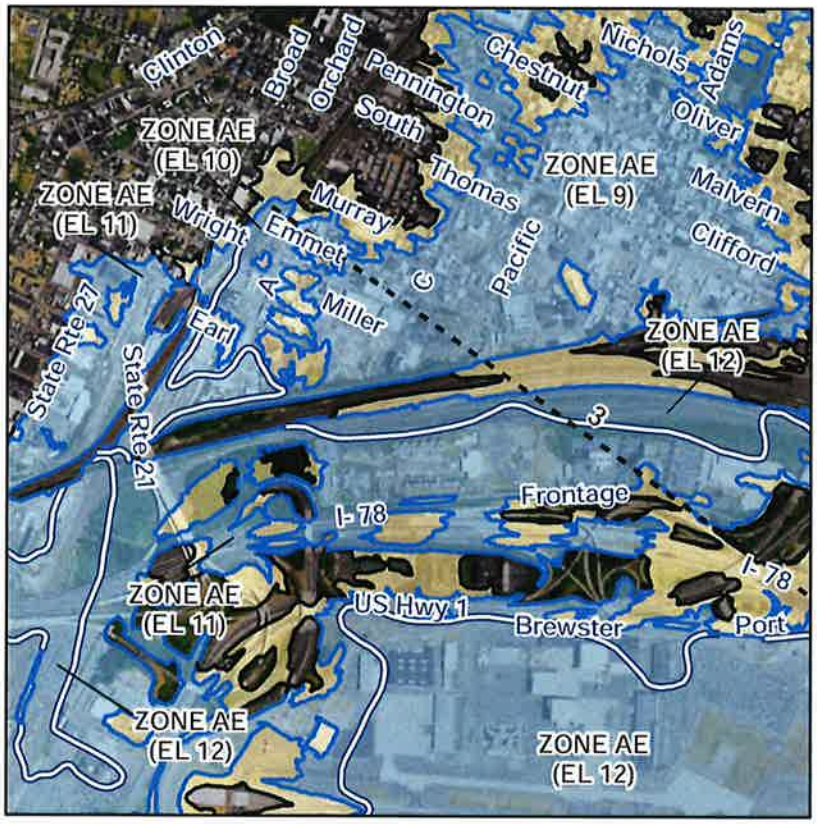
Flood Hazard Zones
- Zone A
- Zone AE
- Zone AO
- Zone D
- Zone VE
- Zone X - 0.2 Pct

Elevation information is provided in feet NAVD88.

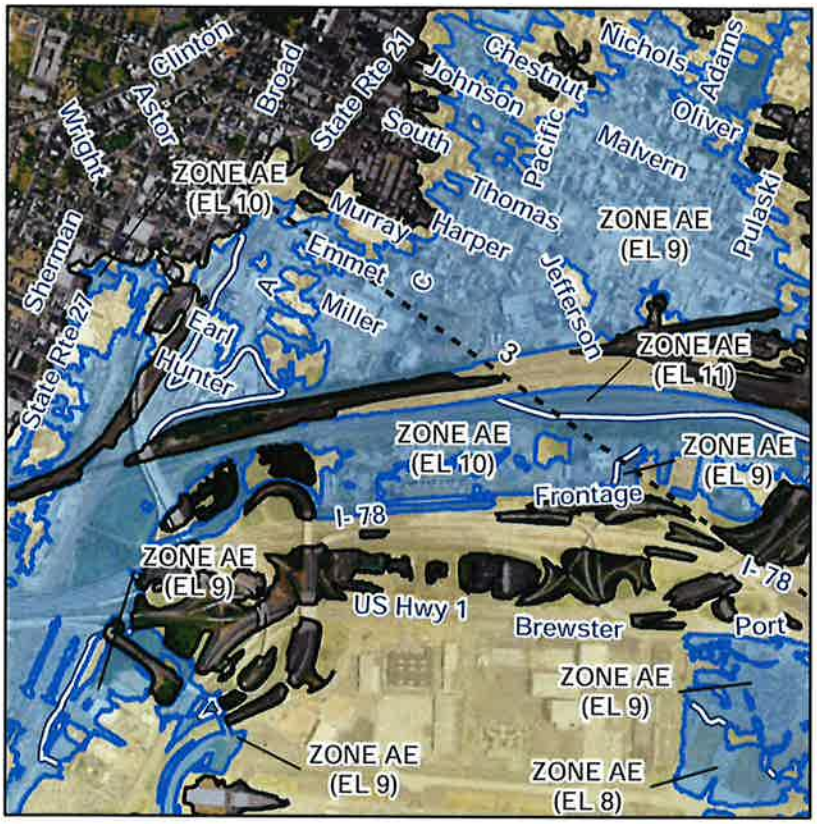
0 650 1,300 2,600 3,900 5,200 Feet

Figure 3 of 8
Property Address: Near Newark Airport, Essex County, NJ
FIRM Panel: 34013C0158 & 34013C0156

Revised Preliminary Mapping



Appeal Resolution Mapping





Flood Hazard Boundaries
- 1 Pct Annual Chance Flood
- Floodway
- Zone D
- 0.2 Pct Annual Chance Flood
- Zone Break
- Limit of Floodway
- Limit of Study

Limit of Moderate Wave Action

Primary Frontal Dune

Coastal Transects

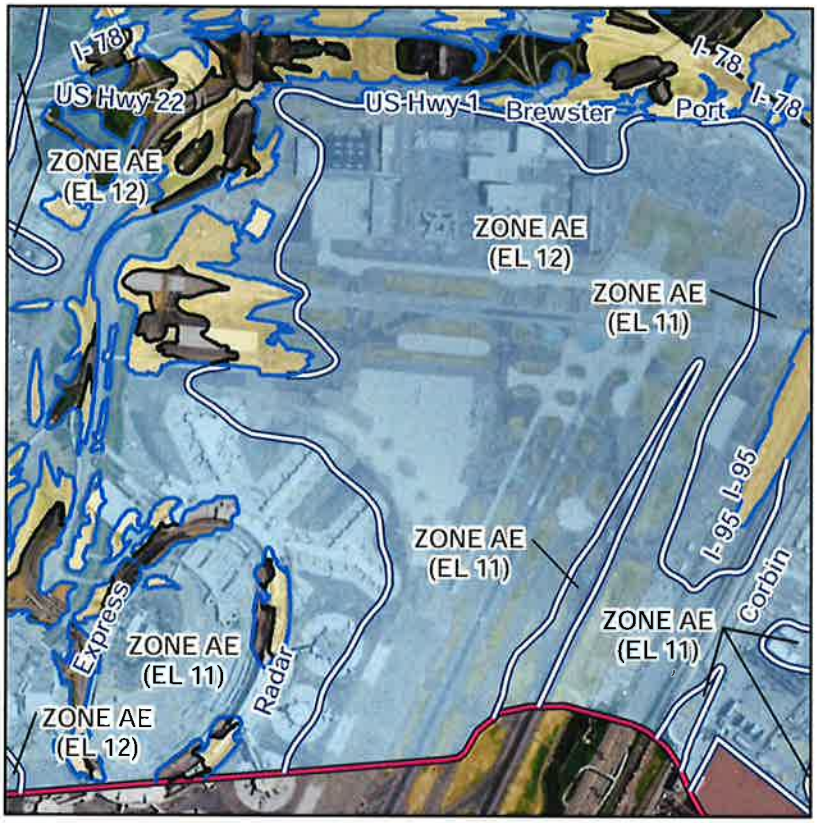
Flood Hazard Zones
- Zone A
- Zone AE
- Zone AO
- Zone D
- Zone VE
- Zone X - 0.2 Pct

Elevation information is provided in feet NAVD88.

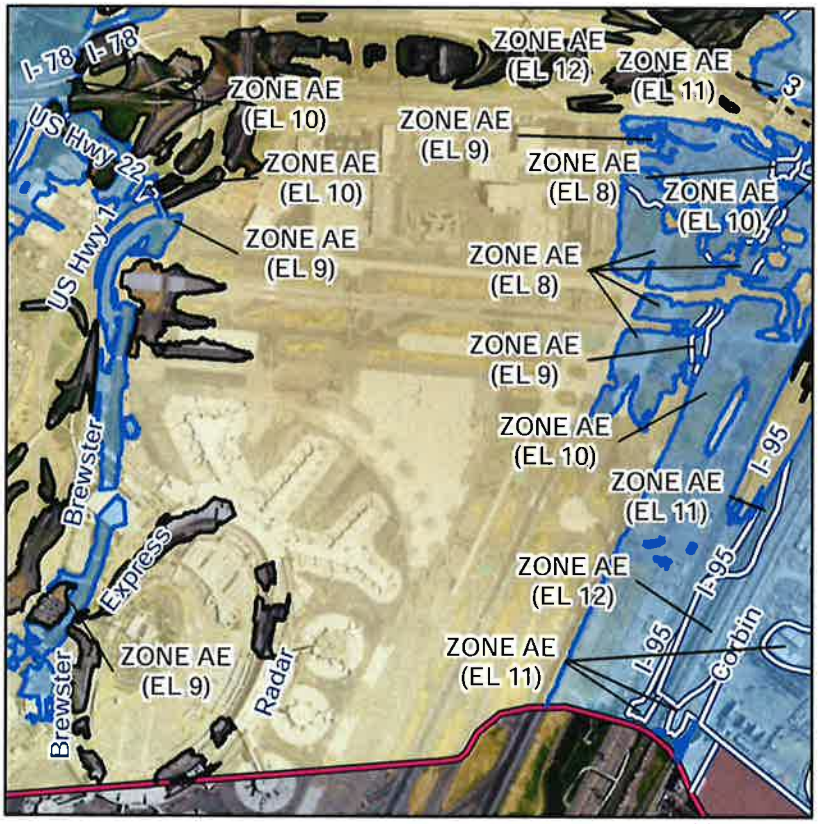
0 650 1,300 2,600 3,900 5,200 Feet

Figure 4 of 8
Property Address: Near Newark Airport, Essex County, NJ
FIRM Panel: 34013C0154

Revised Preliminary Mapping



Appeal Resolution Mapping





Flood Hazard Boundaries
- 1 Pct Annual Chance Flood
- Floodway
- Zone D
- 0.2 Pct Annual Chance Flood
- Zone Break
- Limit of Floodway
- Limit of Study

Limit of Moderate Wave Action

Primary Frontal Dune

Coastal Transects

Flood Hazard Zones
- Zone A
- Zone AE
- Zone AO
- Zone D
- Zone VE
- Zone X - 0.2 Pct

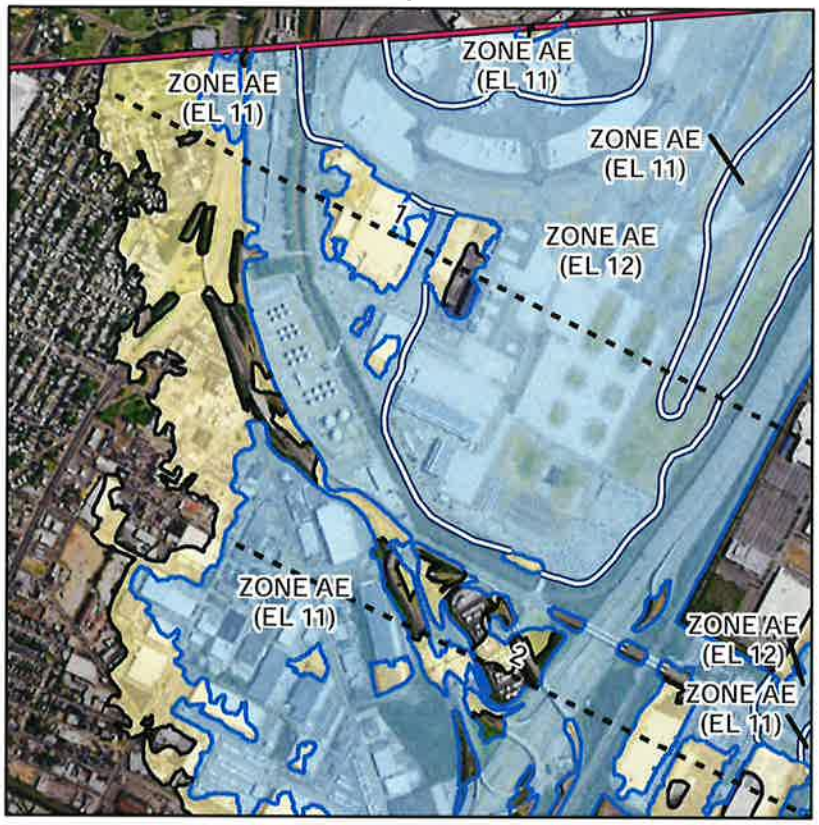
Elevation information is provided in feet NAVD88.

0 650 1,300 2,600 3,900 5,200 Feet

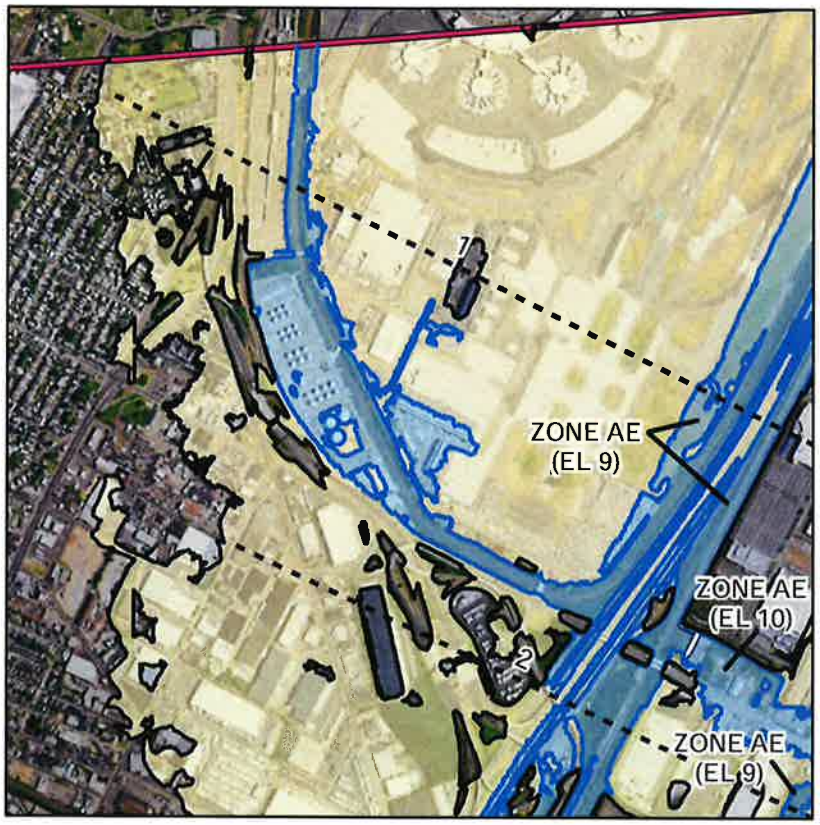
Appeal Resolution, ID: 1559 - Newark Airport, Union County, New Jersey

Figure 5 of 8
Property Address: Near Newark Airport, Union County, NJ
FIRM Panel: 34039C0024 & 34039C0025

Revised Preliminary Mapping



Appeal Resolution Mapping





Flood Hazard Boundaries
- 1 Pct Annual Chance Flood
- Floodway
- Zone D
- 0.2 Pct Annual Chance Flood
- Zone Break
- Limit of Floodway
- Limit of Study

Limit of Moderate Wave Action

Primary Frontal Dune

Coastal Transects

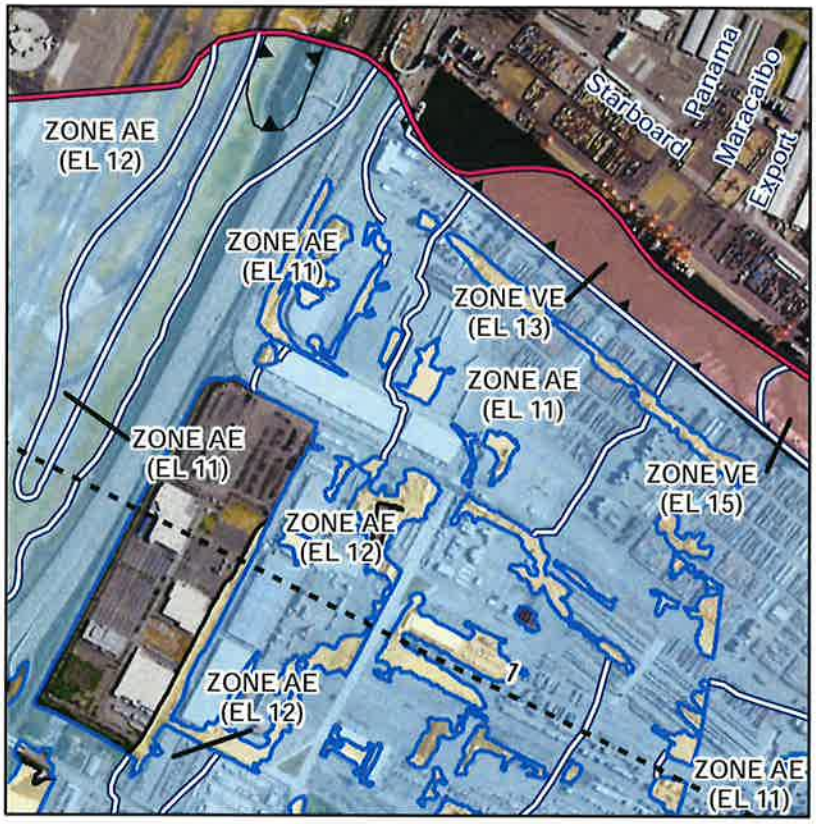
Flood Hazard Zones
- Zone A
- Zone AE
- Zone AO
- Zone D
- Zone VE
- Zone X - 0.2 Pct

Elevation information is provided in feet NAVD88.

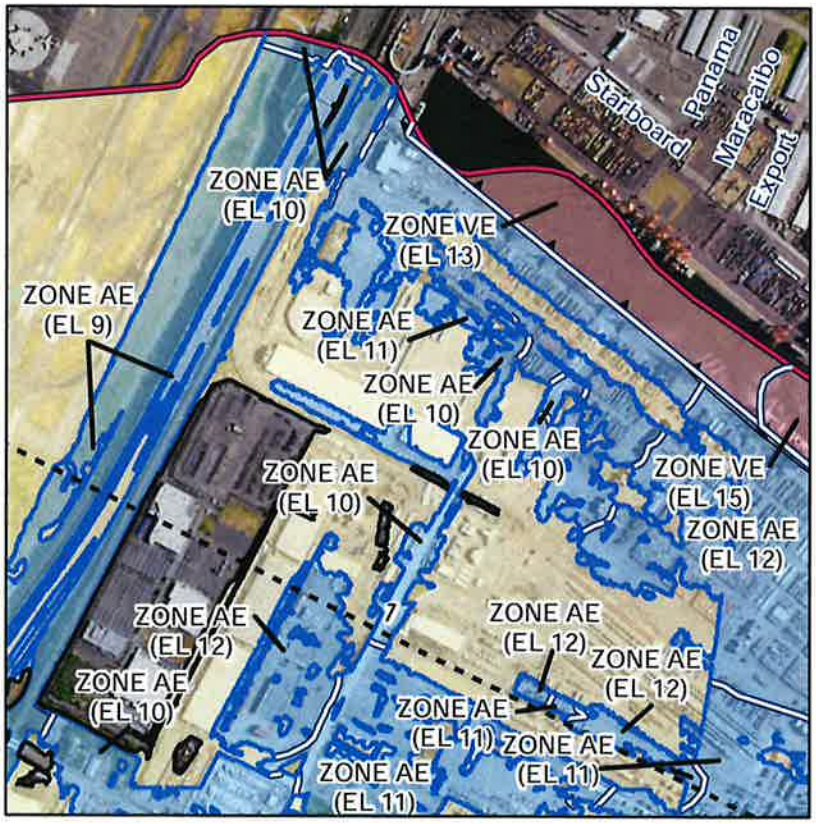
0 650 1,300 2,600 3,900 5,200 Feet

Figure 6 of 8
Property Address: Near Newark Airport, Union County, NJ
FIRM Panel: 34039C0025 & 34039C0026

Revised Preliminary Mapping



Appeal Resolution Mapping





Flood Hazard Boundaries
- 1 Pct Annual Chance Flood
- Floodway
- Zone D
- 0.2 Pct Annual Chance Flood
- Zone Break
- Limit of Floodway
- Limit of Study

Limit of Moderate Wave Action

Primary Frontal Dune

Coastal Transects

Flood Hazard Zones
- Zone A
- Zone AE
- Zone AO
- Zone D
- Zone VE
- Zone X - 0.2 Pct

Elevation information is provided in feet NAVD88.

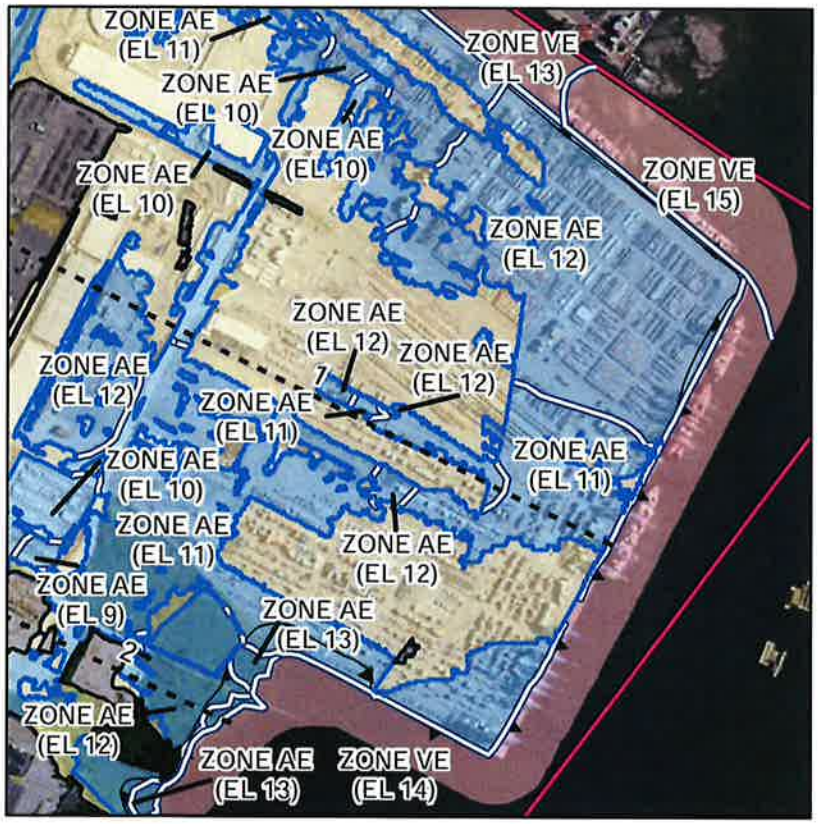
0 650 1,300 2,600 3,900 5,200 Feet

Figure 7 of 8
Property Address: Near Newark Airport, Union County, NJ
FIRM Panel: 34039C0025 & 34039C0026

Revised Preliminary Mapping



Appeal Resolution Mapping



Flood Hazard Boundaries
- 1 Pct Annual Chance Flood
- Floodway
- Zone D
- 0.2 Pct Annual Chance Flood
- Zone Break
- Limit of Floodway
- Limit of Study

Limit of Moderate Wave Action

Primary Frontal Dune

Coastal Transects

Flood Hazard Zones
- Zone A
- Zone AE
- Zone AO
- Zone D
- Zone VE
- Zone X - 0.2 Pct

Elevation information is provided in feet NAVD88.

0 650 1,300 2,600 3,900 5,200 Feet

Appeal Resolution, ID: 1559 - Newark Airport, Union County, New Jersey

Figure 8 of 8
Property Address: Near Newark Airport, Union County, NJ
FIRM Panel: 34039C0025 & 34039C0036

Revised Preliminary Mapping



Appeal Resolution Mapping





Flood Hazard Boundaries
- 1 Pct Annual Chance Flood
- Floodway
- Zone D
- 0.2 Pct Annual Chance Flood
- Zone Break
- Limit of Floodway
- Limit of Study

Limit of Moderate Wave Action

Primary Frontal Dune

Coastal Transects

Flood Hazard Zones
- Zone A
- Zone AE
- Zone AO
- Zone D
- Zone VE
- Zone X - 0.2 Pct

Elevation information is provided in feet NAVD88.

0 650 1,300 2,600 3,900 5,200 Feet

APPENDIX 3

WETLAND DELINEATION DOCUMENTATION

PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

Newark Liberty International Airport (EWR)
AirTrain Replacement Program

NATURAL RESOURCES TECHNICAL ENVIRONMENTAL STUDY

WETLAND DELINEATION DOCUMENTATION

DRAFT

March 17, 2020

Prepared By:

NV5 Infrastructure East
800 Lanidex Plaza, Suite 300
Parsippany, NJ 07054

AVI-15-032

Newark Liberty International Airport AirTrain Replacement Project

Wetland Delineation Summary of Investigation

NV5, Inc. personnel delineated wetlands along the proposed AirTrain and alternative alignments from December 18, 2018 to February 9, 2019. The methodology used was in accordance with NJDEP's current delineation methodology (i.e. the 1989 Manual for Identifying and Delineating Jurisdictional Wetlands). Four (4) wetlands (designated as Wetland Nos. 1 through 4) and the Peripheral Ditch were identified during the delineation. These wetlands are described below. A fifth wetland, partially within the northwestern portion of the study area, was also identified. That wetland was subsequently disturbed as part of a drainage project by a third party. While not delineated by NV5, it is identified on the enclosed mapping. Since threatened and endangered species, specifically black-crowned night heron, may utilize this habitat and are anticipated to be classified as Exceptional Resource Value wetlands, a 150' wetland transition area has been assigned to Wetland Nos. 1, 2, 3, and 4. While not field delineated by NV5, Wetland No. 5 is also anticipated to be classified as Exceptional Resource Value as well.

Wetland 1

Wetland 1 consists of two separate wetlands. The larger wetland is a predominantly scrub shrub wetland with lesser amounts of emergent wetlands that surround a man-made waterbody that appears to be used for stormwater management. Dominant wetland vegetation includes river birch (*Betula nigra*), common reed (*Phragmites australis*), black alder (*Alnus glutinosa*), silky dogwood (*Cornus amomum*), and buttonbush (*Cephalanthus occidentalis*). Dominant upland vegetation consists of mugwort (*Artemisia vulgaris*), black locust (*Robinia pseudoacacia*), and staghorn sumac (*Rhus typhina*). A smaller scrub-shrub/emergent wetland with similar vegetation borders a shallow narrow ditch. Both wetlands are in close proximity to each other.

Wetland 2

Wetland 2, like Wetland 1, consists of two separate wetlands. The L-shaped emergent/scrub-scrub wetland surrounds what appears to be a stormwater management basin. Several trees are also present and rip-rap protection/rock around the stormwater management basin. Dominant wetland vegetation consists of buttonbush, boxelder maple (*Acer negundo*), common reed, and arrowwood viburnum (*Viburnum dentatum*). Dominant upland vegetation consists of common reed and black locust with lesser amounts of morrow's honeysuckle (*Lonicera morrowii*), staghorn sumac, and multiflora rose (*Rosa multiflora*).

A second emergent/scrub-shrub wetland lies adjacent to the L-shaped wetland. River birch and Eastern cottonwood (*Populus deltoids*) characterizes the dominant upland vegetation while black willow (*Salix nigra*) and common reed are the dominant wetland vegetation.

Wetland 3

Wetland 3 is a predominantly emergent wetland. The wetland and wetland areas are dominated by common reed.

Wetland 4

Wetland 4 is a predominantly emergent wetland. Dominant wetland species include common reed and soft rush (*Juncus effuses*). Common reed dominates upland areas as well along with woody vegetation and a mowed lawn pathway.

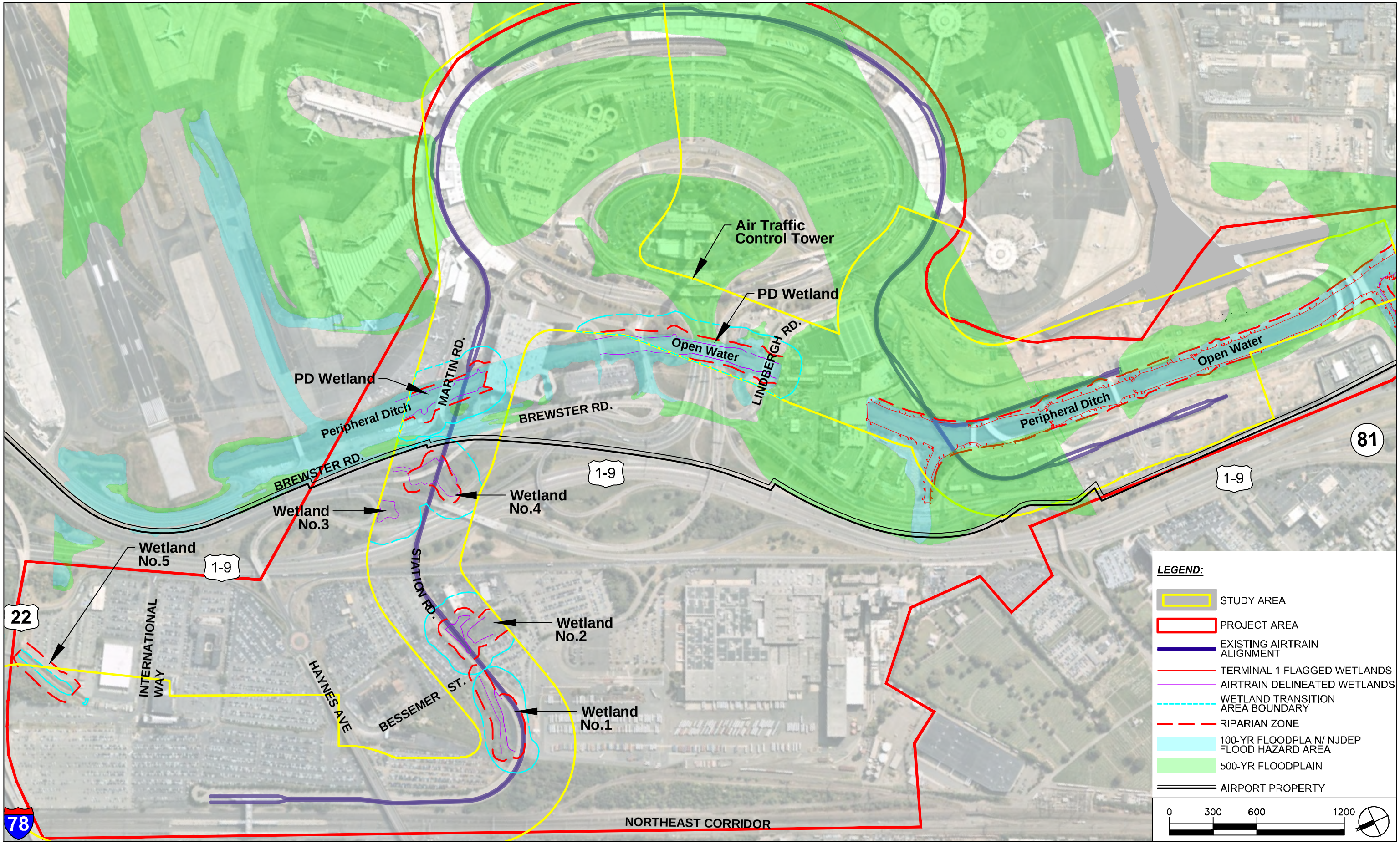
Wetland 5

See paragraph one above.

Peripheral Ditch

The Peripheral Ditch is a man-made, predominantly emergent wetland used as a stormwater management basin. Scrub-shrub communities occur near the tank farm near Terminal 1. Common reed grows densely on both sides of the ditch. Tree of heaven, boxelder maple, common reed, and oriental bittersweet (*Celastrus orbiculatus*) is the prevailing upland vegetation.

FIGURES



PORT AUTHORITY NY NJ AIR LAND RAIL SEA		WATER RESOURCES	Figure 8A	



Wetlands (2012)

Approximate Site Boundary

NJDEP Mapped Wetlands Map

Newark Liberty International Airport
Air Train Replacement Project

N

PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

B-110



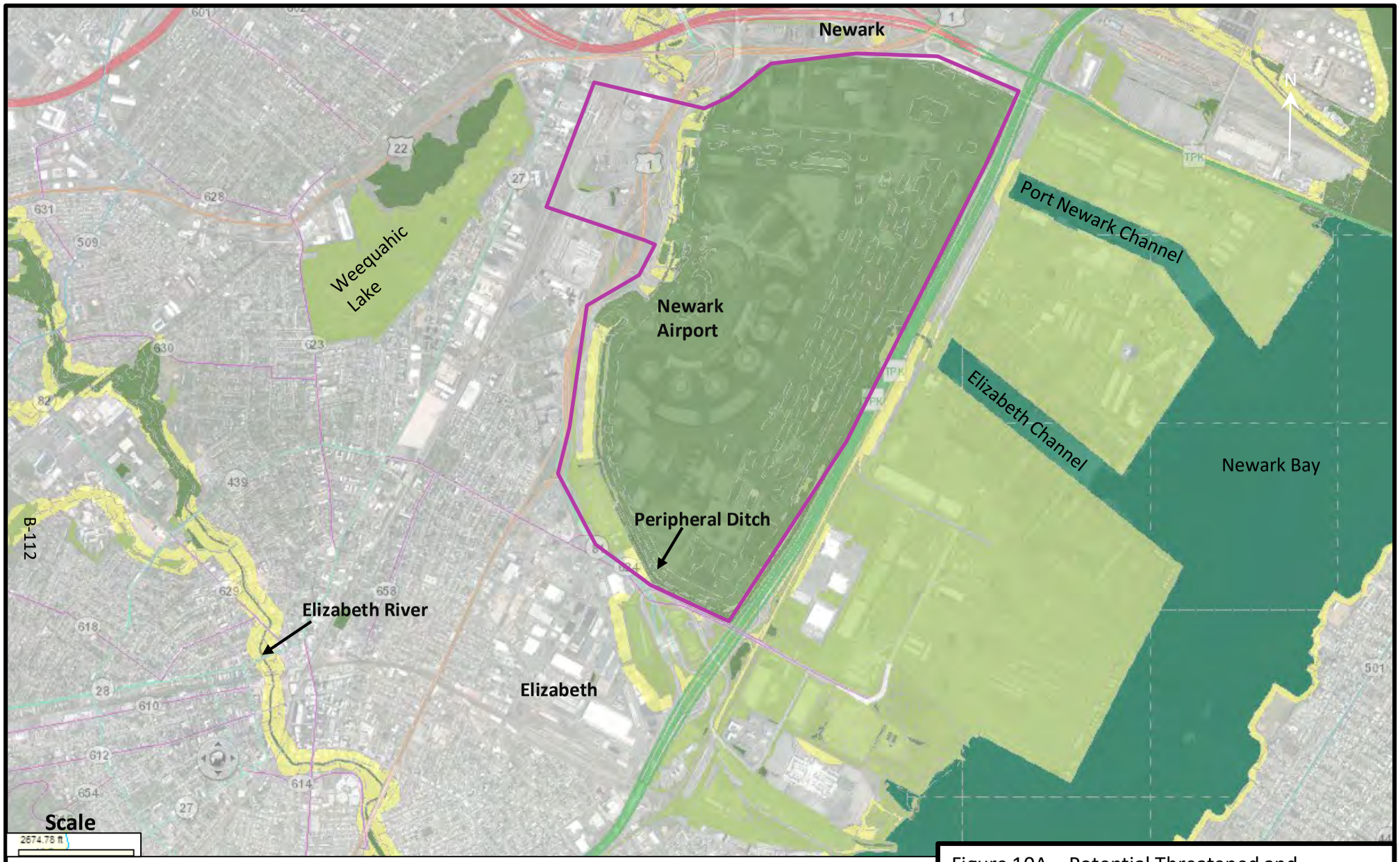
Approximate Site Boundary

USDA NRCS Soil Map

Newark Liberty International Airport
Air Train Replacement Project

N

PORT AUTHORITY NY NJ
AIR LAND RAIL SEA



Rank 1 – Habitat Specific Requirements

Rank 2 – Special Concern

Rank 3 – State Threatened

Rank 4 – State Endangered

Ranke 5 – Federal Listed

Approximate Site Boundary

Figure 10A – Potential Threatened and Endangered Protected Species Map

Newark Liberty International Airport
Air Train Replacement Project

N

PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

APPENDICES

REPRESENTATIVE DATASHEETS

WETLAND INVESTIGATION
DATA FORM

Job No: 28618-0000308.00 Date: 1/31/2018 Wetland:___X_____ Non-wetland_____
Field Investigators: S. Angus, J.Luckhardt, E. Muller Nearest Flag: NV5 A6 (SB-1)
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Emergent/shrub-scrub

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes___X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Betula nigra	FACW	20	6. _____	_____	_____
2. Phragmites australis	FACW	55	7. _____	_____	_____
3. Alnus glutinosa	FACW	20	8. _____	_____	_____
4. _____	_____	_____	9. _____	_____	_____
5. _____	_____	_____	10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes__X__ No _____
Rationale: Dominant vegetation is FACW

SOILS

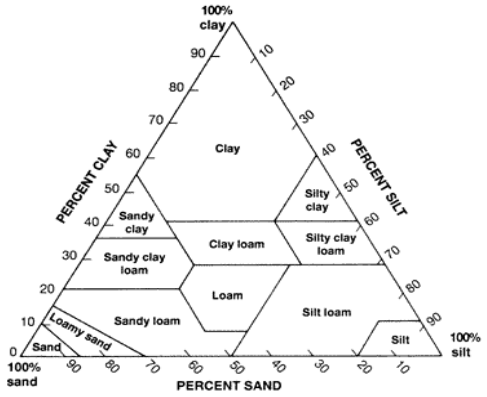
Soil series/Phase RkkcA Is the soil considered hydric? Yes_____ No ___X___

Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	0-5	7.5YR 2.5/2	100					SL
	5-9	5YR 3/4	90	5YR 2.5/2	10			LS
	9-12	5YR 3/4	60	5 YR 2/1				LS
	12-18	5YR 3/4	95	5YR 2/1				LS

Is the hydric soil criterion met? Yes_____ No ____X__
Rationale: Soils do not meet criterion.
Soil disturbed. See notes on next sheet.
_____

__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____



WETLAND INVESTIGATION
DATA FORM

Date: 1/31/2018
Nearest Flag: NV5 A6 (SB-1)

HYDROLOGY

Is the ground surface inundated? Yes_____ No __X____
Is the soil saturated? Yes___X_ No _____
Is the water table present? Yes__X___ No _____
Depth to surface water: 8"
Is the wetland hydrology criterion met? Yes__X___ No _____
Rationale: Hydrological criterion is met.

Primary Hydrology Indicators (1 required)
____ Surface Water
__X__ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
____ Drift Deposits
__X__ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
__X__ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
_X___ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: These are highly distrubed soils in historic fill. The soil may not reflect actual conditions. Based on hydrophytic vegetation and groundwater at 8", this is a wetland.

WETLAND INVESTIGATION
DATA FORM

Job No: 28618-0000308.00 Date: 1/31/2018 Wetland:_____ Non-wetland____X_____
Field Investigators: S. Angus, J.Luckhardt, E. Muller Nearest Flag: NV5 A6 (SB-2)
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Emergent

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Artemisia vulgaris	UPL	50	6. _____	_____	_____
2. Rhus typhina	NI	20	7. _____	_____	_____
3. Apocynum cannabinum	FAC	10	8. _____	_____	_____
4. _____	_____	_____	9. _____	_____	_____
5. _____	_____	_____	10. _____	_____	_____

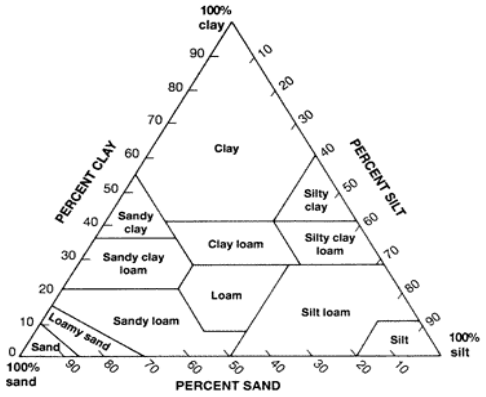
Is the hydrophytic vegetation criterion met? Yes_____ No ___X___
Rationale: Dominant species is A. vulgaris, which is an upland species.

SOILS

Soil series/Phase RkkcA Is the soil considered hydric? Yes_____ No __X____

Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	0-5	10YR 2/1	100					SL
	Refusal							

Is the hydric soil criterion met? Yes_____ No ____X__
Rationale: Soils do not meet criterion. Refusal was present at multiple locations near A6.



__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____

WETLAND INVESTIGATION
DATA FORM

Date: 1/31/2018
Nearest Flag: NV5 A6 (SB-2)

HYDROLOGY

Is the ground surface inundated? Yes_____ No __X____
Is the soil saturated? Yes_____ No __X____
Is the water table present? Yes_____ No ___X___
Depth to surface water:
Is the wetland hydrology criterion met? Yes_____ No ___X___
Rationale: Does not meet hydrological criterion.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
____ Drift Deposits
____ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: These are highly distrubed soils in historic fill. This area was upgradient of the wetland boring where the plant community changed. This is not a wetland due to the lack of wetland indicators.

WETLAND INVESTIGATION
DATA FORM

Job No: 28618-0000308.00 Date: 1/31/2018 Wetland:___X_____ Non-wetland_____
Field Investigators: S. Angus, J.Luckhardt, E. Muller Nearest Flag: NV5 A10 (SB-3)
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Scrub-shrub

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Cornus amomum	FACW	70	6. _____	_____	_____
2. Cephalanthus occidentalis	OBL	30	7. _____	_____	_____
3. _____	_____	_____	8. _____	_____	_____
4. _____	_____	_____	9. _____	_____	_____
5. _____	_____	_____	10. _____	_____	_____

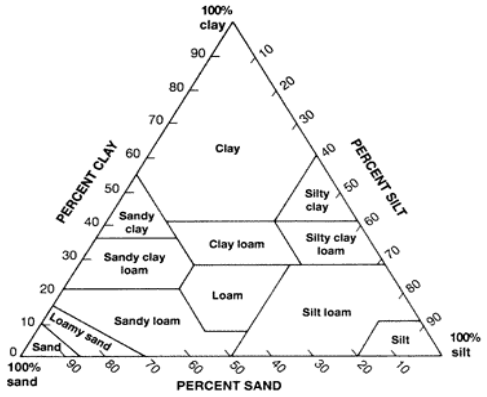
Is the hydrophytic vegetation criterion met? Yes__X__ No _____
Rationale: Dominant vegetation is FACW and OBL.

SOILS

Soil series/Phase: RkkcA_____ Is the soil considered hydric? Yes_____ No ___X___

Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	0-12	5/YR 3/4	95	10YR 2/1	5			LS

Is the hydric soil criterion met? Yes_____ No ____X__
Rationale: Soils do not meet criterion.
See note on next page.



__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____

WETLAND INVESTIGATION
DATA FORM

Date: 1/31/2018
Nearest Flag: NV5 A10 (SB-3)

HYDROLOGY

Is the ground surface inundated? Yes__X__ No _____
Is the soil saturated? Yes___X_ No _____
Is the water table present? Yes__X__ No _____
Depth to surface water: 4"
Is the wetland hydrology criterion met? Yes__X__ No _____
Rationale: Hydrological criterion is met.

Primary Hydrology Indicators (1 required)
_X___ Surface Water
__X__ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
____ Drift Deposits
__X__ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: These are highly distrubed soils in historic fill and the soil may not reflect actual conditions. The boring is on the edge of a water filled basin. Based on hydrophytic vegetation and groundwater at 4", this is a wetland.

WETLAND INVESTIGATION
DATA FORM

Job No: 28618-0000308.00 Date: 1/31/2018 Wetland:_____ Non-wetland____X_____
Field Investigators: S. Angus, J.Luckhardt, E. Muller Nearest Flag: NV5 A10 (SB-4)
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Emergent/Scrub-schrub

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes___X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Artemisia vulgaris	UPL	20	6. _____	_____	_____
2. Rhus typhina	NI	30	7. _____	_____	_____
3. Robinia pseudoacacia	FACU	20	8. _____	_____	_____
4. _____	_____	_____	9. _____	_____	_____
5. _____	_____	_____	10. _____	_____	_____

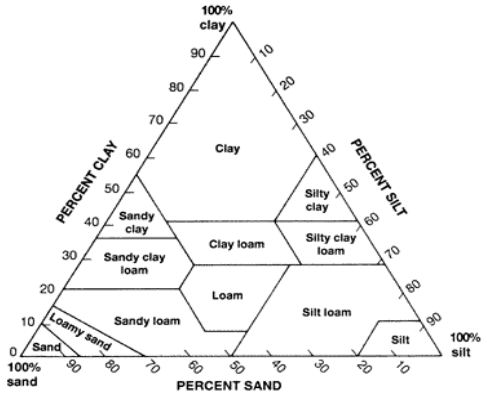
Is the hydrophytic vegetation criterion met? Yes_____ No ___X___
Rationale: Dominant species are FACU and UPL.

SOILS

Soil series/Phase RkkcA Is the soil considered hydric? Yes_____ No ___X___

Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	0-9	5YR 4/6	70	10YR 2/2	30			SL
	Refusal							

Is the hydric soil criterion met? Yes_____ No ____X__
Rationale: Soils are very bright and do not meet criterion. Refusal was present at multiple locations near A10.



_____

__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____

WETLAND INVESTIGATION
DATA FORM

Date: 1/31/2018
Nearest Flag: NV5 A10 (SB-4)

HYDROLOGY

Is the ground surface inundated? Yes_____ No __X____
Is the soil saturated? Yes_____ No __X____
Is the water table present? Yes_____ No ___X___
Depth to surface water:
Is the wetland hydrology criterion met? Yes_____ No ___X___
Rationale: Does not meet hydrological criterion.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
____ Drift Deposits
____ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: This is not a wetland due to the lack ofall wetland indicators.

WETLAND INVESTIGATION
DATA FORM

Job No: 28618-0000308.00 Date: 1/31/2018 Wetland:___X_____ Non-wetland_____
Field Investigators: S. Angus, J.Luckhardt, E. Muller Nearest Flag: NV5 B2 (SB-1)
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Scrub-shrub

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Acer negundo	FAC	60	6. _____	_____	_____
2. Cephalanthus occidentalis	OBL	25	7. _____	_____	_____
3. _____	_____	_____	8. _____	_____	_____
4. _____	_____	_____	9. _____	_____	_____
5. _____	_____	_____	10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes__X__ No _____
Rationale: Dominant vegetation is FAC and OBL.

SOILS

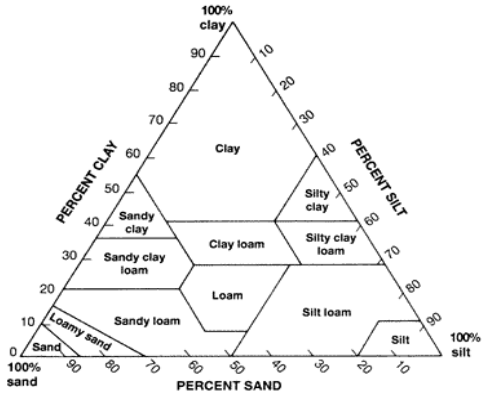
Soil series/Phase UddunB Is the soil considered hydric? Yes_____ No ___X___

Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	0-10	7.5 YR 3/3	70	7.5YR 3/1	10			SL
	10-18	7.5YR 3/1	100					SL

Is the hydric soil criterion met? Yes__X__ No _____
Rationale: These are low chroma soils that meet hydric soil criterion.
_____
_____

__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____



WETLAND INVESTIGATION
DATA FORM

Date: 1/31/2018
Nearest Flag: NV5 B2 (SB-1)

HYDROLOGY

Is the ground surface inundated? Yes__X__ No _____
Is the soil saturated? Yes___X_ No _____
Is the water table present? Yes__X__ No _____
Depth to surface water: 6"
Is the wetland hydrology criterion met? Yes__X__ No _____
Rationale: Hydrological criterion is met.

Primary Hydrology Indicators (1 required)
_X___ Surface Water
__X__ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
____ Drift Deposits
__X__ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: These are highly distrubed soils in historic fill and the soil may not reflect actual conditions. The boring is on the edge of a water filled basin. Based on hydrophytic vegetation and groundwater at 6", this is a wetland.

WETLAND INVESTIGATION
DATA FORM

Job No: 28618-0000308.00 Date: 1/31/2018 Wetland:_____ Non-wetland____X_____
Field Investigators: S. Angus, J.Luckhardt, E. Muller Nearest Flag: NV5 B2 (SB-2)
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ_____ Plant Community: Scrub-shrub

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Cover	Dominant Plant Species	Indicator Status	Stratum
1. Lonicera morrowii	FACU	10	6. _____	_____	_____
2. Rhus typhina	NI	10	7. _____	_____	_____
3. Rosa multiflora	FACU	10	8. _____	_____	_____
4. _____	_____	_____	9. _____	_____	_____
5. _____	_____	_____	10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes_____ No ___X___
Rationale: Dominant species are FACU.

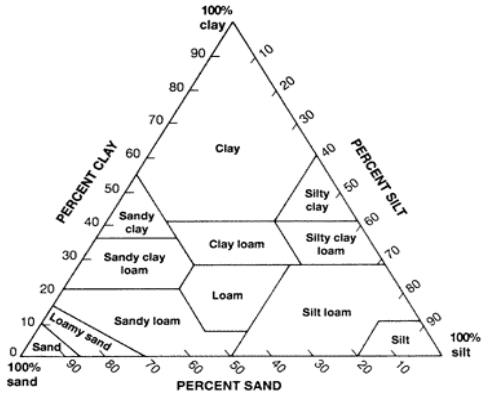
SOILS

Soil series/Phase: UddunB Is the soil considered hydric? Yes_____ No ___X___

Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	Fill							Small gravel/ rip-rap

Is the hydric soil criterion met? Yes_____ No ____X__

Rationale: Soils do not meet criterion.



__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____

WETLAND INVESTIGATION
DATA FORM

Date: 1/31/2018
Nearest Flag: NV5 B2 (SB-2)

HYDROLOGY

Is the ground surface inundated? Yes_____ No __X____
Is the soil saturated? Yes_____ No __X____
Is the water table present? Yes_____ No ___X___
Depth to surface water:
Is the wetland hydrology criterion met? Yes_____ No ___X___
Rationale: Does not meet hydrological criterion.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
____ Drift Deposits
____ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: These are highly distrubed soils in historic fill. This is not a wetland due to the lack of wetland indicators.

WETLAND INVESTIGATION
DATA FORM

Job No: 28618-0000308.00 Date: 2/1/2018 Wetland:___X_____ Non-wetland_____
Field Investigators: S. Angus, J.Luckhardt, E. Muller Nearest Flag: NV5 C10 (SB-1)
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Emergent

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes___X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Phragmites australis	FACW	100	6. _____	_____	_____
2. _____	_____	_____	7. _____	_____	_____
3. _____	_____	_____	8. _____	_____	_____
4. _____	_____	_____	9. _____	_____	_____
5. _____	_____	_____	10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes_____ No ___X___
Rationale: Dominant vegetation is FACW.

SOILS

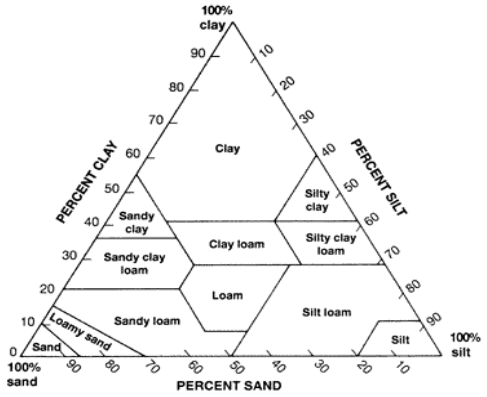
Soil series/Phase: BhguA Is the soil considered hydric? Yes__X__ No _____

Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	0-12	10YR 2/1	95	10YR 4/4	5			SL
	12-18	10YR 2/2	85	10 YR 5/4	15			LS

Is the hydric soil criterion met? Yes__X__ No _____
Rationale: Soils meet hydric criterion S6
_____
_____

__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
_X_ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____



WETLAND INVESTIGATION
DATA FORM

Date: 1/31/2018
Nearest Flag: NV5 C10 (SB-1)

HYDROLOGY

Is the ground surface inundated? Yes_____ No ___X___
Is the soil saturated? Yes_____ No __X____
Is the water table present? Yes_____ No ___X___
Depth to surface water:
Is the wetland hydrology criterion met? Yes__X___ No _____
Rationale: Hydrological criterion is met.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
__X__ Drift Deposits
__X__ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: All wetland critetion are met.

WETLAND INVESTIGATION
DATA FORM

Job No: 28618-0000308.00 Date: 2/1/2018 Wetland:_____ Non-wetland____X_____
Field Investigators: S. Angus, J.Luckhardt, E. Muller Nearest Flag: NV5 C10 (SB-2)
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Emergent/Scrub-shrub

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Ailanthus altissima	UPL	30	6. Phragmites australis	FACW	Herb
2. Elaeagnus umbellata	NI	15	7. _____	_____	_____
3. Lonicera japonica	FACU	15	8. _____	_____	_____
4. Polygonum cuspidatum	FACU	5	9. _____	_____	_____
5.Rhus. (copallinum or typhina)	UPL/NI	15	10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes_____ No ___X___
Rationale: Dominant species is UPL.

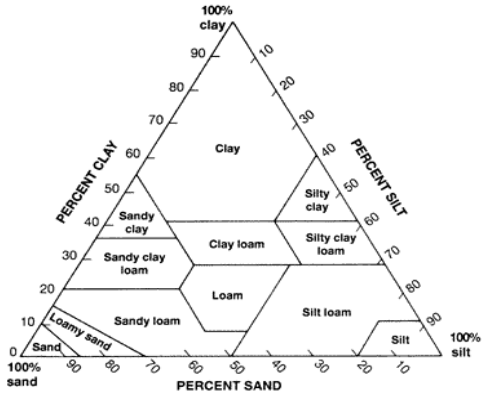
SOILS

Soil series/Phase: BhguA Is the soil considered hydric? Yes_____ No ___X___

Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	0-4	10YR 2/2	100					SL
	4-7	10YR 2/2	95	10YR 5/6	5			SL
	7-18	7.5YR 4/4	90	7.5YR 2/2	10			SL

Is the hydric soil criterion met? Yes_____ No ____X__

Rationale: Soils do not meet criterion.



__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____

WETLAND INVESTIGATION
DATA FORM

Date: 1/31/2018
Nearest Flag: NV5 C10 (SB-2)

HYDROLOGY

Is the ground surface inundated? Yes_____ No __X____
Is the soil saturated? Yes_____ No __X____
Is the water table present? Yes_____ No ___X___
Depth to surface water:
Is the wetland hydrology criterion met? Yes_____ No ___X___
Rationale: Does not meet hydrological criterion.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
____ Drift Deposits
____ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: These are highly distrubed soils in historic fill. This is not a wetland due to the lack of wetland indicators.

WETLAND INVESTIGATION
DATA FORM

Job No:28618-0000308 Date: 2/9/2018 Wetland:____X____ Non-wetland_____
Field Investigators: S. Angus, E. Muller Nearest Flag: NV5 C40 (SB-3)
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Emergent

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Phragmites australis	FACW	100	6. _____	_____	_____
2. _____			7. _____	_____	_____
3. _____			8. _____	_____	_____
4. _____			9. _____	_____	_____
5. _____			10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes__X__ No _____
Rationale: Dominant species are FACW

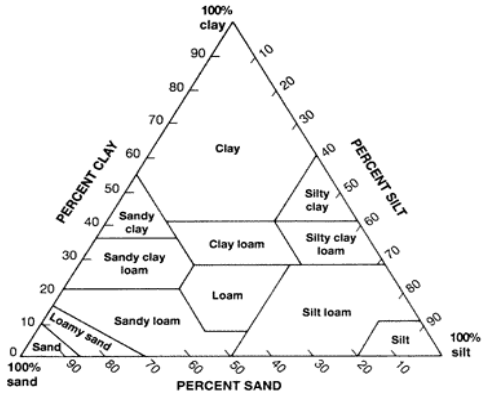
SOILS

Soil series/Phase: BhguA Is the soil considered hydric? Yes_____ No ___X___

Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	0-5	10YR 2/2	100					SL
	5-9	10YR 2/2	80	10YR 3/4	20			SL
	9-18	7.5YR 4/4	100					LS

Is the hydric soil criterion met? Yes__X__ No _____

Rationale: Soils meets hydric criterion S5.
_____



__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
_X_ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____

WETLAND INVESTIGATION
DATA FORM

Date: 2/9/2018
Nearest Flag: NV5 C40 (SB-3)

HYDROLOGY

Is the ground surface inundated? Yes_____ No __X____
Is the soil saturated? Yes__X__ No _____
Is the water table present? Yes_____ No _____
Depth to surface water: 6"
Is the wetland hydrology criterion met? Yes__X__ No _____
Rationale: Hydrological criterion is met.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
__X__ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
__X__ Drift Deposits
__X__ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: All three (3) wetland indicators are present.

WETLAND INVESTIGATION
DATA FORM

Job No:28618-0000308 Date: 2/9/2018 Wetland:_____ Non-wetland____X_____
Field Investigators: S. Angus, E. Muller Nearest Flag: NV5 C40 (SB-4)
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Emergent

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Phragmites australis	FACW	80	6. _____	_____	_____
2. Ailanthus altissima	UPL	20	7. _____	_____	_____
3. Celastrus orbiculatus	UPL	5	8. _____	_____	_____
4. Eupatorium perfoliatum	FACW	5	9. _____	_____	_____
5. Rubus allegheniensis	FACU	5	10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes__X__ No _____
Rationale: Dominant species is FACW, although UPL is also a dominant. Both are invasive.

SOILS

Soil series/Phase: Bhgua Is the soil considered hydric? Yes____ No __X____

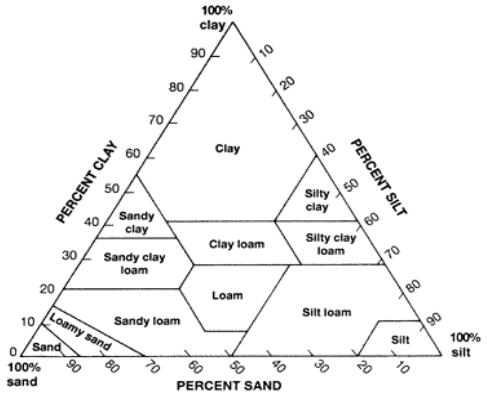
Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
								Refusal and Rip-rap

Is the hydric soil criterion met? Yes_____ No __X____

Rationale: Soil consists of refusal and rip-rap.

__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____



WETLAND INVESTIGATION
DATA FORM

Date: 2/9/2018
Nearest Flag: NV5 C40 (SB-4)

HYDROLOGY

Is the ground surface inundated? Yes_____ No __X____
Is the soil saturated? Yes_____ No ___X___
Is the water table present? Yes_____ No __X____
Depth to surface water:
Is the wetland hydrology criterion met? Yes_____ No ___X___
Rationale: Does not meet hydrological criterion.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
____ Drift Deposits
____ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: These are highly developed soils predominalty covered by invasive species. All three (3) criterion are not met.

WETLAND INVESTIGATION
DATA FORM

Job No: 28618-0000308.00 Date: 2/6/2018 Wetland:_____ Non-wetland____X_____
Field Investigators: S. Angus, J.Luckhardt Nearest Flag: NV5 D8
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Scrub-shrub

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Acer negundo	FAC	30	6. _____	_____	_____
2. Phytolacca americana	FACU	5	7. _____	_____	_____
3. _____	_____	_____	8. _____	_____	_____
4. _____	_____	_____	9. _____	_____	_____
5. _____	_____	_____	10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes__X__ No _____
Rationale: Dominant vegetation is FAC, although this is not a strong indicator of hydric vegetation.

SOILS

Soil series/Phase:BhguA Is the soil considered hydric? Yes_____ No ____X__

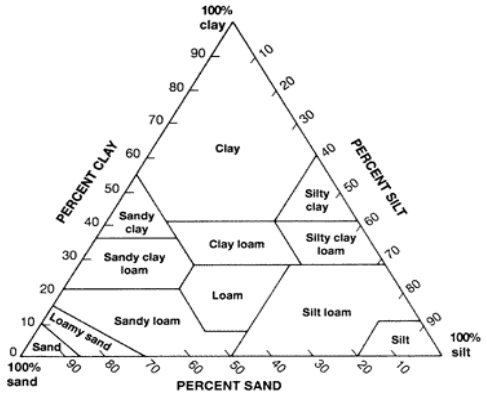
Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	0-7	10YR 3/2	100					
	7-12	7.5YR 5/6	100					

Is the hydric soil criterion met? Yes_____ No __X____
Rationale: Soils do not meet criterion.

_____
_____

__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____



WETLAND INVESTIGATION
DATA FORM

Date: 2/6/2018
Nearest Flag: NV5 D8

HYDROLOGY

Is the ground surface inundated? Yes_____ No ___X___
Is the soil saturated? Yes_____ No __X____
Is the water table present? Yes_____ No ___X___
Depth to surface water:
Is the wetland hydrology criterion met? Yes_____ No __X____
Rationale: Does not meet hydrological criterion.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
____ Drift Deposits
____ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: Does not meet all three (3) wetland criterion.

WETLAND INVESTIGATION
DATA FORM

Job No: 28618-0000308 Date: 2/6/2018 Wetland:____X____ Non-wetland_____
Field Investigators: S. Angus, J.Luckhardt Nearest Flag: NV5 D8
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Emergent

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Phragmites australis	FACW	90	6. _____	_____	_____
2. _____	_____	_____	7. _____	_____	_____
3. _____	_____	_____	8. _____	_____	_____
4. _____	_____	_____	9. _____	_____	_____
5. _____	_____	_____	10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes__X__ No _____
Rationale: Dominant species are FACW.

SOILS

Soil series/Phase BhguA Is the soil considered hydric? Yes_____ No __X____

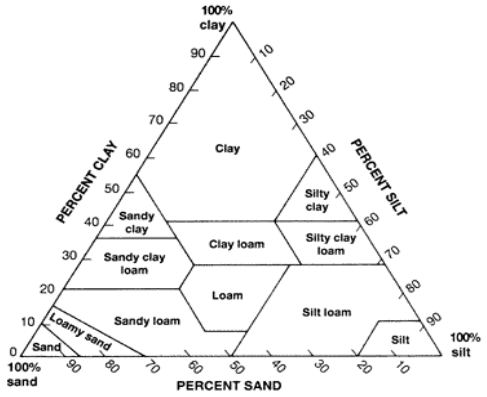
Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	0-9	10YR 2/1	95	10YR 5/4	5			SiCL; Organic
	9-12	10YR 2/1	90	G2 2.5/5.3	10			SiCL
	12-18	Black						SiCL

Is the hydric soil criterion met? Yes___X__ No _____

Rationale: Soils meet hydric soil criterion A3.

__ A1 Histol
__ A2 Histic Epipedon
_X_ A3 Black Histic
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____



WETLAND INVESTIGATION
DATA FORM

Date: 2/6/2018
Nearest Flag: NV5 D8

HYDROLOGY

Is the ground surface inundated? Yes_____ No __X____
Is the soil saturated? Yes_____ No ___X___
Is the water table present? Yes___X__ No _____
Depth to surface water: 12"
Is the wetland hydrology criterion met? Yes__X___ No _____
Rationale: Hydrological criterion is met.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
__X__ Water Marks
____ Sediment Deposits
____ Drift Deposits
__X__ Water Stained Leaves
__X__ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
__X__ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks:All three (3) wetland criterion are met.

WETLAND INVESTIGATION
DATA FORM

Job No:28618-0000308.00 Date: 2/9/2018 Wetland:____X____ Non-wetland_____
Field Investigators: S. Angus, E. Muller Nearest Flag: NV5 D38
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Emergent

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Phragmites australis	FACW	100	6. _____	_____	_____
2. _____			7. _____	_____	_____
3. _____			8. _____	_____	_____
4. _____			9. _____	_____	_____
5. _____			10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes__X__ No _____
Rationale: Dominant species is FACW

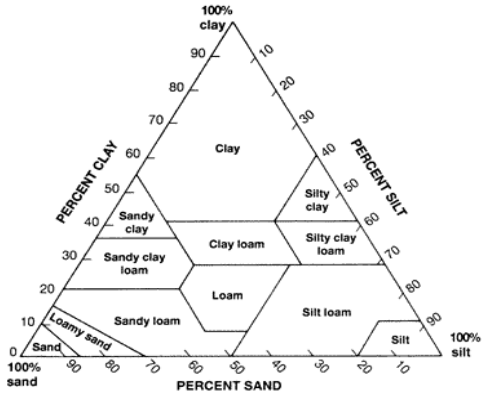
SOILS

Soil series/Phase: BhguA Is the soil considered hydric? Yes_____ No ___X___

Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	0-6	10YR 2/2	100					SL
	6-11	10YR 2/2	90	10YR 3/4	10			SL
	11-18	7.5YR 4/4	100					LS

Is the hydric soil criterion met? Yes__X__ No _____

Rationale: Soils meets hydric criterion S5.
_____



__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
_X_ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____

WETLAND INVESTIGATION
DATA FORM

Date: 2/9/2018
Nearest Flag: NV5 D38

HYDROLOGY

Is the ground surface inundated? Yes_____ No __X____
Is the soil saturated? Yes__X__ No _____
Is the water table present? Yes__X__ No _____
Depth to surface water: 6"
Is the wetland hydrology criterion met? Yes__X__ No _____
Rationale: Hydrological criterion is met.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
__X__ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
__X__ Drift Deposits
__X__ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: All three (3) wetland criterion are met.

WETLAND INVESTIGATION
DATA FORM

Job No:28618-0000308.00 Date: 2/9/2018 Wetland:_____ Non-wetland____X_____
Field Investigators: S. Angus, E. Muller Nearest Flag: NV5 D38
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Emergent

Do normal climatic/hydrologic conditions exist at the plant community? Yes___X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X___ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Phragmites australis	FACW	30	6. Polygonum cuspidatum	FACU	10
2. Ailanthus altissima	UPL	5	7. _____	_____	_____
3. Celastrus orbiculatus	UPL	20	8. _____	_____	_____
4. Eupatorium perfoliatum	FACW	10	9. _____	_____	_____
5. Rubus allegheniensis	FACU	15	10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes_____ No __X____
Rationale: Dominant species are FACW and UPL. Minor species are FACU and UPL.

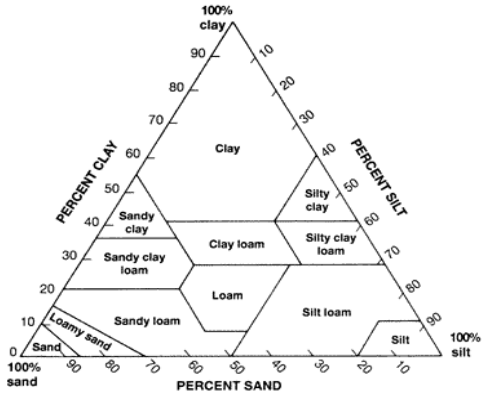
SOILS

Soil series/Phase: Bhgua Is the soil considered hydric? Yes____ No __X____

Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
								Refusal and Rip-rap

Is the hydric soil criterion met? Yes_____ No __X____

Rationale: Soil consists of refusal and rip-rap.



__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____

WETLAND INVESTIGATION
DATA FORM

Date: 2/9/2018
Nearest Flag: NV5 D38

HYDROLOGY

Is the ground surface inundated? Yes_____ No __X____
Is the soil saturated? Yes_____ No ___X___
Is the water table present? Yes_____ No __X____
Depth to surface water:
Is the wetland hydrology criterion met? Yes_____ No ___X___
Rationale: Does not meet hydrological criterion.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
____ Drift Deposits
____ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: These are highly developed soils predominalty covered by invasive species. Wetland criterion is not met.

WETLAND INVESTIGATION
DATA FORM

Job No:28618-0000308.00 Date: 2/9/2018 Wetland:_____ Non-wetland____X_____
Field Investigators: S. Angus, E. Muller Nearest Flag: NV5 F11
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Forested

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Phragmites australis	FACW	10	6. _____	_____	_____
2. Betula nigra	FACW	25	7. _____	_____	_____
3. Populus deltoides	FAC	30	8. _____	_____	_____
4. Rosa multiflora	FACU	15	9. _____	_____	_____
5. _____			10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes___X__ No _____
Rationale: Dominant species are FAC and FACW species.

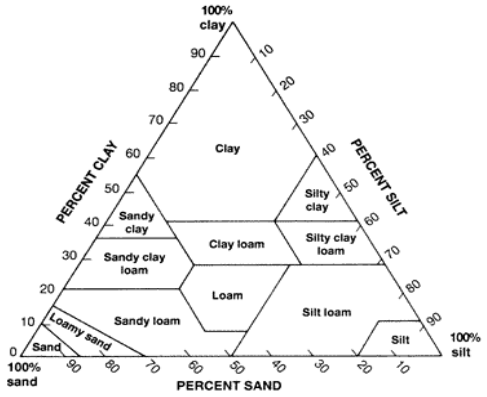
SOILS

Soil series/Phase: UddunB Is the soil considered hydric? Yes____ No __X____

Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	1-15	10YR 2/2	100					Refusal and Rip-rap
								SL

Is the hydric soil criterion met? Yes_____ No __X____

Rationale: Soil does not meet hydric soil criterion.
_____



__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____

WETLAND INVESTIGATION
DATA FORM

Date: 2/9/2018
Nearest Flag: NV5 F11

HYDROLOGY

Is the ground surface inundated? Yes_____ No __X____
Is the soil saturated? Yes_____ No ___X___
Is the water table present? Yes_____ No __X____
Depth to surface water:
Is the wetland hydrology criterion met? Yes_____ No ___X___
Rationale: Does not meet hydrological criterion.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
____ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
____ Drift Deposits
____ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: All three (3) wetland criterion are not met.

WETLAND INVESTIGATION
DATA FORM

Job No:28618-0000308.00 Date: 2/9/2018 Wetland:____X____ Non-wetland_____
Field Investigators: S. Angus, E. Muller Nearest Flag: NV5 F11
Project/Site: Newark Airport Municipality: Newark County: Essex
Applicant/Owner: PANYNJ Plant Community: Emergent/Scrub-shrub

Do normal climatic/hydrologic conditions exist at the plant community? Yes__X__ No _____
If No, explain:_____
Has the vegetation, soils, and or hydrology been disturbed? Yes__X__ No _____
If Yes, explain: Disturbed soils in highly developed area.

VEGETATION

Dominant Plant Species	Indicator Status	Percent Coverage	Dominant Plant Species	Indicator Status	Percent Coverage
1. Phragmites australis	FACW	20	6. _____	_____	_____
2. Betula nigra	FACW	10	7. _____	_____	_____
3. Salix nigra	OBL	25	8. _____	_____	_____
4. Rosa multiflora	FACU	10	9. _____	_____	_____
5. Juncus effusus	OBL	5	10. _____	_____	_____

Is the hydrophytic vegetation criterion met? Yes__X__ No _____
Rationale: Dominant species are FACW

SOILS

Soil series/Phase: UddunB Is the soil considered hydric? Yes_____ No ___X___

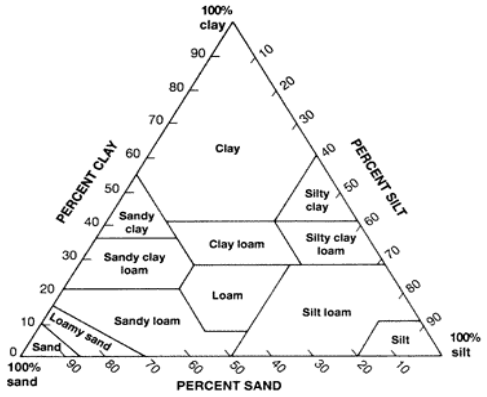
Horizon	Depth	Matrix		Redox Features				Texture
	(inches)	Color	%	Color	%	Type	Location	
	1-12	10YR 2/2	100					SL
	12-18	10YR 3/3	100					SL

Is the hydric soil criterion met? Yes_____ No ___X___

Rationale: Soils do not meet hydric soil criterion.

__ A1 Histol
__ A2 Histic Epipedon
__ A4 Hydrogen Sulfide
__ A5 Stratified Layers
__ A6 Organic bodies
__ A7 5cm of mucky soil
__ A11 Depleted below dark surface
__ A12 Thick dark surface
__ S4 Sandy gleyed matrix
__ S5 Sandy redox
__ S6 Stripped matrix
__ S7 Dark Surface
__ S8 Polyvalue below surface
__ S9 Thin dark surface
__ F1 Loamy mucky mineral
__ F2 Loamy gleyed matrix
__ F3 Depleted matrix
__ F6 Redox dark surface
__ F7 Depleted dark surface
__ F8 Redox depressions

Problem Soils
__ F19 Piedmont floodplain (problem)
__ F20 Anomalous bright loamy soil (problem)
__ TF2 Red parent material (problem)
__ Other: _____



WETLAND INVESTIGATION
DATA FORM

Date: 2/9/2018
Nearest Flag: NV5 F11

HYDROLOGY

Is the ground surface inundated? Yes_____ No __X____
Is the soil saturated? Yes__X__ No _____
Is the water table present? Yes__X__ No _____
Depth to surface water: 9"
Is the wetland hydrology criterion met? Yes__X__ No _____
Rationale: Hydrological criterion is met.

Primary Hydrology Indicators (1 required)
____ Surface Water
____ High Water Table
__X__ Saturation
____ Algal Mat or Crust
____ Iron Deposits
____ Inundation Visible on Aerial Imagery
____ Aquatic Fauna/Invertebrates
____ Marl Deposits
____ Hydrogen Sulfide Odor
____ Presence of Reduced Iron
____ Recent Iron Reduction in Tilled Soils
____ Water Marks
____ Sediment Deposits
____ Drift Deposits
__X__ Water Stained Leaves
____ Oxidized Rhizospheres
____ Thin Muck Surface
____ Stunted/Stressed Plants

Secondary Hydrology Indicators (2 required)
____ Drainage Patterns
____ Moss Trim Lines
____ Crayfish Burrows
____ Saturation Visible on Aerial Imagery
____ Geomorphic Position
____ Shallow Aquitard
____ FAC-Neutral Test
____ Stunted/Stressed Plants (North Jersey)

Other: _____

Remarks: This is a highly distrubed area and hydric soil characteristics may not have developed. Plants are dominated by FACW and OBL species and inundation was observed. Based in these criteria, this is a wetland.

Newark Liberty International Airport AirTrain Replacement Project Technical Environmental Study
Wetland Delineation Documentation

Soil Series/Phase Abbreviation Key

BhguA	Bigapple - Urban land, Bigapple substratum complex, 0 to 3 percent slopes
RkkcA	Rikers loamy sand, 0 to 3 percent slopes
UddunB	Udorthents, Dunellen substratum, 0 to 8 percent slopes

PHOTOGRAPHS



Photograph facing westward toward wetland area of Wetland No. 1.



Photograph facing northeastward toward wetland area of Wetland No. 1.



Photograph facing northeastward toward upland area of Wetland No. 1



Photograph facing eastward toward upland and wetlands areas of Wetland No. 2 (B-line).



Photograph facing southward toward upland and wetlands areas of Wetland No. 2 (B-line).



Photograph of wetland area of Wetland No. 3.



Photograph of upland area of Wetland No. 3.



Photograph of wetland area of Wetland No. 4.



Photograph of wetland area of Wetland No. 4.



Photograph of upland area of Wetland No. 4.



Photograph facing northeastward towards the Peripheral Ditch. The C-line is to the left and D-line is to the right.



Photograph of the upland portion of the Peripheral Ditch near the C-line.

PROJECT RELATED CORRESPONDENCE

State of New Jersey
MAIL CODE 501-04
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF PARKS & FORESTRY
NEW JERSEY FOREST SERVICE
OFFICE OF NATURAL LANDS MANAGEMENT
P.O. BOX 420
TRENTON, NJ 08625-0420
Tel. (609) 984-1339 Fax (609) 984-0427

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

CATHERINE R. McCABE
Commissioner

March 6, 2020

Orielan Harrington
Radin Consulting, Inc.
One Gateway Center, Suite 960
Newark, NJ 07102

Re: AirTrain Replacement
Newark City, Essex County and Elizabeth City, Union County

Dear Orielan Harrington:

Thank you for your data request regarding rare species information for the above referenced project site.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.3) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Natural Heritage Data Request Form into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

We have also checked the Landscape Project habitat mapping and Biotics Database for occurrences of rare wildlife species or wildlife habitat in the immediate vicinity (within ¼ mile) of the referenced site. Additionally, the Natural Heritage Database was checked for occurrences of rare plant species or ecological communities within ¼ mile of the site. Please refer to Table 2 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented within the immediate vicinity of the site. Detailed reports are provided for all categories coded as 'Yes' in Table 2. These reports may include species that have also been documented on the project site.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Tables 1 and 2 (attached) to determine if any priority sites are located on or in the immediate vicinity of the site.

A list of rare plant species and ecological communities that have been documented from the county (or counties), referenced above, can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2010.pdf.

Beginning May 9, 2017, the Natural Heritage Program reports for wildlife species will utilize data from Landscape Project Version 3.3. If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive web application at the following URL,

NHP File No. 20-4007462-18872

https://njdep.maps.arcgis.com/apps/webappviewer/index.html?id=0e6a44098c524ed99bf739953cb4d4c7, or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

For additional information regarding any Federally listed plant or animal species, please contact the U.S. Fish & Wildlife Service, New Jersey Field Office at http://www.fws.gov/northeast/njfieldoffice/endangered/consultation.html.

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Robert J. Cartica
Administrator

e: NHP File No. 20-4007462-18872

Table 1: On Site Data Request Search Results (6 Possible Reports)

Report Name	Included	Number of Pages
1. Possibly on Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	No	0 pages included
2. Natural Heritage Priority Sites On Site	No	0 pages included
3. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Species Based Patches	Yes	1 page(s) included
4. Vernal Pool Habitat on the Project Site Based on Search of Landscape Project 3.3	No	0 pages included
5. Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Stream Habitat File	No	0 pages included
6. Other Animal Species On the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program	No	0 pages included

Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
Aves								
	Black-crowned Night-heron	Nycticorax nycticorax	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Cattle Egret	Bubulcus ibis	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Glossy Ibis	Plegadis falcinellus	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Least Tern	Sternula antillarum	Foraging	4	NA	State Endangered	G4	S1B,S1N
	Least Tern	Sternula antillarum	Nesting Colony	4	NA	State Endangered	G4	S1B,S1N
	Little Blue Heron	Egretta caerulea	Foraging	2	NA	Special Concern	G5	S3B,S3N
	Savannah Sparrow	Passerculus sandwichensis	Breeding Sighting	3	NA	State Threatened	G5	S2B,S4N
	Snowy Egret	Egretta thula	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Upland Sandpiper	Bartramia longicauda	Breeding Sighting	4	NA	State Endangered	G5	S1B,S1N
Insecta								
	Checkered White	Pontia protodice	Breeding/Courtship	3	NA	State Threatened	G5	S2

Table 2: Vicinity Data Request Search Results (6 possible reports)

Report Name	Included	Number of Pages
1. Immediate Vicinity of the Project Site Based on Search of Natural Heritage Database: Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database	No	0 pages included
2. Natural Heritage Priority Sites within the Immediate Vicinity	No	0 pages included
3. Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Species Based Patches	Yes	1 page(s) included
4. Vernal Pool Habitat In the Immediate Vicinity of Project Site Based on Search of Landscape Project 3.3	No	0 pages included
5. Rare Wildlife Species or Wildlife Habitat In the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Stream Habitat File	No	0 pages included
6. Other Animal Species In the Immediate Vicinity of the Project Site Based on Additional Species Tracked by Endangered and Nongame Species Program	No	0 pages included

Rare Wildlife Species or Wildlife Habitat Within the Immediate Vicinity of the Project Site Based on Search of Landscape Project 3.3 Species Based Patches

Class	Common Name	Scientific Name	Feature Type	Rank	Federal Protection Status	State Protection Status	Grank	Srank
Aves								
	Black-crowned Night-heron	Nycticorax nycticorax	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Cattle Egret	Bubulcus ibis	Foraging	3	NA	State Threatened	G5	S2B,S3N
	Glossy Ibis	Plegadis falcinellus	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Least Tern	Sternula antillarum	Foraging	4	NA	State Endangered	G4	S1B,S1N
	Least Tern	Sternula antillarum	Nesting Colony	4	NA	State Endangered	G4	S1B,S1N
	Little Blue Heron	Egretta caerulea	Foraging	2	NA	Special Concern	G5	S3B,S3N
	Savannah Sparrow	Passerculus sandwichensis	Breeding Sighting	3	NA	State Threatened	G5	S2B,S4N
	Snowy Egret	Egretta thula	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Upland Sandpiper	Bartramia longicauda	Breeding Sighting	4	NA	State Endangered	G5	S1B,S1N
Insecta								
	Checkered White	Pontia protodice	Breeding/Courtship	3	NA	State Threatened	G5	S2

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Jersey Field Office
4 E. Jimmie Leeds Road, Suite 4
Galloway, New Jersey 08205-4465
Phone (609) 646-9310
http://www.fws.gov/northeast/njfieldoffice

IN REPLY REFER TO:
20-CPA-0121

William Laventhal, Program Manager
The Port Authority of New York and New Jersey
4 World Trade Center
150 Greenwich Street, 24th Floor
New York, New York 10007
wlaventhal@panynj.gov

FEB 06 2020

Reference: Air Train Newark Replacement Project, Elizabeth City, Union County; and City of Newark, Essex County, New Jersey

The U.S. Fish and Wildlife Service (Service) has reviewed the above-referenced proposed project pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) (ESA) ensuring the protection of federally listed endangered and threatened species. The following comments do not address all Service concerns for fish and wildlife resources and do not preclude separate review and comment by the Service as afforded by other applicable environmental legislation.

The Service has determined that no federally listed species occur within or in the vicinity of the proposed project site. Therefore, no further consultation pursuant the ESA is required. If additional information on federally listed species becomes available, or if project plans change, this determination may be reconsidered.

Please contact Carlo Popolizio at (609) 382-5271 should you have any questions or comments regarding this correspondence.

Reviewing Biologist: _____
Carlo Popolizio

Authorizing Supervisor: _____
Ron Popowski

no effect.doc 01/07/08

From: Karen Greene - NOAA Federal <karen.greene@noaa.gov>
Sent: Thursday, March 12, 2020 3:06 PM
To: Laventhal, William <wlaventhal@panynj.gov>
Cc: Edith Carson-Supino <edith.carson-supino@noaa.gov>; Jessie Murray - NOAA Federal <jessie.murray@noaa.gov>
Subject: Re: FW: EWR AirTrain Replacement Program - NMFS

CAUTION: This email originated from outside the Port Authority. Do not open attachments or click on links from unknown senders or unexpected emails.

My apologies for the delay, William,

We have received your January 23, 2020, letter requesting technical assistance regarding essential fish habitat in the vicinity of Newark Airport in Elizabeth City, Union County and the City of Newark, Essex County, New Jersey as part of the planning and National Environmental Policy Act (NEPA) process for the replacement of the existing AirTrain.

Magnuson-Stevens Fishery Conservation and Management Act - Essential Fish Habitat

Based upon the location map provided, essential fish habitat (EFH) may be designated in tidal, estuarine waterways and wetlands in the vicinity of the project area. Information on EFH and the consultation process can be found on our website at: https://www.fisheries.noaa.gov/new-england-mid-atlantic/habitat-conservation/conserving-habitat-greater-atlantic-region.

Endangered Species Act

No federally listed or proposed threatened or endangered species under our jurisdiction are known to exist in the site of your proposed project. Based on this, we do not believe a consultation in accordance with section 7 of the Endangered Species Act is necessary. As such, no further coordination on this activity with the NOAA Fisheries Protected Resources Division is necessary at this time. Should project plans change or new information become available that changes the basis for this determination, further coordination should be pursued. Please contact me ((978) 282-8490 or Edith.Carson-Supino@noaa.gov), should you have any questions regarding these comments. You can also find information about the temporal and spatial distribution of species and their different life stages on our interactive species mapper. The mapper can be found on our website at https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=1bc332edc5204e03b250ac11f9914a27 .

Thank you.

Karen

Karen Greene
Mid-Atlantic Field Offices Supervisor
NOAA/National Marine Fisheries Service
Greater Atlantic Regional Fisheries Office
Habitat Conservation Division
James J. Howard Marine Sciences Laboratory
74 Magruder Rd.
Highlands, NJ 07732
732 872-3023 (office)

QUALIFICATION OF PREPARERS

SCOTT ANGUS

Senior Environmental Specialist/Wildlife Biologist
USFWS Recognized Qualified Bog Turtle Surveyor

Mr. Angus has over 30 years of professional experience conducting Threatened and Endangered Species Surveys throughout the northeast with a current concentration on listed reptile and amphibian species, especially aquatic turtle species, bog and wood turtles, Northern copperheads and timber rattlesnakes. As a USFWS Recognized Qualified Bog Turtle Surveyor, Mr. Angus has professionally performed the entire spectrum of projects and services with regards to bog turtles including although not limited to Phase I, Phase II and Phase III (Trapping) surveys, written Habitat Management Plans, applied habitat management techniques, radio telemetry, formal and informal consultation with the USFWS under the Endangered Species Act of 1973.

Mr. Angus has over 25 years of professional experience performing freshwater and coastal wetland assessments and delineations, writing the subsequent reports and/or federal or state permits. Mr. Angus is experienced with wetland delineations following both the USACE 1987 Wetland Delineation Manual and the 1989 Wetland Manual. Mr. Angus has contributed to the preparation of NEPA documents, including Categorical Exclusions, Environmental Assessments, and Environmental Impact Statements; and preparation of Environmental Assessments in accordance with NJ Executive Order 215. Mr. Angus has written or contributed to freshwater wetlands individual permits, general permits, Letter of Interpretation Application requests, transition area waivers, and ACOE Section 404 permits.

Project Experience

NORTHEAST UPGRADE (NEUP)

TENESSEE GAS PIPELINE| VARIOUS COUNTIES, NJ & PA

Field lead Senior Environmental Specialist of post-construction ecological monitoring of five natural gas pipeline loops constructed in 2013 covering all federal, state, and local permit requirements. Bi-annual monitoring includes field evaluation of re-created wetlands and their functional values, counting and identifying tree and shrub plantings in uplands for percent survivorship, counting and identifying tree and shrub plantings within wetlands, riparian monitoring for stability and restoration, invasive and noxious weed monitoring, monitoring uplands for stability and restoration, and monitoring off site mitigations sites. Annual reports are compiled and submitted to each agency according to FERC permit requirements in order to track progress and success of post-construction restoration. Recommendations are provided for areas that are not meeting success criteria for restoration. (2015 - Ongoing)

EASTSIDE EXPANSION PIPELINE LOOP

COLUMBIA GAS TRANSMISSION, LLC | VARIOUS COUNTIES, NJ & PA

Field lead Senior Environmental Specialist of post-construction ecological monitoring of two natural gas pipeline loops covering all FERC, federal, state, and local permit requirements. Bi-annual monitoring includes field evaluation of re-created wetlands and their functional values, counting and identifying tree and shrub plantings in uplands for percent survivorship, counting and identifying tree

ENGINEERING
Parsippany, NJ

EDUCATION

Paul Smith's College, Paul Smith's, NY
Ecology & Environmental Tech, 1989
Rutgers University/Cook College Continuing Education:
NJ Threatened and Endangered (T&E) Species, 1998/1999/2000/2001; Northern NJ T&E Species, 2002/2004; Southern NJ T&E Species, 2003; Vegetation (Veg) ID for Wetland Delineation (WD) Piedmont/Highlands, 1998; Veg ID for WD Coast Plain, 1999 Winter Veg ID for WD, 2002; ID of Grasses, Sedges and Rushes, 2000;
NJ Pinelands Special Plant Course 2004
PennDOT/BOD T&E Species Desk Reference Training,, 2009
NJ Endangered & Non-Game Species Program, Venomous Snake Handling Course, 2013
Federal Energy Regulatory Commission (FERC) Certificate of Completion Environmental Review & Compliance for Natural Gas Facilities Minneapolis, MN June 2018.
CSO Trainers, Inc. OSHA 40 Hour HAZWOPER Training Course; 2013

EXPERIENCE

30 years — 7 at NV5

MEMBERSHIPS

Northeastern Partners for Amphibian and Reptile Conservation (Sr. Co-chair)
Association of Northeastern Biologists; Association of Southeastern Biologists
Partners for Amphibian & Reptile Conservation (National Joint Steering Committee)
Board of Directors, Friends of the Cherry Valley and the Wallkill River National Wildlife Refuges
Natural Heritage Advisory Committee-Highlands Coalition
Advisory Board – American Turtle Observatory
Board of Directors – The Wetland Trust

and shrub plantings within wetlands, riparian monitoring for stability and restoration, invasive and noxious weed monitoring, and monitoring uplands for stability and restoration. Annual reports are compiled and submitted to each agency according to permit requirements in order to track progress and success of post-construction restoration. Recommendations are provided for areas that are not meeting success criteria for restoration. (2016 - Ongoing)

ADELPHIA GATEWAY PIPELINE

ADELPHIA GATEWAY, LLC | VARIOUS COUNTIES, PA & DE

Field lead Senior Environmental Specialist of pre-construction wetland investigations along an existing petroleum pipeline for purposes of converting the line to natural gas including new substations, blow-down valves, access roads and additional miscellaneous structures. As a USFWS Recognized Qualified Bog Turtle Surveyor conducted Phase I bog turtle habitat surveys on 30 wetland locations with potential impacts from the project, authored the reports and conducted onsite agency consultation for four (4) of the sites. Other investigations include wetland delineation, a PADEP Wetland Functional Evaluation and invasive species surveys for the Invasive and Noxious Plant Management Reports for PA and DE. (2017 - Ongoing)

CAMDEN COUNTY MULTI-USE TRAIL

CAMDEN COUNTY | CAMDEN COUNTY, NJ

Field lead Senior Environmental Specialist of wetland delineation for a proposed approximate 30 mile multi-use trail stretching the north to south length of Camden County including the Pinelands portion of the county. (2019 - Ongoing)

CAPE MAY COUNTY PARK & ZOO PARKING AND CONGESTION ABATEMENT

CAPE MAY COUNTY | CAPE MAY, NJ

Field lead Senior Environmental Specialist of wetland delineations at the park and zoo for proposed congestion abatement project. Wildlife biologist responsible for the planning and performance of threatened and endangered species habitat evaluations. Providing guidance to junior staff with associated permits and reports. (2020 - Ongoing)

HARRISBURG NATIONAL GUARD HEADQUARTERS

NATIONAL GUARD | DAUPHIN COUNTY, PA

Field lead Senior Environmental Specialist of preliminary wetland investigation and subsequent wetland delineation utilizing the 1987 ACOE delineation manual at the base. Providing guidance to junior staff with associated permits and reports. (2020 - Ongoing)

SHORE ROAD DRAINAGE IMPROVEMENTS

NYDEC | BRONX COUNTY, NY

Field lead Senior Environmental Specialist of wetland delineations along Shore Road near Pelham Bay Park for drainage improvements. Lead field surveys for rare plants within the vicinity of the proposed project. Provided guidance with associated reports. (2018-2019)

FREEHOLD NJDOT MAINTENANCE YARD

NJDOT | MONMOUTH COUNTY, NJ

Field lead Senior Environmental Specialist of a wetland delineation at a NJDOT facility. Provided guidance to junior staff with associated wetland report. (2019)

CAMDEN COUNTY GREENWAY TRAIL

CAMDEN COUNTY | CAMDEN COUNTY, NJ

Field lead Senior Environmental Specialist of wetland delineation of a proposed 5 mile greenway trail within the Pinelands portion of Camden County. (2018).

RIDGEWAY BOULEVARD BRIDGE REPLACEMENT

COUNTY OF OCEAN | OCEAN COUNTY, NJ

Lead Senior Environmental Specialist and Wildlife Biologist conducting habitat evaluations for plant species on the NJ Pinelands Commission Special Plant List including Little Ladies-tresses (*Spiranthes tuberosa*), Pine Barrens Gentian (*Gentiana autumnalis*) and Sickle-leaved Golden Aster (*Pityopsis falacata*). As a USFWS Recognized Qualified Bog Turtle Surveyor conducted preliminary bog turtle habitat evaluation for Federally Threatened and NJ State Endangered Bog Turtle (*Glyptemys muhlenbergii*). Conducted a preliminary habitat evaluation for the federally listed Swamp Pink (*Helonias bullata*). Habitat for *P. falacata*, *S. tuberosa* and *G. autumnalis* was identified as present within the project area. Visual surveys for the species were conducted during the appropriate growing season. Numerous *P. falacata* plants were identified during the visual survey. These plants will be protected during construction via exclusion fences, thus mitigating any impacts to the species. (2017 and 2018)

HERPTILE (REPTILE AND AMPHIBIAN) SPECIES INVENTORY WISSAHICKON CREEK WATERSHED

WISSAHICKON VALLEY WATERSHED ASSOCIATION | VARIOUS, MONTGOMERY COUNTY, PA

During the herptile active season (Mar.-Nov.), managed and performed a comprehensive inventory of the reptile and amphibian species on 13 properties within the Wissahickon Creek Watershed utilizing passive survey techniques. All targeted species have been observed, when possible briefly captured and photographed. Coordinated surveys and targeted survey locations with association staff and provided

periodical updates. Prepared report of findings. Key species observed: Northern red-bellied turtle, spotted turtle, black ratsnake, northern black racer and northern red salamander.

RT 17 WETLAND DELINEATION

NJDOT | BERGEN COUNTY, NJ

Field lead Senior Environmental Specialist of wetland delineations at multiple intersections along RT 17. (2017)

NEWARK LIBERTY INTERNATIONAL AIRPORT AIR TRAIN

PORT AUTHORITY OF NY & NJ | ESSEX COUNTY, NJ

Field lead Senior Environmental Specialist of wetland delineations at Newark Liberty International Airport. (2018)

ROUTES 1&9T, NEW ROAD, ST. PAUL'S AVE TO SECAUCUS RD

NJDOT/BEGEN AND HUDSON COUNTIES, NJ

Subsequent to NV5's original Portway Program work, was the field lead for wetland delineations oversaw preparation of an NJDEP EO-215 Environmental Impact Statement, Individual Freshwater Wetland Permit, US Army Corps of Engineer's Individual Permit and provided coordination support for purchase of compensatory wetland mitigation credit from an NJDEP-approved wetland mitigation bank.

PHASE I BOG TURTLE HABITAT SURVEY FOR THE COUNTY COLLEGE OF MORRIS ENTRANCE ROAD PROJECT

COUNTY COLLEGE OF MORRIS | RANDOLPH TOWNSHIP, MORRIS COUNTY, NJ

Performed a detailed Phase I Bog Turtle Habitat Survey on wetlands associated with the route of a new entrance road to serve the relocated college library and internal road system. A known bog turtle population is within a quarter mile of the site. Utilized USFWS protocols to evaluate the wetlands associated with the project and was able to determine that there would be no direct or indirect impacts to bog turtles or their habitats as a result of the project

WETLAND DELINEATION, THREATENED AND ENDANGERED SPECIES HABITAT EVALUATION, PHASE I BOG TURTLE HABITAT & SWAMP PINK SURVEYS – GARDEN STATE PARKWAY MAINTENANCE FACILITIES

NJ TURNPIKE AUTHORITY | HERBERTSVILLE, WALL TWP, MONMOUTH COUNTY, NJ

Performed detailed freshwater wetlands delineation within the vicinity of the site. Performed a Phase I Bog Turtle Habitat and preliminary Swamp Pink surveys on a 20-acre wetland associated with the project. Performed evaluations for NJ Threatened and Endangered Species and/or their habitats that were identified after tabletop review on the NJDEP GeoWeb revealed numerous species which could occur onsite. Contributed to the EO 215 report writing.

WETLAND DELINEATION, THREATENED AND ENDANGERED SPECIES HABITAT EVALUATIONS, KNIESKERN'S BEAKED-RUSH - GSP MAINTENANCE FACILITIES

NJ TURNPIKE AUTHORITY | OCEAN, BARNEGAT TWP, OCEAN CO, NJ

Performed a detailed freshwater wetlands delineation on the lands within the vicinity of the site. The facility is located within the NJ Pinelands Commission's (NJPC) regulatory boundary. Mr. Angus evaluated the vicinity for the presence of NJ Pinelands listed species and/or their habitats. Met onsite with the NJPC staff to review wetlands boundaries and species evaluations. The facility is within the CAFRA zone, performed the evaluations for NJ Threatened and Endangered Species and/or their habitats for each site. Evaluated the facility for the presence of Kieskern's Beaked-rush habitat. Wrote sections of the NJDEP CAFRA permits.

WETLAND DELINEATION, NJPC AND NJDEP THREATENED AND ENDANGERED SPECIES HABITAT EVALUATIONS, KNIESKERN'S BEAKED-RUSH SURVEY - GSP MAINTENANCE FACILITIES

NJ TURNPIKE AUTHORITY | BASS RIVER, BURLINGTON COUNTY, NJ

Performed detailed freshwater wetlands delineation on the lands within the vicinity of the site. The facility is located within the NJ Pinelands Commission's (NJPC) regulatory boundary. Evaluated the vicinity for the presence of NJ Pinelands listed species and/or their habitats. Met onsite with the NJPC staff to review wetlands boundaries and species evaluations. Per the NJPC requirements, performed a Pinelands Commission Buffer Delineation Model for NJ Pinelands Wetlands on four wetlands associated with the Bass River facility. Conducted an evaluation for the presence of Kieskern's Beaked-rush

WETLAND DELINEATION, THREATENED AND ENDANGERED SPECIES HABITAT EVALUATIONS, KNIESKERN'S BEAKED-RUSH - GARDEN STATE PARKWAY MAINTENANCE FACILITIES

NJ TURNPIKE AUTHORITY | WHITE HORSE, GALLOWAY TWP, ATLANTIC COUNTY, NJ

Performed detailed freshwater wetlands delineation in the vicinity of the site. The facility is located within the NJ Pinelands Commission's (NJPC) regulatory boundary. Evaluated the vicinity for the presence of NJ Pinelands listed species and/or their habitats. Met onsite with the NJPC staff to review wetlands boundaries and species evaluations. Evaluated facility for Kieskern's Beaked-rush habitat.

WETLAND DELINEATION, THREATENED AND ENDANGERED SPECIES HABITAT EVALUATIONS, KNIESKERN'S BEAKED-RUSH - GARDEN STATE PARKWAY MAINTENANCE FACILITIES

NJ TURNPIKE AUTHORITY | SWAINTON, MIDDLE TWP, CAPE MAY CO

Performed detailed freshwater wetlands delineation in the vicinity of the site. The facility is within the CAFRA zone, performed evaluations for NJ Threatened and Endangered Species and/or their habitats for each site. Evaluated the facility for the presence of Kieskern's Beaked-rush habitat. Wrote the wetlands and ecological sections of the NJDEP CAFRA permits.

BOG AND WOOD TURTLE CONSTRUCTION MONITORING - RT 46, SEC 7L & 8K OVER THE ROCKAWAY RIVER

NJDOT | DOVER, MORRIS COUNTY NJ

Principal USFWS Recognized Qualified Bog Turtle Surveyor responsible for consultation with USFWS regarding protections for bog turtle habitat adjacent to the bridge replacement. The USFWS required a "sweep" of the area within and directly adjacent to the limits of disturbance, as a modified Phase II Bog Turtle Survey in accordance with USFWS protocols set forth in the Federal Recovery Plan for the Northern Population of the Bog Turtle (Glyptemys muhlenburgii) (May 2001 rev 2006). If a bog turtle(s) or other wildlife was found they would be removed from the area to allow for the erection of super silt fence. The bridge is located near a documented bog turtle site. Attended a pre-construction meeting where construction contractors were educated on identification of bog turtles. The super silt fences were buried three to four inches into the ground to eliminate the potential for bog turtles to bury under the fence to enter the construction area. After the installation, Mr. Angus performed an inspection of the fence for integrity and gaps. Provided weekly inspections of the silt fence and construction area to protect the bog turtle population directly adjacent to the project area.

JAMI LUCKHARDT

Environmental Specialist

Ms. Luckhardt has diverse expereince within Site Remediation (4.5 years) and Ecology (5.5 years).

Ecology: Performed Ecological Assessments, Freshwater Wetland General Permits, Freshwater Wetland Individual Permits, EO-215 Environmental Assesment, No Net Loss Reforestation Plan, NJDEP Freshwater Wetland Transition Area Reduction Application per N.J.A.C 7:7a-8.1(d), Special Activity Transition Area Waiver for Redevelopment, Flood Hazard Area Compliance Statement, Waterfront Development/Coastal Wetlands General Permit, Application for Letter of Interpretation (LOI) for Line Verification, NEPA CEDs, ACOE Permit, Wetland Delineations, Estuarine and Marine Ecological Surveys, Aquatic and Hydrophytic Vegetation Identification and Control. Daily environmental job responsibilities include: interfacing with clients; contractors; consultants; regulatory agencies; preparation of reports and permits; and providing extensive technical assistance.

Site Remediation: Performed environmental screenings and conducting Site and Remedial Investigations that included the collection of soil/groundwater/sediment samples.

Project Experience — New Jersey

SITE REMEDIATION

CHARTER CONTRACTING – ASSUNPINK CREEK

Charter Contracting | Various Locations, NJ

Collected multiple soil samples from various location throughout New Jersey. Collected PID reading during these events. Collected surface water sample. Prepared summary letter to client. (2019)

CAMBRIA HOTEL AND SUITES

Sunstone Hotels Morristown, LLC | Morristown, NJ

Investigated subsurface soil conditions surrounding a former 5,000-gallon diesel fuel UST. Collected multiple soil samples during the investigation to close properly close the former UST. Preparing a Site Investigation/Remedial Investigation/Remedial Workplan/Remedial Action Report and a Receptor Evaluation Report. Coordinating with client and contractor to continue upcoming sampling events. (2019)

ROUTE 15 RIGHT-OF-WAY

NJDOT| Lafayette, NJ

Performed multiple low-flow groundwater sampling events and 3-volume purge groundwater sampling events. Prepared chain of custody and samples for delivery. Collected PID readings, water level readings, and water quality parameters (e.g., temperature, pH, ORP, conductivity, turbidity, and dissolved oxygen). Conducted oversight of well installations. (2018-2019)

ENVIRONMENTAL
Parsippany, NJ
Jami.Luckhardt@NV5.com
973.946-5605

EDUCATION

M.S., Biology with concentrations in Ecology and Evolution, Montclair State University

B.S., Biology, Minor Chemistry, Montclair State University

EXPERIENCE

10 years

CERTIFICATIONS

Rutgers University Wetland Delineation Certificate Series

Field Techniques and Current Topics in Wildlife Biology

TRAINING

OSHA 40-Hour Hazardous Waste Operations & Emergency Response (HAZWOPER)

Rutgers University Vegetation Identification for Wetland Delineation South

Rutgers University Methodology for Wetland Delineation

Identification of Wetland Plants in Winter

ECOLOGY

NJDOT BORDENTOWN TRAINING FACILITY

NJDOT | BORDENTOWN, NJ

Prepared an EO-215 Environmental Assessment Report including existing site conditions, impact statements, figures, photographic log, and appendices. Prepared the NJDEP Freshwater General Permit 10A – Very Minor Road Crossing along with all associated documents, including figures, photographic log, appendices, forms, and checklists. Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; and Information for Planning and Consultation (IPaC). Submitted certified property owners list request to tax assessor and prepared a Natural Heritage Database request required for permit application. (2018-2019)

NJDOT FREEHOLD MAINTENANCE YARD

NJDOT | BORDENTOWN, NJ

Prepared an EO-215 Environmental Assessment Report including existing site conditions, impact statements, figures, photographic log, and appendices. Prepared the NJDEP Freshwater Special Activity Transition Area Waiver for Redevelopment [N.J.A.C. 7:7a-8.3(F)] And Wetland Transition Area Reduction [N.J.A.C 7:7a-8.1(D)] along with all associated documents, including figures, photographic log, appendices, forms, and checklists. Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; County and Township Resources; and Information for Planning and Consultation (IPaC). Submitted certified property owners list request to tax assessor and prepared a Natural Heritage Database request required for permit application. Assisted with part of the wetland delineation. (2019)

NJDOT BORDENTOWN MAINTENANCE YARD

NJDOT | BORDENTOWN, NJ

Prepared an EO-215 Environmental Assessment Report including existing site conditions, impact statements, figures, photographic log, and appendices. Conducted wetland investigation to determine the presence/absence of wetlands and wetland transition areas, identified potential ecological constraints, and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; County and Township Resources; and Information for Planning and Consultation (IPaC). (2019)

HANOVER MAINTENANCE YARD/SALT STORAGE SHED

NJDOT AND NEW JERSEY DEPARTMENT OF TREASURY | HANOVER TOWNSHIP, NJ

Prepared an EO-215 Environmental Assessment Report including existing site conditions, impact statements, figures, photographic log, and appendices. Prepared a Special Activity Transition Area Waiver for Redevelopment or Freshwater Wetland Permit upon completion of final design. Conducted wetland delineation, identified ecological constraints, and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; County and Township Resources; and Information for Planning and Consultation (IPaC). Submitted certified property owners list request to tax assessor and prepared a Natural Heritage Database request required for permit application. Prepared figures, photographic log, appendices, forms, and checklists. (2018-2019)

PICATINNY ARSENAL BUILDING 3159

PICATINNY ARSENAL | ROCKAWAY TOWNSHIP, NJ

Prepared NJDEP Freshwater Wetland Transition Area Reduction Application per N.J.A.C 7:7a-8.1(d). Assisted with wetland delineation, identified ecological constraints, and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; County and Township Resources; and Information for Planning and Consultation (IPaC). Prepared figures, photographic log, appendices, and a Natural Heritage Database request. (2018)

PICATINNY ARSENAL BUILDING 816 IMPROVEMENTS

PICATINNY ARSENAL | ROCKAWAY TOWNSHIP, NJ

Prepared Freshwater Wetland Individual Permit including figures, photographic log, appendices, forms, and checklist. Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; County and Township Resources; and Information for Planning and Consultation (IPaC). Prepared figures, photographic log, appendices, and a Natural Heritage Database request. (2018)

ALEXANDER ROAD BRIDGE OVER THE D&R CANAL, STRUCTURE NO. 3000-155

NJDOT | MUNICIPALITY OF PRINCETON AND WEST WINDSOR TOWNSHIP, NJ

Prepared Freshwater Wetlands General Permit 10A – Very Minor Road Crossing including figures, photographic log, appendices, forms, and checklist. Assisted with wetland delineation and identified ecological constraints and collected background information utilizing several environmental

databases including, but not limited to NJDEP databases; Web Soil Survey; County and Township Resources; and Information for Planning and Consultation (IPaC). Submitted certified property owners list request and prepared a Natural Heritage Database request required for permit application. Prepared figures, photographic log, and appendices. (2018-2019)

ROUTE 280 TIRE DUMP SITE

STATE OF NEW JERSEY | EAST HANOVER, NJ

Prepared Freshwater Wetland General Permit 4 – Hazardous Site Investigation and Cleanup, Freshwater Wetland General Permit 5 – Landfill Closures In the process of preparing an EO-215 Environmental Assessment and Flood Hazard Area Control Act Rule Compliance Statement. Prepared a No Net Loss Reforestatrion Plan based on initial scope of work. Prepared a Freshwater wetland general permit withdraw letter for the GP-4 and a GP Modification Letter to describe the newly proposed actions, along with modifications GP-5 compliance statements that meet current N.J.A.C 7:7A Freshwater Wetland Protection Act Rules Conducted wetland delineation, identified ecological constraints, and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; County and Township Resources; and National Wetlands inventory. Submitted certified property owners list request and prepared a Natural Heritage Database request required for permit application. Prepared figures, photographic log, appendices, forms, and checklist. (2017-2019)

SECAUCUS MAINTENANCE YARD

NJDOT | SECAUCUS, NJ

Prepared an EO-215 Environmental Assessment Report including existing site conditions and impact statement. Reviewed N.J.A.C applicable documents. Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Bat Municipality List; Bog Turtle and Swamp Pink List of Municipalities; Sturgeon Maps, Section 7 Mapper/ Essential Fish Habitat Web Soil Survey; and Information for Planning and Consultation (IPaC). Prepared figures, photographic log, and appendices. (2018-2019)

SUSSEX MAINTENANCE YARD

NJDOT AND NJDPMC | WANTAGE, NJ

Prepared EO-215 Environmental Assessment Report including existing site conditions, impact statements, figures, photographic log, appendices, forms, and checklist. Prepared the Special Activity Transition Area Waiver for Redevelopment. Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; County and Township Resources; and Information for Planning and Consultation (IPaC). (2018)

SPRINGERS MILL ROAD

CAPE MAY COUNTY | MIDDLE TOWNSHIP, NJ

Preparing a Waterfront Development/Coastal and Freshwater Wetlands Statewide General Permit. Identified existing ecological conditions and constraints, prepared impact statement for proposed activity, and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Bat Municipality List; Bog Turtle and Swamp Pink List of Municipalities; Sturgeon Maps, Section 7 Mapper/Essential Fish Habitat; Prime Fishing Habitats; Raster Charts; Tideland Conveyance Maps; Web Soil Survey; Information for Planning and Consultation (IPaC), and socioeconomic information. Prepared figures, photographic log, notification letters, and certified mail receipts. (2018-2019)

HAND AVENUE

CAPE MAY COUNTY | MIDDLE TOWNSHIP, NJ

Preparing Waterfront Development/Coastal and Freshwater Wetlands Statewide General Permit 10B- Minor Road Crossing. Identified existing ecological conditions and constraints, prepared impact statement for proposed activity, and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Bat Municipality List; Bog Turtle and Swamp Pink List of Municipalities; Sturgeon Maps, Section 7 Mapper/Essential Fish Habitat; Prime Fishing Habitats; Raster Charts; Tideland Conveyance Maps; Web Soil Survey; Information for Planning and Consultation (IPaC), and socioeconomic information. Prepared figures, photographic log, notification letters, and certified mail receipts. (2018-2019)

RIDGEWAY BOULEVARD BRIDGE REPLACEMENT

OCEAN COUNTY | MANCHESTER TOWNSHIP, NJ

Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; National Wetlands inventory; and County and Township Documents. Submitted certified property owners list request. Conducted wetland delineation and completed Freshwater Wetland General Permit 10B – Minor Road Crossing for NJDEP submission. Assisted in Botanical Survey Report. (2017-2018)

FRENCHTOWN ARTYARD REDEVELOPMENT

ARTYARD | FRENCHTOWN TOWNSHIP, NJ

Assisted in completion of the Application of Letter of Interpretation — Presence/Absence. Assisted in preparation of

figures, certified mailings, and collection of background information. (2018)

ADA NORTH, CONTRACT 5

NJDOT | PARAMUS, NJ

Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; and Information for Planning and Consultation (IPaC). Submitted certified property owners list request to tax assessor and prepared a Natural Heritage Database request required for permit application. Prepared notification letters and certified mail receipts. Completed Freshwater Wetland General Permit 10A – Very Minor Road Crossing and necessary forms/checklist for NJDEP submission. (2017-2018)

NJDOT OLD BRIDGE WINTER YARD

NEW JERSEY DEPARTMENT OF TREASURY AND NJDOT | OLD BRIDGE, NJ

Assisted in completion of the EO-215 and Transition Area Waiver. Completed figures, notification letters, and certified mailing notifications. (2018)

CAPE MAY BRIDGES (SUNSET BOULEVARD)

CAPE MAY COUNTY | CAPE MAY POINT BOROUGH LOWER TOWNSHIP, AND WEST CAPE MAY BOROUGH, NJ

Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; and Information for Planning and Consultation (IPaC) along Sunset Boulevard for approximately 2.2 mile. Submitted a Natural Heritage Database request and reviewed findings. Completed an Environmental Screening. (2018)

ESSEX COUNTY NINE INTERSECTIONS - GROUP 1

ESSEX COUNTY | BELLVILLE, BLOOMFIELD, NEWARK, IRVING, AND MAPLEWOOD, NJ

Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; United State Census Bureau; and Information for Planning and Consultation (IPaC) at nine intersections along Franklin Avenue. Prepared summary of findings and completed Categorical Exclusion Document (CED). (2018)

ESSEX COUNTY NINE INTERSECTIONS - GROUP 2

ESSEX COUNTY | EAST ORANGE, NJ

Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; United State Census Bureau; and Information for Planning and Consultation (IPaC) at nine intersections along Park Avenue. Prepared summary of findings and completed Categorical Exclusion Document (CED). (2018)

PASSAIC VALLEY SEWER COMMISSION — FEASIBILITY STUDY

PSE&G | NEWARK, NJ

Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; and Information for Planning and Consultation (IPaC). Completed a preliminary Environmental Screening. (2018)

KEANSBURG SEDIMENT PROJECT- WAACKAACK CREEK CHANNEL

NJDOT OMR | KEANSBURG, NJ

Conducted a sediment investigation for three (3) sample locations provided in the approved Sediment Sampling and Analysis Plan (SSAP). Prepared sediment and sampling analysis for Waackaack Creek Channel, which included three (3) quality control sediment samples. Oversaw contractor that utilized a vessel and Vibracore to collect estuarine sediments using NJDEP approved methods as outlined in the 1997 NJDEP Dredging Manual. Recorded field observations that included GPS location, sediment description/characteristics and thickness, sediment stratification, project depth, measured water depth, tidal adjustment, mean low water adjustment, corrected depth, required core length, depth of penetration, and recovered core length. Developed photographic log of each sediment core with a ruler to indicate sediment stratification and core length. Prepared sediment cores for sample collection. Collected and prepared samples for physical and chemical analysis. Collected water sample for chemical analysis and carboys that contained channel water for preparation of modified elutriate samples. Reviewed physical and chemical results and compared analytical results to NJDEP standards. Prepared detailed technical report for submission to NJDOT/NJDEP. (2017)

WILDWOOD SEDIMENT PROJECT

NJODT OMR | WILDWOOD, NJ

Conducted a sediment sampling investigation for five (5) Channels located within Wildwood: Channel 200 - Ottens Harbor; Channel 201 - Ottens Canal Lagoon; Channel 202 – West Wildwood; Channel 203 - Ottens Canal; and Channel 204 - Sunset Lake. Compiled sampling information for 47 sediment sample locations as per approved Sediment Sampling and Analysis Plan (SSAP). Prepared sediment and sampling analysis for all channels, which included eleven (11) quality control sediment samples and one (1) quality control water sample. Oversaw contractor that utilized a vessel and Vibracore to collect

estuarine sediments using NJDEP approved methods as outlined in the 1997 NJDEP Dredging Manual. Recorded field observations that included sediment description/characteristics and thickness, sediment stratification, project depth, measured water depth, tidal adjustment, mean low water adjustment, corrected depth, required core length, depth of penetration, and recovered core length. Developed photographic log of each sediment core with a ruler to indicate sediment stratification and core length. Prepared sediment cores for sample collection. Collected and prepared samples for physical and chemical analysis. Collected water samples for chemical analysis and carboys that contained channel water for preparation of elutriate samples. Reviewed physical and chemical results and compared analytical results to NJDEP standards. Completed extensive technical report for submission to NJDOT/NJDEP. (2016-2017)

NJARNG FORMER BORDENTOWN COMBINE SUPPORT MAINTENANCE SHOP

NJDOT DER | BORDENTOWN, NJ

Conducted wetland investigation utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; and National Wetlands Inventory. Conducted wetland delineation and prepared an application for Letter of Interpretation (LOI) for line verification. (2017)

NYS&W

COUNTY OF MORRIS | MORRIS COUNTY, NJ

Conducted and assisted with wetland delineation near Stahl Plaza and Meadow Road. (2017)

ROUTE 206 - DRAKES BROOK

MORRIS COUNTY | FLANDERS, NJ

Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP database; Web Soil Survey; and National Wetlands Inventory. Submitted certified property owners list request to tax assessor. Conducted wetland delineation and assisted with preparing a Freshwater Wetland General Permit. (2016-2017)

NEUP

KINDER MORGAN | SUSSEX, BERGEN AND PASSAIC COUNTY, NJ

Monitored wetlands after pipeline construction to ensure wetland re-establishment. Characterized soil to determine the presence or absence of hydric soils. Completed stream data sheets, and identified sample locations using GPS. Collected or assisted in the collection of wetland data, which included documentation, photographic evidence, hydrological indicators, and plant identification. (2016-2017)

PREAKNESS HILLS COUNTRY CLUB

PREAKNESS HILLS COUNTRY CLUB | WAYNE, NJ

Identified ecological constraints and collected background information utilizing several environmental databases including, but not limited to NJDEP databases; Web Soil Survey; and National Wetlands Inventory. Submitted certified property owners list request to tax assessor which is required for permit application. Conducted wetland delineation and assisted with preparing a Freshwater Wetland General Permit. (2016)

272 PARSIPPANY ROAD

PRIVATE | PARSIPPANY, NJ

Determined if wetlands were present or absent at the site. (2016)

ROUTE US 1 OVER ROUTE US 1B

NJDOT | LAWRENCE, NJ

Collected information at and near the site utilizing NJDEP database, Web Soil Survey, and FEMA flood maps. Researched and gathered information on groundwater contamination areas (CEAs and CKEs), historic fill, historical sites, soil data, flood plains, wetlands, streams and waterbodies, critical environmental sites, threatened and endangered species, and open space. Assisted in a wetland delineation investigation. (2016)

MERCER COUNTY BRIDGES #330.1 & #331.1

MERCER COUNTY | PRINCETON, NJ

Identified ecological and environmental constraints utilizing online environmental databases including, but not limited to NJDEP databases; Web Soil Survey; and National Wetlands Inventory. (2016)

MERCER COUNTY BRIDGES #670.4

MERCER COUNTY | HAMILTON, NJ

Identified ecological and environmental constraints utilizing online environmental databases including, but not limited to NJDEP databases; Web Soil Survey; and National Wetlands Inventory. (2016)

EMPLOYMENT RECORD

NV5, Inc. 2016-Present (Current – 4 Years)

Other Firms (6 Years)

Ethan Muller

Environmental Scientist / Wildlife Biologist

ENVIRONMENTAL
Parsippany, NJ
Ethan.Muller@NV5.com
973.946-5622

Mr. Muller is an environmental scientist with five years of experience working on projects for the public and private sectors. He has worked on multidisciplinary teams for The New Jersey Department of Environmental Protection (NJDEP ENSP) and NV5, and has performed and/or reviewed wetland delineations, wetland mitigation monitoring, threatened and endangered species habitat assessments and presence/absence surveys, and their associated reports.

Project Experience

Northeast Upgrade Project

TENESSEE GAS PIPELINE| Various Counties, NJ & PA

Assisted with post-construction ecological monitoring of five natural gas pipeline loops constructed in 2013 covering all federal, state, and local permit requirements. Annual monitoring includes counting and identifying tree and shrub plantings in uplands for percent survivorship, counting and identifying tree and shrub plantings within wetlands, riparian monitoring for stability and restoration, invasive and noxious weed monitoring, monitoring uplands for stability and restoration, and monitoring off site mitigations sites. Annual reports are compiled and submitted to each agency according to permit requirements in order to track progress and success of post-construction restoration. Recommendations are provided for areas that are not meeting success criteria for restoration. (2017 - present)

East Side Expansion Pipeline Looping Project

COLUMBIA GAS TRANSMISSION, LLC | Various Counties, NJ & PA

Assisted with post-construction ecological monitoring of two natural gas pipeline loops covering all federal, state, and local permit requirements. Annual monitoring includes counting and identifying tree and shrub plantings in uplands for percent survivorship, counting and identifying tree and shrub plantings within wetlands, riparian monitoring for stability and restoration, invasive and noxious weed monitoring, and monitoring uplands for stability and restoration. Annual reports are compiled and submitted to each agency according to permit requirements in order to track progress and success of post-construction restoration. Recommendations are provided for areas that are not meeting success criteria for restoration. (2017 - present)

Adelphia Gateway Project

ADELPHIA GATEWAY, LLC | Various Counties, PA

Assisted with pre-construction wetland investigations along an existing petroleum pipeline for purposes of converting the line to natural gas. Investigations include wetland delineation and habitat assessment for potential bog turtle phase one survey requirements. (2018 - ongoing)

EDUCATION

B.S., Biology with concentrations in Ecology and Evolution, Stony Brook University

Minor, Marine Science, Stony Brook University

EXPERIENCE

5 years

CERTIFICATIONS

Rutgers University Wetland Delineation Certificate Series

NJDEP Tertiary Venomous Snake Monitor

TRAINING

Vegetation Identification for Wetland Delineation Northern NJ Course, Rutgers University

Methodology for Wetland Delineation Course, Rutgers University

Serpentine Barrens of the Northern Piedmont, Pennsylvania Botanical Society

Various Wetland Delineations

VARIOUS CLIENTS | Various Counties, NJ & NY

Assisted with and led wetland delineations across New Jersey, New York, and Pennsylvania including sites in Bergen, Camden, Essex, Mercer, Monmouth, Sussex, the Bronx, and Dauphin counties. (2017 - ongoing)

RT 17 Wetland Delineation

NJDOT | Bergen County, NJ

Assisted with wetland delineations at multiple intersections along RT 17. (2017)

Newark Liberty International Airport Wetland Delineation

Port Authority of NY & NJ | Essex County, NJ

Assisted with wetland delineations at Newark Liberty International Airport. (2018)

Shore Road Wetland Delineation

NYDEC | The Bronx, NY

Conducted and assisted with wetland delineations along Shore Road for drainage improvements. Assisted with associated reports. (2018-2019)

Freehold DOT Yard Wetland Delineation

NJDOT | Monmouth County, NJ

Conducted and assisted with wetland delineation at a DOT facility. Authored associated wetland report. (2019)

Camden Trail Wetland Delineation

VARIOUS CLIENTS | Various Counties, NJ & NY

Conducted and assisted with wetland delineations across Camden County for a multi-use trail. (2019 - ongoing)

Cape May County Park & Zoo Wetland Delineation

Cape May County | Cape May, NJ

Assisted with wetland delineations at the zoo. Assisted with associated reports. (2020)

Harrisburg National Guard Base Wetland Delineation

National Guard | Dauphin County, PA

Assisted with wetland delineations at the base. Authored associated wetland report. (2020)

Ridgeway Boulevard Bridge Replacement

COUNTY OF OCEAN | Ocean County, NJ

Assisted with a habitat evaluation for species on the NJ Pinelands Commission Special Plant List including Little Ladies-tresses (Spiranthes tuberosa), Pine Barrens Gentian (Gentiana autumnalis) and Sickle-leaved Golden Aster (Pityopsis falacata). In addition, assisted with a preliminary habitat evaluation for Federally Threatened and NJ State Endangered Bog Turtle (Glyptemys muhlenbergii) and Swamp Pink (Helonias bullata). Habitat for P. falacata, S. tuberosa and G. autumnalis was identified as present within the project area. Visual surveys for the species were conducted during the appropriate growing season. Numerous P. falacata plants were identified during the visual survey. These plants will be protected during construction via exclusion fences, thus mitigating any impacts to the species.

NJDEP ENSP Timber Rattlesnake Projects

NJDEP ENSP | Various Counties, NJ

Assisted with various tasks and projects associated with the NJDEP ENSP's ongoing timber rattlesnake program. Duties consisted of training new employees and leading field teams to conduct existing and potential habitat surveys, basking and gestation surveys, the catch, transportation, and release of both venomous and non-venomous snakes infected with snake fungal disease, radio telemetry tracking, remote sensing via motion cameras, and all associated field documentation, database entry, and data manipulation. The project required regular and extensive decontamination of equipment. Potential habitat sites were located via aerial maps, surveyed and assessed, and recommendations were made for improvements in order to create suitable basking habitat. (2013-2016)

NJDEP ENSP Allegheny Woodrat Project

NJDEP ENSP | Bergen County, NJ

Assisted with trapping, relocation, and subsequent monitoring via radio telemetry of two Allegheny woodrats (Neotoma magister) as part of population studies and an effort to introduce new genetics into the population. Motion cameras were also employed as part of the monitoring process. An effort to medicate raccoons, a vector for diseases impacting the woodrat population, was conducted throughout the area via feeder sites containing medicated food. (2016)

NJDEP ENSP Bog Turtle Projects

NJDEP ENSP | Various Counties, NJ

Assisted with various bog turtle projects including surveying existing habitat through use of vegetation plots and surveys for bog turtles as part of population studies. Multiple species of turtles were handled, recorded, marked via notching, and released. Radio telemetry equipment was also operated for the use of tracking individuals. (2016)

NJDEP ENSP Wood Turtle Projects

NJDEP ENSP | Various Counties, NJ

Assisted with various wood turtle projects. Projects entailed surveying for wood turtles as part of population studies and included capturing, recording, marking via notching, and release of multiple species. (2016)

NJDEP ENSP Bat Projects

NJDEP ENSP | Various Counties, NJ

Conducted and assisted with visual and acoustic surveys for multiple species of bats. Radio telemetry equipment was also operated for the use of tracking individuals. Species included big brown (Eptesicus fuscus), small brown (Myotis lucifugus), and Indiana bats (Myotis sodalis). (2016)

Volunteer Experience

NJDEP ENSP Venomous Snake Response Team

NJDEP ENSP | Various Counties, NJ

Participated in the venomous snake removal service provided by the NJDEP ENSP. This project entails the capture and relocation of timber rattlesnakes and northern copperheads off of private and public properties at the land owner's request to nearby suitable habitat. The team consists of volunteer members who have been trained in capturing and re-locating nuisance snakes by the NJDEP ENSP.

Kittatinny Mountain Raptor Research Station

NJDEP ENSP | Sussex County, NJ

Assisted with raptor migration studies and raptor banding. The project consists of identifying and counting migrating raptors and the capture, banding, documentation, and release of various species.

APPENDIX 4

THREATENED AND ENDANGERED SPECIES INFORMATION

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

Essex and Union counties, New Jersey



Local office

New Jersey Ecological Services Field Office

(609) 646-9310
(609) 646-0352

4 E. Jimmie Leeds Road, Suite 4
Galloway, NJ 08205

http://www.fws.gov/northeast/njfieldoffice/Endangered/consultation.html

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

THERE ARE NO ENDANGERED SPECIES EXPECTED TO OCCUR AT THIS LOCATION.

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Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE.

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"BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle Haliaeetus leucocephalus — Breeds Sep 1 to Jul 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1626

Blue-winged Warbler Vermivora pinus — Breeds May 1 to Jun 30
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Eastern Whip-poor-will Antrostomus vociferus — Breeds May 1 to Aug 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

King Rail Rallus elegans — Breeds May 1 to Sep 5
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8936

Long-eared Owl asio otus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3631

Prairie Warbler Dendroica discolor — Breeds May 1 to Jul 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Red-headed Woodpecker Melanerpes erythrocephalus — Breeds May 10 to Sep 10
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Rusty Blackbird Euphagus carolinus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Wood Thrush Hylocichla mustelina — Breeds May 10 to Aug 31
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

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The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

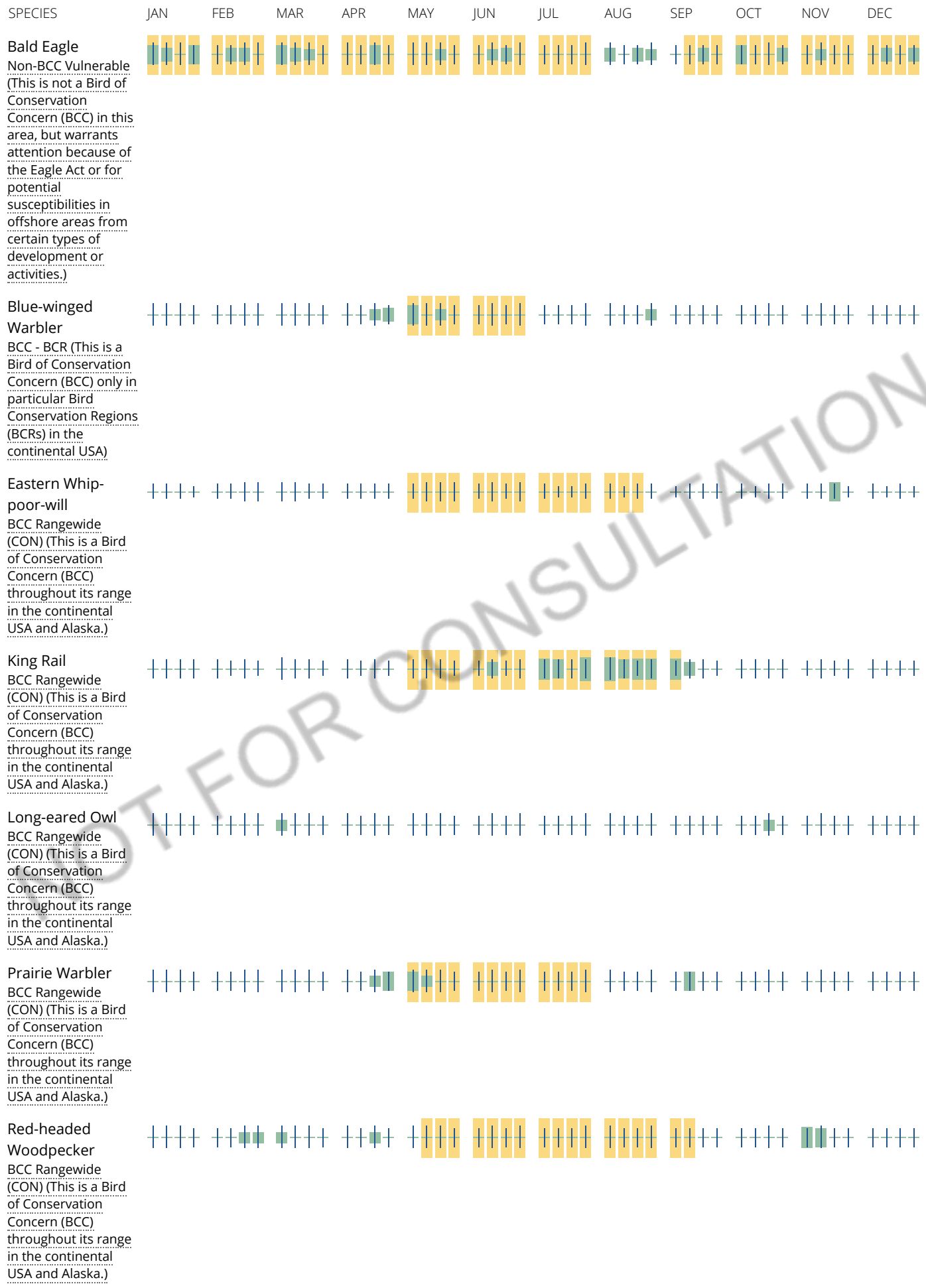
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort – no data

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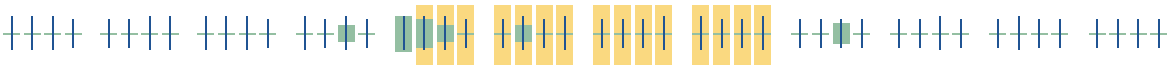


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Rusty Blackbird
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Wood Thrush
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds

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guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or

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minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

ESTUARINE AND MARINE DEEPWATER

- E1UBLx
- E1UBL
- E1UBLx6

ESTUARINE AND MARINE WETLAND

- E2EM5P6
- E2EM5P
- E2EM1Nx
- E2EM1P

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E2EM1N
E2USNx
E2USN

FRESHWATER EMERGENT WETLAND

PEM5R
PEM1E
PEM1R
PEM1Fx
PEM1A
PEM1C

FRESHWATER FORESTED/SHRUB WETLAND

PSS1E

FRESHWATER POND

PUBVx
PUBHx
PUSC

RIVERINE

R1UBVx
R3UBH
R2UBHx
R5UBH

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

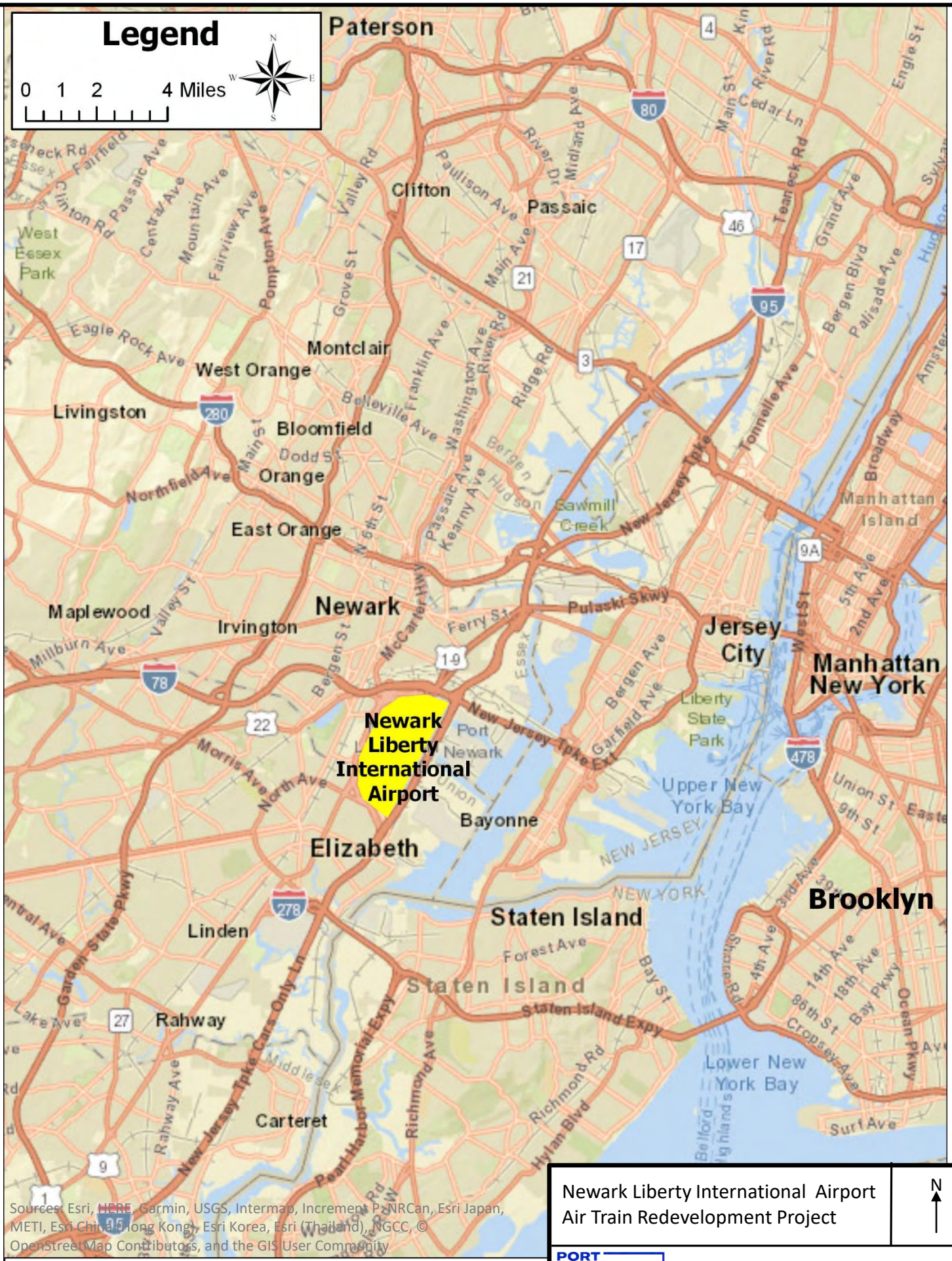
Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

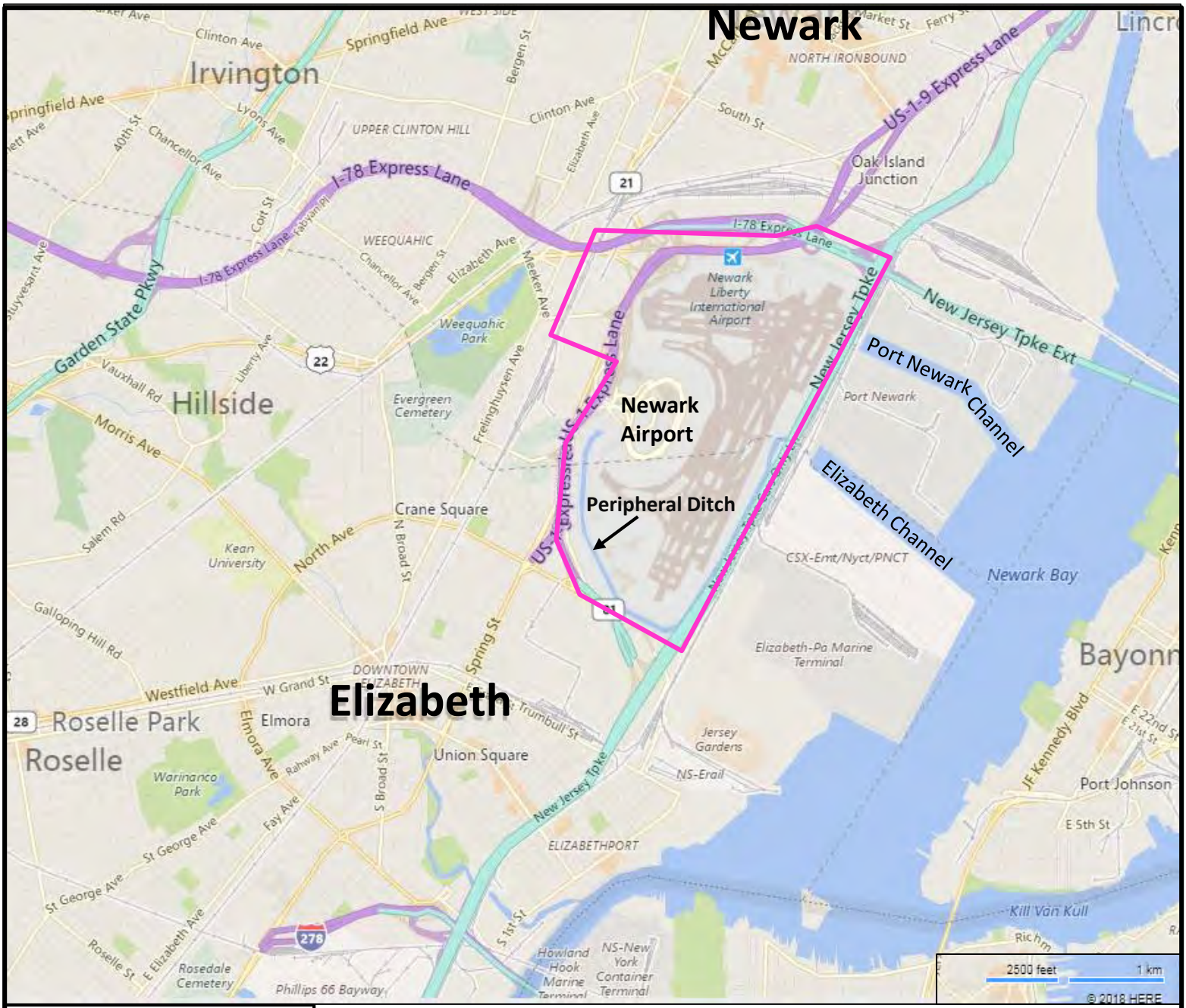
Data precautions

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Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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Legend
0 1 2 4 Miles
Paterson
Clifton
Passaic
Montclair
West Orange
Livingston
Bloomfield
Orange
East Orange
Maplewood
Irvington
Newark
Newark Liberty International Airport
Port Newark
Elizabeth
Bayonne
Jersey City
Manhattan New York
Brooklyn
Staten Island
Linden
Rahway
Carteret
Liberty State Park
Upper New York Bay
Lower New York Bay
Surf Ave
Newark Liberty International Airport
Air Train Redevelopment Project
N
Sources: Esri, HERE, Garmin, USGS, Intermap, Increment P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap Contributors, and the GIS User Community
Map 1-1 : Regional Location Map
B-189
PORT AUTHORITY NY NJ
AIR LAND RAIL SEA



Approximate Site Boundary

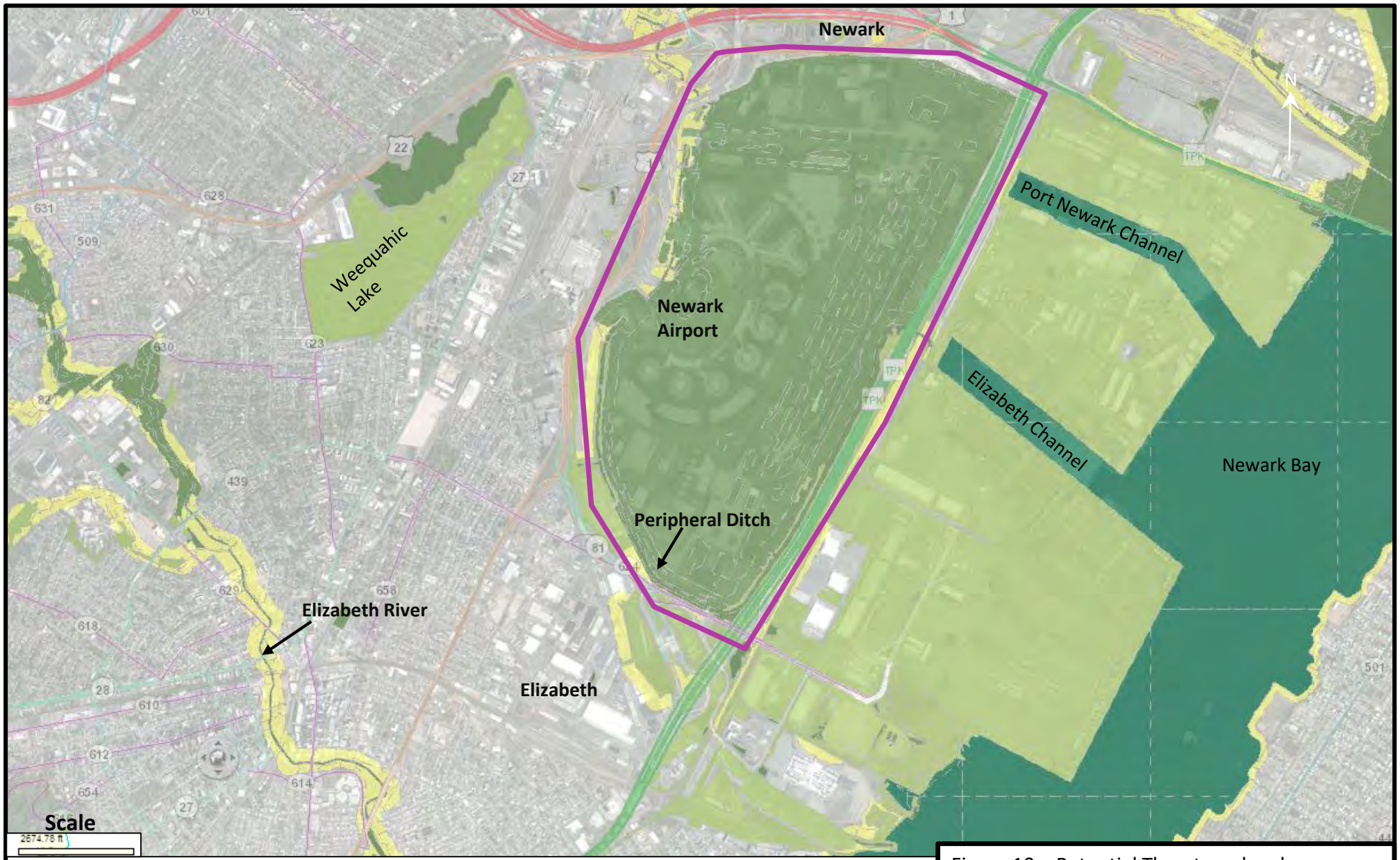
Figure 2 – Street Map

Newark Liberty International Airport
Air Train Replacement Project

N

PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

B-190



Rank 1 – Habitat Specific Requirements
Rank 2 – Special Concern
Rank 3 – State Threatened
Rank 4 – State Endangered
Ranke 5 – Federal Listed

Approximate Site Boundary

Figure 10 – Potential Threatened and Endangered Protected Species Map

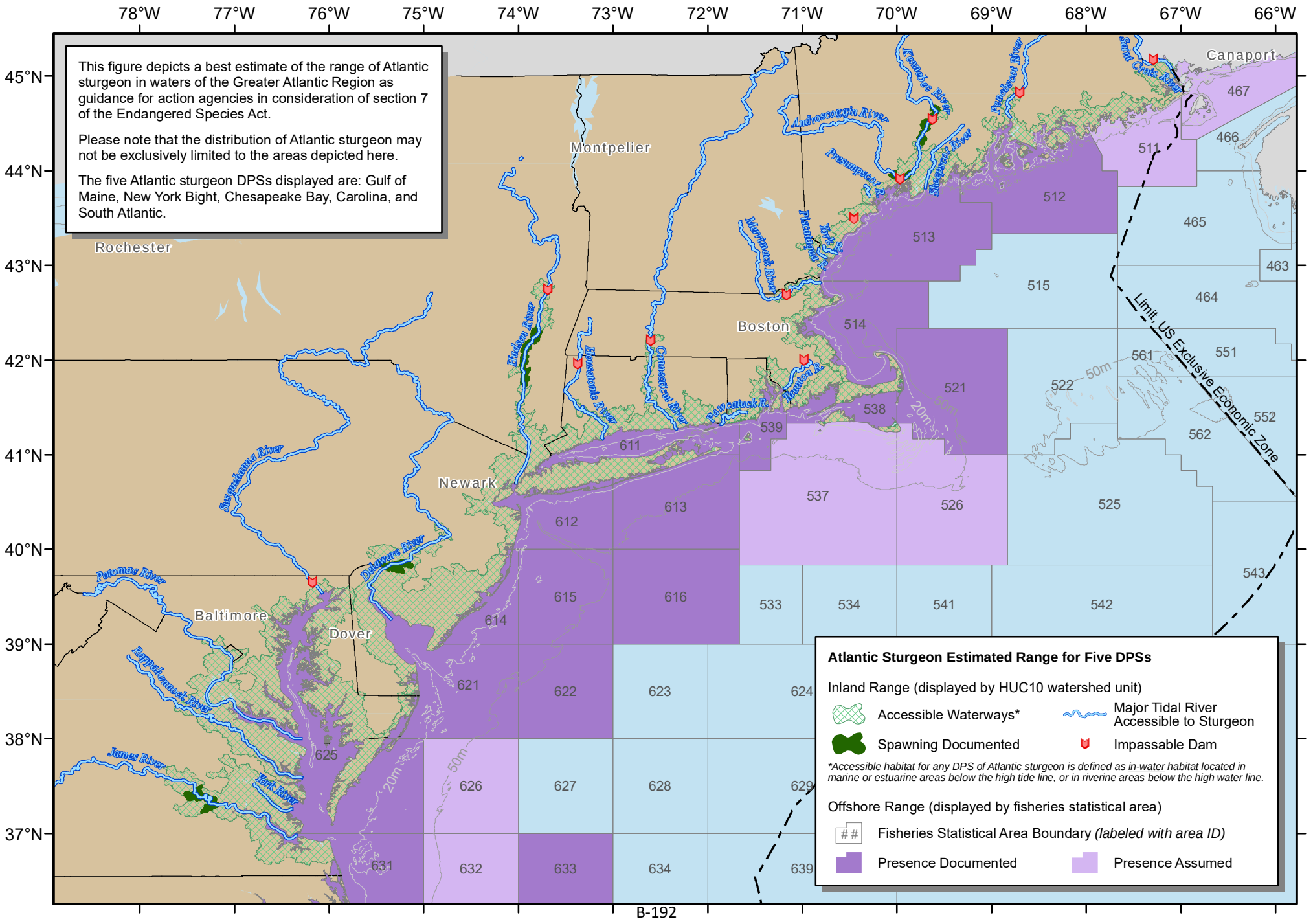
Newark Liberty International Airport
Air Train Replacement Project

N

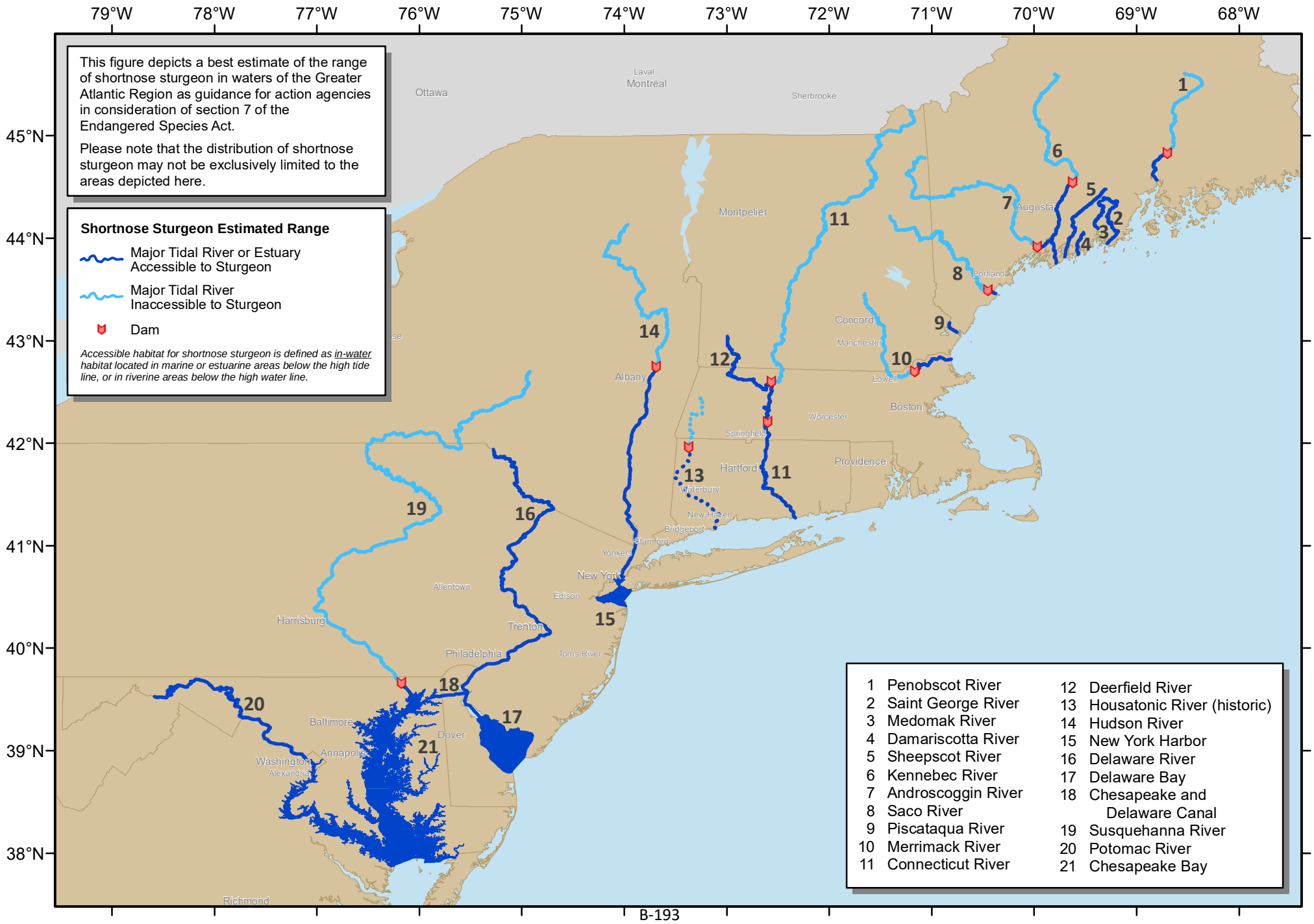
PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

P-191

Estimated Range of Atlantic Sturgeon Distinct Population Segments (DPSs)

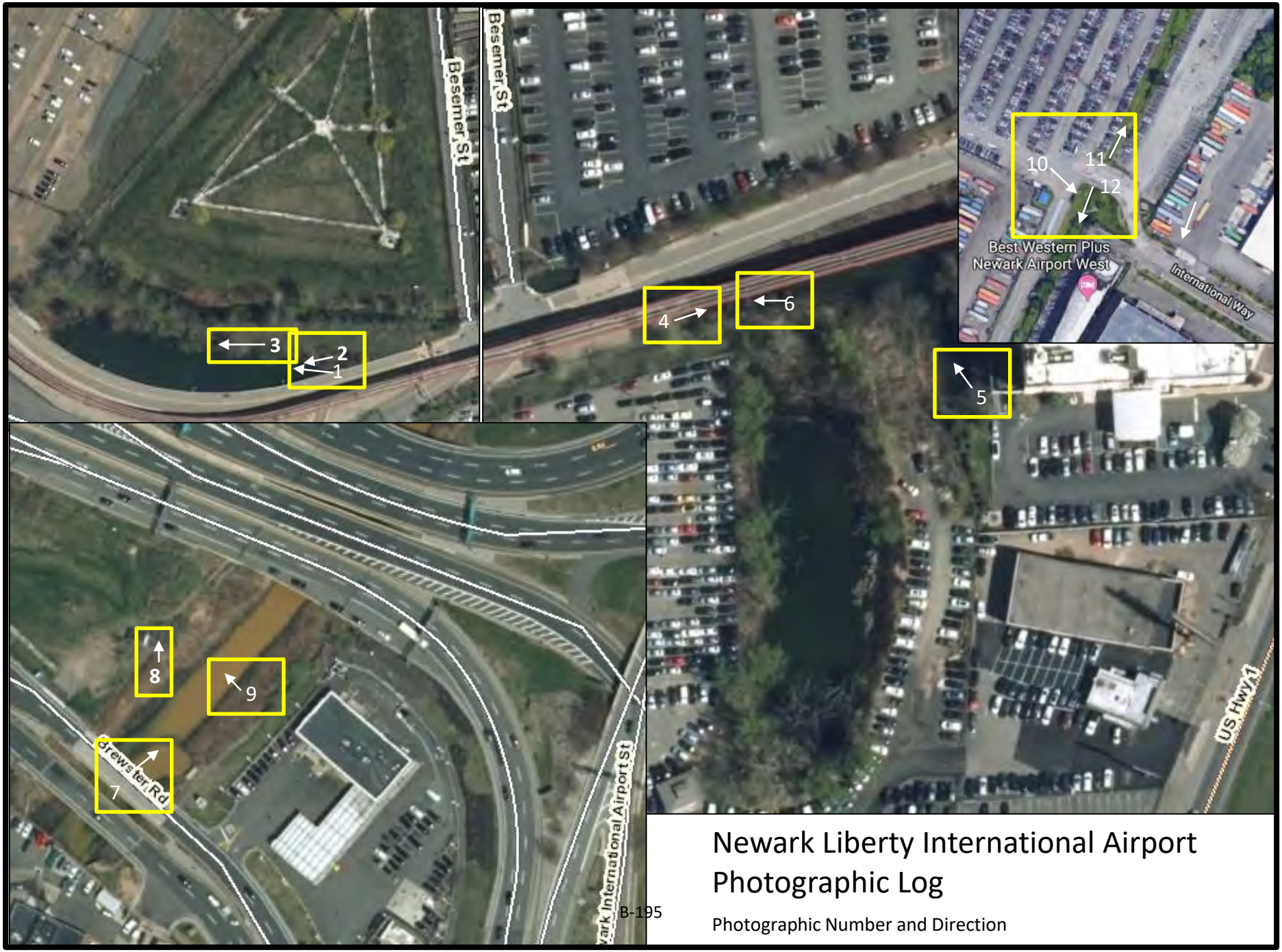


Estimated Range of Shortnose Sturgeon



APPENDIX 5

SITE PHOTOGRAPHS



Newark Liberty International Airport
Photographic Log

Photographic Number and Direction

THE PORT AUTHORITY
OF NEW YORK & NEW JERSEY

PHOTOGRAPHIC LOG

Client Name: **PORT AUTHORITY OF NEW YORK & NEW JERSEY**
Site Location: **NEWARK LIBERTY INTERNATIONAL AIRPORT**
Project Number: **28618-0000308.00**

***Photo Number*:**
1

Date:
1/31/2018

Description: Photograph of Wetland Boundary Flag A6 facing retaining wall.



THE PORT AUTHORITY
OF NEW YORK & NEW JERSEY

PHOTOGRAPHIC LOG

Client Name: **PORT AUTHORITY OF NEW YORK & NEW JERSEY**
Site Location: **NEWARK LIBERTY INTERNATIONAL AIRPORT**
Project Number: **28618-0000308.00**

***Photo Number*:**
2

Date:
1/31/2018

Description: Overview of Wetland Boundary Line A.



THE PORT AUTHORITY
OF NEW YORK & NEW JERSEY

PHOTOGRAPHIC LOG

Client Name: **PORT AUTHORITY OF NEW YORK & NEW JERSEY**
Site Location: **NEWARK LIBERTY INTERNATIONAL AIRPORT**
Project Number: **28618-0000308.00**

Photo Number:

3

Date:

1/31/2018

Description: Photograph near Wetland Boundary Flag NV5 A10 SB-3.



THE PORT AUTHORITY
OF NEW YORK & NEW JERSEY

PHOTOGRAPHIC LOG

Client Name: **PORT AUTHORITY OF NEW YORK & NEW JERSEY**
Site Location: **NEWARK LIBERTY INTERNATIONAL AIRPORT**
Project Number: **28618-0000308.00**

Photo Number:

4

Date:

1/31/2018

Description: Overview of Wetland Boundary Line B area.



THE PORT AUTHORITY
OF NEW YORK & NEW JERSEY

PHOTOGRAPHIC LOG

Client Name: **PORT AUTHORITY OF NEW YORK & NEW JERSEY**
Site Location: **NEWARK LIBERTY INTERNATIONAL AIRPORT**
Project Number: **28618-0000308.00**

***Photo Number*:**
5

Date:
1/31/2018

Description: Photograph near Wetland Boundary Flag NV5 B2 SB-2.



THE PORT AUTHORITY
OF NEW YORK & NEW JERSEY

PHOTOGRAPHIC LOG

Client Name: **PORT AUTHORITY OF NEW YORK & NEW JERSEY**
Site Location: **NEWARK LIBERTY INTERNATIONAL AIRPORT**
Project Number: **28618-0000308.00**

Photo Number:
6

Date:
1/31/2018

Description: Photograph near Wetland Boundary Flag NV5 B20 SB-3.



B-201

THE PORT AUTHORITY
OF NEW YORK & NEW JERSEY

PHOTOGRAPHIC LOG

Client Name: **PORT AUTHORITY OF NEW YORK & NEW JERSEY**
Site Location: **NEWARK LIBERTY INTERNATIONAL AIRPORT**
Project Number: **28618-0000308.00**

Photo Number:
7

Date:
2/01/2018

Description: Partial overview of Wetland Boundary Line C and D.



THE PORT AUTHORITY
OF NEW YORK & NEW JERSEY

PHOTOGRAPHIC LOG

Client Name: **PORT AUTHORITY OF NEW YORK & NEW JERSEY**
Site Location: **NEWARK LIBERTY INTERNATIONAL AIRPORT**
Project Number: **28618-0000308.00**

***Photo Number*:**
8

Date:
2/06/2018

Description: Photograph of Wetland Boundary Flag D8 facing upland.



THE PORT AUTHORITY
OF NEW YORK & NEW JERSEY

PHOTOGRAPHIC LOG

Client Name: **PORT AUTHORITY OF NEW YORK & NEW JERSEY**
Site Location: **NEWARK LIBERTY INTERNATIONAL AIRPORT**
Project Number: **28618-0000308.00**

***Photo Number*:**
9

Date:
2/06/2018

Description: Photograph near Wetland Boundary Flag C11 facing channel toward wetland.



THE PORT AUTHORITY
OF NEW YORK & NEW JERSEY

PHOTOGRAPHIC LOG

Client Name: **PORT AUTHORITY OF NEW YORK & NEW JERSEY**
Site Location: **NEWARK LIBERTY INTERNATIONAL AIRPORT**
Project Number: **28618-0000308.00**

***Photo Number*:**
10

Date:
6/2018

Description: Recently constructed underground stormwater diversion structure near Best Western Hotel.



THE PORT AUTHORITY
OF NEW YORK & NEW JERSEY

PHOTOGRAPHIC LOG

Client Name: **PORT AUTHORITY OF NEW YORK & NEW JERSEY**
Site Location: **NEWARK LIBERTY INTERNATIONAL AIRPORT**
Project Number: **28618-0000308.00**

Photo Number:
11

Date:
6/2018

Description: Recently expanded water course near Best Western Hotel. Looking north.



THE PORT AUTHORITY
OF NEW YORK & NEW JERSEY

PHOTOGRAPHIC LOG

Client Name: **PORT AUTHORITY OF NEW YORK & NEW JERSEY**
Site Location: **NEWARK LIBERTY INTERNATIONAL AIRPORT**
Project Number: **28618-0000308.00**

***Photo Number*:**
12

Date:
6/2018

Description: Recently expanded water course near Best Western Hotel. Looking south.



APPENDIX 6

QUALIFICATION OF PREPARERS

ORIELAN HARRINGTON

Principal Environmental Specialist

Education B.S. Environmental Science, 1994, Cook College, Rutgers University
Memberships Society of Wetlands Scientists

Ms. Harrington is an environmental professional with 20 years of experience in site feasibility and environmental assessment. She is experienced in and responsible for conducting wetland assessments and delineations, socioeconomic studies, environmental impact studies, wetland mitigation planning, and threatened and endangered species surveys. Ms. Condeelis is competent and experienced in performing environmental site assessments and constraints analysis, which often includes permitting and coordination with local, state and federal environmental agencies. As such, she is very familiar with state and federal wetland regulations and is experienced in the preparation of various state and federal permit applications, and environmental clearance documents (NEPA, CEs and EAs) including freshwater wetlands individual permits, general permits, Letter of Interpretation requests, transition area waivers, and ACOE Section 404 permits for a variety of projects throughout New Jersey and New York. She has also prepared CAFRA permits and modifications, Pinelands applications, and waterfront development permit applications.

SCOTT ANGUS

Senior Environmental Specialist

Education Ecology and Environmental Technology, 1989, Paul Smith's College, Paul Smith's, NY

Specialized Training and Experience

- **USFWS Recognized Qualified List of Bog Turtle Surveyors** in all of the states in the northern range PA, NJ, NY, DE, MD and the Hudson/Housatonic Drainage Recovery Unit (NJ, NY, MA, CT).
- **USFWS Recognized Qualified List of Bog Turtle Surveyors** (Phase I Surveys) in the NY Prairie Peninsula/Lake Plain Recovery Unit (Lake Ontario, Finger Lakes and Northwestern NY state).
- **Pre-Qualified Venomous Snake Monitor - NJDEP**
- **Qualified Turtle Surveyors** list of MassWildlife.
- Approved to conduct surveys for the State Endangered **Northern Cricket Frog** by the NY State Department of Conservation (NYDEC).

Memberships Northeastern Partners for Amphibian and Reptile Conservation (Sr. Co-chair)

Association of Northeastern Biologists
Association of Southeastern Biologists
Partners for Amphibian and Reptile Conservation (National Joint Steering Committee)
Board of Directors Friends of the Wallkill River National Wildlife Refuge

Mr. Angus possesses over 23 years of extensive experience performing freshwater and coastal wetland assessments and delineations, writing the subsequent reports and/or federal or state permits. Mr. Angus is experienced with wetland delineations following both the USACE 1987 Wetland Delineation Manual and the 1989 Wetland Manual. Mr. Angus is highly experienced with the flora and fauna of the

NJ Pinelands and the NJ Coastal Plain. Mr. Angus has been responsible for the performance and oversight of various state and federal permit applications, ecological studies and field surveys. Mr. Angus has contributed to the preparation of NEPA documents, including Categorical Exclusions, Environmental Assessments, and Environmental Impact Statements; and preparation of Environmental Assessments in accordance with NJ Executive Order 215. Mr. Angus has written or contributed to freshwater wetlands individual permits, general permits, Letter of Interpretation Application requests, transition area waivers, and ACOE Section 404 permits for a variety of projects throughout New Jersey, New York and Pennsylvania.

In addition to his wetland experience, Mr. Angus has over 28 years of professional experience conducting Threatened and Endangered Species Surveys throughout the northeast for both plant, avian and herptile species. He has particular expertise within his current concentration on listed reptile and amphibian species, especially bog and wood turtles, copperheads and timber rattlesnakes and declining frog species. Mr. Angus has professionally performed the entire spectrum of projects and services with regards to bog turtles including although not limited to Phase I, Phase II and Phase III (Trapping) surveys, written Habitat Management Plans, applied habitat management techniques, radio telemetry, formal and informal consultation with the USFWS under the Endangered Species Act of 1973 as well as State regulatory agencies.

JAMI LUCKHARDT

Environmental Specialist

Education	B.S., Biology, Minor Chemistry, Montclair State University (2009) M.S., Biology with concentration in Ecology and Evolution, Montclair State University (2016)
Certifications	Rutgers University Wetland Delineation Certificate Series Field Techniques and Current Topics in Wildlife Biology
Training	OSHA 40-Hour Hazardous Waste Operations & Emergency Resp. (HAZWOPER) Rutgers University Vegetation Identification for Wetland Delineation South Rutgers University Methodology for Wetland Delineation

Ms. Luckhardt has 4 years of ecological experience in Ecological Assessments, Estuarine and Marine Ecological Surveys, and Aquatic and Hydrophytic Vegetation Identification and Control. Her day to day environmental job responsibilities include: interfacing with clients, contractors, consultants, and regulatory agencies; preparation of reports; and providing extensive technical assistance.

PATRICK MCHUGH, PWS

Supervising Environmental Specialist

Education ***BA Environmental Studies, 1986, Ramapo College of New Jersey***
Graduate coursework in Wetlands Ecology, University of North Carolina, Wilmington,
Memberships ***Atlantic Estuarine Research Society***
Certifications ***Professional Wetland Scientist, Society of Wetland Scientists***

Mr. McHugh responsible for overseeing wetland assessments and delineations; preparation of NEPAcategorical exclusions, environmental assessments/environmental impact statements, hazardous material screenings and environmental impact studies; wetland mitigation planning, design, and monitoring; and social and economic justification and environmental justice studies. With respect to wetland delineation, Mr. McHugh is very experienced in and has utilized the three-parameter methodology adopted by the Corps of Engineers as set forth in the in the USACE 1987 Wetland Delineation Manual and the 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands. With over 28 years of professional experience, he is also very familiar with state and federal wetland regulations and is experienced in the preparation of various state and federal permit applications. He has prepared NEPA documents, freshwater wetlands individual permits, general permits, Letter of Interpretation requests, transition area waivers, and ACOE Section 404 permits for a variety of projects throughout New York, New Jersey, and Pennsylvania. He has also prepared NJDEP CAFRA permits and modifications, Pinelands applications, and NJDEP Waterfront Development permits and has conducted endangered plant species surveys.

Appendix C

Appendix C: Air Quality Technical Report, April 2021, prepared by Paul Carpenter Associates, Inc.

PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

Newark Liberty International Airport (EWR)
AirTrain Replacement Program

APPENDIX C
AIR QUALITY TECHNICAL REPORT

April 5, 2021

Prepared By:

Paul Carpenter Associates, Inc.
7 Columbia Turnpike, Suite 101
Florham Park, NJ 07932

AVI-15-032

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EXECUTIVE SUMMARY

This Air Quality Technical Report provides methodologies and assumptions which formed the basis of the air quality assessment performed for the Newark Liberty International Airport (EWR) AirTrain Replacement Program. Air quality analyses detailed herein were performed in accordance with Federal Aviation Administration (FAA) Guidelines for compliance with the National Environmental Policy Act (NEPA) and supports the Environmental Assessment (EA) submitted for this project.

Newark Liberty International Airport (Airport) is located within an ozone (O_3) nonattainment and carbon monoxide and fine particulate matter smaller than or equal to 2.5 micrometers ($PM_{2.5}$) maintenance area and attainment for all other criteria pollutants established within the United States Environmental Protection Agency (EPA) National Ambient Air Quality Standards (NAAQS). Federally funded projects located in nonattainment/maintenance areas are subject to the General Conformity provisions of the Clean Air Act (CAA) and must demonstrate that the action conforms (i.e., does not interfere) with the state's plan (State Implemental Plan or SIP) to attain and maintain NAAQS. EPA established emission "*de minimis"* thresholds in order to determine whether general conformity requirements would be applicable. While there are no NAAQS established for greenhouse gases (GHGs), there are applicable regulations under the CAA. As such, GHG emissions were assessed in order to provide information necessary to make informed decisions regarding climate change impacts.

The Proposed Action involves a new AirTrain system including stations, pedestrian bridges, and a new Maintenance and Control Facility (MCF) at the northern terminus. The construction and implementation of the proposed replacement AirTrain system and its components would result in a loss of 1,095 parking spaces from surrounding surface parking lots. These lots are primarily used by airline employees who work within the Central Terminal Area (CTA). The combined capacity of surrounding surface parking lots (5,860 spaces) exceed demand (3,786 spaces). Therefore, airline employees will not be displaced due to the loss of parking spaces (1,095) associated with the Proposed Action since adequate surplus is available (2,074 spaces). In addition, supplemental busing is necessary to transport overflow riders from the Rail Link Station to various locations at the Airport beginning in 2022 when the system is expected to reach capacity until the new AirTrain system is implemented. Construction of the Proposed Action would result in construction-related emissions resulting from off road construction equipment and fugitive dust from site preparation, land clearing, material handling and demolition activities as well as on road vehicles such as concrete/material delivery/haul trucks and contractors' commuting vehicles traveling to/from the site .

Emissions associated with the Proposed Action were assessed for each affected year from 2022 through 2026, and the planning horizon year of 2031. The only emission source associated with the No Action Alternative included supplemental busing to support the AirTrain overcrowded condition beginning in 2022. As a general conformity requirement provision of the CAA, the annual net difference in emissions of nonattainment or maintenance pollutants was compared to the applicable *de minimis* thresholds. The annual net difference in emissions was calculated by subtracting the total operational and construction-related emissions of the No Action Alternative from the Proposed Action Alternative for each calendar year. The analysis performed demonstrated that the Proposed Action Alternative does not exceed *de minimis* thresholds and therefore presumed to conform to the SIP.

INTRODUCTION

The Port Authority of New York and New Jersey (PANYNJ) Newark Liberty International Airport AirTrain Replacement Program requires estimation of air emissions that are reasonably foreseeable from both operational and construction-related sources. This Air Quality Technical Report addresses both United States Environmental Protection Agency's (EPA) Clean Air Act (CAA) and the National Environmental Policy Act of 1969 (NEPA) air quality requirements as well as provides detailed information regarding methodologies, assumptions and results in accordance with Federal Aviation Administration (FAA) Order 5050.4B, NEPA Implementing Instructions for Airport Actions; FAA Order 10501F, Policies and Procedures for Considering Environmental Impacts; and FAA Environmental Desk Reference for Airport Actions, Chapter 1. Air Quality.

The PANYNJ is committed to providing transportation, terminal and other facilities of commerce while incorporating environmental policies that address sustainability initiatives, particularly climate change. Greenhouse gases (GHGs) threaten public health and welfare and are known to contribute to the effects of climate change. Fossil fuel combustion is the principal source of GHGs. Since the Proposed Action involves changing surface transportation elements associated with the Newark Liberty International Airport (Airport), this Air Quality Technical Report also provides GHG estimates. Pursuant to FAA Order 1050.1F, a GHG assessment has been included to assist with providing information necessary to make informed decisions regarding climate change impacts.

AIR QUALITY REGULATIONS

Criteria Pollutants

The federal CAA requires the EPA to establish, and periodically review, National Ambient Air Quality Standards (NAAQS) to protect public health, welfare and the environment. Current NAAQS are established for carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), lead (Pb), sulfur dioxide (SO_2), inhalable particulate matter smaller than or equal to 10 micrometers (PM_{10}) and fine particulate matter smaller than or equal to 2.5 micrometers ($PM_{2.5}$). These pollutants are commonly known as "criteria pollutants". NAAQS are divided into two types of criterion: primary standards to protect the public health with an adequate margin of safety and secondary standards to protect the public welfare from any known or anticipated adverse effect of a pollutant (e.g. soiling, vegetation damage, material corrosion). Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, or micrograms per cubic meter of air (μg/m3). The current NAAQS are shown in **Table C-1**.

Table C-1. EPA National Ambient Air Quality Standards

POLLUTANT	AVERAGING PERIOD	PRIMARY NAAQS	SECONDARY NAAQS
Carbon Monoxide (CO)	1 hour 8 hour	35 ppm 9 ppm	- -
Ozone (O_3)[1]	8 hour	0.070 ppm	0.070 ppm
Nitrogen Dioxide (NO_2)	Annual 1 hour	53 ppb 100 ppb	53 ppb -
Lead (Pb)	Rolling 3 month Average	0.15 μg/m^3	0.15 μg/m^3
Sulfur Dioxide (SO_2)	3 hour 1 hour	- 75 ppb	0.5 ppm -
Inhalable Particulates (PM_{10})	24 hour	150 μg/m^3	150 μg/m^3

POLLUTANT	AVERAGING PERIOD	PRIMARY NAAQS	SECONDARY NAAQS
Fine Particulates ($PM_{2.5}$)	24 hour Annual	35 μg/m³ 12 μg/m³	35 μg/m³ 15 μg/m³

[1] – Final rule effective December 28, 2015; EPA revised primary and secondary O_3 standards from 0.075 to 0.070 ppm. Revocation of the 2008 standards and transitioning to the current standards will occur over the next several years.
Note: '-' indicates no standard established
Source: https://www.epa.gov/criteria-air-pollutants/naaqs-table

Areas are assigned designations associated with their compliance with each of the NAAQS. Areas with levels of criteria air pollutants that are equal to or below the NAAQS are designated "attainment"; areas with levels of criteria air pollutants that exceed a NAAQS are designated as "nonattainment"; and areas that once were designated as "nonattainment" but now are in compliance with the NAAQS and are subject to a maintenance plan are designated as "maintenance". Newark Liberty International Airport (Airport) is located in Essex and Union counties, which are designated as in attainment for NO_2, Pb, SO_2, and PM_{10}; nonattainment for O_3; and maintenance for CO and $PM_{2.5}$. Nonattainment areas can have various degrees with which they exceed the NAAQS; the Airport is located in an area designated as serious nonattainment with regard to the 2008 8-hour O_3 NAAQS. Nitrogen oxides (NO_x) and volatile organic compounds (VOCs), referred to as O_3 precursors, react in the presence of sunlight and heat to form ground level O_3.

The Clean Air Act Amendments of 1990 (CAAA) require federal agencies to ensure that proposed federal actions in nonattainment or maintenance areas conform (i.e., do not interfere) with the state's plan to attain and maintain NAAQS (such plan known as a State Implementation Plan, or SIP). This is known as the "general conformity" provision of the CAA. Because the Proposed Action is located within an O_3 nonattainment and CO and $PM_{2.5}$ maintenance areas, the Airport must demonstrate that the Proposed Action conforms with New Jersey's SIP. FAA actions for airport improvements are subject to General Conformity Rule (GCR) promulgated on November 30, 1993, with recent revisions listed within 40 CFR 93 Subpart B.

Recognizing that the vast majority of federal actions do not result in a significant increase in emissions, the EPA has established emissions thresholds below which a proposed federal action is deemed to conform and for which general conformity requirements are not applicable. These thresholds are commonly knowns as "*de minimis* thresholds". An applicability analysis is completed to determine whether a project is subject to General Conformity. In the analysis, the annual net difference in emissions of nonattainment or maintenance pollutants are compared to the applicable *de minimis* thresholds. The annual net difference in emissions is calculated by subtracting the total operational and construction-related emissions of the No Action Alternative from the Proposed Action Alternative for each calendar year. Proposed projects that do not exceed *de minimis* thresholds are presumed to conform to a SIP. **Table C-2** presents *de minimis* thresholds applicable for the Airport.

Table C-2. General Conformity Rule De Minimis Thresholds for EWR

POLLUTANT	*DE MINIMIS* THRESHOLDS (Tons/Year)
CO	100
NO_x (O_3 Precursor)	50
VOC (O_3 Precursor)	50
$PM_{2.5}$	100

Source: 40 C.F.R. Section 93.153(b)(1)

As set forth in Federal Aviation Administration Order 1050.1F, a proposed action would have a significant impact on air quality if "the action would cause pollutant concentrations to exceed one or more of the NAAQS, as established by the EPA under the Clean Air Act, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations." Under NEPA, an emission estimate for each reasonable alternative is required.

Greenhouse Gases

Greenhouse gases (GHGs) trap heat in the earth's atmosphere. Main GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases (e.g. hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride. In 2009, EPA found that current and projected concentrations of the six main GHGs – CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6 – in the atmosphere threaten public health and welfare of current and future generations, and that emissions of GHGs contribute to the greenhouse gas pollution. There are several anthropogenic sources known to contribute to the effects of climate change. Fossil fuel combustion is the principal source of GHGs.

GHGs are regulated pollutants under the CAA, however there are no NAAQS established. FAA Order 1050.1F includes Climate on the list of environmental resource categories that must be considered in NEPA documents. Therefore, in keeping with FAA Order 1050.1F, GHG emissions are estimated for the No Action Alternative, which provides the baseline of existing GHG emissions in the study area, as well as the Proposed Action alternative.

EXISTING CONDITIONS

Each of the criteria pollutants for which ambient air quality standards have been set is monitored on a continuous basis throughout the State of New Jersey by the New Jersey Department of Environmental Protection (NJDEP). Major objectives of monitoring air quality are to provide an early warning system for pollutant concentrations, assess air quality in light of public health and welfare standards, as well as track trends or changes in these pollutants levels. NJDEP monitoring data is available in an annual report entitled 2018 New Jersey Air Quality Report. **Table C-3** includes the closest and most representative ambient air quality data for each criteria pollutant monitored by NJDEP from the 2018 New Jersey Air Quality Report, which is the latest available report.

Table C-3. Existing Ambient Air Quality Monitoring Data;
(Newark Firehouse, 360 Clinton Avenue; Essex County)

POLLUTANT	AVERAGING PERIOD	CONCENTRATION
CO[1]	1-hour 8-hour	2.6 ppm 1.7 ppm
O_3[2]	8-hour	0.067 ppm
NO_2[3]	Annual 1-hour	14 ppb 55 ppb
Pb[4]	3 months	.003 μg/m^3
SO_2[5]	1-hour	3 ppb
PM_{10}[6]	24-hour	40 μg/m^3
$PM_{2.5}$[7]	24-hour Annual	19 μg/m^3 8.4 μg/m^3

POLLUTANT	AVERAGING PERIOD	CONCENTRATION

Notes:

1. *CO data corresponds to the second-highest maximum value.*
2. *O_3 data corresponds to the three-year average value of the fourth-highest maximum eight-hour concentration, consistent with the statistical form in the NAAQS. The three-year average is based on the last three years of monitored data (2016 to 2018).*
3. *The monitored one-hour value is based on a three-year average (2016 to 2018) of the 98th percentile of daily maximum one-hour average concentrations.*
4. *Pb data corresponds to the maximum rolling three-month average over a three-year period.*
5. *SO_2 one-hour value is based on a three-year average of the 99th percentile of the annual distribution of daily maximum one-hour average concentrations.*
6. *24-hour PM_{10} value is based on the maximum over a three-year period.*
7. *24-hour $PM_{2.5}$ data is representative of the 98th percentile 24-hour concentration averaged over three years, consistent with the statistical form in the NAAQS. The annual $PM_{2.5}$ data is representative of the average of three consecutive annual means (2016-2018).*

Source: NJDEP, 2018 New Jersey Air Quality Report.

ANALYSIS SCENARIOS

Pursuant to FAA 1050.1f, a significant air quality impact would occur if a proposed project caused pollutant concentrations to exceed one or more of the NAAQS for any of the time periods analyzed or increased the frequency or severity of any such existing violations. Attaining and maintaining NAAQS is achieved by demonstrating that operational and construction-related emissions are below the General Conformity Rule *de minimis* thresholds for criteria pollutants. In addition, conformance with NEPA is accomplished by disclosing the project-related emissions associated with the Proposed Action.

No Action Alternative

The existing AirTrain system will reach capacity in Year 2022. Therefore, supplemental busing will need to be implemented to provide overflow riders access to/from the Rail Link Station and several Airport locations. Various bus route combinations have been considered to best serve the AirTrain riders. Two routes are currently planned for use in support of the existing AirTrain when supplemental busing becomes necessary: one bus route will transport riders to/from the Rail Link Station and Terminal One; while the second bus route will transport riders to/from the Rail Link Station, Terminal B, Terminal C and the P4 parking garage. The number of buses bound for Terminal One is estimated to remain consistent during all affected years. However, the number of buses necessary for the bus route bound for Rail Link Station, Terminal B, Terminal C and the P4 parking garage is expected to increase with demand between Years 2022 and 2031. Operational emissions associated with supplemental transit busing to meet the system needs will be necessary beginning in Year 2022 coinciding with the anticipated year of AirTrain overcapacity. The transit bus fleet was assumed to operate with ten percent electric and ninety percent diesel-powered engines. No construction would occur under the No Action Alternative; therefore, no construction emissions would result.

Proposed Action Alternative

The entire system powering the new AirTrain propulsion and guideway heating will be electric-powered, and therefore no operational emissions will result from the proposed replacement AirTrain. Each proposed station will continue to utilize electric power for escalator, elevator and door operations and gas-fueled heating/cooling systems, as under the existing condition. The new MCF building (55,881 ft^2) is smaller than the existing MCF building (66,880 ft^2) and will continue to utilize electric power and gas-fueled heating/cooling systems, as under the existing condition.

Operational emissions from supplemental busing for AirTrain overflow riders during construction and testing of the proposed replacement AirTrain (i.e., 2022 through January 30, 2026) were estimated. However,

operational emission reductions have been estimated for the supplemental busing after January 30, 2026, coinciding with "revenue service" of the new AirTrain system, since supplemental busing will no longer be necessary. The supplemental busing emission reductions estimated for analysis years 2026 and 2031 were based on the transit bus volumes assumed under the No Action Alternative analysis for those years.

Construction-related emissions as a result of off road construction equipment and fugitive dust from site preparation, land clearing, material handling and demolition activities as well as on road vehicles such as concrete/material delivery/haul trucks and contractors' commuting vehicles traveling to/from the site were estimated. As part of the project, all nonroad diesel-powered construction equipment equal to, or greater than, 100 horsepower (hp) will be equipped with engines meeting Tier 4 Final engine standards. Additionally, seventy percent of all nonroad construction diesel-powered construction equipment less than 100 hp will be equipped with engines meeting Tier 4 Final engine standards. The remaining thirty percent of nonroad construction diesel-powered construction equipment less than 100 hp may include Tier 0 to 3 engine standards. Construction-related emissions for the Proposed Action are estimated for each affected year from 2022 through 2026, except 2025 when the new AirTrain system will be tested. In addition, emissions were calculated for the planning horizon year of 2031.

To meet the requirements of the General Conformity Rule of the CAA, changes in emissions caused by the Proposed Action requires a comparison to the applicable *de minimis* thresholds. Emissions associated with the No Action Alternative are subtracted from the Proposed Action and total net emissions are then subsequently compared to the *de minimis* thresholds. Projects that do not exceed *de minimis* thresholds do not require a conformity determination.

The air quality assessment was accomplished using the latest version of models and databases for evaluating airport projects analyzed under CAA and NEPA. The addition and reduction in emission sources and description of emission sources, their respective modeling approach and affected years are summarized in **Table C-4**.

Table C-4. Air Emissions Analysis Scenarios

EMISSION SOURCE		EMISSION SOURCE DESCRIPTION	AFFECTED YEARS	COMPUTER MODEL(S)
No Action	**Supplemental Busing**	Additional operational emissions due to new transit bus source necessary to support overcrowded existing AirTrain system	2022-2026 and 2031	EPA's MOVES2014b
Proposed Action	**Supplemental Busing**	Additional operational emissions due to new transit bus source necessary to support overcrowded existing AirTrain system during construction until January 30, 2026	2022-2026	EPA's MOVES2014b
		Decrease in operational emissions due to elimination of supplemental busing after January 30, 2026	2026 and 2031	
	Construction	Additional emissions due to construction equipment, fugitive dust, concrete/material delivery/haul trucks and contractor's commuting vehicles traveling to/from the site	2022-2026	EPA's NONROAD2008a/MOVES2014b AP42

COMPUTER MODELING METHODOLOGY

Air quality analyses related to the proposed project addresses both CAA and NEPA requirements. In order to address General Conformity, emission inventories were estimated for both No Action and Proposed Action Alternatives. Detailed information regarding computer modeling methodologies and data input are included below:

MOVES2014b Air Emissions – Transit bus (supplemental buses), passenger truck (contractor vehicles) and short-haul trucks (material and concrete delivery trucks) emissions were computed using EPA's MOVES2014b model for each analysis year. This model calculates emission quantities and emission rates for various vehicle types based on the fuel type, vehicle speeds, vehicle age, road types, and other factors that influence emissions, such as inspection and maintenance programs. The inputs and use of MOVES2014b incorporate the most current guidance available from EPA. In addition, emissions modeling utilized county-specific data provided by North Jersey Transportation Planning Authority (NJTPA). Since the project is physically located in Essex County, county database files specific to Essex County were utilized. Emission rates were developed for transit buses (source type ID 42), passenger trucks (source type ID 31) and combination short-haul trucks (source type ID 61) traveling on urban unrestricted roadways (road type ID 5). In addition, MOVES2014b was executed to calculate off-network (road type ID 1) emission quantities related to cold engine starts of transit buses. Four hours per weekday were used to estimate daily emissions inventories representing AM peak hour (AM), midday (MD), PM peak hour (PM) and overnight (ON). MOVES2014b emissions inventories were evaluated for January, April, July and October to represent four seasons per analysis year. Conservatively, transit buses, passenger trucks and short-haul trucks were assumed to be diesel-powered. MOVES2014b run specifications

are presented in **Table C-5**.

Table C-5. MOVES 2014b Run Specifications

PARAMETER	INPUT
Model	Onroad
Domain/Scale	County
Calculation Type[1]	Emission Rates
Years	2022, 2023, 2024, 2025, 2026, 2031
Months	January, April, July, October
Day	Weekday
Hours	6:00 AM – 7:00 AM, 12:00 – 1:00 PM, 5:00 PM – 6:00 PM, 12:00 AM – 1:00 AM
Region	Zone & Link
State/County	New Jersey – Essex County
Fuels	Diesel Fuel (Transit Bus, Passenger Truck and Combination Short-Haul Truck)
Road Type[1]	Urban Unrestricted Access
Speeds	0 mph, 5 mph, 10 mph, 15 mph
Pollutants and Processes	See Table C-6
Output Mass Units	Grams
Output Distance Units	Miles
Output Emission	Source Use Type

[1] – For cold engine start emissions, Inventory Mode was chosen for Off-Network roadway type

As previously discussed, the study area is designated by the EPA as serious nonattainment area for O_3 and maintenance for CO and $PM_{2.5}$. Therefore, pollutants of concern are CO, $PM_{2.5}$, SO_2 (a $PM_{2.5}$ precursor), and O_3 precursors (NO_x and VOCs). In addition, the GHG analysis was based on FAA guidance and is reported as carbon dioxide equivalent (CO_{2e}), which is comprised of the three primary tracked GHGs: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). CO_{2e} emissions are based on current Global Warming Potential (GWP) values of 1, 25, and 298 for CO_2, CH_4, and N_2O, respectively. CO_{2e} is reported in metric tons. MOVES2014b automatically assigns the appropriate GWP in the rates/emission quantities within output files for onroad vehicles. MOVES2014b was executed for pollutant and pollutant processes presented in **Table C-6** using Essex County database files provided by NJTA listed in **Table C-7**

Table C-6. MOVES2014b Pollutant and Processes

POLLUTANT	POLLUTANT [SUM OF PROCESSES]
CO	CO – Running Exhaust, Crankcase Running Exhaust [1,15]
NO_x	NO_x – Running Exhaust, Crankcase Running Exhaust [1,15]
VOC	Volatile Organic Compounds – Running Exhaust, Evap Permeation, Evap Fuel Vapor Venting, Evap Fuel Leaks, Crankcase Running Exhaust [1,11,12,13,15]
SO_2	SO_2 – Running Exhaust [1]
$PM_{2.5}$	Primary Exhaust $PM_{2.5}$ – Running Exhaust, Crankcase Running Exhaust [1,15] Primary Exhaust $PM_{2.5}$ – Breakwear Particle [9] Primary Exhaust $PM_{2.5}$ – Tirewear Particle [10]

POLLUTANT	POLLUTANT [SUM OF PROCESSES]
PM_{10}	Primary Exhaust PM_{10} – Running Exhaust, Crankcase Running Exhaust [1,15] Primary PM_{10} Breakwear Particle [9] Primary PM_{10} Tirewear Particle [10]
CO_{2e}	CO_2 Equivalent – Running Exhaust [1]

Table C-7. MOVES2014b Database Source for Emission Analyses

INPUTS	DATA SOURCE	DATA FILE NJTP_FY18-21_INPUT_DATA
Age Distribution	Essex County Database; NJTPA	2020_AgeDistribution.csv 2025_AgeDistribution.csv 2031_AgeDistribution.csv
Average Speed Distribution		avgSpeedDistribution.csv
Fuel		34013_Fuel_AVFT_MOVES14a.txt Fuel_Formulation_MOVES14a.txt 34013_FuelSupply.txt 34013_FuelUsageFraction.txt
Inspection / Maintenance Program		34013_IM_Input.csv
Meteorological Data		34013_Meteo.csv
Road Type Distribution		RoadTypeDistribution.xlsx
Source Type Year		SourceTypeYear.xlsx
Vehicle Type VMT		VehicleTypeVMT.xlsx
Vehicle Type Day VMT Fraction		34013_DayFraction.csv
Vehicle Type Hour VMT Fraction		hourVMTFraction.csv
Vehicle Type Month VMT Fraction		34013_2015_MonthVMTFraction.csv

Nonroad emissions were also computed using EPA's MOVES2014b, which incorporates NONROAD2008a (NONROAD). The model was executed for each construction analysis year for both construction and commercial equipment categories assuming diesel-powered equipment. As part of the project, all nonroad diesel-powered construction equipment equal to, or greater than, 100 horsepower (hp) will be equipped with engines meeting Tier 4 Final engine standards. Additionally, seventy percent of all nonroad construction diesel-powered construction equipment less than 100 hp will be equipped with engines meeting Tier 4 Final engine standards. The remaining thirty percent of nonroad construction diesel-powered construction equipment less than 100 hp may include Tier 0 to 3 engine standards. MOVES2014b construction-related emissions were evaluated for January, April, July and October to represent four seasons per analysis year. GHG emissions from

nonroad equipment is calculated based on the current Global Warming Potential (GWP) values of 1, 25, and 298 for CO_2, CH_4, and N_2O, respectively.

Engine Load – Equipment types, identified by using supportive files from the Draft Conceptual Schedule were utilized along with reasonable equipment quantities. Emission rates for each equipment type were provided by NONROAD for each equipment type by most reasonable horsepower. Equipment load factors, by equipment type, were obtained utilizing guidance available within EPA's *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, dated July 2010.

Fugitive Dust – Construction-related fugitive dust emission rates were calculated based on USEPA's AP42, Fifth Edition Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources, Chapter 13.2.3 (Heavy Construction Operations). According to EPA's AP42 guidance, a fugitive dust PM_{10} emission factor of 1.2 tons per acre disturbed per month during construction and demolition activities was used. Conservatively, twenty-five percent of the project area was assumed to be disturbed per month and a seventy-five percent dust control efficiency through daily watering was also assumed.

NO ACTION EMISSION ASSESSMENT RESULTS

Operational Emissions

As detailed above, the existing AirTrain system will reach capacity in Year 2022. Therefore, supplemental busing will need to be implemented to provide overflow riders access to/from the Rail Link Station and various Airport locations. One bus route (blue) will transport riders to/from the Rail Link Station and Terminal One while the second bus route (red) will transport riders to/from the Rail Link Station, Terminal B, Terminal C and the P4 parking garage. Data to perform supplemental busing route emission estimates, including volume by year, roadway segment speeds and distance, analysis months/hours and bus composition to represent the No Action Alternative are presented in **Table C-8**.

Table C-8. No Action Supplemental Busing Modeling Data

NO ACTION SUPPLEMENTAL BUSING ASSUMPTIONS[1]													
EMISSION SOURCE		**BLUE ROUTE**						**RED ROUTE**					
No Action	**Destination**	Continuous Loops – Rail Link Station to Terminal One						Continuous Loops – Rail Link Station to Terminal B, Terminal C, P4 Parking Garage					
	Number of Buses Per Analysis Hour	2022	2023	2024	2025	2026	2031	2022	2023	2024	2025	2026	2031
		6	6	6	6	6	6	6	7	9	10	12	18
	Roadway Segments	4.02 miles @ 10 mph						3.72 miles @ 10 mph					
		1.73 miles @ 15mph						1.68 miles @ 15 mph					
		Total Idle Time at Stations: 200 seconds						Total Idle Time at Stations: 400 seconds					
		Total Idle Time at Gates/Yields/Stop Signs: 80 seconds						Total Idle Time at Gates/Yield/Stop Signs: 120 seconds					
		Total Idle Time at Stop Lights: NA						Total Idle Time at Stop Lights: 60 seconds					

NO ACTION SUPPLEMENTAL BUSING ASSUMPTIONS[1]			
EMISSION SOURCE		**BLUE ROUTE**	**RED ROUTE**
	Analysis Months	January (Winter), April (Spring), July (Summer) and October (Fall)	
	Weekday Analysis Hours	6:00 - 7:00 AM 12:00 – 1:00 PM 5:00 PM – 6:00 PM 12:00 AM – 1:00 AM	
	Transit Bus Fuel Type	90% diesel, 10% electric	

[1] – Supplemental busing was assumed to be necessary only during peak AirTrain service hours; 12:00 PM – 8:00 PM which equates to four midday hours, three PM hours and one overnight hour.

As detailed in **Table C-4**, operational emissions associated with supplemental transit busing to meet the system needs for the No Action Alternative will be necessary beginning in Year 2022. No construction would occur with this Alternative; therefore, no construction emissions would result. Emissions estimated based on the No Action Alternative are presented in **Table C-9** and emission analysis worksheets are included in **Attachment C-1.**

Table C-9. No Action Alternative Supplemental Busing Emission Results by Year (tons/year)

YEAR	SOURCE	CO	NO_x	VOC	SO_2	$PM_{2.5}$	PM_{10}	CO_{2e}[1]
2022	Operational – Supplemental Busing	0.45	1.20	0.10	<0.01	0.04	0.12	345
2023		0.43	1.15	0.10	<0.01	0.04	0.13	372
2024		0.45	1.18	0.10	<0.01	0.04	0.14	428
2025		0.43	1.13	0.09	<0.01	0.04	0.15	454
2026		0.44	1.16	0.09	<0.01	0.04	0.16	509
2031		0.42	1.09	0.07	0.01	0.04	0.20	669

[1] – Reported in metric tons/year

PROPOSED ACTION EMISSION ASSESSMENT RESULTS

Proposed Action Operational Emissions

As detailed above, the project involves a new AirTrain system including stations, pedestrian bridges, and a new MCF at the northern terminus. Construction and implementation of the proposed AirTrain system and its components would not displace airline employees due to adequate capacity within adjacent surface parking lots.

Emissions from the operation of supplemental busing of AirTrain overflow riders during construction and testing of the proposed replacement AirTrain (i.e., 2022 through January 30, 2026) were estimated. However, operational emission reductions have been estimated for the supplemental busing after January 30, 2026, by

using transit bus volumes assumed under the No Action Alternative, coinciding with "revenue service" of the new AirTrain system since supplemental busing will no longer be necessary. Data to perform supplemental busing route emission estimates, including volume by analysis period, roadway segment speeds and distance, analysis months/hours and the transit bus fuel assumption to represent the Proposed Action Alternative are presented in **Table C-10** and emission results in **Table C-11**. Proposed Action Alternative emission analysis spreadsheets associated with the supplemental busing are included within **Attachment C-2.**

Table C-10. Proposed Action Supplemental Busing Modeling Data

PROPOSED ACTION SUPPLEMENTAL BUSING ASSUMPTIONS[1]													
EMISSION SOURCE		**BLUE ROUTE**						**RED ROUTE**					
Proposed Action	**Destination**	Continuous Loops – Rail Link Station to Terminal One						Continuous Loops – Rail Link Station to Terminal B, Terminal C, P4 Parking Garage					
	Number of Buses Per Hour Analysis	2022	2023	2024	2025	2026	2031	2022	2023	2024	2025	2026	2031
		6	6	6	6	6	6	6	7	9	10	12	-18
	Roadway Segments	4.02 miles @ 10 mph						3.72 miles @ 10 mph					
		1.73 miles @ 15mph						1.68 miles @ 15 mph					
		Total Idle Time at Stations: 200 seconds						Total Idle Time at Stations: 400 seconds					
		Total Idle Time at Gates/Yields/Stop Signs: 80 seconds						Total Idle Time at Gates/Yield/Stop Signs: 120 seconds					
		Total Idle Time at Stop Lights: NA						Total Idle Time at Stop Lights: 60 seconds					
	Analysis Months	January (Winter), April (Spring), July (Summer) and October (Fall)											
	Weekday Analysis Hours	6:00 - 7:00 AM 12:00 – 1:00 PM 5:00 PM – 6:00 PM 12:00 AM – 1:00 AM											
	Transit Bus Fuel Type	90% diesel, 10% electric											

[1] – Supplemental busing was assumed to be necessary only during peak AirTrain service hours; 12:00 PM – 8:00 PM which equates to four midday hours, three PM hours and one overnight hour.

Table C-11. Proposed Action Alternative Supplemental Busing Emission Reduction Results by Year (tons/year)

YEAR	SOURCE	CO	NO_x	VOC	SO_2	$PM_{2.5}$	PM_{10}	CO_{2e}[2]
2022	Operational – Supplemental Busing	0.45	1.20	0.10	<0.01	0.04	0.12	345
2023		0.43	1.15	0.10	<0.01	0.04	0.13	372
2024		0.45	1.18	0.10	<0.01	0.04	0.14	428
2025		0.43	1.13	0.09	<0.01	0.04	0.15	454
2026[1]		0.04	0.10	0.01	<0.01	<0.01	0.01	42
2031		0.00	0.00	0.00	0.00	0.00	0.00	0

[1] – *Assessment based on new AirTrain system commencing January 30, 2026*
[2] – *Reported in metric tons/year*

Based on the result of this analysis, the air quality analysis associated with the Proposed Action fully comply with NEPA and meet the requirements of the CAA General Conformity Rule.

Proposed Action Construction-Related Emissions

Based on the Draft Conceptual Schedule, construction activities for the AirTrain system, MCF, and pedestrian bridges were organized by calendar year and quarter. The number of crews, per crew category, necessary to construct the AirTrain System, MCF, and pedestrian bridges are detailed within **Tables C-12**, **C-13**, and **C-14**, respectively.

Table C-12. Construction-Related Crew Schedule for AirTrain System

	2022				2023				2024				2025
Crew	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**
CD	1	2	2	3	2	2	2	1	0	0	0	0	0
SP	3	4	5	12	10	10	8	6	0	0	0	0	0
CC	2	4	4	7	6	5	5	2	0	0	0	0	0
PD	1	3	4	4	4	3	3	1	0	0	0	0	0
FC	0	0	0	0	0	0	0	0	0	0	0	0	0
LB	0	1	2	2	2	2	2	1	0	0	0	0	0
CA	1	8	12	13	18	13	9	14	4	0	0	0	0
LT	1	7	8	12	15	12	9	6	2	0	0	0	0
DC	0	0	0	0	0	0	0	0	0	0	0	0	0

	2022				2023				2024				2025
Crew	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**
CP	0	4	7	14	19	15	11	11	7	0	0	0	0
SE	0	2	6	5	9	6	3	5	3	0	0	0	0
PC	0	1	3	5	4	3	3	3	0	0	0	0	0

Legend: CD=Concrete Demo Crew, SP= Sheet Pile Crew, CC=Civil Crew, PD=Pile Driving Crew, FC=Finegrade Crew, LB=Labor Crew, CA=Carpenter Crew, LT=Lather Crew, DC=Dowel Crew, CP=Concrete Pour Crew, SE=Steel Erection Crew, PC=Paving Crew

Table C-13. Construction-Related Crew Schedule for MCF

YEAR	2022				2023				2024				2025
Crew	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**
CD	0	0	0	0	0	0	0	0	0	0	0	0	0
SP	2	2	2	0	2	2	0	0	0	0	0	0	0
CC	0	1	1	0	0	1	1	0	0	0	0	0	0
PD	0	0	1	1	1	0	0	0	0	0	0	0	0
FC	0	0	0	0	0	0	0	0	0	0	0	0	0
LB	0	0	0	0	0	0	0	0	0	0	0	0	0
CA	0	0	0	1	1	1	1	1	0	0	0	0	0
LT	0	0	0	0	0	0	0	1	0	0	0	0	0
DC	0	0	0	0	0	0	0	0	0	0	0	0	0
CP	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0	0	0	0
PC	0	0	0	0	0	0	0	0	0	0	0	0	0

Legend: CD=Concrete Demo Crew, SP= Sheet Pile Crew, CC=Civil Crew, PD=Pile Driving Crew, FC=Finegrade Crew, LB=Labor Crew, CA=Carpenter Crew, LT=Lather Crew, DC=Dowel Crew, CP=Concrete Pour Crew, SE=Steel Erection Crew, PC=Paving Crew

Table C-14. Construction-Related Crew Schedule for Pedestrian Bridges

YEAR	2022				2023				2024				2025
Crew	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**
CD	0	0	0	0	0	0	0	0	0	0	0	0	0
SP	1	1	1	0	0	0	0	0	0	0	0	0	0
CC	0	1	1	0	0	0	0	0	0	0	0	0	0
PD	0	1	1	0	0	0	0	0	0	0	0	0	0
FC	0	0	0	0	0	0	0	0	0	0	0	0	0
LB	0	0	0	0	0	0	0	0	0	0	0	0	0
CA	0	0	0	0	0	0	0	0	0	0	0	0	0
LT	0	0	0	0	0	0	0	0	0	0	0	0	0
DC	0	0	0	0	0	0	0	0	0	0	0	0	0
CP	0	1	3	1	1	1	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0	0	0	0
PC	0	0	0	0	0	0	0	0	0	0	0	0	0

Legend: CD=Concrete Demo Crew, SP= Sheet Pile Crew, CC=Civil Crew, PD=Pile Driving Crew, FC=Finegrade Crew, LB=Labor Crew, CA=Carpenter Crew, LT=Lather Crew, DC=Dowel Crew, CP=Concrete Pour Crew, SE=Steel Erection Crew, PC=Paving Crew

Air emission estimates assumed each crew worked eight hours per day, except when special overnight and weekend construction activities are necessary. In addition, each crew was assumed to be comprised of seven contractors, each traveling 60 miles round trip in passenger trucks to/from the site.

While the Draft Conceptual Schedule listed various crew categories (Concrete Demo Crew, Civil Crew, Finegrade Crew and Paving Crew) requiring dump trucks "As Needed", the emissions analysis assumed three trucks per day traveling 60 miles round trip to/from the site and each travel 0.5 miles on-site. Similarly, the Draft Conceptual Scheduled listed various crew categories (Sheet Pile Crew, Pile Driving Crew, Carpenter Crew, Lather Crew, and Steel Erection Crew) requiring truck material deliveries "As Needed", the emissions analysis assumed one truck per day traveling 60 miles round trip to/from the site and each travel 0.5 miles on-site. Finally, the Draft Conceptual Schedule listed various crew categories (Labor Crew and Concrete Pour Crew) requiring concrete trucks "As Needed", the emissions analysis assumed three trucks traveling 60 miles round trip to/from the site and each travel 0.5 miles on-site. All other equipment specified within the Draft Conceptual Schedule as "As Needed" were not included in the emissions analysis. **Table C-15** details the necessary equipment assumed by crew.

Table C-15. Construction-Related Crew Activities and Equipment Per Crew

CREW	CONSTRUCTION ACTIVITY	EQUIPMENT TYPE (HP)	EQUIPMENT QUANTITY PER RIG/CREW
CD	Remove and Dispose Misc. Materials	Backhoe (122)	1
		Dump Truck (400)	As Needed
		Air Compressor (122)	1
SP	Drive Sheets/Extract Sheets	Crawler Crane (340)	1
		Vibratory Hammer (250)	1
		Loader for Material Handling (190)	1
		Welding Machine/Generator (125)	As Needed
		Truck Material Delivery (300)	As Needed
SP-PB	Drive Sheets/Extract Sheets	Rough Terrain Crane (192)	1
		Vibratory Hammer (284)	1
		Loader for Material Handling (190)	1
		Welding Machine/Generator (125)	As Needed
		Truck Material Delivery (300)	As Needed
CC	Foundation Excavation/Structural Backfill	Excavator (190)	1
		Dump Truck (400)	As Needed
		Earth Roller/Compactor (7)	As Needed
PD	Drive Piles	Crawler Crane (340)	1
		Diesel Hammer (250)	1
		Loader for Material Handling (190)	1

CREW	CONSTRUCTION ACTIVITY	EQUIPMENT TYPE (HP)	EQUIPMENT QUANTITY PER RIG/CREW
		Welding Machine/Generator (125)	As Needed
		Truck Material Delivery (300)	As Needed
FC	Clear and Grub & Finegrade Slab	Excavator (151)	1
		Walk Behind Roller (8)	1
		Dozer (87)	1
		Dump Truck (400)	As Needed
LB	Concrete Fill/Pile Cut-Offs	Compressor/Welding Machine/Generator (125)	As Needed
		Concrete Truck (300)	As Needed
CA	Erect & Strip Formwork	Crane (240)	0.25
		Welding Machine/Generator (125)	As Needed
		Truck Material Delivery (300)	As Needed
LT	Reinforcement Steel	Crane (240)	0.25
		Welding Machine/Generator (125)	As Needed
		Truck Material Delivery (300)	As Needed
DC	Drill and Grout Dowels	Hand Tools	2
		Compressor/Welding Machine/Generator (125)	As Needed
CP	Place Concrete	Concrete Pumper Truck (250)	1
		Concrete Truck (300)	As Needed
		Compressor/Welding Machine/Generator (125)	As Needed

CREW	CONSTRUCTION ACTIVITY	EQUIPMENT TYPE (HP)	EQUIPMENT QUANTITY PER RIG/CREW
SE	Install Bearings/Diaphragms/Plate Girders	Crawler Crane (340)	2
		Rough Terrain Crane (240)	1
		Loader for Material Handling (190)	As Needed
		Manlifts/Bucket Trucks (60)	As Needed
		Compressor/Welding Machine/Generator (125)	As Needed
		Light Plant (4)	As Needed
		Truck Material Delivery (300)	As Needed
SE-PB	Install Bearings/Diaphragms/Plate Girders	Manlift (75)	2
		Rough Terrain Crane (523)	1
		Crawler Crane (340)	1
		Air Compressor (122)	1
		Truck Material Delivery (300)	As Needed
PC	Pavement Restoration	Asphalt Paver (142)	1
		47" Tandem Roller (34)	1
		59" Tandem Roller (84)	1
		Plate Compactor (6)	2
		Light Plant (2)	As Needed
		Dump Truck (400)	As Needed

Legend: HP=horsepower, CD=Concrete Demo Crew, SP= Sheet Pile Crew, SP-PB=Sheet Pile Crew (Pedestrian Bridges), CC=Civil Crew, PD=Pile Driving Crew, FC=Finegrade Crew, LB=Labor Crew, CA=Carpenter Crew, LT=Lather Crew, DC=Dowel Crew, CP=Concrete Pour Crew, SE=Steel Erection Crew, SE-PB=Steel Erection Crew (Pedestrian Bridges), PC=Paving Crew

Emission rates provided by NONROAD for the most representative equipment type listed in **Table C-15** was utilized and presented in the analysis. Since equipment sizes have not been identified for all equipment types, the analysis was performed utilizing the emission rate associated with the most reasonable horsepower per equipment type for each affected year. Equipment load factors were obtained utilizing guidance available within

EPA's Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, dated July 2010.

As part of the project, all nonroad diesel-powered construction equipment equal to, or greater than, 100 horsepower (hp) will be equipped with engines meeting Tier 4 Final engine standards. Additionally, seventy percent of all nonroad construction diesel-powered construction equipment less than 100 hp will be equipped with engines meeting Tier 4 Final engine standards. The remaining thirty percent of nonroad construction diesel-powered construction equipment less than 100 hp may include Tier 0 to 3 engine standards.

In general, construction activities would occur six days a week. However, when working in the vicinity of US Route 1/9 and airport access roadways, continuous construction activities would need to occur on Saturdays and Sundays. Emission rates for CO, NO_x (NO and NO_2), SO_2, VOC, $PM_{2.5}$ and PM_{10} were obtained for one month a quarter to represent emissions for each season related to on-site construction equipment necessary to construct the project during Years 2022, 2023, 2024, 2025 and 2026. Primary pollutants from diesel internal combustion are NO_x, total organic compounds (TOC), CO and particulates. PM and SO_2 are the only diesel pollutants that are dependent on fuel sulfur content. Fuel supply and fuel formulation data assumed ultralow sulfur fuel (ULSF)[1].

Ground disturbing activities are a source of fugitive dust including construction associated with the AirTrain system infrastructure, pedestrian bridge structures, new MCF and demolition of the existing AirTrain structure. The portion of the existing AirTrain system that traverses Terminal A, B and C will not be demolished as part of this project. Fugitive dust emissions were calculated using EPA's AP42, Compilation of Air Pollutant Emission Factors.

Construction-related emissions were calculated for ozone precursors (NO_x and VOC), CO, $PM_{2.5}$, SO_2, a $PM_{2.5}$ precursor, and PM_{10} for each year of construction over the course of the project, as presented in **Table C-16**. Peak construction-related emissions are estimated in Year 2023 since major construction activities associated with the new AirTrain guideway, MCF, and pedestrian bridges are scheduled within this calendar year. Construction emission analysis spreadsheets associated with the Proposed Action Alternative are included within **Attachment C-3.**

Table C-16. Proposed Action Alternative Construction Emission Results by Year (tons/year)

YEAR	SOURCE	CO	NO_x	VOC	SO_2	$PM_{2.5}$	PM_{10}
De Minimis Thresholds		***100***	***50***	***50***	***100***	***100***	***100***
2022	Air Train System	12.10	17.90	1.63	0.18	2.36	16.49
2022	MCF	0.71	1.06	0.10	0.01	0.14	0.99
2022	Pedestrian Bridges	1.76	2.75	0.25	0.02	0.42	3.08
2022 Total		**14.57**	**21.70**	**1.97**	**0.22**	**2.92**	**20.56**
2023	Air Train System	17.11	25.74	2.24	0.27	2.74	17.23
2023	MCF	0.69	0.98	0.09	0.01	0.14	0.99
2023	Pedestrian Bridges	2.58	3.84	0.35	0.03	0.51	3.18
2023 Total		**20.38**	**30.56**	**2.67**	**0.32**	**3.38**	**21.40**
2024	Air Train System	1.02	1.55	0.13	0.02	0.45	3.87

[1] Analysis performed including diesel fuel formulation with sulfur content of 11 ppm. A sulfur content of 11 ppm is a default value representative of the average sulfur content of diesel fuel meeting the 15 ppm standard, as fuels meeting this standard are produced with a compliance margin to account for differences in testing and contamination downstream. A sulfur content value of 11 ppm is a default fuel formulation within MOVES201b tables.

YEAR	SOURCE	CO	NO_x	VOC	SO_2	$PM_{2.5}$	PM_{10}
2024	MCF	0.00	0.00	0.00	0.00	0.00	0.00
2024	Pedestrian Bridges	1.18	1.86	0.16	0.02	0.32	2.30
2024 Total		**2.20**	**3.42**	**0.29**	**0.03**	**0.77**	**6.17**
2025	Air Train System	0.00	0.00	0.00	0.00	0.00	0.00
2025	MCF	0.00	0.00	0.00	0.00	0.00	0.00
2025	Pedestrian Bridges	0.00	0.00	0.00	0.00	0.00	0.00
2025[1] Total		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
2026	Air Train System	0.22	0.34	0.03	<0.01	0.23	2.13
2026	MCF	0.00	0.00	0.00	0.00	0.00	0.00
2026	Pedestrian Bridges	0.00	0.00	0.00	0.00	0.00	0.00
2026[2] Total		**0.22**	**0.34**	**0.03**	**<0.01**	**0.23**	**2.13**

[1] – *AirTrain system testing and substantial completion expected on December 25, 2025*
[2] – *Demolition of existing AirTrain system*

There are no NAAQS established under the CAA for GHG pollutants. Pursuant to FAA Order 1050.1F, a GHG assessment has been included to assist with providing information necessary to make informed decisions regarding climate change impacts. Table C-17 provides a summary of the construction-related GHG emissions that will occur for each year of the Proposed Action.

Table C-17. Proposed Action Alternative Construction CO_2e Emission Results by Year (metric tons/year)

Project Improvement		2022	2023	2024	2025[1]	2026[2]	2031
Construction	Air Train System	23,004	34,732	2,214	0	458	0
	MCF	1,855	1,574	0.0	0	0	0
	Pedestrian Bridges	3,106	4,409	2,094	0	0	0
Total GHG Emissions		27,964	40,715	4,309	0	458	0

[1] – *AirTrain system testing and substantial completion expected on December 25, 2025*
[2] – *Demolition of existing AirTrain system*

Emissions Summary

As a general conformity requirement provision of the CAA, the annual net difference in emissions of nonattainment or maintenance pollutants are compared to the applicable *de minimis* thresholds. The annual net difference in emissions is calculated by subtracting the total operational and construction-related emissions of the No Action Alternative from the Proposed Action Alternative for each calendar year. Since supplemental busing will be necessary for both alternatives beginning in January of 2022 and ending in January 2026, net zero emissions are recognized in years 2022, 2023, 2024 and 2025. In 2026, emissions associated with supplemental busing in January is offset by the emissions reduction from February through December coinciding with "revenue service" of the new AirTrain system and elimination of supplemental busing. Proposed projects that do not exceed *de minimis* thresholds are presumed to conform to a SIP. **Table C-18** provides a summary of the operational and construction emissions for criteria pollutants that will occur for each year of the Proposed Action Alternative and demonstrates all net pollutant concentrations are below *de minimis* thresholds.

Table C-18. Proposed Action Net Emissions Result by Year (tons/year)

YEAR	SOURCE	CO	NO_x	VOC	SO_2	$PM_{2.5}$	PM_{10}
De Minimis Thresholds		***100***	***50***	***50***	***100***	***100***	***100***
2022	Operational – Supplemental Busing (No Action)	-0.45	-1.20	-0.10	-<0.01	-0.04	-0.12
2022	Operational – Supplemental Busing (Proposed Action)	0.45	1.20	0.10	<0.01	0.04	0.12
2022	Construction – AirTrain, MCF, Pedestrian Bridges	14.57	21.70	1.97	0.22	2.92	20.56
2022 Total		**14.57**	**21.70**	**1.97**	**0.22**	**2.92**	**20.56**
Exceeds CAA De Minimis?		No	No	No	No	No	No
2023	Operational – Supplemental Busing (No Action)	-0.43	-1.15	-0.10	-<0.01	-0.04	-0.13
2023	Operational – Supplemental Busing (Proposed Action)	0.43	1.15	0.10	<0.01	0.04	0.13
2023	Construction – AirTrain, MCF, Pedestrian Bridges	20.38	30.56	2.67	0.32	3.38	21.40
2023 Total		**20.38**	**30.56**	**2.67**	**0.32**	**3.38**	**21.40**
Exceeds CAA De Minimis?		No	No	No	No	No	No
2024	Operational – Supplemental Busing (No Action)	-0.45	-1.18	-0.10	-<0.01	-0.04	-0.14
2024	Operational – Supplemental Busing (Proposed Action)	0.45	1.18	0.10	<0.01	0.04	0.14
2024	Construction – AirTrain, MCF, Pedestrian Bridges	2.20	3.42	0.29	0.03	0.77	6.17
2024 Total		**2.20**	**3.42**	**0.29**	**0.03**	**0.77**	**6.17**
Exceeds CAA De Minimis?		No	No	No	No	No	No
2025	Operational – Supplemental Busing (No Action)	-0.43	-1.13	-0.09	-<0.01	-0.04	-0.15
2025	Operational – Supplemental Busing (Proposed Action)	0.43	1.13	0.09	<0.01	0.04	0.15
2025	Construction – AirTrain, MCF, Pedestrian Bridges	0.00	0.00	0.00	0.00	0.00	0.00
2025[1] Total		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Exceeds CAA De Minimis?		No	No	No	No	No	No
2026	Operational – Supplemental Busing (No Action)	-0.44	-1.16	-0.09	-<0.01	-0.04	-0.16
2026	Operational – Supplemental Busing (Proposed Action)	0.04	0.10	0.01	<0.01	<0.01	0.01
2026	Construction – AirTrain[1], MCF, Pedestrian Bridges	0.22	0.34	0.03	<0.01	0.23	2.13
2026[2] Total		**-0.18**	**-0.72**	**-0.05**	**0.00**	**0.14**	**1.98**
Exceeds CAA De Minimis?		No	No	No	No	No	No
2031	Operational – Supplemental Busing (No Action)	-0.42	-1.09	-0.07	-0.01	-0.04	-0.20
2031	Construction – AirTrain, MCF, Pedestrian Bridges	0.00	0.00	0.00	0.00	0.00	0.00
2031 Total		**-0.42**	**-1.09**	**-0.07**	**-0.01**	**-0.04**	**-0.20**
Exceeds CAA De Minimis?		No	No	No	No	No	No

[1] – AirTrain system testing and substantial completion expected on December 25, 2025
[2] – Demolition of existing AirTrain system

Air Quality Environmental Measures

One of the "key" components of the Proposed Action Alternative is the implement of emissions minimization measures, which were appropriately accounted for in the emissions modeling. The emission reductions achieved with these minimization measures are additional to those achieved by the operation benefits of the Proposed Action.

While the construction of the Proposed Action would be anticipated to contribute to fugitive dust in and around the construction site, emissions will be minimized by adhering to guidelines included in FAA Advisory Circular (AC) 150/5370-10G, Standards for Specifying Construction Airports. These measures include: (i) exposing the minimum area of erodible earth; (ii) using water spray trucks and covered haul trucks; and requiring contractors to adhere to Construction Emission Control Plans. These efforts will minimize the amount of dust migrating off the Airport and into adjoining communities.

As discussed previously, the following construction emission control measures are considered one of the main contractor requirements for reducing construction emissions associated with the Proposed Action Alternative:

- Equipment Less Than 100 HP; 70% of non-road diesel construction equipment that is less than 100 horsepower shall meet EPA Tier 4 Final emission standards; and
- Equipment Greater Than 100 HP; 100% of nonroad diesel construction equipment equal to or greater than 100 horsepower shall meet USEPA Tier 4 Final emission standards.

These measures are considered "over and above" what is normally required for construction projects off-airport. In addition, the following measures that are already in-place by the PANYNJ will be applied where appropriate:

- Use of ultralow-sulfur diesel fuel to power construction equipment;
- Limiting idling times to less than three minutes on diesel and gasoline powered engines pursuant to N.J.A.C. 7:27-14 and N.J.A.C. 7:27-15;
- Use of electric-powered equipment instead of diesel to the extent feasible;
- Use of the lowest-practical engine size (lowest horsepower) for the task;
- Prohibition on tampering to boost horsepower or to defeat emission controls;
- Random inspections;
- Submittal of a Diesel Emissions Compliance Plan for PANYNJ review and approval;
- Diesel-powered generators are limited to situation where commercial electric power may not readily be available;
- Locating diesel-powered exhausts away from sensitive receptors;
- Limiting on-site equipment to operating speeds of five mph to reduce dust and particulate pollutants from tires and brakes;
- Spraying suppressing agent on any debris pile;
- Utilizing water or appropriate liquids for dust control during demolition, land clearing, grading, and on materials stockpile or surface;
- Covering open-body trucks when transporting materials;
- Removing demolition debris promptly;
- Truck haul routes would be determined to minimize impact to sensitive receptors such as residential areas, hospitals, schools, daycare facilities, senior citizen housing, and convalescent facilities;
- Stationary permitting requirements for construction equipment will be required pursuant to N.J.A.C. 7:27-8.2(c) 1-21 and N.J.A.C. 7:27(d) 15; and
- Odors related to construction activities detected off-site that are injurious to human health or would result in citizen complaints are prohibited pursuant to N.J.A.C. 7:27-5.2.

Compliance with the measures and practices listed in Table 4-4 will be included as part of the Contractor's agreement with the Port Authority and enforced through various means, such as inspections, audits, and routine field oversight.

INDIRECT SOURCE REVIEW

FAA Order 1050.1F Desk Reference contains guidelines for air quality assessment procedures. Based on this order, a Proposed Action must follow State indirect source review (ISR) regulations, if such exist. At this time, ISR requirements have not been established for the State of New Jersey.

Attachment C-1

No-Action Alternative Supplemental Busing Emission Worksheets

2022 NoBuild_Supplemental Mesoscale CO Emissions

Pollutant	Scenario	Year
CO	NoBuild_Supplemental	2022
	NoBuild_Supplemental	2022
	NoBuild_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125
Travel	Bus Blue Route 15 mph	g/mi	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036
Idl	Bus Blue Route Idle	g/sec	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433
Sta	Bus Blue Route Starts	g	0.000000	11.989368	0.000000	0.000000	0.000000	11.989368	0.000000	0.000000	0.000000	11.989368	0.000000	0.000000	0.000000	11.989368	0.000000	0.000000

2022 CO Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	18,313.96	13,735.47	4,578.49	0.00	18,517.44	13,888.08	4,629.36	0.00	18,720.93	14,040.70	4,680.23	0.00	18,720.93	14,040.70	4,680.23
Travel	Bus Blue Route 15 mph	0.00	4,260.09	3,195.06	1,065.02	0.00	4,307.42	3,230.57	1,076.86	0.00	4,354.75	3,266.07	1,088.69	0.00	4,354.75	3,266.07	1,088.69
Idl	Bus Blue Route Idle	0.00	1,944.84	1,458.63	486.21	0.00	1,966.45	1,474.84	491.61	0.00	1,988.06	1,491.04	497.01	0.00	1,988.06	1,491.04	497.01
Sta	Bus Blue Route Starts	0.00	6,474.26	0.00	0.00	0.00	6,546.20	0.00	0.00	0.00	6,618.13	0.00	0.00	0.00	6,618.13	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	111,198.17		100,078.35	
Spring	112,433.71		101,190.34	
Summer	113,669.24		102,302.32	
Fall	113,669.24		102,302.32	
Annual	**450,970.36**		**405,873.32**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.39		0.35	
Idle	0.05		0.04	
Starts	0.06		0.05	
Total Annual Emissions	**0.50**		**0.45**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2022 NoBuild_Supplemental Mesoscale NOx Emissions

Pollutant	Scenario	Year
NOx	NoBuild_Supplemental	2022
	NoBuild_Supplemental	2022
	NoBuild_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Idl Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	6.496090	6.496090	6.496090	6.496090	6.383035	6.331026	6.311454	6.344824	5.631417	5.530310	5.492108	5.505696	6.209526	6.142778	6.122467	6.153915
Idl Travel	Bus Blue Route 15 mph	g/mi	3.657848	3.657848	3.657848	3.657848	3.594181	3.564895	3.553878	3.572669	3.170960	3.114027	3.092515	3.100169	3.496486	3.458904	3.447468	3.465168
Idl	Bus Blue Route Idle	g/sec	0.010026	0.010026	0.010026	0.010026	0.009852	0.009772	0.009716	0.009793	0.008692	0.008536	0.008465	0.008498	0.009584	0.009481	0.009473	0.009498
Sta	Bus Blue Route Starts	g	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

2022 NOx Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	56,406.85	42,305.13	14,101.71	0.00	55,584.38	41,559.41	13,926.38	0.00	49,087.91	36,561.62	12,217.36	0.00	54,524.28	40,758.00	13,655.78
Idl Travel	Bus Blue Route 15 mph	0.00	13,668.65	10,251.48	3,417.16	0.00	13,469.31	10,070.77	3,374.67	0.00	11,895.09	8,859.68	2,960.54	0.00	13,212.46	9,876.58	3,309.10
Idl	Bus Blue Route Idle	0.00	8,013.04	6,009.78	2,003.26	0.00	7,896.19	5,888.65	1,978.35	0.00	6,973.31	5,186.81	1,735.57	0.00	7,745.61	5,804.47	1,939.91
Sta	Bus Blue Route Starts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	316,139.23		284,525.30	
Spring	311,210.50		280,089.45	
Summer	274,233.66		246,810.29	
Fall	305,319.17		274,787.25	
Annual	1,206,902.55		1,086,212.29	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	1.14		1.03	
Idle	0.19		0.17	
Starts	0.00		0.00	
Total Annual Emissions	1.33		1.20	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2022 NoBuild_Supplemental Mesoscale VOC Emissions

Pollutant	Scenario	Year
VOC	NoBuild_Supplemental	2022
	NoBuild_Supplemental	2022
	NoBuild_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905
Trave	Bus Blue Route 15 mph	g/mi	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390
Idl	Bus Blue Route Idle	g/sec	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804
Sta	Bus Blue Route Starts	g	0.000000	0.690336	0.000000	0.000000	0.000000	0.295858	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.225928	0.000000	0.000000

2022 VOC Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	4,549.17	3,411.88	1,137.29	0.00	4,599.72	3,449.79	1,149.93	0.00	4,650.26	3,487.70	1,162.57	0.00	4,650.26	3,487.70	1,162.57
Trave	Bus Blue Route 15 mph	0.00	1,137.44	853.08	284.36	0.00	1,150.08	862.56	287.52	0.00	1,162.72	872.04	290.68	0.00	1,162.72	872.04	290.68
Idl	Bus Blue Route Idle	0.00	642.75	482.06	160.69	0.00	649.89	487.42	162.47	0.00	657.03	492.77	164.26	0.00	657.03	492.77	164.26
Sta	Bus Blue Route Starts	0.00	372.78	0.00	0.00	0.00	161.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	124.71	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	26,360.58		23,724.53	
Spring	26,222.71		23,600.44	
Summer	26,184.24		23,565.82	
Fall	26,433.67		23,790.30	
Annual	**105,201.20**		**94,681.08**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.10		0.09	
Idle	0.02		0.01	
Starts	0.00		0.00	
Total Annual Emissions	**0.12**		**0.10**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2022 NoBuild_Supplemental Mesoscale SO2 Emissions

Pollutant	Scenario	Year
SO2	NoBuild_Supplemental	2022
	NoBuild_Supplemental	2022
	NoBuild_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.017270	0.017270	0.017270	0.017270	0.017270	0.017270	0.017270	0.017270	0.017417	0.019257	0.019475	0.018061	0.017270	0.017270	0.017270	0.017270
Travel	Bus Blue Route 15 mph	g/mi	0.008530	0.008530	0.008530	0.008530	0.008530	0.008530	0.008530	0.008530	0.008608	0.009591	0.009707	0.008952	0.008530	0.008530	0.008530	0.008530
Idl	Bus Blue Route Idle	g/sec	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000017	0.000017	0.000016	0.000015	0.000015	0.000015	0.000015
Sta	Bus Blue Route Starts	g	0.000000	0.002810	0.000000	0.000000	0.000000	0.002225	0.000000	0.000000	0.000000	0.001785	0.000000	0.000000	0.000000	0.002140	0.000000	0.000000

2022 SO2 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	149.96	112.47	37.49	0.00	151.63	113.72	37.91	0.00	170.93	129.65	40.08	0.00	153.29	114.97	38.32
Travel	Bus Blue Route 15 mph	0.00	31.87	23.90	7.97	0.00	32.23	24.17	8.06	0.00	36.64	27.81	8.55	0.00	32.58	24.44	8.15
Idl	Bus Blue Route Idle	0.00	11.74	8.80	2.93	0.00	11.87	8.90	2.97	0.00	14.05	10.64	3.20	0.00	12.00	9.00	3.00
Sta	Bus Blue Route Starts	0.00	1.52	0.00	0.00	0.00	1.21	0.00	0.00	0.00	0.99	0.00	0.00	0.00	1.18	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	772.11		694.90	
Spring	780.05		702.05	
Summer	880.12		792.11	
Fall	788.53		709.68	
Annual	**3,220.82**		**2,898.74**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.00		0.00	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.00**		0.00	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2022 NoBuild_Supplemental Mesoscale PM2.5 Emissions

Pollutant	Scenario	Year
PM2.5	NoBuild_Supplemental	2022
PM2.5 Brakewear	NoBuild_Supplemental	2022
PM2.5 Tirewear	NoBuild_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196
Trave	Bus Blue Route 15 mph	g/mi	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498
Idl	Bus Blue Route Idle	g/sec	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196
Sta	Bus Blue Route Starts	g	0.000000	0.011224	0.000000	0.000000	0.000000	0.011224	0.000000	0.000000	0.000000	0.011224	0.000000	0.000000	0.000000	0.011224	0.000000	0.000000

2022 PM2.5 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	1,851.22	1,388.42	462.81	0.00	1,871.79	1,403.84	467.95	0.00	1,892.36	1,419.27	473.09	0.00	1,892.36	1,419.27	473.09
Trave	Bus Blue Route 15 mph	0.00	446.54	334.90	111.63	0.00	451.50	338.63	112.88	0.00	456.46	342.35	114.12	0.00	456.46	342.35	114.12
Idl	Bus Blue Route Idle	0.00	156.94	117.71	39.24	0.00	158.69	119.02	39.67	0.00	160.43	120.32	40.11	0.00	160.43	120.32	40.11
Sta	Bus Blue Route Starts	0.00	6.06	0.00	0.00	0.00	6.13	0.00	0.00	0.00	6.20	0.00	0.00	0.00	6.20	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	9,783.34		8,805.01	
Spring	9,892.05		8,902.84	
Summer	10,000.75		9,000.67	
Fall	10,000.75		9,000.67	
Annual	**39,676.89**		**35,709.20**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.04		0.04	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.04**		0.04	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2022 NoBuild_Supplemental Mesoscale PM10 Emissions

Pollutant	Scenario	Year
PM10	NoBuild_Supplemental	2022
PM10 Brakewear	NoBuild_Supplemental	2022
PM10 Tirewear	NoBuild_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766
Trave	Bus Blue Route 15 mph	g/mi	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681
Idl	Bus Blue Route Idle	g/sec	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213
Sta	Bus Blue Route Starts	g	0.000000	0.012200	0.000000	0.000000	0.000000	0.012200	0.000000	0.000000	0.000000	0.012200	0.000000	0.000000	0.000000	0.012200	0.000000	0.000000

2022 PM10 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	6,015.43	4,511.57	1,503.86	0.00	6,082.26	4,561.70	1,520.57	0.00	6,149.10	4,611.83	1,537.28	0.00	6,149.10	4,611.83	1,537.28
Trave	Bus Blue Route 15 mph	0.00	1,542.11	1,156.58	385.53	0.00	1,559.24	1,169.43	389.81	0.00	1,576.38	1,182.28	394.09	0.00	1,576.38	1,182.28	394.09
Idl	Bus Blue Route Idle	0.00	170.59	127.94	42.65	0.00	172.49	129.37	43.12	0.00	174.38	130.79	43.60	0.00	174.38	130.79	43.60
Sta	Bus Blue Route Starts	0.00	6.59	0.00	0.00	0.00	6.66	0.00	0.00	0.00	6.73	0.00	0.00	0.00	6.73	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	30,215.35		27,193.82	
Spring	30,551.08		27,495.97	
Summer	30,886.81		27,798.13	
Fall	30,886.81		27,798.13	
Annual	**122,540.05**		**110,286.04**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.13		0.12	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.14**		**0.12**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2022 NoBuild_Supplemental Mesoscale CO2e Emissions

Pollutant	Scenario	Year
CO2e	NoBuild_Supplemental	2022
	NoBuild_Supplemental	2022
	NoBuild_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	2,052.450000	2,052.450000	2,052.450000	2,052.450000	2,052.450000	2,052.450000	2,052.450000	2,052.450000	2,069.890000	2,288.360000	2,314.200000	2,146.280000	2,052.450000	2,052.450000	2,052.450000	2,052.450000
Travel	Bus Blue Route 15 mph	g/mi	1,013.880000	1,013.880000	1,013.880000	1,013.880000	1,013.880000	1,013.880000	1,013.880000	1,013.880000	1,023.200000	1,139.900000	1,153.700000	1,064.010000	1,013.880000	1,013.880000	1,013.880000	1,013.880000
Idl	Bus Blue Route Idle	g/sec	1.746561	1.746561	1.746561	1.746561	1.746561	1.746561	1.746561	1.746561	1.768600	2.044644	2.063969	1.865128	1.746561	1.746561	1.746561	1.746561
Sta	Bus Blue Route Starts	g	0.000000	334.674000	0.000000	0.000000	0.000000	265.269000	0.000000	0.000000	0.000000	213.086000	0.000000	0.000000	0.000000	255.163000	0.000000	0.000000

2022 CO2e Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	17,821,833.84	13,366,375.38	4,455,458.46	0.00	18,019,854.22	13,514,890.66	4,504,963.55	0.00	20,311,849.50	15,405,907.10	4,762,681.17	0.00	18,217,874.59	13,663,405.94	4,554,468.65
Travel	Bus Blue Route 15 mph	0.00	3,788,666.78	2,841,500.09	947,166.70	0.00	3,830,763.08	2,873,072.31	957,690.77	0.00	4,354,235.62	3,305,212.06	1,016,086.99	0.00	3,872,859.38	2,904,644.53	968,214.84
Idl	Bus Blue Route Idle	0.00	1,395,851.64	1,046,888.73	348,962.91	0.00	1,411,361.10	1,058,520.83	352,840.28	0.00	1,670,392.73	1,264,635.36	380,933.70	0.00	1,426,870.57	1,070,152.92	356,717.64
Sta	Bus Blue Route Starts	0.00	180,723.96	0.00	0.00	0.00	144,836.87	0.00	0.00	0.00	117,623.47	0.00	0.00	0.00	140,849.98	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	91,771,426.90		82,594,284.21	
Spring	92,715,319.16		83,443,787.24	
Summer	104,596,066.85		94,136,460.16	
Fall	93,723,011.79		84,350,710.61	
Annual	**382,805,824.69**		**344,525,242.22**	

Annual Emission Contributions by Emission Source (Metric Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	348.51		313.66	
Idle	33.12		29.81	
Starts	1.17		1.05	
Total Annual Emissions	**382.81**		344.53	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 NoBuild_Supplemental Mesoscale CO Emissions

Pollutant	Scenario	Year
CO	NoBuild_Supplemental	2023
	NoBuild_Supplemental	2023
	NoBuild_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938
Trave	Bus Blue Route 15 mph	g/mi	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136
Idl	Bus Blue Route Idle	g/sec	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156
Sta	Bus Blue Route Starts	g	0.000000	11.971995	0.000000	0.000000	0.000000	11.971995	0.000000	0.000000	0.000000	11.971995	0.000000	0.000000	0.000000	11.971995	0.000000	0.000000

2023 CO Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	15,993.91	11,995.44	3,998.48	0.00	16,171.62	12,128.72	4,042.91	0.00	16,349.33	12,262.00	4,087.33	0.00	16,349.33	12,262.00	4,087.33
Trave	Bus Blue Route 15 mph	0.00	3,726.10	2,794.57	931.52	0.00	3,767.50	2,825.62	941.87	0.00	3,808.90	2,856.68	952.23	0.00	3,808.90	2,856.68	952.23
Idl	Bus Blue Route Idle	0.00	1,723.45	1,292.58	430.86	0.00	1,742.60	1,306.95	435.65	0.00	1,761.75	1,321.31	440.44	0.00	1,761.75	1,321.31	440.44
Sta	Bus Blue Route Starts	0.00	6,464.88	0.00	0.00	0.00	6,536.71	0.00	0.00	0.00	6,608.54	0.00	0.00	0.00	6,608.54	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	107,153.18		96,437.86	
Spring	108,343.77		97,509.39	
Summer	109,534.36		98,580.92	
Fall	109,534.36		98,580.92	
Annual	**434,565.66**		**391,109.09**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.37		0.33	
Idle	0.05		0.04	
Starts	0.06		0.06	
Total Annual Emissions	**0.48**		**0.43**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 NoBuild_Supplemental Mesoscale NOx Emissions

Pollutant	Scenario	Year
NOx	NoBuild_Supplemental	2023
	NoBuild_Supplemental	2023
	NoBuild_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Bus Blue Route 10 mph	g/mi	5.743772	5.743772	5.743772	5.743772	5.643820	5.597825	5.580516	5.610022	4.979241	4.889834	4.856067	4.868073	5.490399	5.431378	5.413419	5.441223
Bus Blue Route 15 mph	g/mi	3.234311	3.234311	3.234311	3.234311	3.178021	3.152117	3.142382	3.158991	2.803794	2.753458	2.734438	2.741201	3.091626	3.058398	3.048283	3.063941
Bus Blue Route Idle	g/sec	0.008818	0.008818	0.008818	0.008818	0.008665	0.008594	0.008546	0.008613	0.007645	0.007507	0.007445	0.007474	0.008429	0.008339	0.008332	0.008354
Bus Blue Route Starts	g	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

2023 NOx Emissions (grams) [3]

Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Bus Blue Route 10 mph	0.00	49,874.32	37,405.74	12,468.58	0.00	49,147.12	36,746.36	12,313.55	0.00	43,402.95	32,327.42	10,802.45	0.00	48,209.78	36,037.78	12,074.29
Bus Blue Route 15 mph	0.00	12,085.97	9,064.48	3,021.49	0.00	11,909.71	8,904.69	2,983.92	0.00	10,517.77	7,833.84	2,617.74	0.00	11,682.59	8,732.96	2,925.94
Bus Blue Route Idle	0.00	7,047.59	5,285.69	1,761.90	0.00	6,944.84	5,179.17	1,739.99	0.00	6,133.14	4,561.88	1,526.46	0.00	6,812.38	5,105.13	1,706.18
Bus Blue Route Starts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	302,867.82		272,581.04	
Spring	298,145.36		268,330.82	
Summer	262,721.06		236,448.95	
Fall	292,502.56		263,252.31	
Annual	**1,156,236.80**		**1,040,613.12**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	1.09		0.98	
Idle	0.18		0.17	
Starts	0.00		0.00	
Total Annual Emissions	**1.27**		**1.15**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 NoBuild_Supplemental Mesoscale VOC Emissions

Pollutant	Scenario	Year
VOC	NoBuild_Supplemental	2023
	NoBuild_Supplemental	2023
	NoBuild_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701
Trave	Bus Blue Route 15 mph	g/mi	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782
Idl	Bus Blue Route Idle	g/sec	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686
Sta	Bus Blue Route Starts	g	0.000000	0.673498	0.000000	0.000000	0.000000	0.288642	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.220417	0.000000	0.000000

2023 VOC Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	3,922.21	2,941.66	980.55	0.00	3,965.79	2,974.34	991.45	0.00	4,009.37	3,007.03	1,002.34	0.00	4,009.37	3,007.03	1,002.34
Trave	Bus Blue Route 15 mph	0.00	978.23	733.67	244.56	0.00	989.10	741.82	247.27	0.00	999.97	749.97	249.99	0.00	999.97	749.97	249.99
Idl	Bus Blue Route Idle	0.00	548.21	411.16	137.05	0.00	554.30	415.72	138.57	0.00	560.39	420.29	140.10	0.00	560.39	420.29	140.10
Sta	Bus Blue Route Starts	0.00	363.69	0.00	0.00	0.00	157.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	121.67	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	24,687.00		22,218.30	
Spring	24,506.01		22,055.41	
Summer	24,430.10		21,987.09	
Fall	24,693.71		22,224.34	
Annual	**98,316.82**		**88,485.14**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.09		0.08	
Idle	0.02		0.01	
Starts	0.00		0.00	
Total Annual Emissions	**0.11**		**0.10**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 NoBuild_Supplemental Mesoscale SO2 Emissions

Pollutant	Scenario	Year
SO2	NoBuild_Supplemental	2023
	NoBuild_Supplemental	2023
	NoBuild_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.017180	0.017180	0.017180	0.017180	0.017180	0.017180	0.017180	0.017180	0.017326	0.019158	0.019374	0.017966	0.017180	0.017180	0.017180	0.017180
Trave	Bus Blue Route 15 mph	g/mi	0.008485	0.008485	0.008485	0.008485	0.008485	0.008485	0.008485	0.008485	0.008563	0.009541	0.009657	0.008905	0.008485	0.008485	0.008485	0.008485
Idl	Bus Blue Route Idle	g/sec	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000017	0.000017	0.000016	0.000015	0.000015	0.000015	0.000015
Sta	Bus Blue Route Starts	g	0.000000	0.002790	0.000000	0.000000	0.000000	0.002209	0.000000	0.000000	0.000000	0.001772	0.000000	0.000000	0.000000	0.002124	0.000000	0.000000

2023 SO2 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	149.17	111.88	37.29	0.00	150.83	113.12	37.71	0.00	170.05	128.98	39.87	0.00	152.49	114.37	38.12
Trave	Bus Blue Route 15 mph	0.00	31.71	23.78	7.93	0.00	32.06	24.04	8.01	0.00	36.45	27.67	8.50	0.00	32.41	24.31	8.10
Idl	Bus Blue Route Idle	0.00	11.65	8.74	2.91	0.00	11.78	8.84	2.95	0.00	13.95	10.56	3.18	0.00	11.91	8.93	2.98
Sta	Bus Blue Route Starts	0.00	1.51	0.00	0.00	0.00	1.21	0.00	0.00	0.00	0.98	0.00	0.00	0.00	1.17	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	831.49		748.34	
Spring	840.04		756.04	
Summer	947.94		853.15	
Fall	849.17		764.25	
Annual	3,468.64		3,121.78	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.00		0.00	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	0.00		0.00	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 NoBuild_Supplemental Mesoscale PM2.5 Emissions

Pollutant	Scenario	Year
PM2.5	NoBuild_Supplemental	2023
PM2.5 Brakewear	NoBuild_Supplemental	2023
PM2.5 Tirewear	NoBuild_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781
Travel	Bus Blue Route 15 mph	g/mi	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205
Idle	Bus Blue Route Idle	g/sec	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172
Starts	Bus Blue Route Starts	g	0.000000	0.010124	0.000000	0.000000	0.000000	0.010124	0.000000	0.000000	0.000000	0.010124	0.000000	0.000000	0.000000	0.010124	0.000000	0.000000

2023 PM2.5 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	1,700.01	1,275.01	425.00	0.00	1,718.90	1,289.17	429.72	0.00	1,737.79	1,303.34	434.45	0.00	1,737.79	1,303.34	434.45
Travel	Bus Blue Route 15 mph	0.00	411.81	308.86	102.95	0.00	416.39	312.29	104.10	0.00	420.97	315.72	105.24	0.00	420.97	315.72	105.24
Idle	Bus Blue Route Idle	0.00	137.52	103.14	34.38	0.00	139.05	104.29	34.76	0.00	140.58	105.43	35.14	0.00	140.58	105.43	35.14
Starts	Bus Blue Route Starts	0.00	5.47	0.00	0.00	0.00	5.53	0.00	0.00	0.00	5.59	0.00	0.00	0.00	5.59	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	9,695.39		8,725.85	
Spring	9,803.12		8,822.80	
Summer	9,910.84		8,919.76	
Fall	9,910.84		8,919.76	
Annual	**39,320.19**		**35,388.17**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.04		0.04	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.04**		0.04	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 NoBuild_Supplemental Mesoscale PM10 Emissions

Pollutant	Scenario	Year
PM10	NoBuild_Supplemental	2023
PM10 Brakewear	NoBuild_Supplemental	2023
PM10 Tirewear	NoBuild_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837
Travel	Bus Blue Route 15 mph	g/mi	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580
Idl	Bus Blue Route Idle	g/sec	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187
Sta	Bus Blue Route Starts	g	0.000000	0.011004	0.000000	0.000000	0.000000	0.011004	0.000000	0.000000	0.000000	0.011004	0.000000	0.000000	0.000000	0.011004	0.000000	0.000000

2023 PM10 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	5,851.06	4,388.30	1,462.77	0.00	5,916.07	4,437.06	1,479.02	0.00	5,981.09	4,485.82	1,495.27	0.00	5,981.09	4,485.82	1,495.27
Travel	Bus Blue Route 15 mph	0.00	1,504.36	1,128.27	376.09	0.00	1,521.08	1,140.81	380.27	0.00	1,537.79	1,153.34	384.45	0.00	1,537.79	1,153.34	384.45
Idl	Bus Blue Route Idle	0.00	149.48	112.11	37.37	0.00	151.14	113.36	37.79	0.00	152.80	114.60	38.20	0.00	152.80	114.60	38.20
Sta	Bus Blue Route Starts	0.00	5.94	0.00	0.00	0.00	6.01	0.00	0.00	0.00	6.07	0.00	0.00	0.00	6.07	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	31,696.65		28,526.99	
Spring	32,048.84		28,843.95	
Summer	32,401.02		29,160.92	
Fall	32,401.02		29,160.92	
Annual	**128,547.53**		**115,692.78**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.14		0.12	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.14**		**0.13**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 NoBuild_Supplemental Mesoscale CO2e Emissions

Pollutant	Scenario	Year
CO2e	NoBuild_Supplemental	2023
	NoBuild_Supplemental	2023
	NoBuild_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	2,045.470000	2,045.470000	2,045.470000	2,045.470000	2,045.470000	2,045.470000	2,045.470000	2,045.470000	2,062.860000	2,280.700000	2,306.460000	2,139.030000	2,045.470000	2,045.470000	2,045.470000	2,045.470000
Travel	Bus Blue Route 15 mph	g/mi	1,010.430000	1,010.430000	1,010.430000	1,010.430000	1,010.430000	1,010.430000	1,010.430000	1,010.430000	1,019.730000	1,136.090000	1,149.850000	1,060.420000	1,010.430000	1,010.430000	1,010.430000	1,010.430000
Idl	Bus Blue Route Idle	g/sec	1.737186	1.737186	1.737186	1.737186	1.737186	1.737186	1.737186	1.737186	1.759117	2.033822	2.053053	1.855175	1.737186	1.737186	1.737186	1.737186
Sta	Bus Blue Route Starts	g	0.000000	332.878000	0.000000	0.000000	0.000000	263.846000	0.000000	0.000000	0.000000	211.944000	0.000000	0.000000	0.000000	253.794000	0.000000	0.000000

2023 CO2e Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	17,761,225.10	13,320,918.83	4,440,306.28	0.00	17,958,572.05	13,468,929.04	4,489,643.01	0.00	20,243,858.11	15,354,381.00	4,746,593.13	0.00	18,155,919.00	13,616,939.25	4,538,979.75
Travel	Bus Blue Route 15 mph	0.00	3,775,774.82	2,831,831.12	943,943.71	0.00	3,817,727.88	2,863,295.91	954,431.97	0.00	4,339,682.03	3,294,182.27	1,012,658.68	0.00	3,859,680.93	2,894,760.70	964,920.23
Idl	Bus Blue Route Idle	0.00	1,388,359.14	1,041,269.36	347,089.79	0.00	1,403,785.35	1,052,839.01	350,946.34	0.00	1,661,551.40	1,257,946.50	378,900.94	0.00	1,419,211.57	1,064,408.67	354,802.89
Sta	Bus Blue Route Starts	0.00	179,754.12	0.00	0.00	0.00	144,059.92	0.00	0.00	0.00	116,993.09	0.00	0.00	0.00	140,094.29	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	99,011,936.29		89,110,742.66	
Spring	100,030,404.06		90,027,363.65	
Summer	112,863,899.96		101,577,509.97	
Fall	101,117,617.07		91,005,855.37	
Annual	**413,023,857.38**		**371,721,471.65**	

Annual Emission Contributions by Emission Source (Metric Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	375.28		337.75	
Idle	36.48		32.83	
Starts	1.26		1.13	
Total Annual Emissions	**413.02**		**371.72**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 NoBuild_Supplemental Mesoscale CO Emissions

Pollutant	Scenario	Year
CO	NoBuild_Supplemental	2024
	NoBuild_Supplemental	2024
	NoBuild_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717
Travel	Bus Blue Route 15 mph	g/mi	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750
Idle	Bus Blue Route Idle	g/sec	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926
Starts	Bus Blue Route Starts	g	0.000000	11.958232	0.000000	0.000000	0.000000	11.958232	0.000000	0.000000	0.000000	11.958232	0.000000	0.000000	0.000000	11.958232	0.000000	0.000000

2024 CO Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	14,211.82	10,658.86	3,552.95	0.00	14,211.82	10,658.86	3,552.95	0.00	14,367.99	10,775.99	3,592.00	0.00	14,367.99	10,775.99	3,592.00
Travel	Bus Blue Route 15 mph	0.00	3,316.42	2,487.31	829.10	0.00	3,316.42	2,487.31	829.10	0.00	3,352.86	2,514.65	838.22	0.00	3,352.86	2,514.65	838.22
Idle	Bus Blue Route Idle	0.00	1,556.28	1,167.21	389.07	0.00	1,556.28	1,167.21	389.07	0.00	1,573.39	1,180.04	393.35	0.00	1,573.39	1,180.04	393.35
Starts	Bus Blue Route Starts	0.00	6,529.19	0.00	0.00	0.00	6,529.19	0.00	0.00	0.00	6,600.94	0.00	0.00	0.00	6,600.94	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	112,061.84		100,855.66	
Spring	112,061.84		100,855.66	
Summer	113,293.29		101,963.96	
Fall	113,293.29		101,963.96	
Annual	**450,710.27**		**405,639.24**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.37		0.34	
Idle	0.05		0.05	
Starts	0.07		0.07	
Total Annual Emissions	**0.50**		**0.45**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 NoBuild_Supplemental Mesoscale NOx Emissions

Pollutant	Scenario	Year
NOx	NoBuild_Supplemental	2024
	NoBuild_Supplemental	2024
	NoBuild_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	5.117108	5.117108	5.117108	5.117108	5.028045	4.987076	4.971658	4.997951	4.435983	4.356335	4.326241	4.336946	4.891370	4.838795	4.822787	4.847559
Travel	Bus Blue Route 15 mph	g/mi	2.881477	2.881477	2.881477	2.881477	2.831323	2.808252	2.799568	2.814375	2.497924	2.453082	2.436134	2.442157	2.754366	2.724752	2.715748	2.729695
Idle	Bus Blue Route Idle	g/sec	0.007816	0.007816	0.007816	0.007816	0.007680	0.007617	0.007574	0.007634	0.006776	0.006654	0.006599	0.006624	0.007471	0.007391	0.007385	0.007404
Starts	Bus Blue Route Starts	g	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

2024 NOx Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	44,926.57	33,694.93	11,231.64	0.00	43,784.93	32,737.18	10,970.10	0.00	38,667.53	28,800.30	9,623.86	0.00	42,949.92	32,105.87	10,756.93
Travel	Bus Blue Route 15 mph	0.00	10,887.14	8,165.36	2,721.79	0.00	10,610.47	7,933.25	2,658.40	0.00	9,370.38	6,979.23	2,332.16	0.00	10,408.12	7,780.29	2,606.75
Idle	Bus Blue Route Idle	0.00	6,316.02	4,737.02	1,579.01	0.00	6,155.52	4,590.53	1,542.24	0.00	5,436.09	4,043.40	1,352.97	0.00	6,038.12	4,524.91	1,512.27
Starts	Bus Blue Route Starts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	315,009.79		283,508.82	
Spring	306,688.68		276,019.81	
Summer	270,249.85		243,224.86	
Fall	300,886.70		270,798.03	
Annual	**1,192,835.02**		**1,073,551.52**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	1.12		1.01	
Idle	0.20		0.18	
Starts	0.00		0.00	
Total Annual Emissions	**1.31**		**1.18**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 NoBuild_Supplemental Mesoscale VOC Emissions

Pollutant	Scenario	Year
VOC	NoBuild_Supplemental	2024
	NoBuild_Supplemental	2024
	NoBuild_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319
Travel	Bus Blue Route 15 mph	g/mi	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155
Idle	Bus Blue Route Idle	g/sec	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587
Starts	Bus Blue Route Starts	g	0.000000	0.659493	0.000000	0.000000	0.000000	0.282639	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.215834	0.000000	0.000000

2024 VOC Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	3,435.66	2,576.74	858.91	0.00	3,435.66	2,576.74	858.91	0.00	3,473.41	2,605.06	868.35	0.00	3,473.41	2,605.06	868.35
Travel	Bus Blue Route 15 mph	0.00	854.48	640.86	213.62	0.00	854.48	640.86	213.62	0.00	863.87	647.91	215.97	0.00	863.87	647.91	215.97
Idle	Bus Blue Route Idle	0.00	474.70	356.02	118.67	0.00	474.70	356.02	118.67	0.00	479.92	359.94	119.98	0.00	479.92	359.94	119.98
Starts	Bus Blue Route Starts	0.00	360.08	0.00	0.00	0.00	154.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	119.14	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	25,035.83		22,532.24	
Spring	24,521.42		22,069.28	
Summer	24,400.85		21,960.76	
Fall	24,698.70		22,228.83	
Annual	**98,656.79**		**88,791.11**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.09		0.08	
Idle	0.02		0.01	
Starts	0.00		0.00	
Total Annual Emissions	**0.11**		**0.10**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 NoBuild_Supplemental Mesoscale SO2 Emissions

Pollutant	Scenario	Year
SO2	NoBuild_Supplemental	2024
	NoBuild_Supplemental	2024
	NoBuild_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.017096	0.017096	0.017096	0.017096	0.017096	0.017096	0.017096	0.017096	0.017241	0.019065	0.019281	0.017879	0.017096	0.017096	0.017096	0.017096
Trave	Bus Blue Route 15 mph	g/mi	0.008443	0.008443	0.008443	0.008443	0.008443	0.008443	0.008443	0.008443	0.008521	0.009495	0.009611	0.008862	0.008443	0.008443	0.008443	0.008443
Idl	Bus Blue Route Idle	g/sec	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000015	0.000017	0.000017	0.000015	0.000014	0.000014	0.000014	0.000014
Sta	Bus Blue Route Starts	g	0.000000	0.002772	0.000000	0.000000	0.000000	0.002195	0.000000	0.000000	0.000000	0.001761	0.000000	0.000000	0.000000	0.002111	0.000000	0.000000

2024 SO2 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	150.10	112.57	37.52	0.00	150.10	112.57	37.52	0.00	169.22	128.35	39.67	0.00	151.75	113.81	37.94
Trave	Bus Blue Route 15 mph	0.00	31.90	23.93	7.98	0.00	31.90	23.93	7.98	0.00	36.27	27.53	8.46	0.00	32.25	24.19	8.06
Idl	Bus Blue Route Idle	0.00	11.70	8.78	2.93	0.00	11.70	8.78	2.93	0.00	13.86	10.49	3.16	0.00	11.83	8.87	2.96
Sta	Bus Blue Route Starts	0.00	1.51	0.00	0.00	0.00	1.20	0.00	0.00	0.00	0.97	0.00	0.00	0.00	1.17	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	964.40		867.96	
Spring	963.61		867.25	
Summer	1,087.58		978.82	
Fall	974.08		876.68	
Annual	**3,989.68**		**3,590.71**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.00		0.00	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.00**		0.00	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 NoBuild_Supplemental Mesoscale PM2.5 Emissions

Pollutant	Scenario	Year
PM2.5	NoBuild_Supplemental	2024
PM2.5 Brakewear	NoBuild_Supplemental	2024
PM2.5 Tirewear	NoBuild_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154
Travel	Bus Blue Route 15 mph	g/mi	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398
Idle	Bus Blue Route Idle	g/sec	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152
Starts	Bus Blue Route Starts	g	0.000000	0.009207	0.000000	0.000000	0.000000	0.009207	0.000000	0.000000	0.000000	0.009207	0.000000	0.000000	0.000000	0.009207	0.000000	0.000000

2024 PM2.5 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	1,590.47	1,192.85	397.62	0.00	1,590.47	1,192.85	397.62	0.00	1,607.95	1,205.96	401.99	0.00	1,607.95	1,205.96	401.99
Travel	Bus Blue Route 15 mph	0.00	386.89	290.17	96.72	0.00	386.89	290.17	96.72	0.00	391.14	293.36	97.79	0.00	391.14	293.36	97.79
Idle	Bus Blue Route Idle	0.00	122.62	91.96	30.65	0.00	122.62	91.96	30.65	0.00	123.97	92.97	30.99	0.00	123.97	92.97	30.99
Starts	Bus Blue Route Starts	0.00	5.03	0.00	0.00	0.00	5.03	0.00	0.00	0.00	5.08	0.00	0.00	0.00	5.08	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	10,421.12		9,379.01	
Spring	10,421.12		9,379.01	
Summer	10,535.63		9,482.07	
Fall	10,535.63		9,482.07	
Annual	**41,913.50**		**37,722.15**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.04		0.04	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.05**		0.04	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 NoBuild_Supplemental Mesoscale PM10 Emissions

Pollutant	Scenario	Year
PM10	NoBuild_Supplemental	2024
PM10 Brakewear	NoBuild_Supplemental	2024
PM10 Tirewear	NoBuild_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Idl	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938
Idl	Bus Blue Route 15 mph	g/mi	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095
Idl	Bus Blue Route Idle	g/sec	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165
Sta	Bus Blue Route Starts	g	0.000000	0.010008	0.000000	0.000000	0.000000	0.010008	0.000000	0.000000	0.000000	0.010008	0.000000	0.000000	0.000000	0.010008	0.000000	0.000000

2024 PM10 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	5,776.49	4,332.36	1,444.12	0.00	5,776.49	4,332.36	1,444.12	0.00	5,839.96	4,379.97	1,459.99	0.00	5,839.96	4,379.97	1,459.99
Idl	Bus Blue Route 15 mph	0.00	1,489.02	1,116.76	372.25	0.00	1,489.02	1,116.76	372.25	0.00	1,505.38	1,129.03	376.34	0.00	1,505.38	1,129.03	376.34
Idl	Bus Blue Route Idle	0.00	133.28	99.96	33.32	0.00	133.28	99.96	33.32	0.00	134.75	101.06	33.69	0.00	134.75	101.06	33.69
Sta	Bus Blue Route Starts	0.00	5.46	0.00	0.00	0.00	5.46	0.00	0.00	0.00	5.52	0.00	0.00	0.00	5.52	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	35,909.41		32,318.47	
Spring	35,909.41		32,318.47	
Summer	36,304.02		32,673.62	
Fall	36,304.02		32,673.62	
Annual	**144,426.87**		**129,984.18**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.15		0.14	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.16**		**0.14**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 NoBuild_Supplemental Mesoscale CO2e Emissions

Pollutant	Scenario	Year
CO2e	NoBuild_Supplemental	2024
	NoBuild_Supplemental	2024
	NoBuild_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Idl	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Sta	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	2,038.690000	2,038.690000	2,038.690000	2,038.690000	2,038.690000	2,038.690000	2,038.690000	2,038.690000	2,056.030000	2,273.230000	2,298.920000	2,131.980000	2,038.690000	2,038.690000	2,038.690000	2,038.690000
	Bus Blue Route 15 mph	g/mi	1,007.090000	1,007.090000	1,007.090000	1,007.090000	1,007.090000	1,007.090000	1,007.090000	1,007.090000	1,016.350000	1,132.380000	1,146.090000	1,056.930000	1,007.090000	1,007.090000	1,007.090000	1,007.090000
Idl	Bus Blue Route Idle	g/sec	1.728675	1.728675	1.728675	1.728675	1.728675	1.728675	1.728675	1.728675	1.750506	2.023967	2.043111	1.846131	1.728675	1.728675	1.728675	1.728675
Sta	Bus Blue Route Starts	g	0.000000	331.247000	0.000000	0.000000	0.000000	262.554000	0.000000	0.000000	0.000000	210.907000	0.000000	0.000000	0.000000	252.552000	0.000000	0.000000

2024 CO2e Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	17,899,045.82	13,424,284.36	4,474,761.45	0.00	17,899,045.82	13,424,284.36	4,474,761.45	0.00	20,177,553.20	15,304,186.31	4,730,948.90	0.00	18,095,738.63	13,571,803.97	4,523,934.66
Idl	Bus Blue Route 15 mph	0.00	3,805,108.29	2,853,831.22	951,277.07	0.00	3,805,108.29	2,853,831.22	951,277.07	0.00	4,325,510.42	3,283,410.32	1,009,325.87	0.00	3,846,922.67	2,885,192.00	961,730.67
Sta	Bus Blue Route Idle	0.00	1,396,907.69	1,047,680.77	349,226.92	0.00	1,396,907.69	1,047,680.77	349,226.92	0.00	1,653,499.81	1,251,855.04	377,053.70	0.00	1,412,258.33	1,059,193.75	353,064.58
	Bus Blue Route Starts	0.00	180,860.86	0.00	0.00	0.00	143,354.48	0.00	0.00	0.00	116,420.66	0.00	0.00	0.00	139,408.70	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	115,018,173.00		103,516,355.70	
Spring	114,924,407.05		103,431,966.35	
Summer	129,691,485.34		116,722,336.81	
Fall	116,173,509.86		104,556,158.88	
Annual	**475,807,575.26**		**428,226,817.73**	

Annual Emission Contributions by Emission Source (Metric Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	430.90		387.81	
Idle	43.46		39.11	
Starts	1.45		1.31	
Total Annual Emissions	475.81		428.23	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 NoBuild_Supplemental Mesoscale CO Emissions

Pollutant	Scenario	Year
CO	NoBuild_Supplemental	2025
	NoBuild_Supplemental	2025
	NoBuild_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136
Travel	Bus Blue Route 15 mph	g/mi	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522
Idle	Bus Blue Route Idle	g/sec	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735
Starts	Bus Blue Route Starts	g	0.000000	11.947073	0.000000	0.000000	0.000000	11.947073	0.000000	0.000000	0.000000	11.947073	0.000000	0.000000	0.000000	11.947073	0.000000	0.000000

2025 CO Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	12,444.21	9,333.16	3,111.05	0.00	12,582.48	9,436.86	3,145.62	0.00	12,720.75	9,540.56	3,180.19	0.00	12,720.75	9,540.56	3,180.19
Travel	Bus Blue Route 15 mph	0.00	2,909.18	2,181.88	727.29	0.00	2,941.50	2,206.13	735.38	0.00	2,973.83	2,230.37	743.46	0.00	2,973.83	2,230.37	743.46
Idle	Bus Blue Route Idle	0.00	1,386.86	1,040.15	346.72	0.00	1,402.27	1,051.70	350.57	0.00	1,417.68	1,063.26	354.42	0.00	1,417.68	1,063.26	354.42
Starts	Bus Blue Route Starts	0.00	6,451.42	0.00	0.00	0.00	6,523.10	0.00	0.00	0.00	6,594.78	0.00	0.00	0.00	6,594.78	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	106,857.53		96,171.78	
Spring	108,044.84		97,240.36	
Summer	109,232.15		98,308.93	
Fall	109,232.15		98,308.93	
Annual	**433,366.67**		**390,030.00**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.35		0.32	
Idle	0.05		0.04	
Starts	0.08		0.07	
Total Annual Emissions	**0.48**		**0.43**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 NoBuild_Supplemental Mesoscale NOx Emissions

Pollutant	Scenario	Year
NOx	NoBuild_Supplemental	2025
	NoBuild_Supplemental	2025
	NoBuild_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	4.605357	4.605357	4.605357	4.605357	4.525213	4.488327	4.474461	4.498121	3.992346	3.920666	3.893594	3.903218	4.402200	4.354880	4.340484	4.362774
Travel	Bus Blue Route 15 mph	g/mi	2.593316	2.593316	2.593316	2.593316	2.548187	2.527428	2.519615	2.532930	2.248129	2.207772	2.192525	2.197948	2.478927	2.452276	2.444173	2.456718
Idle	Bus Blue Route Idle	g/sec	0.006999	0.006999	0.006999	0.006999	0.006877	0.006821	0.006783	0.006836	0.006067	0.005958	0.005909	0.005932	0.006690	0.006618	0.006613	0.006630
Starts	Bus Blue Route Starts	g	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

2025 NOx Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	39,989.23	29,991.92	9,997.31	0.00	39,406.07	29,463.25	9,873.02	0.00	34,800.46	25,920.12	8,661.40	0.00	38,654.61	28,895.12	9,681.17
Travel	Bus Blue Route 15 mph	0.00	9,690.70	7,268.03	2,422.68	0.00	9,549.43	7,139.93	2,392.56	0.00	8,433.33	6,281.32	2,098.95	0.00	9,367.30	7,002.26	2,346.07
Idle	Bus Blue Route Idle	0.00	5,593.52	4,195.14	1,398.38	0.00	5,511.97	4,110.60	1,381.00	0.00	4,867.74	3,620.67	1,211.52	0.00	5,406.86	4,051.82	1,354.16
Starts	Bus Blue Route Starts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	299,028.25		269,125.42	
Spring	294,364.27		264,927.84	
Summer	259,389.91		233,450.92	
Fall	288,796.25		259,916.63	
Annual	1,141,578.68		1,027,420.81	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	1.07		0.96	
Idle	0.19		0.17	
Starts	0.00		0.00	
Total Annual Emissions	1.26		1.13	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 NoBuild_Supplemental Mesoscale VOC Emissions

Pollutant	Scenario	Year
VOC	NoBuild_Supplemental	2025
	NoBuild_Supplemental	2025
	NoBuild_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987
Travel	Bus Blue Route 15 mph	g/mi	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450
Idl	Bus Blue Route Idle	g/sec	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506
Sta	Bus Blue Route Starts	g	0.000000	0.647817	0.000000	0.000000	0.000000	0.277636	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.212013	0.000000	0.000000

2025 VOC Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	2,960.86	2,220.65	740.22	0.00	2,993.76	2,245.32	748.44	0.00	3,026.66	2,269.99	756.66	0.00	3,026.66	2,269.99	756.66
Travel	Bus Blue Route 15 mph	0.00	734.09	550.57	183.52	0.00	742.25	556.69	185.56	0.00	750.41	562.80	187.60	0.00	750.41	562.80	187.60
Idl	Bus Blue Route Idle	0.00	404.02	303.01	101.00	0.00	408.51	306.38	102.13	0.00	413.00	309.75	103.25	0.00	413.00	309.75	103.25
Sta	Bus Blue Route Starts	0.00	349.82	0.00	0.00	0.00	151.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	117.03	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	23,078.74		20,770.86	
Spring	22,796.19		20,516.57	
Summer	22,638.01		20,374.21	
Fall	22,950.10		20,655.09	
Annual	**91,463.03**		**82,316.73**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.08		0.08	
Idle	0.01		0.01	
Starts	0.00		0.00	
Total Annual Emissions	**0.10**		0.09	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 NoBuild_Supplemental Mesoscale SO2 Emissions

Pollutant	Scenario	Year
SO2	NoBuild_Supplemental	2025
	NoBuild_Supplemental	2025
	NoBuild_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Bus Blue Route 10 mph	g/mi	0.017018	0.017018	0.017018	0.017018	0.017018	0.017018	0.017018	0.017018	0.017163	0.018979	0.019194	0.017798	0.017018	0.017018	0.017018	0.017018
Bus Blue Route 15 mph	g/mi	0.008405	0.008405	0.008405	0.008405	0.008405	0.008405	0.008405	0.008405	0.008483	0.009453	0.009567	0.008822	0.008405	0.008405	0.008405	0.008405
Bus Blue Route Idle	g/sec	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000015	0.000017	0.000017	0.000015	0.000014	0.000014	0.000014	0.000014
Bus Blue Route Starts	g	0.000000	0.002755	0.000000	0.000000	0.000000	0.002182	0.000000	0.000000	0.000000	0.001751	0.000000	0.000000	0.000000	0.002098	0.000000	0.000000

2025 SO2 Emissions (grams) [3]

Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Bus Blue Route 10 mph	0.00	147.77	110.83	36.94	0.00	149.41	112.06	37.35	0.00	168.46	127.78	39.50	0.00	151.06	113.29	37.76
Bus Blue Route 15 mph	0.00	31.41	23.56	7.85	0.00	31.76	23.82	7.94	0.00	36.11	27.41	8.42	0.00	32.11	24.08	8.03
Bus Blue Route Idle	0.00	11.51	8.63	2.88	0.00	11.64	8.73	2.91	0.00	13.78	10.43	3.14	0.00	11.76	8.82	2.94
Bus Blue Route Starts	0.00	1.49	0.00	0.00	0.00	1.19	0.00	0.00	0.00	0.97	0.00	0.00	0.00	1.16	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	1,012.29		911.06	
Spring	1,022.71		920.43	
Summer	1,154.39		1,038.95	
Fall	1,033.82		930.44	
Annual	4,223.21		3,800.89	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.00		0.00	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	0.00		0.00	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 NoBuild_Supplemental Mesoscale PM2.5 Emissions

Pollutant	Scenario	Year
PM2.5	NoBuild_Supplemental	2025
PM2.5 Brakewear	NoBuild_Supplemental	2025
PM2.5 Tirewear	NoBuild_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802
Travel	Bus Blue Route 15 mph	g/mi	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227
Idle	Bus Blue Route Idle	g/sec	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133
Starts	Bus Blue Route Starts	g	0.000000	0.008441	0.000000	0.000000	0.000000	0.008441	0.000000	0.000000	0.000000	0.008441	0.000000	0.000000	0.000000	0.008441	0.000000	0.000000

2025 PM2.5 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	1,457.06	1,092.79	364.26	0.00	1,473.25	1,104.93	368.31	0.00	1,489.43	1,117.08	372.36	0.00	1,489.43	1,117.08	372.36
Travel	Bus Blue Route 15 mph	0.00	355.84	266.88	88.96	0.00	359.80	269.85	89.95	0.00	363.75	272.81	90.94	0.00	363.75	272.81	90.94
Idle	Bus Blue Route Idle	0.00	106.24	79.68	26.56	0.00	107.42	80.56	26.85	0.00	108.60	81.45	27.15	0.00	108.60	81.45	27.15
Starts	Bus Blue Route Starts	0.00	4.56	0.00	0.00	0.00	4.61	0.00	0.00	0.00	4.66	0.00	0.00	0.00	4.66	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	10,137.93		9,124.13	
Spring	10,250.57		9,225.51	
Summer	10,363.21		9,326.89	
Fall	10,363.21		9,326.89	
Annual	**41,114.92**		**37,003.43**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.04		0.04	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.05**		0.04	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 NoBuild_Supplemental Mesoscale PM10 Emissions

Pollutant	Scenario	Year
PM10	NoBuild_Supplemental	2025
PM10 Brakewear	NoBuild_Supplemental	2025
PM10 Tirewear	NoBuild_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Idl	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425
Idl	Bus Blue Route 15 mph	g/mi	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299
Idl	Bus Blue Route Idle	g/sec	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144
Sta	Bus Blue Route Starts	g	0.000000	0.009175	0.000000	0.000000	0.000000	0.009175	0.000000	0.000000	0.000000	0.009175	0.000000	0.000000	0.000000	0.009175	0.000000	0.000000

2025 PM10 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	5,586.99	4,190.24	1,396.75	0.00	5,649.06	4,236.80	1,412.27	0.00	5,711.14	4,283.36	1,427.79	0.00	5,711.14	4,283.36	1,427.79
Idl	Bus Blue Route 15 mph	0.00	1,443.52	1,082.64	360.88	0.00	1,459.56	1,094.67	364.89	0.00	1,475.60	1,106.70	368.90	0.00	1,475.60	1,106.70	368.90
Idl	Bus Blue Route Idle	0.00	115.47	86.61	28.87	0.00	116.76	87.57	29.19	0.00	118.04	88.53	29.51	0.00	118.04	88.53	29.51
Sta	Bus Blue Route Starts	0.00	4.95	0.00	0.00	0.00	5.01	0.00	0.00	0.00	5.06	0.00	0.00	0.00	5.06	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	36,908.34		33,217.51	
Spring	37,318.43		33,586.59	
Summer	37,728.53		33,955.67	
Fall	37,728.53		33,955.67	
Annual	**149,683.83**		**134,715.45**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.16		0.14	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.16**		**0.15**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 NoBuild_Supplemental Mesoscale CO2e Emissions

Pollutant	Scenario	Year
CO2e	NoBuild_Supplemental	2025
	NoBuild_Supplemental	2025
	NoBuild_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	2,032.110000	2,032.110000	2,032.110000	2,032.110000	2,032.110000	2,032.110000	2,032.110000	2,032.110000	2,049.400000	2,265.970000	2,291.580000	2,125.130000	2,032.110000	2,032.110000	2,032.110000	2,032.110000
Travel	Bus Blue Route 15 mph	g/mi	1,003.840000	1,003.840000	1,003.840000	1,003.840000	1,003.840000	1,003.840000	1,003.840000	1,003.840000	1,013.070000	1,128.760000	1,142.440000	1,053.530000	1,003.840000	1,003.840000	1,003.840000	1,003.840000
Idl	Bus Blue Route Idle	g/sec	1.720867	1.720867	1.720867	1.720867	1.720867	1.720867	1.720867	1.720867	1.742606	2.014917	2.033981	1.837831	1.720867	1.720867	1.720867	1.720867
Sta	Bus Blue Route Starts	g	0.000000	329.749000	0.000000	0.000000	0.000000	261.368000	0.000000	0.000000	0.000000	209.955000	0.000000	0.000000	0.000000	251.411000	0.000000	0.000000

2025 CO2e Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	17,645,217.55	13,233,913.16	4,411,304.39	0.00	17,841,275.52	13,380,956.64	4,460,318.88	0.00	20,113,112.28	15,255,323.05	4,715,748.48	0.00	18,037,333.50	13,528,000.12	4,509,333.37
Travel	Bus Blue Route 15 mph	0.00	3,751,149.31	2,813,361.98	937,787.33	0.00	3,792,828.75	2,844,621.56	948,207.19	0.00	4,311,682.60	3,272,953.51	1,006,079.01	0.00	3,834,508.19	2,875,881.14	958,627.05
Idl	Bus Blue Route Idle	0.00	1,375,316.64	1,031,487.48	343,829.16	0.00	1,390,597.94	1,042,948.45	347,649.48	0.00	1,646,106.32	1,246,260.57	375,358.51	0.00	1,405,879.23	1,054,409.42	351,469.81
Sta	Bus Blue Route Starts	0.00	178,064.46	0.00	0.00	0.00	142,706.93	0.00	0.00	0.00	115,895.16	0.00	0.00	0.00	138,778.87	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	120,890,149.25		108,801,134.32	
Spring	122,133,810.39		109,920,429.35	
Summer	137,839,157.79		124,055,242.01	
Fall	123,461,283.47		111,115,155.13	
Annual	**504,324,400.90**		**453,891,960.81**	

Annual Emission Contributions by Emission Source (Metric Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	456.14		410.52	
Idle	46.65		41.99	
Starts	1.53		1.38	
Total Annual Emissions	**504.32**		**453.89**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 NoBuild_Supplemental Mesoscale CO Emissions

Pollutant	Scenario	Year
CO	NoBuild_Supplemental	2026
	NoBuild_Supplemental	2026
	NoBuild_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322
Trave	Bus Blue Route 15 mph	g/mi	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255
Idl	Bus Blue Route Idle	g/sec	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577
Sta	Bus Blue Route Starts	g	0.000000	11.939454	0.000000	0.000000	0.000000	11.939454	0.000000	0.000000	0.000000	11.939454	0.000000	0.000000	0.000000	11.939454	0.000000	0.000000

2026 CO Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	11,108.61	8,331.46	2,777.15	0.00	11,232.04	8,424.03	2,808.01	0.00	11,355.47	8,516.60	2,838.87	0.00	11,355.47	8,516.60	2,838.87
Trave	Bus Blue Route 15 mph	0.00	2,601.77	1,951.32	650.44	0.00	2,630.68	1,973.01	657.67	0.00	2,659.58	1,994.69	664.90	0.00	2,659.58	1,994.69	664.90
Idl	Bus Blue Route Idle	0.00	1,260.73	945.55	315.18	0.00	1,274.74	956.06	318.69	0.00	1,288.75	966.56	322.19	0.00	1,288.75	966.56	322.19
Sta	Bus Blue Route Starts	0.00	6,447.30	0.00	0.00	0.00	6,518.94	0.00	0.00	0.00	6,590.58	0.00	0.00	0.00	6,590.58	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	109,640.67		98,676.61	
Spring	110,858.90		99,773.01	
Summer	112,077.13		100,869.42	
Fall	112,077.13		100,869.42	
Annual	**444,653.84**		**400,188.46**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.35		0.32	
Idle	0.05		0.05	
Starts	0.09		0.08	
Total Annual Emissions	**0.49**		**0.44**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 NoBuild_Supplemental Mesoscale NOx Emissions

Pollutant	Scenario	Year
NOx	NoBuild_Supplemental	2026
	NoBuild_Supplemental	2026
	NoBuild_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	4.181000	4.181000	4.181000	4.181000	4.108243	4.074760	4.062165	4.083643	3.624482	3.559408	3.534819	3.543562	3.996561	3.953605	3.940530	3.960768
Travel	Bus Blue Route 15 mph	g/mi	2.354333	2.354333	2.354333	2.354333	2.313357	2.294500	2.287408	2.299502	2.040955	2.004301	1.990456	1.995378	2.250474	2.226285	2.218922	2.230316
Idl	Bus Blue Route Idle	g/sec	0.006324	0.006324	0.006324	0.006324	0.006214	0.006164	0.006129	0.006177	0.005482	0.005384	0.005340	0.005360	0.006045	0.005980	0.005975	0.005991
Sta	Bus Blue Route Starts	g	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

2026 NOx Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	36,304.46	27,228.34	9,076.11	0.00	35,775.09	26,748.38	8,963.27	0.00	31,593.87	23,531.71	7,863.31	0.00	35,092.83	26,232.58	8,789.10
Travel	Bus Blue Route 15 mph	0.00	8,797.67	6,598.25	2,199.42	0.00	8,669.36	6,481.92	2,172.06	0.00	7,656.11	5,702.42	1,905.51	0.00	8,504.05	6,356.94	2,129.86
Idl	Bus Blue Route Idle	0.00	5,054.34	3,790.75	1,263.58	0.00	4,980.64	3,714.36	1,247.87	0.00	4,398.51	3,271.65	1,094.73	0.00	4,885.65	3,661.24	1,223.63
Sta	Bus Blue Route Starts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	305,477.00		274,929.30	
Spring	300,711.39		270,640.25	
Summer	264,983.17		238,484.85	
Fall	295,024.75		265,522.27	
Annual	1,166,196.31		1,049,576.68	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	1.09		0.98	
Idle	0.20		0.18	
Starts	0.00		0.00	
Total Annual Emissions	1.29		1.16	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 NoBuild_Supplemental Mesoscale VOC Emissions

Pollutant	Scenario	Year
VOC	NoBuild_Supplemental	2026
	NoBuild_Supplemental	2026
	NoBuild_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183
Travel	Bus Blue Route 15 mph	g/mi	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791
Idl	Bus Blue Route Idle	g/sec	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438
Sta	Bus Blue Route Starts	g	0.000000	0.638221	0.000000	0.000000	0.000000	0.273524	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.208873	0.000000	0.000000

2026 VOC Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	2,597.86	1,948.40	649.47	0.00	2,626.73	1,970.05	656.68	0.00	2,655.59	1,991.69	663.90	0.00	2,655.59	1,991.69	663.90
Travel	Bus Blue Route 15 mph	0.00	641.95	481.46	160.49	0.00	649.08	486.81	162.27	0.00	656.22	492.16	164.05	0.00	656.22	492.16	164.05
Idl	Bus Blue Route Idle	0.00	349.91	262.43	87.48	0.00	353.80	265.35	88.45	0.00	357.69	268.27	89.42	0.00	357.69	268.27	89.42
Sta	Bus Blue Route Starts	0.00	344.64	0.00	0.00	0.00	149.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	115.30	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	22,857.40		20,571.66	
Spring	22,514.00		20,262.60	
Summer	22,308.45		20,077.61	
Fall	22,654.34		20,388.91	
Annual	**90,334.20**		**81,300.78**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.08		0.07	
Idle	0.01		0.01	
Starts	0.00		0.00	
Total Annual Emissions	**0.10**		0.09	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 NoBuild_Supplemental Mesoscale SO2 Emissions

Pollutant	Scenario	Year
SO2	NoBuild_Supplemental	2026
	NoBuild_Supplemental	2026
	NoBuild_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.016946	0.016946	0.016946	0.016946	0.016946	0.016946	0.016946	0.016946	0.017090	0.018899	0.019113	0.017723	0.016946	0.016946	0.016946	0.016946
Trave	Bus Blue Route 15 mph	g/mi	0.008369	0.008369	0.008369	0.008369	0.008369	0.008369	0.008369	0.008369	0.008447	0.009413	0.009527	0.008785	0.008369	0.008369	0.008369	0.008369
Idl	Bus Blue Route Idle	g/sec	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000015	0.000017	0.000017	0.000015	0.000014	0.000014	0.000014	0.000014
Sta	Bus Blue Route Starts	g	0.000000	0.002741	0.000000	0.000000	0.000000	0.002171	0.000000	0.000000	0.000000	0.001742	0.000000	0.000000	0.000000	0.002087	0.000000	0.000000

2026 SO2 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	147.15	110.36	36.79	0.00	148.78	111.59	37.20	0.00	167.75	127.24	39.33	0.00	150.42	112.81	37.60
Trave	Bus Blue Route 15 mph	0.00	31.28	23.46	7.82	0.00	31.62	23.72	7.91	0.00	35.96	27.29	8.39	0.00	31.97	23.98	7.99
Idl	Bus Blue Route Idle	0.00	11.45	8.59	2.86	0.00	11.58	8.68	2.89	0.00	13.71	10.38	3.13	0.00	11.70	8.78	2.93
Sta	Bus Blue Route Starts	0.00	1.48	0.00	0.00	0.00	1.19	0.00	0.00	0.00	0.96	0.00	0.00	0.00	1.15	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	1,133.24		1,019.92	
Spring	1,144.90		1,030.41	
Summer	1,292.48		1,163.23	
Fall	1,157.35		1,041.61	
Annual	**4,727.97**		**4,255.17**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.00		0.00	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.01**		0.00	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 NoBuild_Supplemental Mesoscale PM2.5 Emissions

Pollutant	Scenario	Year
PM2.5	NoBuild_Supplemental	2026
PM2.5 Brakewear	NoBuild_Supplemental	2026
PM2.5 Tirewear	NoBuild_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Idl	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Sta	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740
Idl	Bus Blue Route 15 mph	g/mi	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284
Sta	Bus Blue Route Idle	g/sec	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117
	Bus Blue Route Starts	g	0.000000	0.007808	0.000000	0.000000	0.000000	0.007808	0.000000	0.000000	0.000000	0.007808	0.000000	0.000000	0.000000	0.007808	0.000000	0.000000

2026 PM2.5 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	1,361.01	1,020.75	340.25	0.00	1,376.13	1,032.10	344.03	0.00	1,391.25	1,043.44	347.81	0.00	1,391.25	1,043.44	347.81
Idl	Bus Blue Route 15 mph	0.00	333.64	250.23	83.41	0.00	337.34	253.01	84.34	0.00	341.05	255.79	85.26	0.00	341.05	255.79	85.26
Sta	Bus Blue Route Idle	0.00	93.81	70.36	23.45	0.00	94.85	71.14	23.71	0.00	95.90	71.92	23.97	0.00	95.90	71.92	23.97
	Bus Blue Route Starts	0.00	4.22	0.00	0.00	0.00	4.26	0.00	0.00	0.00	4.31	0.00	0.00	0.00	4.31	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	10,602.77		9,542.49	
Spring	10,720.58		9,648.52	
Summer	10,838.39		9,754.55	
Fall	10,838.39		9,754.55	
Annual	**43,000.13**		**38,700.11**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.04		0.04	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.05**		0.04	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 NoBuild_Supplemental Mesoscale PM10 Emissions

Pollutant	Scenario	Year
PM10	NoBuild_Supplemental	2026
PM10 Brakewear	NoBuild_Supplemental	2026
PM10 Tirewear	NoBuild_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401
Trave	Bus Blue Route 15 mph	g/mi	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840
Idl	Bus Blue Route Idle	g/sec	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128
Sta	Bus Blue Route Starts	g	0.000000	0.008486	0.000000	0.000000	0.000000	0.008486	0.000000	0.000000	0.000000	0.008486	0.000000	0.000000	0.000000	0.008486	0.000000	0.000000

2026 PM10 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	5,482.58	4,111.94	1,370.65	0.00	5,543.50	4,157.63	1,385.88	0.00	5,604.42	4,203.31	1,401.10	0.00	5,604.42	4,203.31	1,401.10
Trave	Bus Blue Route 15 mph	0.00	1,419.38	1,064.54	354.85	0.00	1,435.16	1,076.37	358.79	0.00	1,450.93	1,088.20	362.73	0.00	1,450.93	1,088.20	362.73
Idl	Bus Blue Route Idle	0.00	101.97	76.48	25.49	0.00	103.10	77.33	25.78	0.00	104.23	78.18	26.06	0.00	104.23	78.18	26.06
Sta	Bus Blue Route Starts	0.00	4.58	0.00	0.00	0.00	4.63	0.00	0.00	0.00	4.68	0.00	0.00	0.00	4.68	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	40,567.40		36,510.66	
Spring	41,018.14		36,916.33	
Summer	41,468.89		37,322.00	
Fall	41,468.89		37,322.00	
Annual	**164,523.33**		**148,070.99**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.18		0.16	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.18**		**0.16**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 NoBuild_Supplemental Mesoscale CO2e Emissions

Pollutant	Scenario	Year
CO2e	NoBuild_Supplemental	2026
	NoBuild_Supplemental	2026
	NoBuild_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	2,025.710000	2,025.710000	2,025.710000	2,025.710000	2,025.710000	2,025.710000	2,025.710000	2,025.710000	2,042.950000	2,258.880000	2,284.420000	2,118.460000	2,025.710000	2,025.710000	2,025.710000	2,025.710000
Travel	Bus Blue Route 15 mph	g/mi	1,000.680000	1,000.680000	1,000.680000	1,000.680000	1,000.680000	1,000.680000	1,000.680000	1,000.680000	1,009.890000	1,125.230000	1,138.870000	1,050.230000	1,000.680000	1,000.680000	1,000.680000	1,000.680000
Idl	Bus Blue Route Idle	g/sec	1.713833	1.713833	1.713833	1.713833	1.713833	1.713833	1.713833	1.713833	1.735489	2.006736	2.025725	1.830339	1.713833	1.713833	1.713833	1.713833
Sta	Bus Blue Route Starts	g	0.000000	328.401000	0.000000	0.000000	0.000000	260.300000	0.000000	0.000000	0.000000	209.098000	0.000000	0.000000	0.000000	250.384000	0.000000	0.000000

2026 CO2e Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	17,589,645.07	13,192,233.80	4,397,411.27	0.00	17,785,085.57	13,338,814.18	4,446,271.39	0.00	20,050,180.30	15,207,658.07	4,700,947.48	0.00	17,980,526.07	13,485,394.56	4,495,131.52
Travel	Bus Blue Route 15 mph	0.00	3,739,341.02	2,804,505.77	934,835.26	0.00	3,780,889.26	2,835,666.94	945,222.31	0.00	4,298,198.56	3,262,725.89	1,002,927.64	0.00	3,822,437.49	2,866,828.12	955,609.37
Idl	Bus Blue Route Idle	0.00	1,369,695.60	1,027,271.70	342,423.90	0.00	1,384,914.44	1,038,685.83	346,228.61	0.00	1,639,423.13	1,241,202.22	373,828.41	0.00	1,400,133.28	1,050,099.96	350,033.32
Sta	Bus Blue Route Starts	0.00	177,336.54	0.00	0.00	0.00	142,123.80	0.00	0.00	0.00	115,422.10	0.00	0.00	0.00	138,211.97	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	135,483,421.72		121,935,079.54	
Spring	136,877,243.63		123,189,519.27	
Summer	154,496,015.78		139,046,414.20	
Fall	138,364,968.27		124,528,471.44	
Annual	**565,221,649.39**		**508,699,484.45**	

Annual Emission Contributions by Emission Source (Metric Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	510.06		459.05	
Idle	53.44		48.10	
Starts	1.72		1.55	
Total Annual Emissions	**565.22**		508.70	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2031 NoBuild_Supplemental Mesoscale CO Emissions

Pollutant	Scenario	Year
CO	NoBuild_Supplemental	2031
	NoBuild_Supplemental	2031
	NoBuild_Supplemental	2031

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.810243	0.810243	0.810243	0.810243	0.810243	0.810243	0.810243	0.810243	0.810243	0.810243	0.810243	0.810243	0.810243	0.810243	0.810243	0.810243
Trave	Bus Blue Route 15 mph	g/mi	0.445413	0.445413	0.445413	0.445413	0.445413	0.445413	0.445413	0.445413	0.445413	0.445413	0.445413	0.445413	0.445413	0.445413	0.445413	0.445413
Idl	Bus Blue Route Idle	g/sec	0.001099	0.001099	0.001099	0.001099	0.001099	0.001099	0.001099	0.001099	0.001099	0.001099	0.001099	0.001099	0.001099	0.001099	0.001099	0.001099
Sta	Bus Blue Route Starts	g	0.000000	11.913521	0.000000	0.000000	0.000000	11.913521	0.000000	0.000000	0.000000	11.913521	0.000000	0.000000	0.000000	11.913521	0.000000	0.000000

2031 CO Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	7,035.50	5,276.63	1,758.88	0.00	7,113.67	5,335.25	1,778.42	0.00	7,191.84	5,393.88	1,797.96	0.00	7,191.84	5,393.88	1,797.96
Trave	Bus Blue Route 15 mph	0.00	1,664.42	1,248.31	416.10	0.00	1,682.91	1,262.18	420.73	0.00	1,701.41	1,276.05	425.35	0.00	1,701.41	1,276.05	425.35
Idl	Bus Blue Route Idle	0.00	878.06	658.54	219.51	0.00	887.82	665.86	221.95	0.00	897.57	673.18	224.39	0.00	897.57	673.18	224.39
Sta	Bus Blue Route Starts	0.00	6,433.30	0.00	0.00	0.00	6,504.78	0.00	0.00	0.00	6,576.26	0.00	0.00	0.00	6,576.26	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	103,189.82		92,870.84	
Spring	104,336.37		93,902.74	
Summer	105,482.93		94,934.63	
Fall	105,482.93		94,934.63	
Annual	**418,492.05**		**376,642.84**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.30		0.27	
Idle	0.05		0.05	
Starts	0.12		0.10	
Total Annual Emissions	**0.46**		**0.42**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2031 NoBuild_Supplemental Mesoscale NOx Emissions

Pollutant	Scenario	Year
NOx	NoBuild_Supplemental	2031
	NoBuild_Supplemental	2031
	NoBuild_Supplemental	2031

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Idl	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Sta	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	2.960508	2.960508	2.960508	2.960508	2.908981	2.885277	2.868965	2.891568	2.566442	2.520366	2.499553	2.509144	2.829909	2.799495	2.797205	2.804566
Idl	Bus Blue Route 15 mph	g/mi	1.665178	1.665178	1.665178	1.665178	1.636203	1.622862	1.613690	1.626402	1.443536	1.417612	1.405911	1.411301	1.591717	1.574615	1.573335	1.577465
Sta	Bus Blue Route Idle	g/sec	0.004403	0.004403	0.004403	0.004403	0.004326	0.004291	0.004267	0.004300	0.003817	0.003748	0.003717	0.003732	0.004209	0.004163	0.004160	0.004171
	Bus Blue Route Starts	g	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

2031 NOx Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	25,706.68	19,280.01	6,426.67	0.00	25,331.81	18,891.45	6,346.76	0.00	22,371.17	16,639.82	5,567.89	0.00	24,848.77	18,621.33	6,223.44
Idl	Bus Blue Route 15 mph	0.00	6,222.44	4,666.83	1,555.61	0.00	6,131.69	4,572.78	1,536.27	0.00	5,415.05	4,027.77	1,347.74	0.00	6,014.78	4,507.41	1,506.42
Sta	Bus Blue Route Idle	0.00	3,518.84	2,639.13	879.71	0.00	3,467.53	2,585.95	868.77	0.00	3,062.26	2,277.73	762.16	0.00	3,401.41	2,548.97	851.89
	Bus Blue Route Starts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	288,112.84		259,301.55	
Spring	283,386.96		255,048.27	
Summer	249,813.44		224,832.10	
Fall	278,475.36		250,627.82	
Annual	1,099,788.60		989,809.74	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	1.02		0.92	
Idle	0.19		0.17	
Starts	0.00		0.00	
Total Annual Emissions	1.21		1.09	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2031 NoBuild_Supplemental Mesoscale VOC Emissions

Pollutant	Scenario	Year
VOC	NoBuild_Supplemental	2031
	NoBuild_Supplemental	2031
	NoBuild_Supplemental	2031

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.171833	0.171833	0.171833	0.171833	0.171833	0.171833	0.171833	0.171833	0.171833	0.171833	0.171833	0.171833	0.171833	0.171833	0.171833	0.171833
Travel	Bus Blue Route 15 mph	g/mi	0.096646	0.096646	0.096646	0.096646	0.096646	0.096646	0.096646	0.096646	0.096646	0.096646	0.096646	0.096646	0.096646	0.096646	0.096646	0.096646
Idl	Bus Blue Route Idle	g/sec	0.000232	0.000232	0.000232	0.000232	0.000232	0.000232	0.000232	0.000232	0.000232	0.000232	0.000232	0.000232	0.000232	0.000232	0.000232	0.000232
Sta	Bus Blue Route Starts	g	0.000000	0.608957	0.000000	0.000000	0.000000	0.260981	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.199295	0.000000	0.000000

2031 VOC Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	1,492.06	1,119.05	373.02	0.00	1,508.64	1,131.48	377.16	0.00	1,525.22	1,143.92	381.31	0.00	1,525.22	1,143.92	381.31
Travel	Bus Blue Route 15 mph	0.00	361.15	270.86	90.29	0.00	365.16	273.87	91.29	0.00	369.17	276.88	92.29	0.00	369.17	276.88	92.29
Idl	Bus Blue Route Idle	0.00	185.48	139.11	46.37	0.00	187.54	140.66	46.89	0.00	189.61	142.20	47.40	0.00	189.61	142.20	47.40
Sta	Bus Blue Route Starts	0.00	328.84	0.00	0.00	0.00	142.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	110.01	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	17,796.52		16,016.87	
Spring	17,234.28		15,510.85	
Summer	16,847.42		15,162.68	
Fall	17,287.47		15,558.72	
Annual	**69,165.70**		**62,249.13**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.06		0.06	
Idle	0.01		0.01	
Starts	0.00		0.00	
Total Annual Emissions	**0.08**		**0.07**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2031 NoBuild_Supplemental Mesoscale SO2 Emissions

Pollutant	Scenario	Year
SO2	NoBuild_Supplemental	2031
	NoBuild_Supplemental	2031
	NoBuild_Supplemental	2031

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.016688	0.016688	0.016688	0.016688	0.016688	0.016688	0.016688	0.016688	0.016830	0.018612	0.018737	0.017453	0.016688	0.016688	0.016688	0.016688
Trave	Bus Blue Route 15 mph	g/mi	0.008242	0.008242	0.008242	0.008242	0.008242	0.008242	0.008242	0.008242	0.008318	0.009270	0.009337	0.008651	0.008242	0.008242	0.008242	0.008242
Idl	Bus Blue Route Idle	g/sec	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000016	0.000017	0.000015	0.000014	0.000014	0.000014	0.000014
Sta	Bus Blue Route Starts	g	0.000000	0.002691	0.000000	0.000000	0.000000	0.002131	0.000000	0.000000	0.000000	0.001710	0.000000	0.000000	0.000000	0.002049	0.000000	0.000000

2031 SO2 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	144.90	108.68	36.23	0.00	146.51	109.88	36.63	0.00	165.20	124.73	38.73	0.00	148.12	111.09	37.03
Trave	Bus Blue Route 15 mph	0.00	30.80	23.10	7.70	0.00	31.14	23.36	7.79	0.00	35.41	26.75	8.26	0.00	31.48	23.61	7.87
Idl	Bus Blue Route Idle	0.00	11.24	8.43	2.81	0.00	11.36	8.52	2.84	0.00	13.46	10.19	3.07	0.00	11.49	8.62	2.87
Sta	Bus Blue Route Starts	0.00	1.45	0.00	0.00	0.00	1.16	0.00	0.00	0.00	0.94	0.00	0.00	0.00	1.13	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	1,485.77		1,337.19	
Spring	1,501.05		1,350.95	
Summer	1,692.26		1,523.03	
Fall	1,517.37		1,365.63	
Annual	**6,196.45**		**5,576.80**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.01		0.01	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.01**		0.01	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2031 NoBuild_Supplemental Mesoscale PM2.5 Emissions

Pollutant	Scenario	Year
PM2.5	NoBuild_Supplemental	2031
PM2.5 Brakewear	NoBuild_Supplemental	2031
PM2.5 Tirewear	NoBuild_Supplemental	2031

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.125782	0.125782	0.125782	0.125782	0.125782	0.125782	0.125782	0.125782	0.125782	0.125782	0.125782	0.125782	0.125782	0.125782	0.125782	0.125782
Travel	Bus Blue Route 15 mph	g/mi	0.072574	0.072574	0.072574	0.072574	0.072574	0.072574	0.072574	0.072574	0.072574	0.072574	0.072574	0.072574	0.072574	0.072574	0.072574	0.072574
Idl	Bus Blue Route Idle	g/sec	0.000073	0.000073	0.000073	0.000073	0.000073	0.000073	0.000073	0.000073	0.000073	0.000073	0.000073	0.000073	0.000073	0.000073	0.000073	0.000073
Sta	Bus Blue Route Starts	g	0.000000	0.005883	0.000000	0.000000	0.000000	0.005883	0.000000	0.000000	0.000000	0.005883	0.000000	0.000000	0.000000	0.005883	0.000000	0.000000

2031 PM2.5 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	1,092.19	819.14	273.05	0.00	1,104.32	828.24	276.08	0.00	1,116.46	837.34	279.11	0.00	1,116.46	837.34	279.11
Travel	Bus Blue Route 15 mph	0.00	271.19	203.40	67.80	0.00	274.21	205.66	68.55	0.00	277.22	207.92	69.31	0.00	277.22	207.92	69.31
Idl	Bus Blue Route Idle	0.00	58.50	43.87	14.62	0.00	59.15	44.36	14.79	0.00	59.80	44.85	14.95	0.00	59.80	44.85	14.95
Sta	Bus Blue Route Starts	0.00	3.18	0.00	0.00	0.00	3.21	0.00	0.00	0.00	3.25	0.00	0.00	0.00	3.25	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	11,136.29		10,022.66	
Spring	11,260.03		10,134.03	
Summer	11,383.77		10,245.39	
Fall	11,383.77		10,245.39	
Annual	**45,163.86**		**40,647.47**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.05		0.04	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.05**		0.04	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2031 NoBuild_Supplemental Mesoscale PM10 Emissions

Pollutant	Scenario	Year
PM10	NoBuild_Supplemental	2031
PM10 Brakewear	NoBuild_Supplemental	2031
PM10 Tirewear	NoBuild_Supplemental	2031

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.597751	0.597751	0.597751	0.597751	0.597751	0.597751	0.597751	0.597751	0.597751	0.597751	0.597751	0.597751	0.597751	0.597751	0.597751	0.597751
Trave	Bus Blue Route 15 mph	g/mi	0.361677	0.361677	0.361677	0.361677	0.361677	0.361677	0.361677	0.361677	0.361677	0.361677	0.361677	0.361677	0.361677	0.361677	0.361677	0.361677
Idl	Bus Blue Route Idle	g/sec	0.000080	0.000080	0.000080	0.000080	0.000080	0.000080	0.000080	0.000080	0.000080	0.000080	0.000080	0.000080	0.000080	0.000080	0.000080	0.000080
Sta	Bus Blue Route Starts	g	0.000000	0.006395	0.000000	0.000000	0.000000	0.006395	0.000000	0.000000	0.000000	0.006395	0.000000	0.000000	0.000000	0.006395	0.000000	0.000000

2031 PM10 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	5,190.39	3,892.79	1,297.60	0.00	5,248.06	3,936.04	1,312.01	0.00	5,305.73	3,979.30	1,326.43	0.00	5,305.73	3,979.30	1,326.43
Trave	Bus Blue Route 15 mph	0.00	1,351.51	1,013.64	337.88	0.00	1,366.53	1,024.90	341.63	0.00	1,381.55	1,036.16	345.39	0.00	1,381.55	1,036.16	345.39
Idl	Bus Blue Route Idle	0.00	63.59	47.69	15.90	0.00	64.29	48.22	16.07	0.00	65.00	48.75	16.25	0.00	65.00	48.75	16.25
Sta	Bus Blue Route Starts	0.00	3.45	0.00	0.00	0.00	3.49	0.00	0.00	0.00	3.53	0.00	0.00	0.00	3.53	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	50,608.66		45,547.79	
Spring	51,170.97		46,053.88	
Summer	51,733.29		46,559.96	
Fall	51,733.29		46,559.96	
Annual	**205,246.21**		**184,721.59**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.22		0.20	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.23**		**0.20**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2031 NoBuild_Supplemental Mesoscale CO2e Emissions

Pollutant	Scenario	Year
CO2e	NoBuild_Supplemental	2031
	NoBuild_Supplemental	2031
	NoBuild_Supplemental	2031

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	2,001.620000	2,001.620000	2,001.620000	2,001.620000	2,001.620000	2,001.620000	2,001.620000	2,001.620000	2,018.660000	2,232.110000	2,247.050000	2,093.300000	2,001.620000	2,001.620000	2,001.620000	2,001.620000
Trave	Bus Blue Route 15 mph	g/mi	988.787000	988.787000	988.787000	988.787000	988.787000	988.787000	988.787000	988.787000	997.887000	1,111.910000	1,119.890000	1,037.760000	988.787000	988.787000	988.787000	988.787000
Idl	Bus Blue Route Idle	g/sec	1.688211	1.688211	1.688211	1.688211	1.688211	1.688211	1.688211	1.688211	1.709547	1.976839	1.995550	1.803017	1.688211	1.688211	1.688211	1.688211
Sta	Bus Blue Route Starts	g	0.000000	339.249000	0.000000	0.000000	0.000000	263.164000	0.000000	0.000000	0.000000	205.976000	0.000000	0.000000	0.000000	251.800000	0.000000	0.000000

2031 CO2e Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	17,380,466.78	13,035,350.09	4,345,116.70	0.00	17,573,583.08	13,180,187.31	4,393,395.77	0.00	19,812,565.50	14,958,881.50	4,645,116.43	0.00	17,766,699.38	13,325,024.53	4,441,674.84
Trave	Bus Blue Route 15 mph	0.00	3,694,899.26	2,771,174.45	923,724.82	0.00	3,735,953.70	2,801,965.27	933,988.42	0.00	4,247,318.29	3,208,350.46	991,019.29	0.00	3,777,008.13	2,832,756.10	944,252.03
Idl	Bus Blue Route Idle	0.00	1,349,218.32	1,011,913.74	337,304.58	0.00	1,364,209.63	1,023,157.23	341,052.41	0.00	1,614,998.30	1,222,713.40	368,248.12	0.00	1,379,200.95	1,034,400.71	344,800.24
Sta	Bus Blue Route Starts	0.00	183,194.46	0.00	0.00	0.00	143,687.54	0.00	0.00	0.00	113,698.75	0.00	0.00	0.00	138,993.60	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	178,270,185.03		160,443,166.53	
Spring	180,084,795.22		162,076,315.70	
Summer	202,972,945.27		182,675,650.74	
Fall	182,038,657.30		163,834,791.57	
Annual	**743,366,582.82**		**669,029,924.54**	

Annual Emission Contributions by Emission Source (Metric Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	667.78		601.00	
Idle	73.27		65.95	
Starts	2.32		2.09	
Total Annual Emissions	**743.37**		669.03	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

Attachment C-2

Proposed Action Alternative Supplemental Busing Emission Worksheets

2022 Build_Supplemental Mesoscale CO Emissions

Pollutant	Scenario	Year
CO	Build_Supplemental	2022
	Build_Supplemental	2022
	Build_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125	2.109125
Travel	Bus Blue Route 15 mph	g/mi	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036	1.140036
Idl	Bus Blue Route Idle	g/sec	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433	0.002433
Sta	Bus Blue Route Starts	g	0.000000	11.989368	0.000000	0.000000	0.000000	11.989368	0.000000	0.000000	0.000000	11.989368	0.000000	0.000000	0.000000	11.989368	0.000000	0.000000

2022 CO Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	18,313.96	13,735.47	4,578.49	0.00	18,517.44	13,888.08	4,629.36	0.00	18,720.93	14,040.70	4,680.23	0.00	18,720.93	14,040.70	4,680.23
Travel	Bus Blue Route 15 mph	0.00	4,260.09	3,195.06	1,065.02	0.00	4,307.42	3,230.57	1,076.86	0.00	4,354.75	3,266.07	1,088.69	0.00	4,354.75	3,266.07	1,088.69
Idl	Bus Blue Route Idle	0.00	1,944.84	1,458.63	486.21	0.00	1,966.45	1,474.84	491.61	0.00	1,988.06	1,491.04	497.01	0.00	1,988.06	1,491.04	497.01
Sta	Bus Blue Route Starts	0.00	6,474.26	0.00	0.00	0.00	6,546.20	0.00	0.00	0.00	6,618.13	0.00	0.00	0.00	6,618.13	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	111,198.17		100,078.35	
Spring	112,433.71		101,190.34	
Summer	113,669.24		102,302.32	
Fall	113,669.24		102,302.32	
Annual	**450,970.36**		**405,873.32**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.39		0.35	
Idle	0.05		0.04	
Starts	0.06		0.05	
Total Annual Emissions	**0.50**		**0.45**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2022 Build_Supplemental Mesoscale NOx Emissions

Pollutant	Scenario	Year
NOx	Build_Supplemental	2022
	Build_Supplemental	2022
	Build_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	6.496090	6.496090	6.496090	6.496090	6.383035	6.331026	6.311454	6.344824	5.631417	5.530310	5.492108	5.505696	6.209526	6.142778	6.122467	6.153915
Travel	Bus Blue Route 15 mph	g/mi	3.657848	3.657848	3.657848	3.657848	3.594181	3.564895	3.553878	3.572669	3.170960	3.114027	3.092515	3.100169	3.496486	3.458904	3.447468	3.465168
Idl	Bus Blue Route Idle	g/sec	0.010026	0.010026	0.010026	0.010026	0.009852	0.009772	0.009716	0.009793	0.008692	0.008536	0.008465	0.008498	0.009584	0.009481	0.009473	0.009498
Sta	Bus Blue Route Starts	g	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

2022 NOx Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	56,406.85	42,305.13	14,101.71	0.00	55,584.38	41,559.41	13,926.38	0.00	49,087.91	36,561.62	12,217.36	0.00	54,524.28	40,758.00	13,655.78
Travel	Bus Blue Route 15 mph	0.00	13,668.65	10,251.48	3,417.16	0.00	13,469.31	10,070.77	3,374.67	0.00	11,895.09	8,859.68	2,960.54	0.00	13,212.46	9,876.58	3,309.10
Idl	Bus Blue Route Idle	0.00	8,013.04	6,009.78	2,003.26	0.00	7,896.19	5,888.65	1,978.35	0.00	6,973.31	5,186.81	1,735.57	0.00	7,745.61	5,804.47	1,939.91
Sta	Bus Blue Route Starts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	316,139.23		284,525.30	
Spring	311,210.50		280,089.45	
Summer	274,233.66		246,810.29	
Fall	305,319.17		274,787.25	
Annual	**1,206,902.55**		**1,086,212.29**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	1.14		1.03	
Idle	0.19		0.17	
Starts	0.00		0.00	
Total Annual Emissions	**1.33**		**1.20**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2022 Build_Supplemental Mesoscale VOC Emissions

Pollutant	Scenario	Year
VOC	Build_Supplemental	2022
	Build_Supplemental	2022
	Build_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905	0.523905
Travel	Bus Blue Route 15 mph	g/mi	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390	0.304390
Idl	Bus Blue Route Idle	g/sec	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804	0.000804
Sta	Bus Blue Route Starts	g	0.000000	0.690336	0.000000	0.000000	0.000000	0.295858	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.225928	0.000000	0.000000

2022 VOC Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	4,549.17	3,411.88	1,137.29	0.00	4,599.72	3,449.79	1,149.93	0.00	4,650.26	3,487.70	1,162.57	0.00	4,650.26	3,487.70	1,162.57
Travel	Bus Blue Route 15 mph	0.00	1,137.44	853.08	284.36	0.00	1,150.08	862.56	287.52	0.00	1,162.72	872.04	290.68	0.00	1,162.72	872.04	290.68
Idl	Bus Blue Route Idle	0.00	642.75	482.06	160.69	0.00	649.89	487.42	162.47	0.00	657.03	492.77	164.26	0.00	657.03	492.77	164.26
Sta	Bus Blue Route Starts	0.00	372.78	0.00	0.00	0.00	161.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	124.71	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	26,360.58		23,724.53	
Spring	26,222.71		23,600.44	
Summer	26,184.24		23,565.82	
Fall	26,433.67		23,790.30	
Annual	**105,201.20**		**94,681.08**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.10		0.09	
Idle	0.02		0.01	
Starts	0.00		0.00	
Total Annual Emissions	**0.12**		**0.10**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2022 Build_Supplemental Mesoscale SO2 Emissions

Pollutant	Scenario	Year
SO2	Build_Supplemental	2022
	Build_Supplemental	2022
	Build_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.017270	0.017270	0.017270	0.017270	0.017270	0.017270	0.017270	0.017270	0.017417	0.019257	0.019475	0.018061	0.017270	0.017270	0.017270	0.017270
Travel	Bus Blue Route 15 mph	g/mi	0.008530	0.008530	0.008530	0.008530	0.008530	0.008530	0.008530	0.008530	0.008608	0.009591	0.009707	0.008952	0.008530	0.008530	0.008530	0.008530
Idl	Bus Blue Route Idle	g/sec	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000017	0.000017	0.000016	0.000015	0.000015	0.000015	0.000015
Sta	Bus Blue Route Starts	g	0.000000	0.002810	0.000000	0.000000	0.000000	0.002225	0.000000	0.000000	0.000000	0.001785	0.000000	0.000000	0.000000	0.002140	0.000000	0.000000

2022 SO2 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	149.96	112.47	37.49	0.00	151.63	113.72	37.91	0.00	170.93	129.65	40.08	0.00	153.29	114.97	38.32
Travel	Bus Blue Route 15 mph	0.00	31.87	23.90	7.97	0.00	32.23	24.17	8.06	0.00	36.64	27.81	8.55	0.00	32.58	24.44	8.15
Idl	Bus Blue Route Idle	0.00	11.74	8.80	2.93	0.00	11.87	8.90	2.97	0.00	14.05	10.64	3.20	0.00	12.00	9.00	3.00
Sta	Bus Blue Route Starts	0.00	1.52	0.00	0.00	0.00	1.21	0.00	0.00	0.00	0.99	0.00	0.00	0.00	1.18	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	772.11		694.90	
Spring	780.05		702.05	
Summer	880.12		792.11	
Fall	788.53		709.68	
Annual	3,220.82		2,898.74	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.00		0.00	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	0.00		0.00	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2022 Build_Supplemental Mesoscale PM2.5 Emissions

Pollutant	Scenario	Year
PM2.5	Build_Supplemental	2022
PM2.5 Brakewear	Build_Supplemental	2022
PM2.5 Tirewear	Build_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196	0.213196
Travel	Bus Blue Route 15 mph	g/mi	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498	0.119498
Idl	Bus Blue Route Idle	g/sec	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196	0.000196
Sta	Bus Blue Route Starts	g	0.000000	0.011224	0.000000	0.000000	0.000000	0.011224	0.000000	0.000000	0.000000	0.011224	0.000000	0.000000	0.000000	0.011224	0.000000	0.000000

2022 PM2.5 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	1,851.22	1,388.42	462.81	0.00	1,871.79	1,403.84	467.95	0.00	1,892.36	1,419.27	473.09	0.00	1,892.36	1,419.27	473.09
Travel	Bus Blue Route 15 mph	0.00	446.54	334.90	111.63	0.00	451.50	338.63	112.88	0.00	456.46	342.35	114.12	0.00	456.46	342.35	114.12
Idl	Bus Blue Route Idle	0.00	156.94	117.71	39.24	0.00	158.69	119.02	39.67	0.00	160.43	120.32	40.11	0.00	160.43	120.32	40.11
Sta	Bus Blue Route Starts	0.00	6.06	0.00	0.00	0.00	6.13	0.00	0.00	0.00	6.20	0.00	0.00	0.00	6.20	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	9,783.34		8,805.01	
Spring	9,892.05		8,902.84	
Summer	10,000.75		9,000.67	
Fall	10,000.75		9,000.67	
Annual	**39,676.89**		**35,709.20**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.04		0.04	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.04**		0.04	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2022 Build_Supplemental Mesoscale PM10 Emissions

Pollutant	Scenario	Year
PM10	Build_Supplemental	2022
PM10 Brakewear	Build_Supplemental	2022
PM10 Tirewear	Build_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766	0.692766
Travel	Bus Blue Route 15 mph	g/mi	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681	0.412681
Idl	Bus Blue Route Idle	g/sec	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213	0.000213
Sta	Bus Blue Route Starts	g	0.000000	0.012200	0.000000	0.000000	0.000000	0.012200	0.000000	0.000000	0.000000	0.012200	0.000000	0.000000	0.000000	0.012200	0.000000	0.000000

2022 PM10 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	6,015.43	4,511.57	1,503.86	0.00	6,082.26	4,561.70	1,520.57	0.00	6,149.10	4,611.83	1,537.28	0.00	6,149.10	4,611.83	1,537.28
Travel	Bus Blue Route 15 mph	0.00	1,542.11	1,156.58	385.53	0.00	1,559.24	1,169.43	389.81	0.00	1,576.38	1,182.28	394.09	0.00	1,576.38	1,182.28	394.09
Idl	Bus Blue Route Idle	0.00	170.59	127.94	42.65	0.00	172.49	129.37	43.12	0.00	174.38	130.79	43.60	0.00	174.38	130.79	43.60
Sta	Bus Blue Route Starts	0.00	6.59	0.00	0.00	0.00	6.66	0.00	0.00	0.00	6.73	0.00	0.00	0.00	6.73	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	30,215.35		27,193.82	
Spring	30,551.08		27,495.97	
Summer	30,886.81		27,798.13	
Fall	30,886.81		27,798.13	
Annual	**122,540.05**		**110,286.04**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.13		0.12	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.14**		**0.12**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2022 Build_Supplemental Mesoscale CO2e Emissions

Pollutant	Scenario	Year
CO2e	Build_Supplemental	2022
	Build_Supplemental	2022
	Build_Supplemental	2022

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	2,052.450000	2,052.450000	2,052.450000	2,052.450000	2,052.450000	2,052.450000	2,052.450000	2,052.450000	2,069.890000	2,288.360000	2,314.200000	2,146.280000	2,052.450000	2,052.450000	2,052.450000	2,052.450000
Travel	Bus Blue Route 15 mph	g/mi	1,013.880000	1,013.880000	1,013.880000	1,013.880000	1,013.880000	1,013.880000	1,013.880000	1,013.880000	1,023.200000	1,139.900000	1,153.700000	1,064.010000	1,013.880000	1,013.880000	1,013.880000	1,013.880000
Idl	Bus Blue Route Idle	g/sec	1.746561	1.746561	1.746561	1.746561	1.746561	1.746561	1.746561	1.746561	1.768600	2.044644	2.063969	1.865128	1.746561	1.746561	1.746561	1.746561
Sta	Bus Blue Route Starts	g	0.000000	334.674000	0.000000	0.000000	0.000000	265.269000	0.000000	0.000000	0.000000	213.086000	0.000000	0.000000	0.000000	255.163000	0.000000	0.000000

2022 CO2e Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	17,821,833.84	13,366,375.38	4,455,458.46	0.00	18,019,854.22	13,514,890.66	4,504,963.55	0.00	20,311,849.50	15,405,907.10	4,762,681.17	0.00	18,217,874.59	13,663,405.94	4,554,468.65
Travel	Bus Blue Route 15 mph	0.00	3,788,666.78	2,841,500.09	947,166.70	0.00	3,830,763.08	2,873,072.31	957,690.77	0.00	4,354,235.62	3,305,212.06	1,016,086.99	0.00	3,872,859.38	2,904,644.53	968,214.84
Idl	Bus Blue Route Idle	0.00	1,395,851.64	1,046,888.73	348,962.91	0.00	1,411,361.10	1,058,520.83	352,840.28	0.00	1,670,392.73	1,264,635.36	380,933.70	0.00	1,426,870.57	1,070,152.92	356,717.64
Sta	Bus Blue Route Starts	0.00	180,723.96	0.00	0.00	0.00	144,836.87	0.00	0.00	0.00	117,623.47	0.00	0.00	0.00	140,849.98	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	91,771,426.90		82,594,284.21	
Spring	92,715,319.16		83,443,787.24	
Summer	104,596,066.85		94,136,460.16	
Fall	93,723,011.79		84,350,710.61	
Annual	**382,805,824.69**		**344,525,242.22**	

Annual Emission Contributions by Emission Source (Metric Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	348.51		313.66	
Idle	33.12		29.81	
Starts	1.17		1.05	
Total Annual Emissions	382.81		344.53	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 Build_Supplemental Mesoscale CO Emissions

Pollutant	Scenario	Year
CO	Build_Supplemental	2023
	Build_Supplemental	2023
	Build_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938	1.841938
Travel	Bus Blue Route 15 mph	g/mi	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136	0.997136
Idl	Bus Blue Route Idle	g/sec	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156	0.002156
Sta	Bus Blue Route Starts	g	0.000000	11.971995	0.000000	0.000000	0.000000	11.971995	0.000000	0.000000	0.000000	11.971995	0.000000	0.000000	0.000000	11.971995	0.000000	0.000000

2023 CO Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	15,993.91	11,995.44	3,998.48	0.00	16,171.62	12,128.72	4,042.91	0.00	16,349.33	12,262.00	4,087.33	0.00	16,349.33	12,262.00	4,087.33
Travel	Bus Blue Route 15 mph	0.00	3,726.10	2,794.57	931.52	0.00	3,767.50	2,825.62	941.87	0.00	3,808.90	2,856.68	952.23	0.00	3,808.90	2,856.68	952.23
Idl	Bus Blue Route Idle	0.00	1,723.45	1,292.58	430.86	0.00	1,742.60	1,306.95	435.65	0.00	1,761.75	1,321.31	440.44	0.00	1,761.75	1,321.31	440.44
Sta	Bus Blue Route Starts	0.00	6,464.88	0.00	0.00	0.00	6,536.71	0.00	0.00	0.00	6,608.54	0.00	0.00	0.00	6,608.54	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	107,153.18		96,437.86	
Spring	108,343.77		97,509.39	
Summer	109,534.36		98,580.92	
Fall	109,534.36		98,580.92	
Annual	**434,565.66**		**391,109.09**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.37		0.33	
Idle	0.05		0.04	
Starts	0.06		0.06	
Total Annual Emissions	**0.48**		**0.43**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 Build_Supplemental Mesoscale NOx Emissions

Pollutant	Scenario	Year
NOx	Build_Supplemental	2023
	Build_Supplemental	2023
	Build_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Idl Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	5.743772	5.743772	5.743772	5.743772	5.643820	5.597825	5.580516	5.610022	4.979241	4.889834	4.856067	4.868073	5.490399	5.431378	5.413419	5.441223
Idl Travel	Bus Blue Route 15 mph	g/mi	3.234311	3.234311	3.234311	3.234311	3.178021	3.152117	3.142382	3.158991	2.803794	2.753458	2.734438	2.741201	3.091626	3.058398	3.048283	3.063941
Idl	Bus Blue Route Idle	g/sec	0.008818	0.008818	0.008818	0.008818	0.008665	0.008594	0.008546	0.008613	0.007645	0.007507	0.007445	0.007474	0.008429	0.008339	0.008332	0.008354
Sta	Bus Blue Route Starts	g	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

2023 NOx Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	49,874.32	37,405.74	12,468.58	0.00	49,147.12	36,746.36	12,313.55	0.00	43,402.95	32,327.42	10,802.45	0.00	48,209.78	36,037.78	12,074.29
Idl Travel	Bus Blue Route 15 mph	0.00	12,085.97	9,064.48	3,021.49	0.00	11,909.71	8,904.69	2,983.92	0.00	10,517.77	7,833.84	2,617.74	0.00	11,682.59	8,732.96	2,925.94
Idl	Bus Blue Route Idle	0.00	7,047.59	5,285.69	1,761.90	0.00	6,944.84	5,179.17	1,739.99	0.00	6,133.14	4,561.88	1,526.46	0.00	6,812.38	5,105.13	1,706.18
Sta	Bus Blue Route Starts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	302,867.82		272,581.04	
Spring	298,145.36		268,330.82	
Summer	262,721.06		236,448.95	
Fall	292,502.56		263,252.31	
Annual	**1,156,236.80**		**1,040,613.12**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	1.09		0.98	
Idle	0.18		0.17	
Starts	0.00		0.00	
Total Annual Emissions	**1.27**		**1.15**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 Build_Supplemental Mesoscale VOC Emissions

Pollutant	Scenario	Year
VOC	Build_Supplemental	2023
	Build_Supplemental	2023
	Build_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701	0.451701
Travel	Bus Blue Route 15 mph	g/mi	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782	0.261782
Idl	Bus Blue Route Idle	g/sec	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686	0.000686
Sta	Bus Blue Route Starts	g	0.000000	0.673498	0.000000	0.000000	0.000000	0.288642	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.220417	0.000000	0.000000

2023 VOC Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	3,922.21	2,941.66	980.55	0.00	3,965.79	2,974.34	991.45	0.00	4,009.37	3,007.03	1,002.34	0.00	4,009.37	3,007.03	1,002.34
Travel	Bus Blue Route 15 mph	0.00	978.23	733.67	244.56	0.00	989.10	741.82	247.27	0.00	999.97	749.97	249.99	0.00	999.97	749.97	249.99
Idl	Bus Blue Route Idle	0.00	548.21	411.16	137.05	0.00	554.30	415.72	138.57	0.00	560.39	420.29	140.10	0.00	560.39	420.29	140.10
Sta	Bus Blue Route Starts	0.00	363.69	0.00	0.00	0.00	157.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	121.67	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	24,687.00		22,218.30	
Spring	24,506.01		22,055.41	
Summer	24,430.10		21,987.09	
Fall	24,693.71		22,224.34	
Annual	**98,316.82**		**88,485.14**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.09		0.08	
Idle	0.02		0.01	
Starts	0.00		0.00	
Total Annual Emissions	**0.11**		**0.10**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 Build_Supplemental Mesoscale SO2 Emissions

Pollutant	Scenario	Year
SO2	Build_Supplemental	2023
	Build_Supplemental	2023
	Build_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.017180	0.017180	0.017180	0.017180	0.017180	0.017180	0.017180	0.017180	0.017326	0.019158	0.019374	0.017966	0.017180	0.017180	0.017180	0.017180
Travel	Bus Blue Route 15 mph	g/mi	0.008485	0.008485	0.008485	0.008485	0.008485	0.008485	0.008485	0.008485	0.008563	0.009541	0.009657	0.008905	0.008485	0.008485	0.008485	0.008485
Idle	Bus Blue Route Idle	g/sec	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000017	0.000017	0.000016	0.000015	0.000015	0.000015	0.000015
Starts	Bus Blue Route Starts	g	0.000000	0.002790	0.000000	0.000000	0.000000	0.002209	0.000000	0.000000	0.000000	0.001772	0.000000	0.000000	0.000000	0.002124	0.000000	0.000000

2023 SO2 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	149.17	111.88	37.29	0.00	150.83	113.12	37.71	0.00	170.05	128.98	39.87	0.00	152.49	114.37	38.12
Travel	Bus Blue Route 15 mph	0.00	31.71	23.78	7.93	0.00	32.06	24.04	8.01	0.00	36.45	27.67	8.50	0.00	32.41	24.31	8.10
Idle	Bus Blue Route Idle	0.00	11.65	8.74	2.91	0.00	11.78	8.84	2.95	0.00	13.95	10.56	3.18	0.00	11.91	8.93	2.98
Starts	Bus Blue Route Starts	0.00	1.51	0.00	0.00	0.00	1.21	0.00	0.00	0.00	0.98	0.00	0.00	0.00	1.17	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	831.49		748.34	
Spring	840.04		756.04	
Summer	947.94		853.15	
Fall	849.17		764.25	
Annual	3,468.64		3,121.78	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.00		0.00	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	0.00		0.00	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 Build_Supplemental Mesoscale PM2.5 Emissions

Pollutant	Scenario	Year
PM2.5	Build_Supplemental	2023
PM2.5 Brakewear	Build_Supplemental	2023
PM2.5 Tirewear	Build_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781	0.195781
Travel	Bus Blue Route 15 mph	g/mi	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205	0.110205
Idl	Bus Blue Route Idle	g/sec	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172	0.000172
Sta	Bus Blue Route Starts	g	0.000000	0.010124	0.000000	0.000000	0.000000	0.010124	0.000000	0.000000	0.000000	0.010124	0.000000	0.000000	0.000000	0.010124	0.000000	0.000000

2023 PM2.5 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	1,700.01	1,275.01	425.00	0.00	1,718.90	1,289.17	429.72	0.00	1,737.79	1,303.34	434.45	0.00	1,737.79	1,303.34	434.45
Travel	Bus Blue Route 15 mph	0.00	411.81	308.86	102.95	0.00	416.39	312.29	104.10	0.00	420.97	315.72	105.24	0.00	420.97	315.72	105.24
Idl	Bus Blue Route Idle	0.00	137.52	103.14	34.38	0.00	139.05	104.29	34.76	0.00	140.58	105.43	35.14	0.00	140.58	105.43	35.14
Sta	Bus Blue Route Starts	0.00	5.47	0.00	0.00	0.00	5.53	0.00	0.00	0.00	5.59	0.00	0.00	0.00	5.59	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	9,695.39		8,725.85	
Spring	9,803.12		8,822.80	
Summer	9,910.84		8,919.76	
Fall	9,910.84		8,919.76	
Annual	**39,320.19**		**35,388.17**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.04		0.04	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.04**		0.04	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 Build_Supplemental Mesoscale PM10 Emissions

Pollutant	Scenario	Year
PM10	Build_Supplemental	2023
PM10 Brakewear	Build_Supplemental	2023
PM10 Tirewear	Build_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837	0.673837
Travel	Bus Blue Route 15 mph	g/mi	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580	0.402580
Idl	Bus Blue Route Idle	g/sec	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187	0.000187
Sta	Bus Blue Route Starts	g	0.000000	0.011004	0.000000	0.000000	0.000000	0.011004	0.000000	0.000000	0.000000	0.011004	0.000000	0.000000	0.000000	0.011004	0.000000	0.000000

2023 PM10 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	5,851.06	4,388.30	1,462.77	0.00	5,916.07	4,437.06	1,479.02	0.00	5,981.09	4,485.82	1,495.27	0.00	5,981.09	4,485.82	1,495.27
Travel	Bus Blue Route 15 mph	0.00	1,504.36	1,128.27	376.09	0.00	1,521.08	1,140.81	380.27	0.00	1,537.79	1,153.34	384.45	0.00	1,537.79	1,153.34	384.45
Idl	Bus Blue Route Idle	0.00	149.48	112.11	37.37	0.00	151.14	113.36	37.79	0.00	152.80	114.60	38.20	0.00	152.80	114.60	38.20
Sta	Bus Blue Route Starts	0.00	5.94	0.00	0.00	0.00	6.01	0.00	0.00	0.00	6.07	0.00	0.00	0.00	6.07	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	31,696.65		28,526.99	
Spring	32,048.84		28,843.95	
Summer	32,401.02		29,160.92	
Fall	32,401.02		29,160.92	
Annual	**128,547.53**		**115,692.78**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.14		0.12	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.14**		**0.13**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2023 Build_Supplemental Mesoscale CO2e Emissions

Pollutant	Scenario	Year
CO2e	Build_Supplemental	2023
	Build_Supplemental	2023
	Build_Supplemental	2023

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	2,045.470000	2,045.470000	2,045.470000	2,045.470000	2,045.470000	2,045.470000	2,045.470000	2,045.470000	2,062.860000	2,280.700000	2,306.460000	2,139.030000	2,045.470000	2,045.470000	2,045.470000	2,045.470000
Trave	Bus Blue Route 15 mph	g/mi	1,010.430000	1,010.430000	1,010.430000	1,010.430000	1,010.430000	1,010.430000	1,010.430000	1,010.430000	1,019.730000	1,136.090000	1,149.850000	1,060.420000	1,010.430000	1,010.430000	1,010.430000	1,010.430000
Idl	Bus Blue Route Idle	g/sec	1.737186	1.737186	1.737186	1.737186	1.737186	1.737186	1.737186	1.737186	1.759117	2.033822	2.053053	1.855175	1.737186	1.737186	1.737186	1.737186
Sta	Bus Blue Route Starts	g	0.000000	332.878000	0.000000	0.000000	0.000000	263.846000	0.000000	0.000000	0.000000	211.944000	0.000000	0.000000	0.000000	253.794000	0.000000	0.000000

2023 CO2e Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	17,761,225.10	13,320,918.83	4,440,306.28	0.00	17,958,572.05	13,468,929.04	4,489,643.01	0.00	20,243,858.11	15,354,381.00	4,746,593.13	0.00	18,155,919.00	13,616,939.25	4,538,979.75
Trave	Bus Blue Route 15 mph	0.00	3,775,774.82	2,831,831.12	943,943.71	0.00	3,817,727.88	2,863,295.91	954,431.97	0.00	4,339,682.03	3,294,182.27	1,012,658.68	0.00	3,859,680.93	2,894,760.70	964,920.23
Idl	Bus Blue Route Idle	0.00	1,388,359.14	1,041,269.36	347,089.79	0.00	1,403,785.35	1,052,839.01	350,946.34	0.00	1,661,551.40	1,257,946.50	378,900.94	0.00	1,419,211.57	1,064,408.67	354,802.89
Sta	Bus Blue Route Starts	0.00	179,754.12	0.00	0.00	0.00	144,059.92	0.00	0.00	0.00	116,993.09	0.00	0.00	0.00	140,094.29	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	99,011,936.29		89,110,742.66	
Spring	100,030,404.06		90,027,363.65	
Summer	112,863,899.96		101,577,509.97	
Fall	101,117,617.07		91,005,855.37	
Annual	**413,023,857.38**		**371,721,471.65**	

Annual Emission Contributions by Emission Source (Metric Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	375.28		337.75	
Idle	36.48		32.83	
Starts	1.26		1.13	
Total Annual Emissions	**413.02**		**371.72**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 Build_Supplemental Mesoscale CO Emissions

Pollutant	Scenario	Year
CO	Build_Supplemental	2024
	Build_Supplemental	2024
	Build_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717	1.618717
Travel	Bus Blue Route 15 mph	g/mi	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750	0.877750
Idl	Bus Blue Route Idle	g/sec	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926	0.001926
Sta	Bus Blue Route Starts	g	0.000000	11.958232	0.000000	0.000000	0.000000	11.958232	0.000000	0.000000	0.000000	11.958232	0.000000	0.000000	0.000000	11.958232	0.000000	0.000000

2024 CO Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	14,211.82	10,658.86	3,552.95	0.00	14,211.82	10,658.86	3,552.95	0.00	14,367.99	10,775.99	3,592.00	0.00	14,367.99	10,775.99	3,592.00
Travel	Bus Blue Route 15 mph	0.00	3,316.42	2,487.31	829.10	0.00	3,316.42	2,487.31	829.10	0.00	3,352.86	2,514.65	838.22	0.00	3,352.86	2,514.65	838.22
Idl	Bus Blue Route Idle	0.00	1,556.28	1,167.21	389.07	0.00	1,556.28	1,167.21	389.07	0.00	1,573.39	1,180.04	393.35	0.00	1,573.39	1,180.04	393.35
Sta	Bus Blue Route Starts	0.00	6,529.19	0.00	0.00	0.00	6,529.19	0.00	0.00	0.00	6,600.94	0.00	0.00	0.00	6,600.94	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	112,061.84		100,855.66	
Spring	112,061.84		100,855.66	
Summer	113,293.29		101,963.96	
Fall	113,293.29		101,963.96	
Annual	**450,710.27**		**405,639.24**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.37		0.34	
Idle	0.05		0.05	
Starts	0.07		0.07	
Total Annual Emissions	**0.50**		**0.45**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 Build_Supplemental Mesoscale NOx Emissions

Pollutant	Scenario	Year
NOx	Build_Supplemental	2024
	Build_Supplemental	2024
	Build_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	5.117108	5.117108	5.117108	5.117108	5.028045	4.987076	4.971658	4.997951	4.435983	4.356335	4.326241	4.336946	4.891370	4.838795	4.822787	4.847559
Travel	Bus Blue Route 15 mph	g/mi	2.881477	2.881477	2.881477	2.881477	2.831323	2.808252	2.799568	2.814375	2.497924	2.453082	2.436134	2.442157	2.754366	2.724752	2.715748	2.729695
Idle	Bus Blue Route Idle	g/sec	0.007816	0.007816	0.007816	0.007816	0.007680	0.007617	0.007574	0.007634	0.006776	0.006654	0.006599	0.006624	0.007471	0.007391	0.007385	0.007404
Starts	Bus Blue Route Starts	g	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

2024 NOx Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	44,926.57	33,694.93	11,231.64	0.00	43,784.93	32,737.18	10,970.10	0.00	38,667.53	28,800.30	9,623.86	0.00	42,949.92	32,105.87	10,756.93
Travel	Bus Blue Route 15 mph	0.00	10,887.14	8,165.36	2,721.79	0.00	10,610.47	7,933.25	2,658.40	0.00	9,370.38	6,979.23	2,332.16	0.00	10,408.12	7,780.29	2,606.75
Idle	Bus Blue Route Idle	0.00	6,316.02	4,737.02	1,579.01	0.00	6,155.52	4,590.53	1,542.24	0.00	5,436.09	4,043.40	1,352.97	0.00	6,038.12	4,524.91	1,512.27
Starts	Bus Blue Route Starts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	315,009.79		283,508.82	
Spring	306,688.68		276,019.81	
Summer	270,249.85		243,224.86	
Fall	300,886.70		270,798.03	
Annual	1,192,835.02		1,073,551.52	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	1.12		1.01	
Idle	0.20		0.18	
Starts	0.00		0.00	
Total Annual Emissions	1.31		1.18	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 Build_Supplemental Mesoscale VOC Emissions

Pollutant	Scenario	Year
VOC	Build_Supplemental	2024
	Build_Supplemental	2024
	Build_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319	0.391319
Travel	Bus Blue Route 15 mph	g/mi	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155	0.226155
Idl	Bus Blue Route Idle	g/sec	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587	0.000587
Sta	Bus Blue Route Starts	g	0.000000	0.659493	0.000000	0.000000	0.000000	0.282639	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.215834	0.000000	0.000000

2024 VOC Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	3,435.66	2,576.74	858.91	0.00	3,435.66	2,576.74	858.91	0.00	3,473.41	2,605.06	868.35	0.00	3,473.41	2,605.06	868.35
Travel	Bus Blue Route 15 mph	0.00	854.48	640.86	213.62	0.00	854.48	640.86	213.62	0.00	863.87	647.91	215.97	0.00	863.87	647.91	215.97
Idl	Bus Blue Route Idle	0.00	474.70	356.02	118.67	0.00	474.70	356.02	118.67	0.00	479.92	359.94	119.98	0.00	479.92	359.94	119.98
Sta	Bus Blue Route Starts	0.00	360.08	0.00	0.00	0.00	154.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	119.14	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	25,035.83		22,532.24	
Spring	24,521.42		22,069.28	
Summer	24,400.85		21,960.76	
Fall	24,698.70		22,228.83	
Annual	98,656.79		88,791.11	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.09		0.08	
Idle	0.02		0.01	
Starts	0.00		0.00	
Total Annual Emissions	0.11		0.10	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 Build_Supplemental Mesoscale SO2 Emissions

Pollutant	Scenario	Year
SO2	Build_Supplemental	2024
	Build_Supplemental	2024
	Build_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	0.017096	0.017096	0.017096	0.017096	0.017096	0.017096	0.017096	0.017096	0.017241	0.019065	0.019281	0.017879	0.017096	0.017096	0.017096	0.017096
Trave	Bus Blue Route 15 mph	g/mi	0.008443	0.008443	0.008443	0.008443	0.008443	0.008443	0.008443	0.008443	0.008521	0.009495	0.009611	0.008862	0.008443	0.008443	0.008443	0.008443
Idl	Bus Blue Route Idle	g/sec	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000015	0.000017	0.000017	0.000015	0.000014	0.000014	0.000014	0.000014
Sta	Bus Blue Route Starts	g	0.000000	0.002772	0.000000	0.000000	0.000000	0.002195	0.000000	0.000000	0.000000	0.001761	0.000000	0.000000	0.000000	0.002111	0.000000	0.000000

2024 SO2 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	150.10	112.57	37.52	0.00	150.10	112.57	37.52	0.00	169.22	128.35	39.67	0.00	151.75	113.81	37.94
Trave	Bus Blue Route 15 mph	0.00	31.90	23.93	7.98	0.00	31.90	23.93	7.98	0.00	36.27	27.53	8.46	0.00	32.25	24.19	8.06
Idl	Bus Blue Route Idle	0.00	11.70	8.78	2.93	0.00	11.70	8.78	2.93	0.00	13.86	10.49	3.16	0.00	11.83	8.87	2.96
Sta	Bus Blue Route Starts	0.00	1.51	0.00	0.00	0.00	1.20	0.00	0.00	0.00	0.97	0.00	0.00	0.00	1.17	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	964.40		867.96	
Spring	963.61		867.25	
Summer	1,087.58		978.82	
Fall	974.08		876.68	
Annual	**3,989.68**		**3,590.71**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.00		0.00	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.00**		0.00	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 Build_Supplemental Mesoscale PM2.5 Emissions

Pollutant	Scenario	Year
PM2.5	Build_Supplemental	2024
PM2.5 Brakewear	Build_Supplemental	2024
PM2.5 Tirewear	Build_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154	0.181154
Travel	Bus Blue Route 15 mph	g/mi	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398	0.102398
Idle	Bus Blue Route Idle	g/sec	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152	0.000152
Starts	Bus Blue Route Starts	g	0.000000	0.009207	0.000000	0.000000	0.000000	0.009207	0.000000	0.000000	0.000000	0.009207	0.000000	0.000000	0.000000	0.009207	0.000000	0.000000

2024 PM2.5 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	1,590.47	1,192.85	397.62	0.00	1,590.47	1,192.85	397.62	0.00	1,607.95	1,205.96	401.99	0.00	1,607.95	1,205.96	401.99
Travel	Bus Blue Route 15 mph	0.00	386.89	290.17	96.72	0.00	386.89	290.17	96.72	0.00	391.14	293.36	97.79	0.00	391.14	293.36	97.79
Idle	Bus Blue Route Idle	0.00	122.62	91.96	30.65	0.00	122.62	91.96	30.65	0.00	123.97	92.97	30.99	0.00	123.97	92.97	30.99
Starts	Bus Blue Route Starts	0.00	5.03	0.00	0.00	0.00	5.03	0.00	0.00	0.00	5.08	0.00	0.00	0.00	5.08	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	10,421.12		9,379.01	
Spring	10,421.12		9,379.01	
Summer	10,535.63		9,482.07	
Fall	10,535.63		9,482.07	
Annual	**41,913.50**		**37,722.15**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.04		0.04	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.05**		0.04	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 Build_Supplemental Mesoscale PM10 Emissions

Pollutant	Scenario	Year
PM10	Build_Supplemental	2024
PM10 Brakewear	Build_Supplemental	2024
PM10 Tirewear	Build_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938	0.657938
Travel	Bus Blue Route 15 mph	g/mi	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095	0.394095
Idl	Bus Blue Route Idle	g/sec	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165	0.000165
Sta	Bus Blue Route Starts	g	0.000000	0.010008	0.000000	0.000000	0.000000	0.010008	0.000000	0.000000	0.000000	0.010008	0.000000	0.000000	0.000000	0.010008	0.000000	0.000000

2024 PM10 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	5,776.49	4,332.36	1,444.12	0.00	5,776.49	4,332.36	1,444.12	0.00	5,839.96	4,379.97	1,459.99	0.00	5,839.96	4,379.97	1,459.99
Travel	Bus Blue Route 15 mph	0.00	1,489.02	1,116.76	372.25	0.00	1,489.02	1,116.76	372.25	0.00	1,505.38	1,129.03	376.34	0.00	1,505.38	1,129.03	376.34
Idl	Bus Blue Route Idle	0.00	133.28	99.96	33.32	0.00	133.28	99.96	33.32	0.00	134.75	101.06	33.69	0.00	134.75	101.06	33.69
Sta	Bus Blue Route Starts	0.00	5.46	0.00	0.00	0.00	5.46	0.00	0.00	0.00	5.52	0.00	0.00	0.00	5.52	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	35,909.41		32,318.47	
Spring	35,909.41		32,318.47	
Summer	36,304.02		32,673.62	
Fall	36,304.02		32,673.62	
Annual	**144,426.87**		**129,984.18**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.15		0.14	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.16**		**0.14**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2024 Build_Supplemental Mesoscale CO2e Emissions

Pollutant	Scenario	Year
CO2e	Build_Supplemental	2024
	Build_Supplemental	2024
	Build_Supplemental	2024

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	2,038.690000	2,038.690000	2,038.690000	2,038.690000	2,038.690000	2,038.690000	2,038.690000	2,038.690000	2,056.030000	2,273.230000	2,298.920000	2,131.980000	2,038.690000	2,038.690000	2,038.690000	2,038.690000
Travel	Bus Blue Route 15 mph	g/mi	1,007.090000	1,007.090000	1,007.090000	1,007.090000	1,007.090000	1,007.090000	1,007.090000	1,007.090000	1,016.350000	1,132.380000	1,146.090000	1,056.930000	1,007.090000	1,007.090000	1,007.090000	1,007.090000
Idl	Bus Blue Route Idle	g/sec	1.728675	1.728675	1.728675	1.728675	1.728675	1.728675	1.728675	1.728675	1.750506	2.023967	2.043111	1.846131	1.728675	1.728675	1.728675	1.728675
Sta	Bus Blue Route Starts	g	0.000000	331.247000	0.000000	0.000000	0.000000	262.554000	0.000000	0.000000	0.000000	210.907000	0.000000	0.000000	0.000000	252.552000	0.000000	0.000000

2024 CO2e Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	17,899,045.82	13,424,284.36	4,474,761.45	0.00	17,899,045.82	13,424,284.36	4,474,761.45	0.00	20,177,553.20	15,304,186.31	4,730,948.90	0.00	18,095,738.63	13,571,803.97	4,523,934.66
Travel	Bus Blue Route 15 mph	0.00	3,805,108.29	2,853,831.22	951,277.07	0.00	3,805,108.29	2,853,831.22	951,277.07	0.00	4,325,510.42	3,283,410.32	1,009,325.87	0.00	3,846,922.67	2,885,192.00	961,730.67
Idl	Bus Blue Route Idle	0.00	1,396,907.69	1,047,680.77	349,226.92	0.00	1,396,907.69	1,047,680.77	349,226.92	0.00	1,653,499.81	1,251,855.04	377,053.70	0.00	1,412,258.33	1,059,193.75	353,064.58
Sta	Bus Blue Route Starts	0.00	180,860.86	0.00	0.00	0.00	143,354.48	0.00	0.00	0.00	116,420.66	0.00	0.00	0.00	139,408.70	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	115,018,173.00		103,516,355.70	
Spring	114,924,407.05		103,431,966.35	
Summer	129,691,485.34		116,722,336.81	
Fall	116,173,509.86		104,556,158.88	
Annual	**475,807,575.26**		**428,226,817.73**	

Annual Emission Contributions by Emission Source (Metric Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	430.90		387.81	
Idle	43.46		39.11	
Starts	1.45		1.31	
Total Annual Emissions	475.81		428.23	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 Build_Supplemental Mesoscale CO Emissions

Pollutant	Scenario	Year
CO	Build_Supplemental	2025
	Build_Supplemental	2025
	Build_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Trave	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Trave	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	g/mi	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136	1.433136
Trave	Bus Blue Route 15 mph	g/mi	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522	0.778522
Idl	Bus Blue Route Idle	g/sec	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735	0.001735
Sta	Bus Blue Route Starts	g	0.000000	11.947073	0.000000	0.000000	0.000000	11.947073	0.000000	0.000000	0.000000	11.947073	0.000000	0.000000	0.000000	11.947073	0.000000	0.000000

2025 CO Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Trave	Bus Blue Route 10 mph	0.00	12,444.21	9,333.16	3,111.05	0.00	12,582.48	9,436.86	3,145.62	0.00	12,720.75	9,540.56	3,180.19	0.00	12,720.75	9,540.56	3,180.19
Trave	Bus Blue Route 15 mph	0.00	2,909.18	2,181.88	727.29	0.00	2,941.50	2,206.13	735.38	0.00	2,973.83	2,230.37	743.46	0.00	2,973.83	2,230.37	743.46
Idl	Bus Blue Route Idle	0.00	1,386.86	1,040.15	346.72	0.00	1,402.27	1,051.70	350.57	0.00	1,417.68	1,063.26	354.42	0.00	1,417.68	1,063.26	354.42
Sta	Bus Blue Route Starts	0.00	6,451.42	0.00	0.00	0.00	6,523.10	0.00	0.00	0.00	6,594.78	0.00	0.00	0.00	6,594.78	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	106,857.53		96,171.78	
Spring	108,044.84		97,240.36	
Summer	109,232.15		98,308.93	
Fall	109,232.15		98,308.93	
Annual	**433,366.67**		**390,030.00**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.35		0.32	
Idle	0.05		0.04	
Starts	0.08		0.07	
Total Annual Emissions	**0.48**		**0.43**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 Build_Supplemental Mesoscale NOx Emissions

Pollutant	Scenario	Year
NOx	Build_Supplemental	2025
	Build_Supplemental	2025
	Build_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	4.605357	4.605357	4.605357	4.605357	4.525213	4.488327	4.474461	4.498121	3.992346	3.920666	3.893594	3.903218	4.402200	4.354880	4.340484	4.362774
Travel	Bus Blue Route 15 mph	g/mi	2.593316	2.593316	2.593316	2.593316	2.548187	2.527428	2.519615	2.532930	2.248129	2.207772	2.192525	2.197948	2.478927	2.452276	2.444173	2.456718
Idl	Bus Blue Route Idle	g/sec	0.006999	0.006999	0.006999	0.006999	0.006877	0.006821	0.006783	0.006836	0.006067	0.005958	0.005909	0.005932	0.006690	0.006618	0.006613	0.006630
Sta	Bus Blue Route Starts	g	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

2025 NOx Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	39,989.23	29,991.92	9,997.31	0.00	39,406.07	29,463.25	9,873.02	0.00	34,800.46	25,920.12	8,661.40	0.00	38,654.61	28,895.12	9,681.17
Travel	Bus Blue Route 15 mph	0.00	9,690.70	7,268.03	2,422.68	0.00	9,549.43	7,139.93	2,392.56	0.00	8,433.33	6,281.32	2,098.95	0.00	9,367.30	7,002.26	2,346.07
Idl	Bus Blue Route Idle	0.00	5,593.52	4,195.14	1,398.38	0.00	5,511.97	4,110.60	1,381.00	0.00	4,867.74	3,620.67	1,211.52	0.00	5,406.86	4,051.82	1,354.16
Sta	Bus Blue Route Starts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	299,028.25		269,125.42	
Spring	294,364.27		264,927.84	
Summer	259,389.91		233,450.92	
Fall	288,796.25		259,916.63	
Annual	1,141,578.68		1,027,420.81	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	1.07		0.96	
Idle	0.19		0.17	
Starts	0.00		0.00	
Total Annual Emissions	1.26		1.13	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 Build_Supplemental Mesoscale VOC Emissions

Pollutant	Scenario	Year
VOC	Build_Supplemental	2025
	Build_Supplemental	2025
	Build_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987	0.340987
Travel	Bus Blue Route 15 mph	g/mi	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450	0.196450
Idl	Bus Blue Route Idle	g/sec	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506	0.000506
Sta	Bus Blue Route Starts	g	0.000000	0.647817	0.000000	0.000000	0.000000	0.277636	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.212013	0.000000	0.000000

2025 VOC Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	2,960.86	2,220.65	740.22	0.00	2,993.76	2,245.32	748.44	0.00	3,026.66	2,269.99	756.66	0.00	3,026.66	2,269.99	756.66
Travel	Bus Blue Route 15 mph	0.00	734.09	550.57	183.52	0.00	742.25	556.69	185.56	0.00	750.41	562.80	187.60	0.00	750.41	562.80	187.60
Idl	Bus Blue Route Idle	0.00	404.02	303.01	101.00	0.00	408.51	306.38	102.13	0.00	413.00	309.75	103.25	0.00	413.00	309.75	103.25
Sta	Bus Blue Route Starts	0.00	349.82	0.00	0.00	0.00	151.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	117.03	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	23,078.74		20,770.86	
Spring	22,796.19		20,516.57	
Summer	22,638.01		20,374.21	
Fall	22,950.10		20,655.09	
Annual	**91,463.03**		**82,316.73**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.08		0.08	
Idle	0.01		0.01	
Starts	0.00		0.00	
Total Annual Emissions	**0.10**		0.09	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 Build_Supplemental Mesoscale SO2 Emissions

Pollutant	Scenario	Year
SO2	Build_Supplemental	2025
	Build_Supplemental	2025
	Build_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.017018	0.017018	0.017018	0.017018	0.017018	0.017018	0.017018	0.017018	0.017163	0.018979	0.019194	0.017798	0.017018	0.017018	0.017018	0.017018
Travel	Bus Blue Route 15 mph	g/mi	0.008405	0.008405	0.008405	0.008405	0.008405	0.008405	0.008405	0.008405	0.008483	0.009453	0.009567	0.008822	0.008405	0.008405	0.008405	0.008405
Idl	Bus Blue Route Idle	g/sec	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000015	0.000017	0.000017	0.000015	0.000014	0.000014	0.000014	0.000014
Sta	Bus Blue Route Starts	g	0.000000	0.002755	0.000000	0.000000	0.000000	0.002182	0.000000	0.000000	0.000000	0.001751	0.000000	0.000000	0.000000	0.002098	0.000000	0.000000

2025 SO2 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	147.77	110.83	36.94	0.00	149.41	112.06	37.35	0.00	168.46	127.78	39.50	0.00	151.06	113.29	37.76
Travel	Bus Blue Route 15 mph	0.00	31.41	23.56	7.85	0.00	31.76	23.82	7.94	0.00	36.11	27.41	8.42	0.00	32.11	24.08	8.03
Idl	Bus Blue Route Idle	0.00	11.51	8.63	2.88	0.00	11.64	8.73	2.91	0.00	13.78	10.43	3.14	0.00	11.76	8.82	2.94
Sta	Bus Blue Route Starts	0.00	1.49	0.00	0.00	0.00	1.19	0.00	0.00	0.00	0.97	0.00	0.00	0.00	1.16	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	1,012.29		911.06	
Spring	1,022.71		920.43	
Summer	1,154.39		1,038.95	
Fall	1,033.82		930.44	
Annual	**4,223.21**		**3,800.89**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.00		0.00	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.00**		0.00	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 Build_Supplemental Mesoscale PM2.5 Emissions

Pollutant	Scenario	Year
PM2.5	Build_Supplemental	2025
PM2.5 Brakewear	Build_Supplemental	2025
PM2.5 Tirewear	Build_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802	0.167802
Travel	Bus Blue Route 15 mph	g/mi	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227	0.095227
Idle	Bus Blue Route Idle	g/sec	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133	0.000133
Starts	Bus Blue Route Starts	g	0.000000	0.008441	0.000000	0.000000	0.000000	0.008441	0.000000	0.000000	0.000000	0.008441	0.000000	0.000000	0.000000	0.008441	0.000000	0.000000

2025 PM2.5 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	1,457.06	1,092.79	364.26	0.00	1,473.25	1,104.93	368.31	0.00	1,489.43	1,117.08	372.36	0.00	1,489.43	1,117.08	372.36
Travel	Bus Blue Route 15 mph	0.00	355.84	266.88	88.96	0.00	359.80	269.85	89.95	0.00	363.75	272.81	90.94	0.00	363.75	272.81	90.94
Idle	Bus Blue Route Idle	0.00	106.24	79.68	26.56	0.00	107.42	80.56	26.85	0.00	108.60	81.45	27.15	0.00	108.60	81.45	27.15
Starts	Bus Blue Route Starts	0.00	4.56	0.00	0.00	0.00	4.61	0.00	0.00	0.00	4.66	0.00	0.00	0.00	4.66	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	10,137.93		9,124.13	
Spring	10,250.57		9,225.51	
Summer	10,363.21		9,326.89	
Fall	10,363.21		9,326.89	
Annual	**41,114.92**		**37,003.43**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.04		0.04	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.05**		0.04	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 Build_Supplemental Mesoscale PM10 Emissions

Pollutant	Scenario	Year
PM10	Build_Supplemental	2025
PM10 Brakewear	Build_Supplemental	2025
PM10 Tirewear	Build_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425	0.643425
Travel	Bus Blue Route 15 mph	g/mi	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299	0.386299
Idl	Bus Blue Route Idle	g/sec	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144	0.000144
Sta	Bus Blue Route Starts	g	0.000000	0.009175	0.000000	0.000000	0.000000	0.009175	0.000000	0.000000	0.000000	0.009175	0.000000	0.000000	0.000000	0.009175	0.000000	0.000000

2025 PM10 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	5,586.99	4,190.24	1,396.75	0.00	5,649.06	4,236.80	1,412.27	0.00	5,711.14	4,283.36	1,427.79	0.00	5,711.14	4,283.36	1,427.79
Travel	Bus Blue Route 15 mph	0.00	1,443.52	1,082.64	360.88	0.00	1,459.56	1,094.67	364.89	0.00	1,475.60	1,106.70	368.90	0.00	1,475.60	1,106.70	368.90
Idl	Bus Blue Route Idle	0.00	115.47	86.61	28.87	0.00	116.76	87.57	29.19	0.00	118.04	88.53	29.51	0.00	118.04	88.53	29.51
Sta	Bus Blue Route Starts	0.00	4.95	0.00	0.00	0.00	5.01	0.00	0.00	0.00	5.06	0.00	0.00	0.00	5.06	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	36,908.34		33,217.51	
Spring	37,318.43		33,586.59	
Summer	37,728.53		33,955.67	
Fall	37,728.53		33,955.67	
Annual	**149,683.83**		**134,715.45**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.16		0.14	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	**0.16**		**0.15**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2025 Build_Supplemental Mesoscale CO2e Emissions

Pollutant	Scenario	Year
CO2e	Build_Supplemental	2025
	Build_Supplemental	2025
	Build_Supplemental	2025

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	2,032.110000	2,032.110000	2,032.110000	2,032.110000	2,032.110000	2,032.110000	2,032.110000	2,032.110000	2,049.400000	2,265.970000	2,291.580000	2,125.130000	2,032.110000	2,032.110000	2,032.110000	2,032.110000
Travel	Bus Blue Route 15 mph	g/mi	1,003.840000	1,003.840000	1,003.840000	1,003.840000	1,003.840000	1,003.840000	1,003.840000	1,003.840000	1,013.070000	1,128.760000	1,142.440000	1,053.530000	1,003.840000	1,003.840000	1,003.840000	1,003.840000
Idl	Bus Blue Route Idle	g/sec	1.720867	1.720867	1.720867	1.720867	1.720867	1.720867	1.720867	1.720867	1.742606	2.014917	2.033981	1.837831	1.720867	1.720867	1.720867	1.720867
Sta	Bus Blue Route Starts	g	0.000000	329.749000	0.000000	0.000000	0.000000	261.368000	0.000000	0.000000	0.000000	209.955000	0.000000	0.000000	0.000000	251.411000	0.000000	0.000000

2025 CO2e Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	17,645,217.55	13,233,913.16	4,411,304.39	0.00	17,841,275.52	13,380,956.64	4,460,318.88	0.00	20,113,112.28	15,255,323.05	4,715,748.48	0.00	18,037,333.50	13,528,000.12	4,509,333.37
Travel	Bus Blue Route 15 mph	0.00	3,751,149.31	2,813,361.98	937,787.33	0.00	3,792,828.75	2,844,621.56	948,207.19	0.00	4,311,682.60	3,272,953.51	1,006,079.01	0.00	3,834,508.19	2,875,881.14	958,627.05
Idl	Bus Blue Route Idle	0.00	1,375,316.64	1,031,487.48	343,829.16	0.00	1,390,597.94	1,042,948.45	347,649.48	0.00	1,646,106.32	1,246,260.57	375,358.51	0.00	1,405,879.23	1,054,409.42	351,469.81
Sta	Bus Blue Route Starts	0.00	178,064.46	0.00	0.00	0.00	142,706.93	0.00	0.00	0.00	115,895.16	0.00	0.00	0.00	138,778.87	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	120,890,149.25		108,801,134.32	
Spring	122,133,810.39		109,920,429.35	
Summer	137,839,157.79		124,055,242.01	
Fall	123,461,283.47		111,115,155.13	
Annual	**504,324,400.90**		**453,891,960.81**	

Annual Emission Contributions by Emission Source (Metric Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	456.14		410.52	
Idle	46.65		41.99	
Starts	1.53		1.38	
Total Annual Emissions	**504.32**		**453.89**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 Build_Supplemental Mesoscale CO Emissions

Pollutant	Scenario	Year
CO	Build_Supplemental	2026
	Build_Supplemental	2026
	Build_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322	1.279322
Travel	Bus Blue Route 15 mph	g/mi	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255	0.696255
Idl	Bus Blue Route Idle	g/sec	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577	0.001577
Sta	Bus Blue Route Starts	g	0.000000	11.939454	0.000000	0.000000	0.000000	11.939454	0.000000	0.000000	0.000000	11.939454	0.000000	0.000000	0.000000	11.939454	0.000000	0.000000

2026 CO Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	3,826.30	2,869.72	956.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Travel	Bus Blue Route 15 mph	0.00	896.16	672.12	224.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Idl	Bus Blue Route Idle	0.00	434.25	325.69	108.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sta	Bus Blue Route Starts	0.00	2,220.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	37,765.12		33,988.61	
Spring	0.00		0.00	
Summer	0.00		0.00	
Fall	0.00		0.00	
Annual	**37,765.12**		**33,988.61**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.03		0.03	
Idle	0.00		0.00	
Starts	0.01		0.01	
Total Annual Emissions	**0.04**		**0.04**	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 Build_Supplemental Mesoscale NOx Emissions

Pollutant	Scenario	Year
NOx	Build_Supplemental	2026
	Build_Supplemental	2026
	Build_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Start	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	4.181000	4.181000	4.181000	4.181000	4.108243	4.074760	4.062165	4.083643	3.624482	3.559408	3.534819	3.543562	3.996561	3.953605	3.940530	3.960768
Travel	Bus Blue Route 15 mph	g/mi	2.354333	2.354333	2.354333	2.354333	2.313357	2.294500	2.287408	2.299502	2.040955	2.004301	1.990456	1.995378	2.250474	2.226285	2.218922	2.230316
Idl	Bus Blue Route Idle	g/sec	0.006324	0.006324	0.006324	0.006324	0.006214	0.006164	0.006129	0.006177	0.005482	0.005384	0.005340	0.005360	0.006045	0.005980	0.005975	0.005991
Start	Bus Blue Route Starts	g	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

2026 NOx Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	12,504.87	9,378.65	3,126.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Travel	Bus Blue Route 15 mph	0.00	3,030.31	2,272.73	757.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Idl	Bus Blue Route Idle	0.00	1,740.94	1,305.70	435.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Start	Bus Blue Route Starts	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	105,219.85		94,697.87	
Spring	0.00		0.00	
Summer	0.00		0.00	
Fall	0.00		0.00	
Annual	105,219.85		94,697.87	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.10		0.09	
Idle	0.02		0.02	
Starts	0.00		0.00	
Total Annual Emissions	0.12		0.10	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 Build_Supplemental Mesoscale VOC Emissions

Pollutant	Scenario	Year
VOC	Build_Supplemental	2026
	Build_Supplemental	2026
	Build_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183	0.299183
Travel	Bus Blue Route 15 mph	g/mi	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791	0.171791
Idl	Bus Blue Route Idle	g/sec	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438	0.000438
Sta	Bus Blue Route Starts	g	0.000000	0.638221	0.000000	0.000000	0.000000	0.273524	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.208873	0.000000	0.000000

2026 VOC Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	894.82	671.11	223.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Travel	Bus Blue Route 15 mph	0.00	221.12	165.84	55.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Idl	Bus Blue Route Idle	0.00	120.52	90.39	30.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sta	Bus Blue Route Starts	0.00	118.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel 100%	Electric 0%	Gas/Diesel 90%	Electric 10%
Winter	7,873.11		7,085.79	
Spring	0.00		0.00	
Summer	0.00		0.00	
Fall	0.00		0.00	
Annual	**7,873.11**		**7,085.79**	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel 100%	Electric 0%	Gas/Diesel 90%	Electric 10%
Travel	0.01		0.01	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	0.01		0.01	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 Build_Supplemental Mesoscale SO2 Emissions

Pollutant	Scenario	Year
SO2	Build_Supplemental	2026
	Build_Supplemental	2026
	Build_Supplemental	2026

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(January)

VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.016946	0.016946	0.016946	0.016946	0.016946	0.016946	0.016946	0.016946	0.017090	0.018899	0.019113	0.017723	0.016946	0.016946	0.016946	0.016946
Travel	Bus Blue Route 15 mph	g/mi	0.008369	0.008369	0.008369	0.008369	0.008369	0.008369	0.008369	0.008369	0.008447	0.009413	0.009527	0.008785	0.008369	0.008369	0.008369	0.008369
Idl	Bus Blue Route Idle	g/sec	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000014	0.000015	0.000017	0.000017	0.000015	0.000014	0.000014	0.000014	0.000014
Sta	Bus Blue Route Starts	g	0.000000	0.002741	0.000000	0.000000	0.000000	0.002171	0.000000	0.000000	0.000000	0.001742	0.000000	0.000000	0.000000	0.002087	0.000000	0.000000

2026 SO2 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	50.68	38.01	12.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Travel	Bus Blue Route 15 mph	0.00	10.77	8.08	2.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Idl	Bus Blue Route Idle	0.00	3.94	2.96	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sta	Bus Blue Route Starts	0.00	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	390.34		351.31	
Spring	0.00		0.00	
Summer	0.00		0.00	
Fall	0.00		0.00	
Annual	390.34		351.31	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.00		0.00	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	0.00		0.00	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 Build_Supplemental Mesoscale PM2.5 Emissions

Pollutant	Scenario	Year
PM2.5	Build_Supplemental	2026
PM2.5 Brakewear	Build_Supplemental	2026
PM2.5 Tirewear	Build_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idle	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Starts	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740	0.156740
Travel	Bus Blue Route 15 mph	g/mi	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284	0.089284
Idle	Bus Blue Route Idle	g/sec	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117	0.000117
Starts	Bus Blue Route Starts	g	0.000000	0.007808	0.000000	0.000000	0.000000	0.007808	0.000000	0.000000	0.000000	0.007808	0.000000	0.000000	0.000000	0.007808	0.000000	0.000000

2026 PM2.5 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	468.79	351.59	117.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Travel	Bus Blue Route 15 mph	0.00	114.92	86.19	28.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Idle	Bus Blue Route Idle	0.00	32.31	24.23	8.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Starts	Bus Blue Route Starts	0.00	1.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	3,652.07		3,286.86	
Spring	0.00		0.00	
Summer	0.00		0.00	
Fall	0.00		0.00	
Annual	3,652.07		3,286.86	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.00		0.00	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	0.00		0.00	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 Build_Supplemental Mesoscale PM10 Emissions

Pollutant	Scenario	Year
PM10	Build_Supplemental	2026
PM10 Brakewear	Build_Supplemental	2026
PM10 Tirewear	Build_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401	0.631401
Travel	Bus Blue Route 15 mph	g/mi	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840	0.379840
Idl	Bus Blue Route Idle	g/sec	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128
Sta	Bus Blue Route Starts	g	0.000000	0.008486	0.000000	0.000000	0.000000	0.008486	0.000000	0.000000	0.000000	0.008486	0.000000	0.000000	0.000000	0.008486	0.000000	0.000000

2026 PM10 Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	1,888.45	1,416.33	472.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Travel	Bus Blue Route 15 mph	0.00	488.90	366.67	122.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Idl	Bus Blue Route Idle	0.00	35.12	26.34	8.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sta	Bus Blue Route Starts	0.00	1.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	13,973.21		12,575.89	
Spring	0.00		0.00	
Summer	0.00		0.00	
Fall	0.00		0.00	
Annual	13,973.21		12,575.89	

Annual Emission Contributions by Emission Source (US Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	0.02		0.01	
Idle	0.00		0.00	
Starts	0.00		0.00	
Total Annual Emissions	0.02		0.01	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

2026 Build_Supplemental Mesoscale CO2e Emissions

Pollutant	Scenario	Year
CO2e	Build_Supplemental	2026
	Build_Supplemental	2026
	Build_Supplemental	2026

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VMT / Seconds / Starts [1]

	Emission Source	Unit	AM	MD	PM	ON
Travel	Bus Blue Route 10 mph	mi	0.00	96.48	72.36	24.12
Travel	Bus Blue Route 15 mph	mi	0.00	41.52	31.14	10.38
Idl	Bus Blue Route Idle	sec	0.00	8,880.00	6,660.00	2,220.00
Sta	Bus Blue Route Starts	# Starts	0.00	6.00	0.00	0.00

Emission Rate/Quantity [2]

	Emission Source	Unit	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	g/mi	2,025.710000	2,025.710000	2,025.710000	2,025.710000	2,025.710000	2,025.710000	2,025.710000	2,025.710000	2,042.950000	2,258.880000	2,284.420000	2,118.460000	2,025.710000	2,025.710000	2,025.710000	2,025.710000
Travel	Bus Blue Route 15 mph	g/mi	1,000.680000	1,000.680000	1,000.680000	1,000.680000	1,000.680000	1,000.680000	1,000.680000	1,000.680000	1,009.890000	1,125.230000	1,138.870000	1,050.230000	1,000.680000	1,000.680000	1,000.680000	1,000.680000
Idl	Bus Blue Route Idle	g/sec	1.713833	1.713833	1.713833	1.713833	1.713833	1.713833	1.713833	1.713833	1.735489	2.006736	2.025725	1.830339	1.713833	1.713833	1.713833	1.713833
Sta	Bus Blue Route Starts	g	0.000000	328.401000	0.000000	0.000000	0.000000	260.300000	0.000000	0.000000	0.000000	209.098000	0.000000	0.000000	0.000000	250.384000	0.000000	0.000000

2026 CO2e Emissions (grams) [3]

	Emission Source	Winter AM	Winter MD	Winter PM	Winter ON	Spring AM	Spring MD	Spring PM	Spring ON	Summer AM	Summer MD	Summer PM	Summer ON	Fall AM	Fall MD	Fall PM	Fall ON
Travel	Bus Blue Route 10 mph	0.00	6,058,655.52	4,543,991.64	1,514,663.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Travel	Bus Blue Route 15 mph	0.00	1,287,995.24	965,996.43	321,998.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Idl	Bus Blue Route Idle	0.00	471,784.04	353,838.03	117,946.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sta	Bus Blue Route Starts	0.00	61,082.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Total Emission Contributions by Season (grams) [4]

Season	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Winter	46,666,511.92		41,999,860.73	
Spring	0.00		0.00	
Summer	0.00		0.00	
Fall	0.00		0.00	
Annual	**46,666,511.92**		**41,999,860.73**	

Annual Emission Contributions by Emission Source (Metric Tons)

Emission Source	Gas/Diesel	Electric	Gas/Diesel	Electric
	100%	0%	90%	10%
Travel	42.12		37.91	
Idle	4.36		3.92	
Starts	0.18		0.16	
Total Annual Emissions	46.67		42.00	

[1] VMT is calculated as follows - Supplemental Busing fleet assumed to travel via two routes (Blue and Red). Distance traveled and idle times were obtained from PANYNJ and were assumed to be - Blue Route Bus Distance at 10 mph: 4.02 miles, Blue Route Bus Distance at 15 mph: 1.73 miles, Blue Route Bus Idle Time at Stations: 200 seconds, Blue Route Bus Idle Time at

[2] Emission Rate/Quantity were obtained for source type ID - 42 (Transit Bus), month ID - 1 (Winter), 4 (Spring), 7 (Summer), and 10 (Fall), hour ID - 7 (AM), 13 (MD), 18 (PM), and 1 (ON). Due to insignificant difference between Weekday and Weekend emissions, only day ID - 5 (Weekday) was used to represent each day in these calculations. Running emissions for buses at 10

[3] Emission calculated with the formula = (hourly VMT/number of idle seconds/number of starts) * (emission rate/quantity) * (number of days in each season)

[4] Supplemental Busing fleet assumed to be composed of 90% Diesel and 10% Electric Buses.

Attachment C-3

Proposed Action Alternative Construction-Related Emission Worksheets

PANYNJ NEWARK LIBERTY INTERNATIONAL AIRPORT (EWR) AIRTRAIN REPLACEMENT PROGRAM

OFF ROAD EQUIPMENT EMISSION RESULTS

Annual Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	17,261	26,147	1,696	0	305	45,409
MCF	1,517	1,216	0	0	0	2,733
Pedestrian Bridges	2,256	3,452	1,596	0	0	7,304
TOTAL EMISSIONS	**21,034**	**30,815**	**3,292**	**0**	**305**	**55,446**

Annual CO Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	2.162	3.311	0.247	0.000	0.029	5.749
MCF	0.109	0.102	0.000	0.000	0.000	0.211
Pedestrian Bridges	0.339	1.062	0.461	0.000	0.000	1.861
TOTAL CO EMISSIONS	**2.610**	**4.474**	**0.707**	**0.000**	**0.029**	**7.821**

Annual NOx Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	6.739	10.210	0.650	0.000	0.102	17.701
MCF	0.430	0.368	0.000	0.000	0.000	0.798
Pedestrian Bridges	0.996	2.057	0.989	0.000	0.000	4.042
TOTAL NOx EMISSIONS	**8.164**	**12.630**	**1.639**	**0.000**	**0.102**	**22.536**

Annual SO2 Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	0.125	0.189	0.012	0.000	0.002	0.328
MCF	0.011	0.009	0.000	0.000	0.000	0.020
Pedestrian Bridges	0.016	0.025	0.012	0.000	0.000	0.053
TOTAL SO2 EMISSIONS	**0.152**	**0.230**	**0.024**	**0.000**	**0.002**	**0.408**

Annual VOC Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	0.519	0.780	0.053	0.000	0.005	1.357
MCF	0.034	0.028	0.000	0.000	0.000	0.062
Pedestrian Bridges	0.076	0.175	0.081	0.000	0.000	0.332
TOTAL VOC EMISSIONS	**0.629**	**0.984**	**0.133**	**0.000**	**0.005**	**1.751**

Annual PM10 Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	15.292	15.500	3.769	0.000	2.100	36.660
MCF	0.921	0.919	0.000	0.000	0.000	1.840
Pedestrian Bridges	2.892	2.981	2.191	0.000	0.000	8.065
TOTAL PM10 EMISSIONS	**19.105**	**19.400**	**5.960**	**0.000**	**2.100**	**46.566**

Annual PM2.5 Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	1.854	2.050	0.412	0.000	0.215	4.531
MCF	0.113	0.110	0.000	0.000	0.000	0.223
Pedestrian Bridges	0.338	0.425	0.276	0.000	0.000	1.038
TOTAL PM2.5 EMISSIONS	**2.304**	**2.580**	**0.688**	**0.000**	**0.215**	**5.787**

Annual CO2e Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	17,235	26,115	1,691	0	302	45,343
MCF	1,515	1,215	0	0	0	2,730
Pedestrian Bridges	2,251	3,445	1,592	0	0	7,289
TOTAL CO2e EMISSIONS	**21,001**	**30,775**	**3,283**	**0**	**302**	**55,362**

PANYNJ NEWARK LIBERTY INTERNATIONAL AIRPORT (EWR) AIRTRAIN REPLACEMENT PROGRAM
ON ROAD VEHICLE EMISSIONS

Annual Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	5,793	8,651	526	0	157	15,126
MCF	341	360	0	0	0	701
Pedestrian Bridges	858	967	504	0	0	2,329
TOTAL EMISSIONS	**6,992**	**9,978**	**1,030**	**0**	**157**	**18,156**

Annual CO Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	9.940	13.796	0.770	0.000	0.188	24.694
MCF	0.599	0.591	0.000	0.000	0.000	1.191
Pedestrian Bridges	1.420	1.515	0.723	0.000	0.000	3.658
TOTAL CO EMISSIONS	**11.960**	**15.910**	**1.493**	**0.000**	**0.188**	**29.550**

Annual NOx Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	11.156	15.526	0.902	0.000	0.240	27.825
MCF	0.627	0.614	0.000	0.000	0.000	1.240
Pedestrian Bridges	1.756	1.787	0.875	0.000	0.000	4.418
TOTAL NOx EMISSIONS	**13.538**	**17.927**	**1.778**	**0.000**	**0.240**	**33.483**

Annual SO2 Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	0.053	0.080	0.005	0.000	0.001	0.139
MCF	0.003	0.003	0.000	0.000	0.000	0.006
Pedestrian Bridges	0.008	0.009	0.005	0.000	0.000	0.021
TOTAL SO2 EMISSIONS	**0.065**	**0.0919**	**0.009**	**0.000**	**0.001**	**0.168**

Annual VOC Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	1.106	1.463	0.080	0.000	0.021	2.670
MCF	0.062	0.057	0.000	0.000	0.000	0.119
Pedestrian Bridges	0.177	0.170	0.080	0.000	0.000	0.427
TOTAL VOC EMISSIONS	**1.344**	**1.690**	**0.160**	**0.000**	**0.021**	**3.216**

Annual PM10 Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	1.197	1.731	0.104	0.000	0.032	3.064
MCF	0.067	0.069	0.000	0.000	0.000	0.136
Pedestrian Bridges	0.189	0.200	0.103	0.000	0.000	0.492
TOTAL PM10 EMISSIONS	**1.454**	**2.000**	**0.207**	**0.000**	**0.032**	**3.692**

Annual PM2.5 Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	0.507	0.690	0.040	0.000	0.011	1.247
MCF	0.028	0.026	0.000	0.000	0.000	0.054
Pedestrian Bridges	0.083	0.081	0.040	0.000	0.000	0.204
TOTAL PM2.5 EMISSIONS	**0.617**	**0.797**	**0.080**	**0.000**	**0.011**	**1.506**

Annual CO2e Emissions (tons/year)						
Operation	**2022**	**2023**	**2024**	**2025**	**2026**	**Total**
Air Train	5,769	8,617	524	0	156	15,066
MCF	339	359	0	0	0	698
Pedestrian Bridges	854	964	502	0	0	2,320
TOTAL CO2e EMISSIONS	**6,963**	**9,940**	**1,026**	**0**	**156**	**18,085**

PANYNJ Newark Liberty International Airport (EWR) AirTrain Replacement Program
Emissions - AirTrain

		2022 Winter	2022 Spring	2022 Summer	2022 Fall	2023 Winter	2023 Spring	2023 Summer	2023 Fall	2024 Winter	2024 Spring	2024 Summer	2024 Fall	2025 Winter	2025 Spring	2025 Summer	2025 Fall	2026 Winter	2026 Spring	2026 Summer	2026 Fall
Crews Working Per Quarter																					
	Concrete Demo Crew	1	2	2	3	2	2	2	1	0	0	0	0	0	0	0	0	1	1	1	1
	Sheet Pile Crew	3	4	5	12	10	10	8	6	0	0	0	0	0	0	0	0	0	0	0	0
	Sheet Pile Crew PB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Civil Crew	2	4	4	7	6	5	5	2	0	0	0	0	0	0	0	0	0	0	0	0
	Pile Driving Crew	1	3	4	4	4	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0
	Finegrade Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Labor Crew	0	1	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
	Carpenter Crew	1	8	12	13	18	13	9	14	4	0	0	0	0	0	0	0	0	0	0	0
	Lather Crew	1	7	8	12	15	12	9	6	2	0	0	0	0	0	0	0	0	0	0	0
	Dowel Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Concrete Pour Crew	0	4	7	14	19	15	11	11	7	0	0	0	0	0	0	0	0	0	0	0
	Steel Erection Crew	0	2	6	5	9	6	3	5	3	0	0	0	0	0	0	0	0	0	0	0
	Steel Erection Crew PB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Paving Crew	0	1	3	5	4	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0
Working Hours Per Quarter (Assuming 8 Hours of Work per Day)																					
	Working Hours	696	720	720	696	688	720	720	696	704	720	720	704	720	728	736	736	696	720	712	704
CO Emissions Per Crew Per Quarter (US Tons)																					
CO	Concrete Demo Crew	0.071557	0.148049	0.151263	0.214672	0.130880	0.136967	0.139948	0.066201	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.053002	0.054830	0.055393	0.053611
CO	Sheet Pile Crew	0.176235	0.243082	0.311886	0.704939	0.542768	0.568013	0.466334	0.329448	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Civil Crew	0.161946	0.335061	0.341488	0.566812	0.448268	0.390931	0.398383	0.151160	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Pile Driving Crew	0.058745	0.182312	0.249509	0.234980	0.217107	0.170404	0.174875	0.054908	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Labor Crew	0.000000	0.071783	0.146780	0.138781	0.126508	0.132392	0.135373	0.063989	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Carpenter Crew	0.054777	0.453323	0.699265	0.712095	0.905409	0.684321	0.487174	0.712395	0.191131	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Lather Crew	0.054777	0.396658	0.466176	0.657319	0.754507	0.631681	0.487174	0.305312	0.095566	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Concrete Pour Crew	0.000000	0.293265	0.524461	0.992214	1.230506	1.016636	0.761927	0.720682	0.428720	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Steel Erection Crew	0.000000	0.220409	0.670866	0.532654	0.914522	0.638039	0.323491	0.513976	0.301340	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Paving Crew	0.000000	0.097324	0.296791	0.470399	0.351394	0.275803	0.280274	0.266610	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx Emissions Per Crew Per Quarter (US Tons)																					
NOx	Concrete Demo Crew	0.118418	0.241604	0.219812	0.342759	0.214745	0.221687	0.202151	0.104888	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.085408	0.087248	0.079273	0.083651
NOx	Sheet Pile Crew	0.284976	0.389337	0.457683	1.112465	0.884229	0.917026	0.692197	0.524460	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Civil Crew	0.242392	0.494700	0.451117	0.819214	0.660689	0.568566	0.519725	0.215325	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Pile Driving Crew	0.094992	0.292003	0.366146	0.370822	0.353692	0.275108	0.259574	0.087410	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Labor Crew	0.000000	0.112598	0.203404	0.212645	0.199049	0.205261	0.185724	0.096949	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Carpenter Crew	0.070088	0.572576	0.789292	0.881426	1.148178	0.856980	0.546692	0.874837	0.241214	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Lather Crew	0.070088	0.501004	0.526195	0.813624	0.956815	0.791058	0.546692	0.374930	0.120607	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Concrete Pour Crew	0.000000	0.488260	0.778184	1.616640	2.063135	1.681698	1.125796	1.167275	0.714298	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Steel Erection Crew	0.000000	0.344252	0.997969	0.825020	1.439114	0.999034	0.483983	0.798598	0.476047	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Paving Crew	0.000000	0.208201	0.591917	0.993698	0.763860	0.594972	0.565667	0.568359	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2 Emissions Per Crew Per Quarter (US Tons)																					
SO2	Concrete Demo Crew	0.000908	0.001879	0.001884	0.002725	0.001785	0.001868	0.001873	0.000903	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000889	0.000920	0.000912	0.000899
SO2	Sheet Pile Crew	0.004411	0.006085	0.007614	0.017645	0.014492	0.015166	0.012146	0.008796	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Civil Crew	0.001333	0.002757	0.002768	0.004664	0.003920	0.003419	0.003432	0.001322	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Pile Driving Crew	0.001470	0.004563	0.006092	0.005882	0.005797	0.004550	0.004555	0.001466	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Labor Crew	0.000000	0.000736	0.001478	0.001423	0.001396	0.001461	0.001467	0.000706	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Carpenter Crew	0.000662	0.005479	0.008240	0.008607	0.011702	0.008844	0.006138	0.009207	0.002645	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Lather Crew	0.000662	0.004794	0.005493	0.007945	0.009752	0.008164	0.006138	0.003946	0.001322	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Concrete Pour Crew	0.000000	0.004151	0.007282	0.014044	0.018740	0.015483	0.011383	0.010976	0.007030	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Steel Erection Crew	0.000000	0.004162	0.012498	0.010059	0.017859	0.012460	0.006235	0.010037	0.006079	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Paving Crew	0.000000	0.000863	0.002597	0.004171	0.003277	0.002572	0.002580	0.002486	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC Emissions Per Crew Per Quarter (US Tons)																					
VOC	Concrete Demo Crew	0.010165	0.021031	0.021069	0.030495	0.017807	0.018635	0.018668	0.009007	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.006537	0.006763	0.006699	0.006612
VOC	Sheet Pile Crew	0.023339	0.032191	0.040334	0.093355	0.070739	0.074029	0.059353	0.042937	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Civil Crew	0.025405	0.052561	0.052637	0.088916	0.068474	0.059716	0.059797	0.023090	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Pile Driving Crew	0.007780	0.024144	0.032267	0.031118	0.028295	0.022209	0.022258	0.007156	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Labor Crew	0.000000	0.010120	0.020277	0.019565	0.017048	0.017841	0.017873	0.008623	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Carpenter Crew	0.005683	0.047030	0.070771	0.073876	0.089928	0.067969	0.047202	0.070757	0.018348	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Lather Crew	0.005683	0.041151	0.047181	0.068193	0.074940	0.062741	0.047202	0.030325	0.009174	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Concrete Pour Crew	0.000000	0.043674	0.076562	0.147764	0.176540	0.145856	0.107140	0.103396	0.059625	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Steel Erection Crew	0.000000	0.033438	0.100427	0.080809	0.138297	0.096486	0.048292	0.077725	0.045632	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Paving Crew	0.000000	0.016467	0.049458	0.079590	0.058400	0.045837	0.045886	0.044309	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		721574.2	721574.2	721574.2	721574.2	721574.2	721574.2	721574.2	721574.2	721574.2	721574.2	721574.2	721574.2	101032.8	101032.8	101032.8	101032.8	101032.8	101032.8	101032.8	101032.8
		16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3
		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
		75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Fugitive Dust PM10 Emissions Per Quarter (US Tons)																					

PANYNJ Newark Liberty International Airport (EWR) AirTrain Replacement Program
Emissions - AirTrain

	PM10 Fugitive Dust	3.727139	3.727139	3.727139	3.727139	3.727139	3.727139	3.727139	3.727139	3.727139	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.521864	0.521864	0.521864	0.521864
	PM10 Emissions Per Crew Per Quarter (US Tons)																				
PM10	Concrete Demo Crew	0.010880	0.022510	0.022510	0.032640	0.020569	0.021526	0.021526	0.010404	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.009436	0.009762	0.009653	0.009545
PM10	Sheet Pile Crew	0.022106	0.030492	0.038114	0.088425	0.071160	0.074470	0.059576	0.043193	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Civil Crew	0.024072	0.049805	0.049805	0.084253	0.068486	0.059726	0.059726	0.023094	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Pile Driving Crew	0.007369	0.022869	0.030492	0.029475	0.028464	0.022341	0.022341	0.007199	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Labor Crew	0.000000	0.010802	0.021604	0.020884	0.019650	0.020564	0.020564	0.009939	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Carpenter Crew	0.006170	0.051065	0.076598	0.080215	0.105878	0.080024	0.055401	0.083307	0.023433	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Lather Crew	0.006170	0.044682	0.051065	0.074044	0.088231	0.073868	0.055401	0.035703	0.011716	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Concrete Pour Crew	0.000000	0.045124	0.078967	0.152669	0.196148	0.162056	0.118841	0.114880	0.071675	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Steel Erection Crew	0.000000	0.026779	0.080337	0.064716	0.113901	0.079466	0.039733	0.064014	0.038609	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Paving Crew	0.000000	0.013909	0.041726	0.067225	0.051399	0.040343	0.040343	0.038998	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
	Fugitive Dust PM2.5 Emissions Per Quarter (US Tons)																				
	PM2.5 Fugitive Dust	0.372714	0.372714	0.372714	0.372714	0.372714	0.372714	0.372714	0.372714	0.372714	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.052186	0.052186	0.052186	0.052186
	PM2.5 Emissions Per Crew Per Quarter (US Tons)																				
PM2.5	Concrete Demo Crew	0.005533	0.011448	0.011448	0.016599	0.010090	0.010559	0.010559	0.005104	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.004241	0.004387	0.004338	0.004290
PM2.5	Sheet Pile Crew	0.012490	0.017228	0.021535	0.049961	0.039660	0.041505	0.033204	0.024073	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Civil Crew	0.013309	0.027536	0.027536	0.046582	0.036844	0.032131	0.032131	0.012424	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Pile Driving Crew	0.004163	0.012921	0.017228	0.016654	0.015864	0.012451	0.012451	0.004012	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Labor Crew	0.000000	0.005284	0.010568	0.010216	0.009198	0.009626	0.009626	0.004652	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Carpenter Crew	0.003001	0.024835	0.037253	0.039012	0.049844	0.037673	0.026081	0.039218	0.010758	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Lather Crew	0.003001	0.021731	0.024835	0.036011	0.041537	0.034775	0.026081	0.016808	0.005379	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Concrete Pour Crew	0.000000	0.022995	0.040242	0.077800	0.096570	0.079785	0.058509	0.056559	0.034407	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Steel Erection Crew	0.000000	0.019801	0.059404	0.047853	0.084055	0.058643	0.029322	0.047240	0.028472	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Paving Crew	0.000000	0.008298	0.024893	0.040105	0.030133	0.023651	0.023651	0.022862	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	CH4 Emissions Per Crew Per Quarter (N/A)																				
CH4	Concrete Demo Crew	73.079282	151.198514	151.198328	219.237575	144.738315	151.470774	151.470516	73.210749	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	73.605365	76.143550	75.297412	74.451406
CH4	Sheet Pile Crew	383.659391	529.183708	661.480085	1534.631469	1266.494789	1325.401775	1060.324508	768.733327	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Civil Crew	144.392093	298.741541	298.742488	505.373524	428.748506	373.908745	373.908666	144.577985	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Pile Driving Crew	127.886464	396.887781	529.184068	511.543823	506.597916	397.620532	397.621691	128.122221	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Labor Crew	0.000000	50.577660	101.155500	97.783650	96.740712	101.240100	101.240280	48.932802	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Carpenter Crew	55.288648	457.560651	686.342056	718.752420	984.765305	744.298188	515.284338	774.834716	224.156945	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Lather Crew	55.288648	400.365570	457.561371	663.463772	820.637754	687.044481	515.284338	332.072021	112.078472	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Concrete Pour Crew	0.000000	312.945890	547.655938	1058.802528	1423.995706	1176.494490	862.763616	834.004829	538.178026	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Steel Erection Crew	0.000000	1385.675963	4157.034973	3348.710542	5965.135315	4161.715663	2080.861387	3352.498173	2036.907158	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Paving Crew	0.000000	388.847230	1166.547210	1879.430656	1490.937394	1170.210929	1170.213034	1131.205681	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	CO2 Emissions Per Crew Per Quarter (N/A)																				
CO2	Concrete Demo Crew	73285379.601957	151625095.504511	151624934.105890	219856169.183140	144885982.917116	151625039.956779	151624866.327667	73285342.081128	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	73285473.027102	75812551.954294	74970291.440101	74127846.834115
CO2	Sheet Pile Crew	501403725.157165	691591331.989094	864489939.966324	2005612302.045010	1652133378.756820	1728976475.021620	1383182953.909520	1002806863.276300	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Civil Crew	78566711.867198	162551810.363196	162552062.260610	274982743.390931	232990426.905879	203189875.483104	203190080.615964	78566854.667659	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Pile Driving Crew	167134575.052388	518693498.991821	691591951.973059	668537434.015002	660853351.502729	518692942.506485	518693607.716069	167134477.212717	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Labor Crew	0.000000	47791735.848000	95583420.918000	92397306.887400	91335322.386400	95583362.580000	95583476.916000	46198680.509400	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Carpenter Crew	55733969.878501	461246918.816333	691869833.636313	724541530.312018	991680848.521897	749525486.732381	518902756.585214	780275728.876547	225498544.424507	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Lather Crew	55733969.878501	403591053.964291	461246555.757542	668807566.441862	826400707.101581	691869680.060659	518902756.585214	334403883.804234	112749272.212254	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Concrete Pour Crew	0.000000	357360873.675840	625380973.629300	1209071057.832040	1622020819.833990	1340101212.393600	982742023.242540	949984366.652706	611484031.048581	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Steel Erection Crew	0.000000	494541194.098954	1483624046.227020	1195140359.502310	2126526235.943260	1483621079.777800	741811351.487731	1195138669.482420	725326362.381850	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Paving Crew	0.000000	64126837.978601	192380254.406753	309946291.644683	245106884.308090	192380547.005500	192379996.494276	185967804.435897	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
10210	CO2 to Fuel = Diesel fuel consumption calculated from CO2 emissions (10.21 kg CO2/gal x 1000 g/kg = 10210 g CO2/gal)																				
	Fuel Emissions Per Crew Per Quarter																				
Fuel	Concrete Demo Crew	7177.804075	14850.645985	14850.630177	21533.415199	14190.595780	14850.640544	14850.623538	7177.800400	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	7177.813225	7425.323404	7342.829720	7260.318005
Fuel	Sheet Pile Crew	49109.081798	67736.663270	84670.904992	196436.072678	161815.218292	169341.476496	135473.354937	98218.106100	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Civil Crew	7695.074620	15920.843326	15920.867998	26932.687893	22819.826338	19901.065180	19901.085271	7695.088606	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Pile Driving Crew	16369.693933	50802.497453	67736.723993	65478.690893	64726.087317	50802.442949	50802.508101	16369.684350	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Labor Crew	0.000000	4680.875205	9361.745438	9049.687256	8945.673103	9361.739724	9361.750922	4524.846279	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Carpenter Crew	5458.762966	45175.995966	67763.940611	70963.910902	97128.388690	73410.919367	50822.992810	76422.696266	22086.047446	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Lather Crew	5458.762966	39528.996471	45175.960407	65505.148525	80940.323908	67763.925569	50822.992810	32752.584114	11043.023723	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Concrete Pour Crew	0.000000	35001.065003	61251.809366	118420.279905	158865.898123	131253.791615	96252.891601	93044.502121	59890.698438	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Steel Erection Crew	0.000000	48436.943594	145310.876222	117055.862831	208278.769436	145310.585679	72655.372330	117055.697305	71040.779861	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Paving Crew	0.000000	6280.787265	18842.336377	30357.129446	24006.550863	18842.365035	18842.311116	18214.280552	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
0.26	Fuel to N2O = N2O emissions calculated from diesel fuel consumption (Diesel construction equipment = 0.26 g N2O/gal)																				
	N2O Emissions Per Crew Per Quarter																				
N2O	Concrete Demo Crew	1866.229059	3861.167956	3861.163846	5598.687952	3689.554903	3861.166542	3861.162120	1866.228104	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1866.231438	1930.584085	1909.135727	1887.682681
N2O	Sheet Pile Crew	12768.361267	17611.532450	22014.435298	51073.378896	42071.956756	44028.783889	35223.072284	25536.707586	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

PANYNJ Newark Liberty International Airport (EWR) AirTrain Replacement Program
Emissions - AirTrain

N2O	Civil Crew	2000.719401	4139.419265	4139.425680	7002.498852	5933.154848	5174.276947	5174.282170	2000.723038											
N2O	Pile Driving Crew	4256.120422	13208.649338	17611.548238	17024.459632	16828.782702	13208.635167	13208.652106	4256.117931											
N2O	Finegrade Crew																			
N2O	Labor Crew		1217.027553	2434.053814	2352.918687	2325.875007	2434.052328	2434.055240	1176.460033											
N2O	Carpenter Crew	1419.278371	11745.758951	17618.624559	18450.616835	25253.381059	19086.839035	13213.978130	19869.901029	5742.372336										
N2O	Lather Crew	1419.278371	10277.539082	11745.749706	17031.338617	21044.484216	17618.620648	13213.978130	8515.671870	2871.186168										
N2O	Dowel Crew																			
N2O	Concrete Pour Crew		9100.276901	15925.470435	30789.272775	41305.133512	34125.985820	25025.751816	24191.570551	15571.581594										
N2O	Steel Erection Crew		12593.605335	37780.827818	30434.524336	54152.480053	37780.752276	18890.396806	30434.481299	18470.602764										
N2O	Steel Erection Crew PB																			
N2O	Paving Crew		1633.004689	4899.007458	7892.853656	6241.703224	4899.014909	4899.000890	4735.712944											

GWP	Pollutant
25	CH4
1	CO2
298	N2O

CO2e Nonroad emissions calculated from CH4 (GWP = 25), CO2 (GWP = 1), and N2O (GWP = 298)

CO2e Nonroad Emissions Per Crew Per Quarter (Metric Tons)

CO2e	Concrete Demo Crew	73.843343	152.779504	152.779341	221.530059	145.989089	152.779454	152.779279	73.843308									73.843450	76.389770	75.541096	74.692238
CO2e	Sheet Pile Crew	505.218288	696.852798	871.066779	2020.870535	1664.702484	1742.130188	1393.705938	1010.436020											
CO2e	Sheet Pile Crew PB																			
CO2e	Civil Crew	79.166536	163.792826	163.793080	277.082122	234.769226	204.741158	204.741364	79.166685											
CO2e	Pile Driving Crew	168.406096	522.639599	696.853423	673.623512	665.880994	522.639056	522.639727	168.406003											
CO2e	Finegrade Crew																			
CO2e	Labor Crew		48.155675	96.311298	93.100921	92.030852	96.311241	96.311356	46.550489											
CO2e	Carpenter Crew	56.158297	464.758594	697.137342	730.057783	999.230975	755.231972	522.853404	786.216330	227.215375										
CO2e	Lather Crew	56.158297	406.663770	464.758228	673.899492	832.692479	697.137205	522.853404	336.949856	113.607688										
CO2e	Dowel Crew																			
CO2e	Concrete Pour Crew		360.080580	630.140455	1218.272731	1634.365350	1350.300169	990.221266	957.214305	616.137817										
CO2e	Steel Erection Crew		498.328730	1494.986659	1204.293566	2142.812803	1494.983787	747.492711	1204.291957	730.881525										
CO2e	Steel Erection Crew PB																			
CO2e	Paving Crew		64.623195	193.869322	312.345348	247.004185	193.869709	193.869154	187.407327											

CO2e Onroad emissions calculated normally below

CO2e Onroad Emissions Per Crew Per Quarter (Metric Tons)

CO2e	Concrete Demo Crew	40.585195	83.969368	84.539176	121.755584	79.236114	82.921514	83.484988	40.078732									38.740679	40.076564	39.901423	39.185974
CO2e	Sheet Pile Crew	83.557516	115.251746	145.002717	334.230065	271.004696	283.609566	228.366821	164.493548											
CO2e	Sheet Pile Crew PB																			
CO2e	Civil Crew	81.170389	167.938736	169.078352	284.096362	237.708341	207.303786	208.712471	80.157464											
CO2e	Pile Driving Crew	27.852505	86.438810	116.002174	111.410022	108.401879	85.082870	85.637558	27.415591											
CO2e	Finegrade Crew																			
CO2e	Labor Crew		41.984684	84.539176	81.170389	79.236114	82.921514	83.484988	40.078732											
CO2e	Carpenter Crew	27.852505	230.503493	348.006521	362.082570	487.808454	368.692436	256.912673	383.818279	109.300858										
CO2e	Lather Crew	27.852505	201.690556	232.004347	334.230065	406.507045	340.331479	256.912673	164.493548	54.650429										
CO2e	Dowel Crew																			
CO2e	Concrete Pour Crew		167.938736	295.887117	568.192725	752.743081	621.911358	459.167435	440.866052	280.441059										
CO2e	Steel Erection Crew		57.625873	174.003260	139.262527	243.904227	170.165740	85.637558	137.077957	81.975643										
CO2e	Steel Erection Crew PB																			
CO2e	Paving Crew		41.984684	126.808764	202.925973	158.472228	124.382272	125.227482	120.236196											

CO2e Nonroad emissions and CO2e Onroad emissions added together below

CO2e Emissions Per Crew Per Quarter (Metric Tons)

CO2e	Concrete Demo Crew	114.428537	236.748872	237.318517	343.285643	225.225202	235.700969	236.264268	113.922040									112.584129	116.466334	115.442519	113.878212
CO2e	Sheet Pile Crew	588.775804	812.104545	1016.069496	2355.100599	1935.707181	2025.739754	1622.072758	1174.929569											
CO2e	Sheet Pile Crew PB																			
CO2e	Civil Crew	160.336925	331.731562	332.871432	561.178485	472.477567	412.044944	413.453835	159.324149											
CO2e	Pile Driving Crew	196.258601	609.078408	812.855597	785.033533	774.282872	607.721926	608.277284	195.821595											
CO2e	Finegrade Crew																			
CO2e	Labor Crew		90.140359	180.850474	174.271311	171.266965	179.232756	179.796345	86.629221											
CO2e	Carpenter Crew	84.010802	695.262087	1045.143863	1092.140353	1487.039429	1123.924408	779.766078	1170.034610	336.516233										
CO2e	Lather Crew	84.010802	608.354326	696.762575	1008.129557	1239.199524	1037.468684	779.766078	501.443404	168.258116										
CO2e	Dowel Crew																			
CO2e	Concrete Pour Crew		528.019316	926.027572	1786.465456	2387.108430	1972.211527	1449.388701	1398.080356	896.578876										
CO2e	Steel Erection Crew		555.954604	1668.989919	1343.556092	2386.717030	1665.149526	833.130269	1341.369914	812.857168										
CO2e	Steel Erection Crew PB																			
CO2e	Paving Crew		106.607879	320.678087	515.271321	405.476413	318.251980	319.096636	307.643523											

PANYNJ Newark Liberty International Airport (EWR) AirTrain Replacement Program
Emissions - MCF

		2022 Winter	2022 Spring	2022 Summer	2022 Fall	2023 Winter	2023 Spring	2023 Summer	2023 Fall	2024 Winter	2024 Spring	2024 Summer	2024 Fall	2025 Winter	2025 Spring	2025 Summer	2025 Fall	2026 Winter	2026 Spring	2026 Summer	2026 Fall
Crews Working Per Quarter																					
	Concrete Demo Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sheet Pile Crew	2	2	2	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sheet Pile Crew PB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Civil Crew	0	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Pile Driving Crew	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Finegrade Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Labor Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Carpenter Crew	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Lather Crew	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Dowel Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Concrete Pour Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Steel Erection Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Steel Erection Crew PB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Paving Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Working Hours Per Quarter (Assuming 8 Hours of Work per Day)																					
	Working Hours	696	720	720	696	688	720	720	696	704	720	720	704	720	728	736	736	696	720	712	704
CO Emissions Per Crew Per Quarter (US Tons)																					
CO	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Sheet Pile Crew	0.117490	0.121541	0.124754	0.000000	0.108554	0.113603	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Civil Crew	0.000000	0.083765	0.085372	0.000000	0.000000	0.078186	0.079677	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Pile Driving Crew	0.000000	0.000000	0.062377	0.058745	0.054277	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Carpenter Crew	0.000000	0.000000	0.000000	0.054777	0.050300	0.052640	0.054130	0.050885	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.050885	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx Emissions Per Crew Per Quarter (US Tons)																					
NOx	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Sheet Pile Crew	0.189984	0.194669	0.183073	0.000000	0.176846	0.183405	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Civil Crew	0.000000	0.123675	0.112779	0.000000	0.000000	0.113713	0.103945	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Pile Driving Crew	0.000000	0.000000	0.091537	0.092705	0.088423	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Carpenter Crew	0.000000	0.000000	0.000000	0.067802	0.063788	0.065922	0.060744	0.062488	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.062488	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2 Emissions Per Crew Per Quarter (US Tons)																					
SO2	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Sheet Pile Crew	0.002941	0.003042	0.003046	0.000000	0.002898	0.003033	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Civil Crew	0.000000	0.000689	0.000692	0.000000	0.000000	0.000684	0.000686	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Pile Driving Crew	0.000000	0.000000	0.001523	0.001470	0.001449	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Carpenter Crew	0.000000	0.000000	0.000000	0.000662	0.000650	0.000680	0.000682	0.000658	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000658	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC Emissions Per Crew Per Quarter (US Tons)																					
VOC	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Sheet Pile Crew	0.015559	0.016096	0.016133	0.000000	0.014148	0.014806	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Civil Crew	0.000000	0.013140	0.013159	0.000000	0.000000	0.011943	0.011959	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Pile Driving Crew	0.000000	0.000000	0.008067	0.007780	0.007074	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

PANYNJ Newark Liberty International Airport (EWR) AirTrain Replacement Program
Emissions - MCF

VOC	Carpenter Crew	0.000000	0.000000	0.000000	0.005683	0.004996	0.005228	0.005245	0.005054	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.005054	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8	43427.8
		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
		75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Fugitive Dust PM10 Emissions Per Quarter (US Tons)																						
	PM10 Fugitive Dust	0.224317	0.224317	0.224317	0.224317	0.224317	0.224317	0.224317	0.224317	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	PM10 Emissions Per Crew Per Quarter (US Tons)																						
PM10	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Sheet Pile Crew	0.014738	0.015246	0.015246	0.000000	0.014232	0.014894	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Civil Crew	0.000000	0.012451	0.012451	0.000000	0.000000	0.011945	0.011945	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Pile Driving Crew	0.000000	0.000000	0.007623	0.007369	0.007116	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Carpenter Crew	0.000000	0.000000	0.000000	0.006170	0.005882	0.006156	0.006156	0.005950	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.005950	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
	Fugitive Dust PM2.5 Emissions Per Quarter (US Tons)																						
	PM2.5 Fugitive Dust	0.022432	0.022432	0.022432	0.022432	0.022432	0.022432	0.022432	0.022432	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	PM2.5 Emissions Per Crew Per Quarter (US Tons)																						
PM2.5	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Sheet Pile Crew	0.008327	0.008614	0.008614	0.000000	0.007932	0.008301	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Civil Crew	0.000000	0.006884	0.006884	0.000000	0.000000	0.006426	0.006426	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Pile Driving Crew	0.000000	0.000000	0.004307	0.004163	0.003966	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Carpenter Crew	0.000000	0.000000	0.000000	0.003001	0.002769	0.002898	0.002898	0.002801	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.002801	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	CH4 Emissions Per Crew Per Quarter (N/A)																						
CH4	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Sheet Pile Crew	255.772927	264.591854	264.592034	0.000000	253.298958	265.080355	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Civil Crew	0.000000	74.685385	74.685622	0.000000	0.000000	74.781749	74.781733	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Pile Driving Crew	0.000000	0.000000	132.296017	127.885956	126.649479	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Carpenter Crew	0.000000	0.000000	0.000000	55.288648	54.709184	57.253707	57.253815	55.345337	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	55.345337	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	CO2 Emissions Per Crew Per Quarter (N/A)																						
CO2	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Sheet Pile Crew	334269150.104776	345795665.994547	345795975.986530	0.000000	330426675.751364	345795295.004323	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Civil Crew	0.000000	40637952.590799	40638015.565153	0.000000	0.000000	40637975.096621	40638016.123193	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Pile Driving Crew	0.000000	0.000000	172897987.993265	167134358.503751	165213337.875682	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

PANYNJ Newark Liberty International Airport (EWR) AirTrain Replacement Program
Emissions - MCF

CO2	Carpenter Crew	0.000000	0.000000	0.000000	55733963.870155	55093380.473439	57655806.671722	57655861.842802	55733980.634039	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	55733980.634039	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

10210	CO2 to Fuel = Diesel fuel consumption calculated from CO2 emissions (10.21 kg CO2/gal x 1000 g/kg = 10210 g CO2/gal)

Fuel Emissions Per Crew Per Quarter

Fuel	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Sheet Pile Crew	32739.387865	33868.331635	33868.361997	0.000000	32363.043658	33868.295299	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Civil Crew	0.000000	3980.210832	3980.217000	0.000000	0.000000	3980.213036	3980.217054	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Pile Driving Crew	0.000000	0.000000	16934.180998	16369.672723	16181.521829	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Carpenter Crew	0.000000	0.000000	0.000000	5458.762377	5396.021594	5646.993797	5646.999201	5458.764019	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	5458.764019	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

0.26	Fuel to N2O = N2O emissions calculated from diesel fuel consumption (Diesel construction equipment = 0.26 g N2O/gal)

N2O Emissions Per Crew Per Quarter

N2O	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Sheet Pile Crew	8512.240845	8805.766225	8805.774119	0.000000	8414.391351	8805.756778	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Civil Crew	0.000000	1034.854816	1034.856420	0.000000	0.000000	1034.855389	1034.856434	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Pile Driving Crew	0.000000	0.000000	4402.887060	4256.114908	4207.195676	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Carpenter Crew	0.000000	0.000000	0.000000	1419.278218	1402.965614	1468.218387	1468.219792	1419.278645	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1419.278645	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

GWP	Pollutant
25	CH4
1	CO2
298	N2O

CO2e Nonroad emissions calculated from CH4 (GWP = 25), CO2 (GWP = 1), and N2O (GWP = 298)

CO2e Nonroad Emissions Per Crew Per Quarter (Metric Tons)

CO2e	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Sheet Pile Crew	336.812192	348.426399	348.426711	0.000000	332.940497	348.426038	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Civil Crew	0.000000	40.948206	40.948270	0.000000	0.000000	40.948232	40.948273	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Pile Driving Crew	0.000000	0.000000	174.213356	168.405878	166.470248	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Carpenter Crew	0.000000	0.000000	0.000000	56.158291	55.512832	58.094767	58.094823	56.158309	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	56.158309	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

CO2e Onroad emissions calculated normally below

CO2e Onroad Emissions Per Crew Per Quarter (Metric Tons)

CO2e	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Sheet Pile Crew	55.705011	57.625873	58.001087	0.000000	54.200939	56.721913	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Civil Crew	0.000000	41.984684	42.269588	0.000000	0.000000	41.460757	41.742494	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Pile Driving Crew	0.000000	0.000000	29.000543	27.852505	27.100470	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Carpenter Crew	0.000000	0.000000	0.000000	27.852505	27.100470	28.360957	28.545853	27.415591	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	27.415591	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

PANYNJ Newark Liberty International Airport (EWR) AirTrain Replacement Program
Emissions - MCF

CO2e	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

CO2e Nonroad emissions and CO2e Onroad emissions added together below

	CO2e Emissions Per Crew Per Quarter (Metric Tons)																						
CO2e	Concrete Demo Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Sheet Pile Crew	392.517203	406.052272	406.427798	0.000000	387.141436	405.147951	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Sheet Pile Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Civil Crew	0.000000	82.932891	83.217858	0.000000	0.000000	82.408989	82.690767	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Pile Driving Crew	0.000000	0.000000	203.213899	196.258383	193.570718	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Labor Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Carpenter Crew	0.000000	0.000000	0.000000	84.010796	82.613302	86.455724	86.640675	83.573901	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	83.573901	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Concrete Pour Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Paving Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

PANYNJ Newark Liberty International Airport (EWR) AirTrain Replacement Program
Emissions - PedBridge

		2022 Winter	2022 Spring	2022 Summer	2022 Fall	2023 Winter	2023 Spring	2023 Summer	2023 Fall	2024 Winter	2024 Spring	2024 Summer	2024 Fall	2025 Winter	2025 Spring	2025 Summer	2025 Fall	2026 Winter	2026 Spring	2026 Summer	2026 Fall
	Crews Working Per Quarter																				
	Concrete Demo Crew	1	1	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
	Sheet Pile Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Sheet Pile Crew PB	1	1	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
	Civil Crew	0	1	1	1	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
	Pile Driving Crew	0	0	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0
	Finegrade Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Labor Crew	0	0	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0
	Carpenter Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Lather Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Dowel Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Concrete Pour Crew	0	1	2	2	2	2	1	1	2	1	1	0	0	0	0	0	0	0	0	0
	Steel Erection Crew	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Steel Erection Crew PB	0	0	0	1	2	2	2	2	1	1	1	0	0	0	0	0	0	0	0	0
	Paving Crew	0	0	1	1	1	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0
	Working Hours Per Quarter (Assuming 8 Hours of Work per Day)																				
	Working Hours	696	720	720	696	688	720	720	696	704	720	720	704	720	728	736	736	696	720	712	704
	CO Emissions Per Crew Per Quarter (US Tons)																				
CO	Concrete Demo Crew	0.071557	0.074025	0.075631	0.071557	0.065440	0.000000	0.069974	0.000000	0.000000	0.063345	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Sheet Pile Crew PB	0.058137	0.060142	0.061749	0.058137	0.053678	0.000000	0.057666	0.000000	0.000000	0.052462	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Civil Crew	0.000000	0.083765	0.085372	0.080973	0.074711	0.000000	0.079677	0.000000	0.000000	0.073010	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Pile Driving Crew	0.000000	0.000000	0.062377	0.058745	0.054277	0.056801	0.000000	0.054908	0.000000	0.053086	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Labor Crew	0.000000	0.000000	0.073390	0.069390	0.063254	0.066196	0.000000	0.063989	0.000000	0.061011	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Concrete Pour Crew	0.000000	0.073316	0.149846	0.141745	0.129527	0.135551	0.069266	0.065517	0.122492	0.062638	0.064017	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.155650	0.300108	0.314067	0.317048	0.303598	0.149897	0.153304	0.154683	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO	Paving Crew	0.000000	0.000000	0.098930	0.094080	0.087848	0.000000	0.093425	0.000000	0.000000	0.173895	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	NOx Emissions Per Crew Per Quarter (US Tons)																				
NOx	Concrete Demo Crew	0.118418	0.120802	0.109906	0.114253	0.107373	0.000000	0.101075	0.000000	0.000000	0.101724	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Sheet Pile Crew PB	0.091115	0.093324	0.087526	0.088829	0.084592	0.000000	0.082515	0.000000	0.000000	0.082721	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Civil Crew	0.000000	0.123675	0.112779	0.117031	0.110115	0.000000	0.103945	0.000000	0.000000	0.104590	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Pile Driving Crew	0.000000	0.000000	0.091537	0.092705	0.088423	0.091703	0.000000	0.087410	0.000000	0.086730	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Labor Crew	0.000000	0.000000	0.101702	0.106323	0.099525	0.102630	0.000000	0.096949	0.000000	0.093501	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Concrete Pour Crew	0.000000	0.122065	0.222338	0.230949	0.217172	0.224226	0.102345	0.106116	0.204085	0.103000	0.094268	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.209817	0.408369	0.425696	0.415340	0.409034	0.203978	0.207870	0.203242	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
NOx	Paving Crew	0.000000	0.000000	0.197306	0.198740	0.190965	0.000000	0.188556	0.000000	0.000000	0.378570	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	SO2 Emissions Per Crew Per Quarter (US Tons)																				
SO2	Concrete Demo Crew	0.000908	0.000940	0.000942	0.000908	0.000893	0.000000	0.000937	0.000000	0.000000	0.000929	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Sheet Pile Crew PB	0.001349	0.001395	0.001397	0.001349	0.001329	0.000000	0.001392	0.000000	0.000000	0.001386	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Civil Crew	0.000000	0.000689	0.000692	0.000666	0.000653	0.000000	0.000686	0.000000	0.000000	0.000679	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Pile Driving Crew	0.000000	0.000000	0.001523	0.001470	0.001449	0.001517	0.000000	0.001466	0.000000	0.001512	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Labor Crew	0.000000	0.000000	0.000739	0.000712	0.000698	0.000731	0.000000	0.000706	0.000000	0.000726	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Concrete Pour Crew	0.000000	0.001038	0.002081	0.002006	0.001973	0.002064	0.001035	0.000998	0.002009	0.001027	0.001030	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.001712	0.003376	0.003533	0.003537	0.003416	0.001723	0.001763	0.001764	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
SO2	Paving Crew	0.000000	0.000000	0.000866	0.000834	0.000819	0.000000	0.000860	0.000000	0.000000	0.001705	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	VOC Emissions Per Crew Per Quarter (US Tons)																				
VOC	Concrete Demo Crew	0.010165	0.010515	0.010534	0.010165	0.008904	0.000000	0.009334	0.000000	0.000000	0.008302	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Sheet Pile Crew PB	0.007454	0.007711	0.007730	0.007454	0.006752	0.000000	0.007083	0.000000	0.000000	0.006535	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Civil Crew	0.000000	0.013140	0.013159	0.012702	0.011412	0.000000	0.011959	0.000000	0.000000	0.010928	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Pile Driving Crew	0.000000	0.000000	0.008067	0.007780	0.007074	0.007403	0.000000	0.007156	0.000000	0.006871	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Labor Crew	0.000000	0.000000	0.010139	0.009782	0.008524	0.008920	0.000000	0.008623	0.000000	0.007904	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

PANYNJ Newark Liberty International Airport (EWR) AirTrain Replacement Program
Emissions - PedBridge

VOC	Concrete Pour Crew	0.000000	0.010919	0.021875	0.021109	0.018583	0.019447	0.009740	0.009400	0.017036	0.008711	0.008726	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.019746	0.037804	0.039562	0.039595	0.038243	0.018820	0.019248	0.019262	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
VOC	Paving Crew	0.000000	0.000000	0.016486	0.015918	0.014600	0.000000	0.015295	0.000000	0.000000	0.028547	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3	137140.3
		3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
		75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Fugitive Dust PM10 Emissions Per Quarter (US Tons)																					
	PM10 Fugitive Dust	0.708370	0.708370	0.708370	0.708370	0.708370	0.708370	0.708370	0.708370	0.708370	0.708370	0.708370	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	PM10 Emissions Per Crew Per Quarter (US Tons)																					
PM10	Concrete Demo Crew	0.010880	0.011255	0.011255	0.010880	0.010285	0.000000	0.010763	0.000000	0.000000	0.010416	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Sheet Pile Crew PB	0.007192	0.007440	0.007440	0.007192	0.006943	0.000000	0.007266	0.000000	0.000000	0.007156	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Civil Crew	0.000000	0.012451	0.012451	0.012036	0.011414	0.000000	0.011945	0.000000	0.000000	0.011585	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Pile Driving Crew	0.000000	0.000000	0.007623	0.007369	0.007116	0.007447	0.000000	0.007199	0.000000	0.007334	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Labor Crew	0.000000	0.000000	0.010802	0.010442	0.009825	0.010282	0.000000	0.009939	0.000000	0.009907	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Concrete Pour Crew	0.000000	0.011281	0.022562	0.021810	0.020647	0.021607	0.010804	0.010444	0.020479	0.010472	0.010472	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.018335	0.035888	0.037557	0.037557	0.036305	0.018238	0.018653	0.018653	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM10	Paving Crew	0.000000	0.000000	0.013909	0.013445	0.012850	0.000000	0.013448	0.000000	0.000000	0.026264	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
	Fugitive Dust PM2.5 Emissions Per Quarter (US Tons)																					
	PM2.5 Fugitive Dust	0.070837	0.070837	0.070837	0.070837	0.070837	0.070837	0.070837	0.070837	0.070837	0.070837	0.070837	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	PM2.5 Emissions Per Crew Per Quarter (US Tons)																					
PM2.5	Concrete Demo Crew	0.005533	0.005724	0.005724	0.005533	0.005045	0.000000	0.005280	0.000000	0.000000	0.004973	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Sheet Pile Crew PB	0.003992	0.004129	0.004129	0.003992	0.003798	0.000000	0.003975	0.000000	0.000000	0.003880	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Civil Crew	0.000000	0.006884	0.006884	0.006655	0.006141	0.000000	0.006426	0.000000	0.000000	0.006106	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Pile Driving Crew	0.000000	0.000000	0.004307	0.004163	0.003966	0.004150	0.000000	0.004012	0.000000	0.004053	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Labor Crew	0.000000	0.000000	0.005284	0.005108	0.004599	0.004813	0.000000	0.004652	0.000000	0.004479	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Concrete Pour Crew	0.000000	0.005749	0.011498	0.011114	0.010165	0.010638	0.005319	0.005142	0.009830	0.005027	0.005027	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Steel Erection Crew PB	0.000000	0.000000	0.000000	0.014801	0.028938	0.030284	0.030284	0.029275	0.014698	0.015032	0.015032	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PM2.5	Paving Crew	0.000000	0.000000	0.008298	0.008021	0.007533	0.000000	0.007884	0.000000	0.000000	0.015214	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	CH4 Emissions Per Crew Per Quarter (N/A)																					
CH4	Concrete Demo Crew	73.079282	75.599257	75.599164	73.079192	72.369158	0.000000	75.735258	0.000000	0.000000	75.871322	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Sheet Pile Crew PB	116.610760	120.631545	120.631635	116.610418	115.511044	0.000000	120.883819	0.000000	0.000000	121.135803	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Civil Crew	0.000000	74.685385	74.685622	72.196218	71.458084	0.000000	74.781733	0.000000	0.000000	74.877708	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Pile Driving Crew	0.000000	0.000000	132.296017	127.885956	126.649479	132.540177	0.000000	128.122221	0.000000	132.784839	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Labor Crew	0.000000	0.000000	50.577750	48.891825	48.370356	50.620050	0.000000	48.932802	0.000000	50.662628	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Concrete Pour Crew	0.000000	78.236473	156.473125	151.257504	149.894285	156.865932	78.433056	75.818621	153.765150	78.629604	78.629905	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Steel Erection Crew PB	0.000000	0.000000	0.000000	883.569232	1747.208056	1828.473306	1828.471113	1767.525559	894.107330	914.432868	914.435177	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CH4	Paving Crew	0.000000	0.000000	388.849070	375.886131	372.734348	0.000000	390.071011	0.000000	0.000000	782.587723	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	CO2 Emissions Per Crew Per Quarter (N/A)																					
CO2	Concrete Demo Crew	73285379.601957	75812547.752256	75812467.052945	73285389.727713	72442991.458558	0.000000	75812433.163834	0.000000	0.000000	75812460.468632	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Sheet Pile Crew PB	150346600.713050	155531025.713995	155531015.337583	150346429.880313	148618386.229295	0.000000	155531074.968608	0.000000	0.000000	155531030.768309	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Civil Crew	0.000000	40637952.590799	40638015.565153	39283249.055847	38831737.817646	0.000000	40638016.123193	0.000000	0.000000	40638011.894163	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Pile Driving Crew	0.000000	0.000000	172897987.993265	167134358.503751	165213337.875682	172897647.502162	0.000000	167134477.212717	0.000000	172897883.771137	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Labor Crew	0.000000	0.000000	47791710.459000	46198653.443700	45667661.193200	47791681.290000	0.000000	46198680.509400	0.000000	47791707.765353	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Concrete Pour Crew	0.000000	89340218.418960	178680278.179800	172724436.833148	170739033.666736	178680161.652480	89340183.931140	86362215.150246	174709723.156737	89340159.822241	89340191.655041	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2	Steel Erection Crew PB	0.000000	0.000000	0.000000	195279774.531682	386070535.664440	404026657.090422	404027316.503139	390559045.093079	197524293.134069	202013720.427903	202013941.638145	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

PANYNJ Newark Liberty International Airport (EWR) AirTrain Replacement Program
Emissions - PedBridge

CO2	Paving Crew	0.000000	0.000000	64126751.468918	61989258.328937	61276721.077023	0.000000	64126665.498092	0.000000	0.000000	128253312.839875	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

10210 CO2 to Fuel = Diesel fuel consumption calculated from CO2 emissions (10.21 kg CO2/gal x 1000 g/kg = 10210 g CO2/gal)

Fuel Emissions Per Crew Per Quarter

Fuel	Concrete Demo Crew	7177.804075	7425.322992	7425.315088	7177.805066	7095.297890	0.000000	7425.311769	0.000000	0.000000	7425.314444	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Sheet Pile Crew PB	14725.426123	15233.205261	15233.204245	14725.409391	14556.159278	0.000000	15233.210085	0.000000	0.000000	15233.205756	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Civil Crew	0.000000	3980.210832	3980.217000	3847.526842	3803.304390	0.000000	3980.217054	0.000000	0.000000	3980.216640	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Pile Driving Crew	0.000000	0.000000	16934.180998	16369.672723	16181.521829	16934.147650	0.000000	16369.684350	0.000000	16934.170791	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Labor Crew	0.000000	0.000000	4680.872719	4524.843628	4472.836552	4680.869862	0.000000	4524.846279	0.000000	4680.872455	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Concrete Pour Crew	0.000000	8750.266251	17500.516962	16917.182844	16722.726118	17500.505549	8750.262873	8458.591102	17111.628125	8750.260511	8750.263629	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Steel Erection Crew PB	0.000000	0.000000	0.000000	19126.324636	37812.980966	39571.660832	39571.725417	38252.599911	19346.159954	19785.868798	19785.890464	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Fuel	Paving Crew	0.000000	0.000000	6280.778792	6071.425889	6001.637716	0.000000	6280.770372	0.000000	0.000000	12561.538966	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

0.26 Fuel to N2O = N2O emissions calculated from diesel fuel consumption (Diesel construction equipment = 0.26 g N2O/gal)

N2O Emissions Per Crew Per Quarter

N2O	Concrete Demo Crew	1866.229059	1930.583978	1930.581923	1866.229317	1844.777451	0.000000	1930.581060	0.000000	0.000000	1930.581755	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Sheet Pile Crew PB	3828.610792	3960.633368	3960.633104	3828.606442	3784.601412	0.000000	3960.634622	0.000000	0.000000	3960.633497	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Civil Crew	0.000000	1034.854816	1034.856420	1000.356979	988.859141	0.000000	1034.856434	0.000000	0.000000	1034.856326	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Pile Driving Crew	0.000000	0.000000	4402.887060	4256.114908	4207.195676	4402.878389	0.000000	4256.117931	0.000000	4402.884406	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Labor Crew	0.000000	0.000000	1217.026907	1176.459343	1162.937503	1217.026164	0.000000	1176.460033	0.000000	1217.026838	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Concrete Pour Crew	0.000000	2275.069225	4550.134410	4398.467539	4347.908791	4550.131443	2275.068347	2199.233686	4449.023313	2275.067733	2275.068544	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Steel Erection Crew PB	0.000000	0.000000	0.000000	4972.844405	9831.375051	10288.631816	10288.648608	9945.675977	5030.001588	5144.325887	5144.331521	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
N2O	Paving Crew	0.000000	0.000000	1633.002486	1578.570731	1560.425806	0.000000	1633.000297	0.000000	0.000000	3266.000131	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

GWP	Pollutant
25	CH4
1	CO2
298	N2O

CO2e Nonroad emissions calculated from CH4 (GWP = 25), CO2 (GWP = 1), and N2O (GWP = 298)

CO2e Nonroad Emissions Per Crew Per Quarter (Metric Tons)

CO2e	Concrete Demo Crew	73.843343	76.389752	76.389670	73.843353	72.994544	0.000000	76.389640	0.000000	0.000000	76.389671	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Sheet Pile Crew PB	151.490442	156.714310	156.714300	151.490270	149.749085	0.000000	156.714366	0.000000	0.000000	156.714328	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Civil Crew	0.000000	40.948206	40.948270	39.583160	39.128204	0.000000	40.948273	0.000000	0.000000	40.948271	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Pile Driving Crew	0.000000	0.000000	174.213356	168.405878	166.470248	174.213019	0.000000	168.406003	0.000000	174.213263	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Labor Crew	0.000000	0.000000	48.155649	46.550461	46.015426	48.155621	0.000000	46.550489	0.000000	48.155648	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Concrete Pour Crew	0.000000	90.020145	180.040130	174.038962	172.038458	180.040022	90.020115	87.019482	176.039376	90.020096	90.020128	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Steel Erection Crew PB	0.000000	0.000000	0.000000	196.783771	389.043966	407.138381	407.139046	393.567045	199.045586	203.569590	203.569813	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Paving Crew	0.000000	0.000000	64.623107	62.469070	61.751046	0.000000	64.623051	0.000000	0.000000	129.246146	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

CO2e Onroad emissions calculated normally below

CO2e Onroad Emissions Per Crew Per Quarter (Metric Tons)

CO2e	Concrete Demo Crew	40.585195	41.984684	42.269588	40.585195	39.618057	0.000000	41.742494	0.000000	0.000000	40.973531	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Sheet Pile Crew PB	27.852505	28.812937	29.000543	27.852505	27.100470	0.000000	28.545853	0.000000	0.000000	27.946242	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Civil Crew	0.000000	41.984684	42.269588	40.585195	39.618057	0.000000	41.742494	0.000000	0.000000	40.973531	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Pile Driving Crew	0.000000	0.000000	29.000543	27.852505	27.100470	28.360957	0.000000	27.415591	0.000000	27.946242	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Labor Crew	0.000000	0.000000	42.269588	40.585195	39.618057	41.460757	0.000000	40.078732	0.000000	40.973531	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Concrete Pour Crew	0.000000	41.984684	84.539176	81.170389	79.236114	82.921514	41.742494	40.078732	80.126017	40.973531	41.252217	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Steel Erection Crew PB	0.000000	0.000000	0.000000	27.852505	54.200939	56.721913	57.091705	54.831183	27.325214	27.946242	28.128541	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Paving Crew	0.000000	0.000000	42.269588	40.585195	39.618057	0.000000	41.742494	0.000000	0.000000	81.947063	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

CO2e Nonroad emissions and CO2e Onroad emissions added together below

CO2e Emissions Per Crew Per Quarter (Metric Tons)

CO2e	Concrete Demo Crew	114.428537	118.374436	118.659259	114.428548	112.612601	0.000000	118.132134	0.000000	0.000000	117.363202	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Sheet Pile Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

PANYNJ Newark Liberty International Airport (EWR) AirTrain Replacement Program
Emissions - PedBridge

CO2e	Sheet Pile Crew PB	179.342947	185.527247	185.714843	179.342775	176.849555	0.000000	185.260219	0.000000	0.000000	184.660570	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Civil Crew	0.000000	82.932891	83.217858	80.168355	78.746261	0.000000	82.690767	0.000000	0.000000	81.921802	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Pile Driving Crew	0.000000	0.000000	203.213899	196.258383	193.570718	202.573975	0.000000	195.821595	0.000000	202.159505	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Finegrade Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Labor Crew	0.000000	0.000000	90.425237	87.135655	85.633483	89.616378	0.000000	86.629221	0.000000	89.129180	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Carpenter Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Lather Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Dowel Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Concrete Pour Crew	0.000000	132.004829	264.579306	255.209351	251.274572	262.961537	131.762609	127.098214	256.165393	130.993627	131.272345	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Steel Erection Crew	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Steel Erection Crew PB	0.000000	0.000000	0.000000	224.636277	443.244905	463.860294	464.230751	448.398227	226.370801	231.515832	231.698354	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
CO2e	Paving Crew	0.000000	0.000000	106.892696	103.054264	101.369103	0.000000	106.365545	0.000000	0.000000	211.193208	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Appendix D

Appendix D: D.1 Phase 1A Archeological Survey, September 2020, prepared by NV5, Inc.

D.2 Phase 1B and Phase II Archaeological Testing Work Plan, prepared by NV5, Inc. and HPO approval of Phase 1B/II Archaeological Testing Work Plan, September 22, 2020.

D.3 Phase 1B Archaeological Survey, November 2020, prepared by NV5, Inc.

PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

Newark Liberty International Airport (EWR)
AirTrain Replacement Program

PHASE 1A ARCHAEOLOGICAL SURVEY

September 2020

Prepared By:

NV5 Infrastructure East
800 Lanidex Plaza, Suite 300
Parsippany, NJ 07054

AVI-15-032

Abstract

A Phase IA Cultural Resources Survey was conducted by NV5, Inc. for the proposed AirTrain Replacement Project at Newark Liberty International Airport in the City of Newark, Essex County, and the City of Elizabeth, Union County, New Jersey. The Area of Potential Effect (APE) for archaeology was defined as all locations where subsurface impacts can be anticipated from project actions. The archaeological potential of the APE was evaluated based on past and present environmental conditions, previous research on archaeological sites in the area, an assessment of historic land use, and visual inspection. No archaeological subsurface field testing was undertaken.

One area along the proposed alignment within Block 5090, Lots 1.05 and 44.01, which was formerly the site of a glue factory and several dwellings during the latter half of the 19th century and the early part of the 20th century, is viewed to have a low-to-moderate potential for the presence of historic archaeological resources. A program of machine-assisted Phase I subsurface testing may be necessary to determine the presence or absence of any archaeological resources. The need for these possible further investigations will be determined through consultation with the New Jersey Historic Preservation Office.

One potential archaeological resource, the Newark City Cemetery (in use from 1869 through 1954), was identified adjacent to the APE. Consultation with the New Jersey Historic Preservation Office (NJHPO) to determine adequate measures to protect the cemetery during construction is recommended.

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1 INTRODUCTION

A Phase IA Cultural Resources Survey was conducted by NV5, Inc. for the proposed Newark Liberty Airport AirTrain Replacement Project, in the City of Newark, Essex County, and City of Elizabeth, Union County, New Jersey. The survey was conducted for Radin Consulting, Inc., consultant to Lea+Elliott/Port Authority of New York and New Jersey (PANYNJ), pursuant to requirements under Section 106 of the National Historic Preservation Act; 23 CFR 771, as amended October 30, 1980; the guidelines developed by the Advisory Council on Historic Preservation published November 26, 1980; the amended procedures for the Protection of Historic and Cultural Properties as set forth in 36 CFR § 800 (October 1, 1986); and the amended procedures for the Protection of Historic Properties as set forth in 36 CFR § 800 (May 18, 1999).

The Project is located in a major metropolitan area within the Cities of Newark and Elizabeth along the boundary between Essex and Union Counties (Figures 1.1 and 1.2). Properties included in the Project Area contain rail lines, highways, local roads, and airport facilities (existing and under construction), as shown on an aerial map in Figure 1.3. The Proposed Action is shown on Figure 1.4.

1.1 Project Description for Proposed Action

The Proposed Action will replace the existing AirTrain, which was opened in 1996 and expanded with a link to the Northeast Corridor (NEC) Station (also called the Rail Link Station) in 2001 (in the remainder of this report the existing AirTrain is often referred to as the "existing monorail" in order to distinguish it from the proposed replacement). The existing monorail was built in two phases. The 1996 portion consisted of a two-mile, on-airport, dual-lane guideway system with seven stations positioned at each of the three existing-airline terminals and four parking lot/rent-a-car areas. The 2001 link added one mile of dual-lane guideway to connect the airport terminals to the Rail Link Station.

The Proposed Action would include replacing the existing system with a new automated people mover (APM) system. This replacement system will enhance reliability and capacity, provide service between on-airport facilities, and maintain the connection to the NJ TRANSIT and Amtrak lines via an improved Rail Link Station. The new AirTrain EWR will serve Terminals B and C and the new Terminal 1 as well as parking areas (with hotel shuttle transportation), the Consolidated Rental Car Facility and Parking Garage (ConRAC), and the Rail Link Station.

The proposed replacement AirTrain system will be a 2.4-mile dual guideway system located primarily on PANYNJ property. The Port Authority anticipates acquiring land outside the CTA to accommodate permanent structures of the new AirTrain. These areas, located west of U.S. Route 1/9 adjacent to the existing AirTrain alignment near the existing Rail Link Station, are primarily vacant or used for employee parking by United Airlines. In addition, the Port Authority will have to obtain temporary easements for construction of the Proposed Action.

The Proposed Action involves the construction of all facilities and infrastructure for the replacement AirTrain system – including elevated guideway infrastructure, rider stations, elevated pedestrian connectors, utilities, substations, a maintenance and control facility (MCF), vehicles, train control, and a power distribution system.



Figure 1.1 – General Location of Project Area

Newark Liberty International Airport
Air Train Replacement Project

N

PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

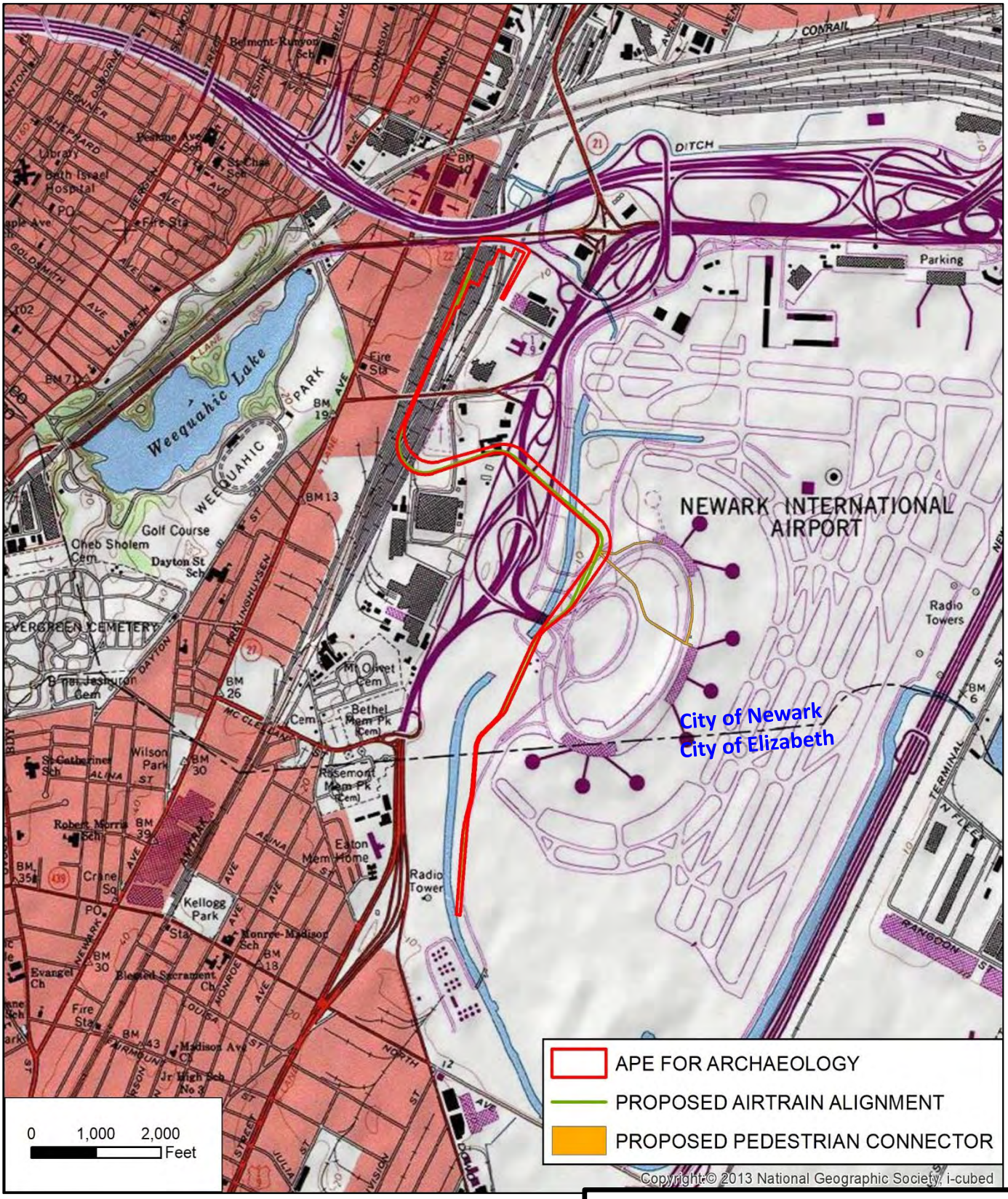


Figure 1.2 – Project Area shown on U.S.G.S. Elizabeth, New Jersey/ New York Quadrangle

Newark Liberty International Airport
Air Train Replacement Project

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PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

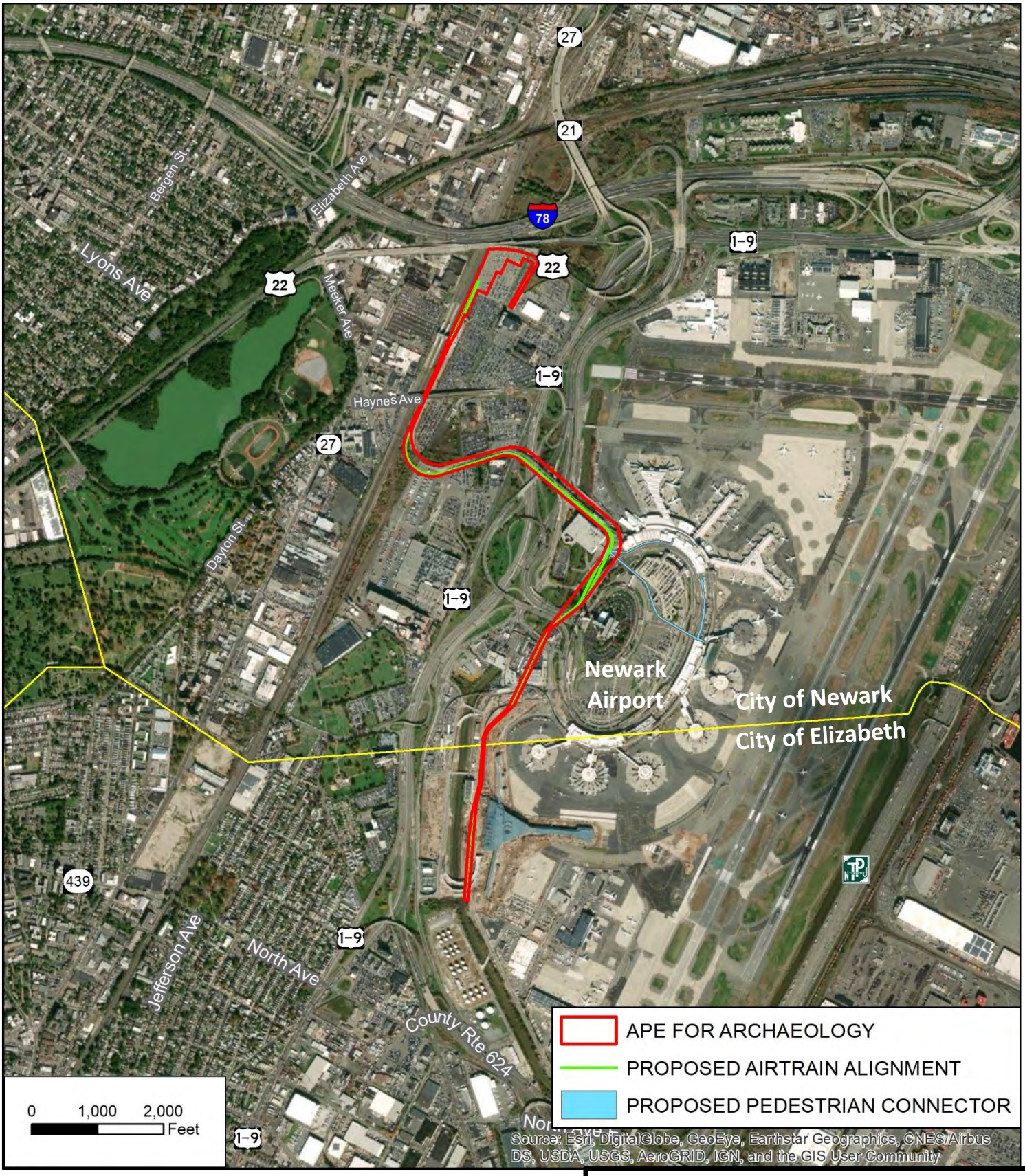
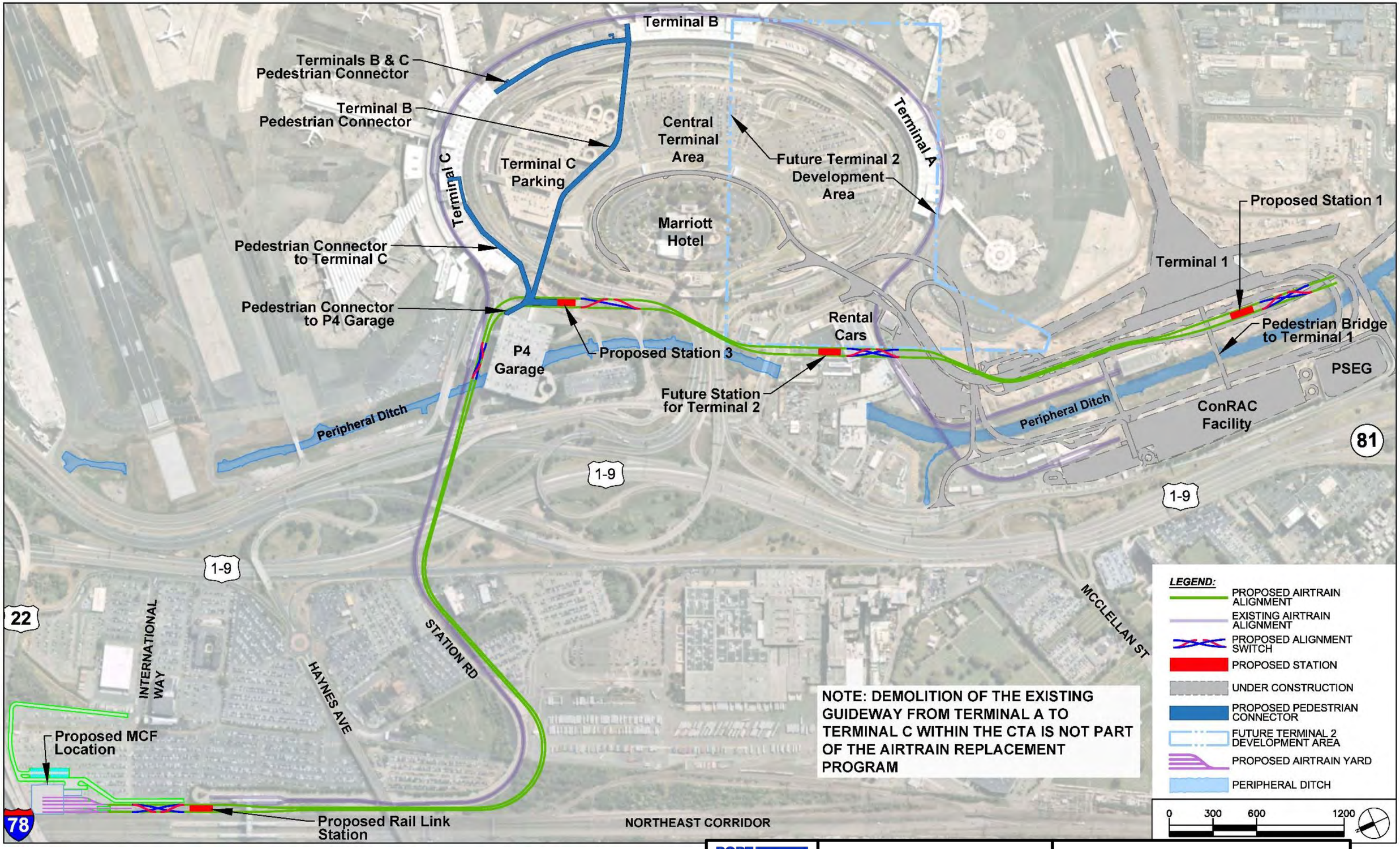


Figure 1.3 – Aerial View of Project Area

Newark Liberty International Airport
Air Train Replacement Project

N

PORT AUTHORITY NY NJ
AIR LAND RAIL SEA



PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

Newark Liberty International Airport
Air Train Replacement Project

Figure 1.4 – Proposed Action. Port Authority of New York and New Jersey 2020.

The Proposed Action assumes that Terminal 1 and ConRAC, which are currently under construction, are completed. Additionally, the Port Authority is evaluating the replacement of Terminal B with a new terminal (Terminal Two). At present, initial planning for Terminal Two is in progress; consequently, there is no schedule, definitive plan or funding sources identified for the project. Although the PANYNJ is just beginning to evaluate the potential replacement of Terminal B, the Proposed Action assumes that any terminal replacements (such as a new Terminal Two to replace Terminal B) would be consistent with the overall north-south alignment of existing Terminal C and new Terminal One.

Elevated Guideway

As shown in Figure 1.4, the AirTrain guideway would run parallel to the existing AirTrain guideway between the Rail Link Station and the P4 Station, but then diverges from the existing alignment and will be installed adjacent to the Peripheral Ditch. The elevated guideway structure would include the structural components to support the train (foundations, substructure (piers, columns, bents, caps) and superstructure (beams/girders, deck slab, parapet walls, equipment supports, emergency and maintenance walkways, etc.). The guideway elevation would likely vary between 5 to 75 feet above grade with track separations from 17 to 60 feet. Alignment switches will be provided along the guideway so that a train may travel along the opposite guideway in the event a section of guideway is taken out of service, a train is stuck on a section of track, or an obstacle needs to be avoided.

Stations

Rail Link Station

The Proposed Action would expand the existing Rail Link Station to the north and would include construction of a new enclosed, climate-controlled, center platform for riders, located between the two new guideways. To the south of the new platform would be an enclosed two-story space that houses an APM equipment room, a new substation, a mechanical room, and an electrical room. An emergency generator will be installed at this facility. The existing Rail Link Station will remain open for passengers passing through and to provide access to the street level.

Expanded rider circulation space (escalators, stairs, and elevators) would be provided to transfer riders from the Rail Link Station platform up to the existing pedestrian connector where riders can cross over to the NJ Transit and Amtrak platforms. At the north end of the existing building, an existing stairway would be replaced with two escalators, one elevator and a staircase to ground level to facilitate the transfer of riders between the existing station and a proposed bus pick up and drop off area. This vertical circulation and bus operation would be used during AirTrain outages of both the existing and the replacement AirTrain. After the existing AirTrain is out of service, the existing platform and the APM equipment rooms would be repurposed as needed.

Station 1

Station 1 would anchor the southern end of the proposed alignment and would serve Terminal One and the CONRAC facility. The enclosed, climate-controlled building would be comprised of three levels, and would include rider areas and support facilities (a substation, electrical and mechanical rooms). The station platform would be the highest level and would have two elevators and three escalators at the north end of the platform to provide circulation to the station's concourse level and the Terminal One pedestrian connector below. Stairs on the opposite end of the platform and under the escalators provide emergency egress to grade.

Station 2
Future Station 2 will provide service to Future Terminal 2. The substructure and superstructure will be constructed initially as part of the AirTrain Replacement to allow for the future load of the structure. The riders to be served by Station 2 are Terminal 2 passengers.

Station 3
Station 3 would be the largest of the proposed stations because it would be used by riders accessing more than one terminal (B and C) as well as Parking Garage P4. The station platform would lie between the dual guideways and would be a climate-controlled space with two elevators, four escalators, and a stairwell to connect the station platform to the concourse level below it. The concourse level would house an equipment room, mechanical room, and an electrical room, as well as restrooms. There would be an emergency stairwell and one elevator to access the grade level.

Pedestrian Connectors

The Proposed Action would include construction of four pedestrian connectors that link terminals and other facilities to the replacement AirTrain. The proposed pedestrian connectors are depicted in Figure 1.4. The connectors would be elevated above existing roadways and bridges, providing safe and climate-controlled passageways. Each connector would be supported by steel or concrete columns in locations to minimize disruption to parking and traffic patterns. All connectors longer than 1,000 feet would include moving walkways. The proposed connectors have a 25-foot minimum interior width and vary from 20 feet to 50 feet above grade.

Maintenance and Control Facility (MCF)

The MCF houses the operation and maintenance-related functional space required for the AirTrain EWR APM system. Space is required for inspection, maintenance, and testing of APM vehicles and other system equipment, as well as for tool parts and storage, administrative functions, and personnel support. The following key functional areas will be required within the maintenance facility:

It is anticipated that the MCF will house the Central Control Facility for monitoring and control of the system operation. Additionally, the facility will include train storage positions, a test track for performing departure and maintenance tests, and an APM car wash. A traction power substation used to power the maintenance building, yard, and spur tracks will be located either in the yard or within the MCF building. The MCF will be located close to existing grade and northeast of the existing Rail Link Station in the current United Airlines employee parking lot. It is anticipated that the MCF will remove between 900 existing parking spots permanently. The construction of this facility will also require property acquisition of approximately 7 acres.

The existing MCF was designed and constructed to the specific requirements of the AirTrain EWR monorail technology. The monorail uses a straddle beam type guideway that continues into the MCF as train maintenance lanes. The trains are narrower and shorter than any currently available technologies that meet the purpose and need of the project. There are no physical attributes of the maintenance lanes or specialized maintenance pits or elevated platforms that could be adopted intact or even moderately modified to be utilized for the current generation and configuration of APM cars.

Demolition of Existing AirTrain

Once the Proposed Action is tested and commissioned, portions of the existing AirTrain would be decommissioned and demolished. This would include removal of all rail cars; demolition of the existing MCF, P2 and P3 Stations; partial demolition of the P4 and existing Rail Link Stations; and demolition of the existing guideway outside the passenger terminal areas. All guideway, foundations and structures western end of Terminal A to the western end of Terminal C would remain in place in order to minimize disruption to airside and terminal operations. Stations located within Terminals A, B, and C would remain in place with a possible repurpose that has not been determined at the time of this report.

1.2 Summary of Scope of Work and Results of Phase IA Survey

Since the Project Area has been surveyed previously for Newark Liberty International Airport, the existing monorail, and other transportation projects, the present report focuses on reviewing reports of the prior surveys and consulting maps and boring logs to assess potential specific to the preliminary defined APE. The history of the project area is amply covered in the previous studies and is not detailed here.

The purpose of the Phase IA study is to determine the archaeological potential of the proposed AirTrain project's Area of Potential Effects (APE) based on past and present environmental conditions, previous research on archaeological sites in the area, historic land use as shown on maps and in photographs, review of previous subsurface investigations, and visual inspection. For the purpose of this survey, the APE for archaeology was defined as all locations that may undergo subsurface disturbance from the project. As of this time, the archaeological APE is limited to the alignment for the Proposed Action and facilities along this alignment, as shown on Figure 1.4, and encompasses the footprint of the existing monorail, which will be demolished.

This study has concluded that one property that may contain significant archaeological resources, the Newark City Cemetery, is adjacent to the APE. Impacts to the cemetery should be avoided and it should be protected through maintaining a buffer and possibly other measures that may be determined through consultation with the New Jersey Historic Preservation Office. It is further concluded that archaeological potential within the APE is low due to the environmental setting or to prior disturbance, although one stretch of the proposed alignment, south of the cemetery, may contain archaeological resources associated with residential and industrial land use in the 19th century.

2 ENVIRONMENTAL SETTING

The Project Area is located in the Piedmont Lowlands physiographic province of New Jersey (Figure 2.1). It partially overlaps the Newark Meadowlands, a large tidal wetland area on the west side of Newark Bay, which has been filled within the Project Area. Figure 2.2 shows the Project Area on a topographic map of 1898, with the pre-development meadows delineated. Figure 2.3 shows the extent of the area currently mapped as filled land. Land use today consists predominantly of urban land with a small stream and several small patches of wetland.

An assessment of environmental history identified the wetlands around Newark Bay as formerly within Glacial Lake Hackensack, formed circa 15,000 years ago from meltwater trapped behind the glacier's terminal moraine to the south. Sea level at that time would have been some 300 feet lower than today. After the lake drained, an extensive wetland system developed, and when sea levels rose, the salt meadows formed. These meadows within the Project Area were filled when the airport was developed in

the 1920s and 30s (see discussions in Alderman 1989; Lenik et al. 1994, Boesch 1999; Lombardi et al. 2001).

Soils in the project area are almost wholly disturbed soils or urban land (Figure 2.4):

BhguA Bigapple - Urban land, Bigapple substratum complex, 0 - 3 percent slopes
Typical soil profile comprises 0-3 inches of loamy sand; 3-26 inches of gravely sand; 26-38 inches of loamy sand; and 38-60 inches of gravelly loamy sand. This soil is somewhat excessively drained and is strongly to moderately acid. Water table is greater than 6' deep.

URBHGB Urban land, Bigapple substratum, 0 - 8 percent slopes
Typical profile for URBHGB soils comprise 0-12 inches of impervious material (asphalt, pavements, concrete, buildings, etc.); 12-26 inches of gravelly sand; 26-38 inches of loamy sand; and 38-60 inches of gravelly loamy sand. The soil is strongly to moderately acid. Water table is greater than 6' deep.

URKTTB Urban land, loamy fill substratum, 0 - 8 percent slopes
Typical soil profile consists of 0-12 inches of pavement, concrete, buildings, and other structures; 12-41 inches of clay loam; and 41-61 inches of silty clay. Soils are acidic and the depth to water table ranges between 48-122 inches.

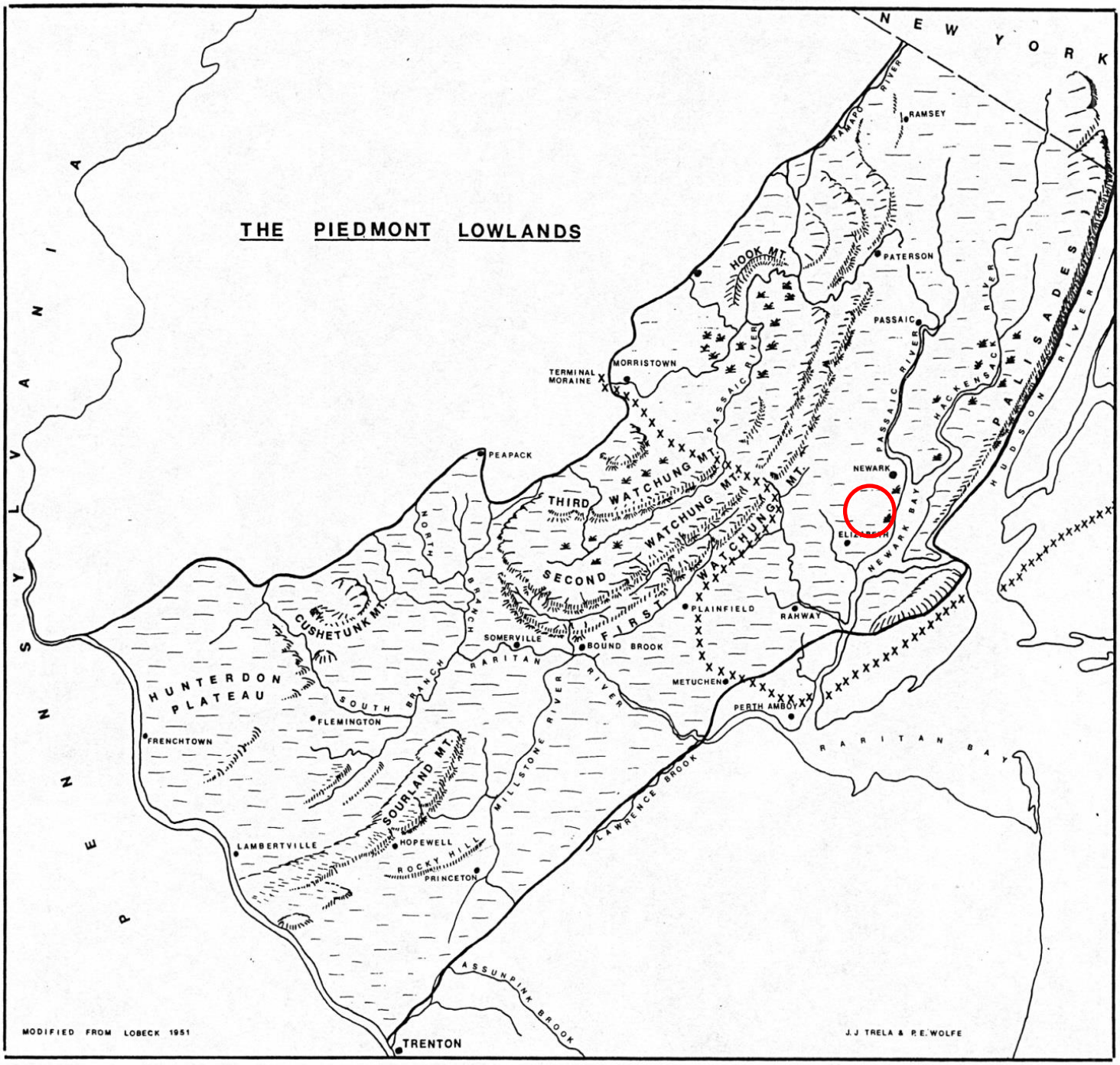
URDUNB Urban land, Dunellen substratum, 0 - 8 percent slopes
Typically consists of 0-12 inches of impervious material, 12-42 inches of sandy loam, and 42-70 inches of loamy sand. Permeability is moderately rapid to rapid beneath the surface layer. Water table is greater than 6' deep.

UddunB Udorthents, Dunellen substratum, 0 - 8 percent slopes
The profile for UddunB consists of 0-12 inches of loam, 12-42 inches of sandy loam, and 42-70 inches of loamy sand; well drained. The soil is very strongly to moderately acidic. Water table is greater than 6' deep.

UdoB Udorthents, organic substratum, 0 - 8 percent slopes
Typically a well-drained soil characterized by 0-36 inches of sand, followed by 36-60 inches of muck.

RkkcA Rikers loamy sand, 0 - 3 percent slopes
Typically a somewhat excessively drained soil characterized by 0-6 inches of loamy sand, 6-11 inches of gravely sand, and 11-71 inches of extremely gravely sand. The soil is slightly acidic to neutral. Water table is greater than 6' deep. The Rikers loamy sand is mapped within a northern segment of the project area where the AirTrain alignments curve north to approach the train station; the station area itself; and the proposed maintenance and control facility to the north of the station.

As can be seen on Figure 2.2, the north end of the project crosses areas that were fast land in the 19th century. These locations have soils mapped as Rikers loamy sand or as Urban Land or Udorthents of the Dunellen substratum (i.e. better-drained soils that would have been suitable for occupation compared to the surrounding wetlands).



1"= 10 miles

Figure 2.1 – Map of the Piedmont Lowlands Physiographic Province of New Jersey with the General Location of the Project Area Circled (Wolfe 1977:245)

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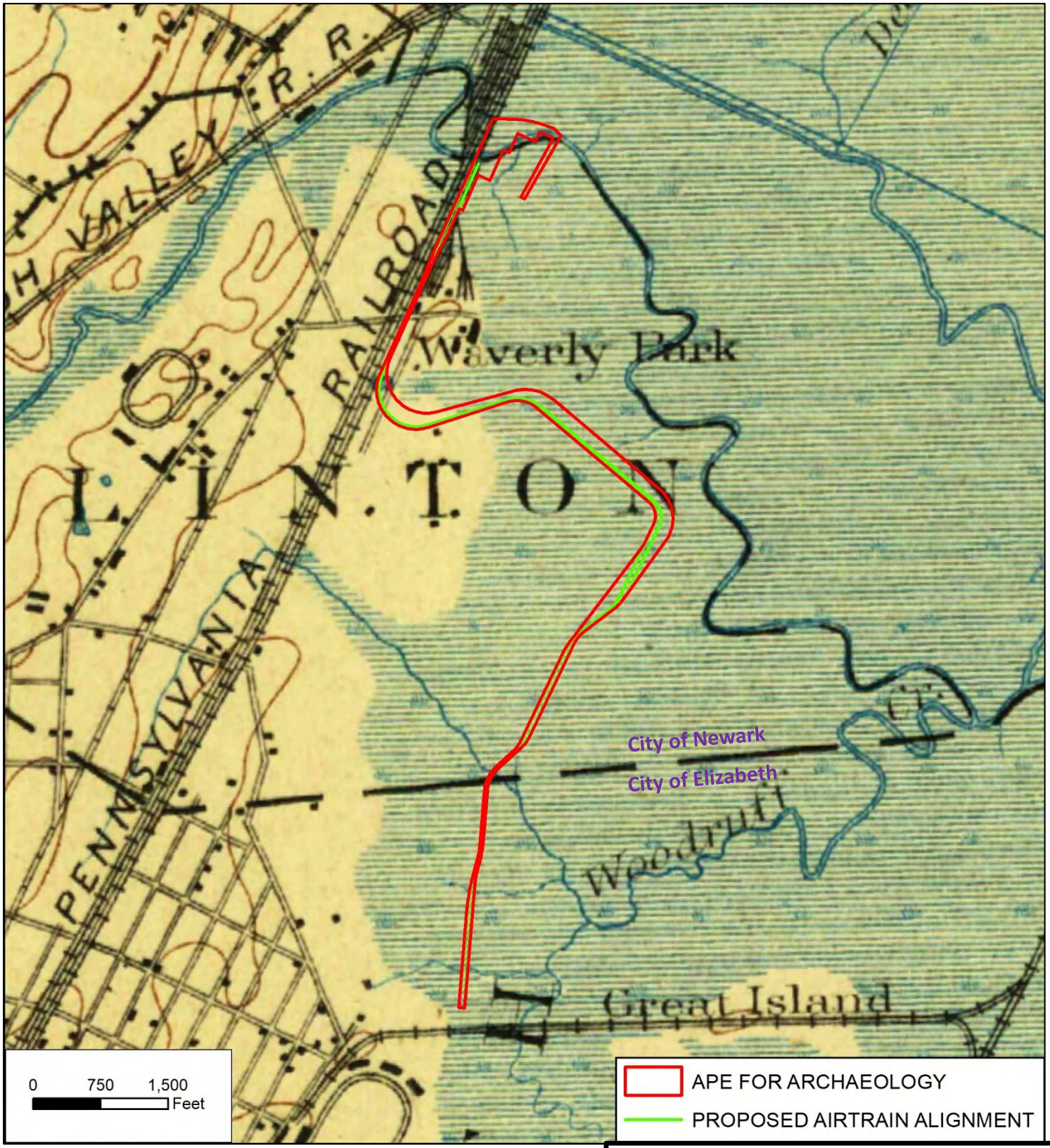


Figure 2.2 – Project Area Shown on the 1898 U.S.G.S. Staten Island Quadrangle, New Jersey-New York

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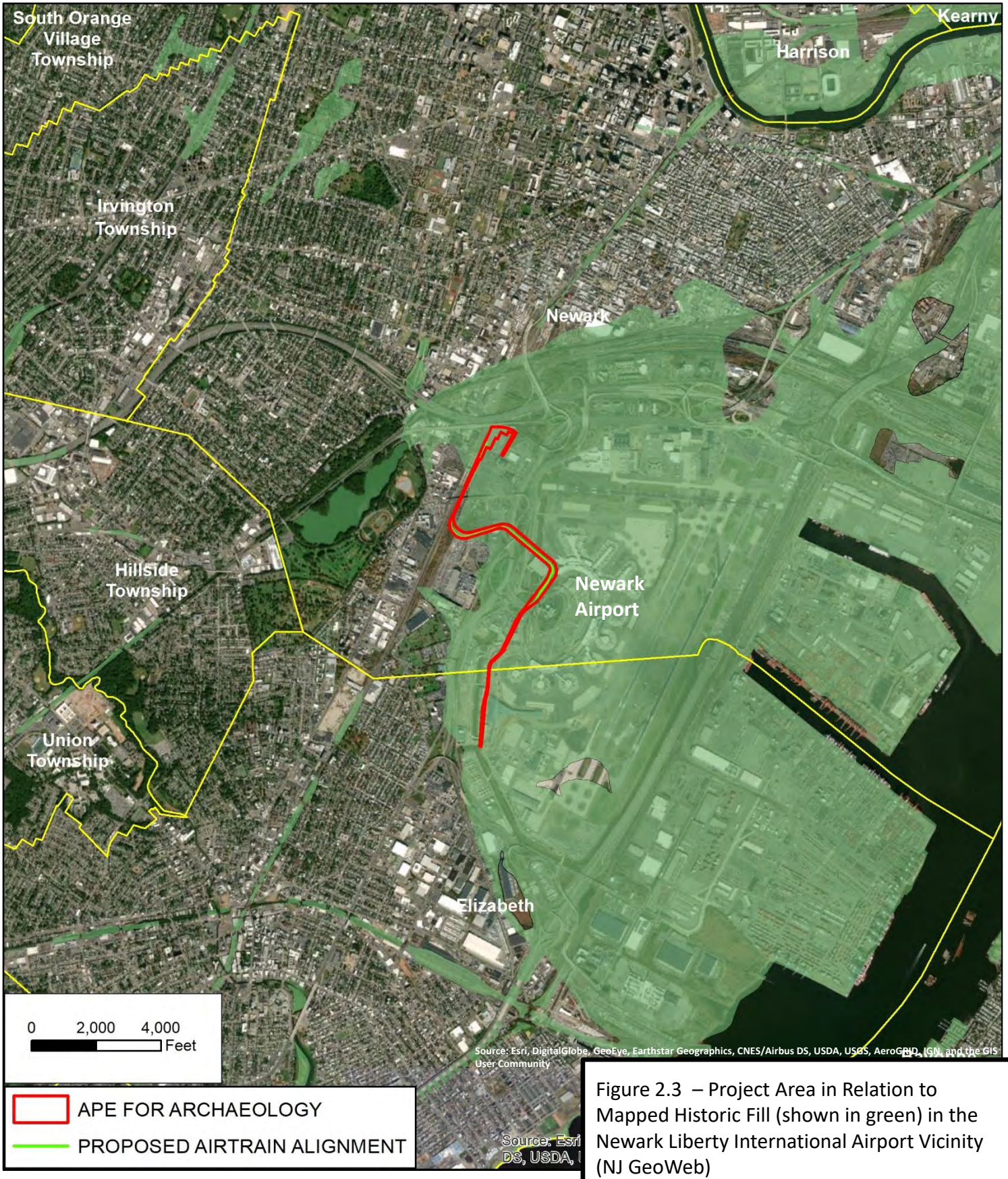


Figure 2.3 – Project Area in Relation to Mapped Historic Fill (shown in green) in the Newark Liberty International Airport Vicinity (NJ GeoWeb)

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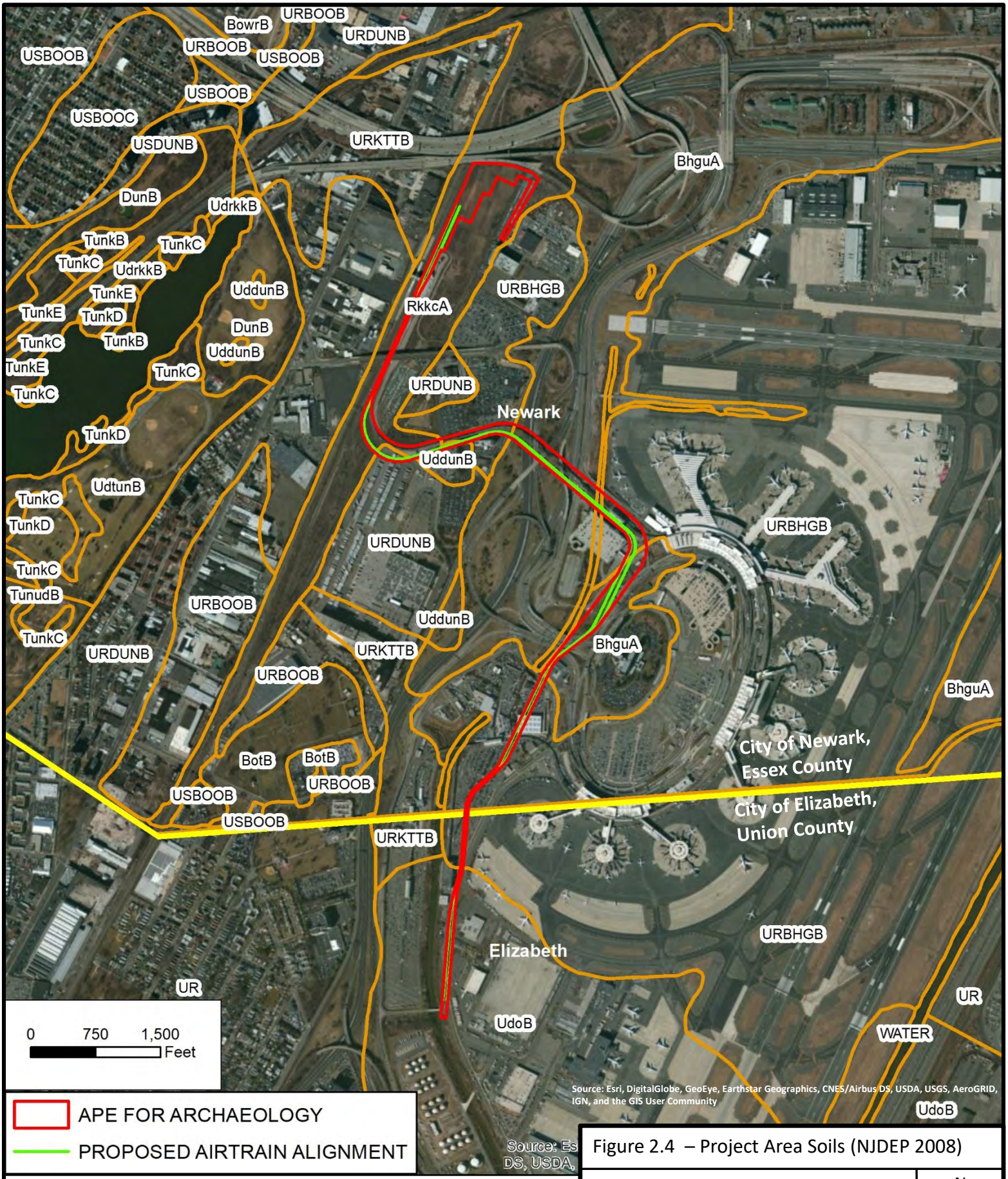


Figure 2.4 – Project Area Soils (NJDEP 2008)

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PANYNJ provided reports from numerous previous soil boring programs conducted in the project corridor, which provide information on subsurface conditions. A map and logs from the borings performed for the existing monorail NEC connector are included as Appendix A to this report. These borings do in fact indicate that there is no buried decomposed peat layer (representing the pre-fill marsh) in the locations shown as fast land on early topographic maps (see Figure 2.2). Although there is no evidence of a marsh layer, the borings within the fast land area of interest indicate fill to depths of 10 or more feet. The deeper portions of this fill are not characterized in the boring logs as "miscellaneous or man-made fill" containing debris, but rather as sandy soils with silt and traces of gravel. Deposits containing archaeological resources cannot be ruled out within such strata, but the general area has undergone cutting, filling, and various other near-surface disturbances, mainly from roadway and railyard construction and demolition, as noted in previous surveys.

3 PREVIOUS RESEARCH

The current project area has been evaluated previously for archaeological potential. This report summarizes the results of the previous surveys, and focuses on locations where the proposed construction may involve new subsurface impacts. Reference should be made to Alderman 1989; Lenik et al. 1994; Boesch 1999; Geismar 1995; and Lombardi et al. 2001 for overviews of the environment, local history, and land use within the project area.

The archaeological site files of the New Jersey State Museum (NJSM) and holdings of the NJHPO, which include the maps and files associated with the New Jersey and National Registers of Historic Places, cultural resource survey reports, archaeological studies, and historic sites surveys, were searched for information obtained on archaeological sites in the Project Area and vicinity in the years since the prior studies were completed. Due to project confidentiality, NJHPO staff members were not consulted directly and project files, including correspondence related to previous surveys, were not reviewed.

There are no recorded Pre-Contact archaeological sites within the project's APE for archaeology, nor within a one-mile radius. Archaeological research covering the wider vicinity indicates, however, that indigenous people occupied the region in which the project is situated from the Paleo-Indian Period through the period of European conquest, when Munsee-speaking peoples, possibly of the group known as the Hackensacks, were present here (Skinner and Schrabisch 1913; Marshall 1982; Kraft 1977, 1982, 1986; Boesch 1999; Tull et al. 2001). The lack of known sites close to the project area is likely due to heavy disturbance from historic development in this dense urban area.

One historic site, the Newark City Cemetery, lies immediately adjacent to the project area where the proposed AirTrain alignments parallel and then curve eastward from the NEC tracks toward the airport. The cemetery, which contains thousands of historic burials, is not registered as an archaeological site.

The previous surveys have addressed the general archaeological potential of the AirTrain Project Area. In general, they identify archaeological potential in the locations where fast land (dry and elevated) bordered the former meadows. Such locations would have been attractive as camp sites and for exploitation of the abundant and varied food resources that wetlands provide, and would have been the most likely sites for historic-period occupation as well. Previous studies also document the extensive land modification and disturbances in the area that would have impacted archaeological resources. Finally, these studies identify, provide historic documentation for, and evaluate the preservation of the Newark City Cemetery.

The pertinent studies are summarized below (in chronological order):

- A Phase I survey was conducted for the Newark Airport Redevelopment Program by Louis Berger & Associates (Alderman 1989). The study area covered the portions of the proposed AirTrain alignments from U.S. Route 1/9 eastward. Berger's survey concluded that the majority of their project area was within former marshlands with little Pre-Contact or Historic Period potential, but that small areas of fast land bordering or within the marsh had high potential. Accordingly, two such locations with limited prior disturbance were subjected to archaeological surface survey and testing: one adjacent to the east side of U.S. Route 1/9 to the south of the present project alignment and one near the southern terminus of the present project. The testing consisted only of posthole tests since machine excavation was precluded by access problems. In each location, only one test penetrated the fill and produced only a few historic period artifacts. The conclusion was that potentially sensitive areas were highly disturbed by filling and construction.

- A Phase IA survey was conducted for the Newark Airport Automated People Mover-Northeast Corridor Connection Project by Historical Perspectives, Inc. (Lenik and Gibbs 1993; Lenik et al. 1994). The study area included the present project area from the Rail Link Station eastward to the point where the new proposed alignments depart from the existing monorail alignment, just east of Parking Deck P4. The Historical Perspectives study notes that the road that is now Haynes Avenue was in place by 1850, as shown on the Sidney Map of Essex County of that year, and that locations in the western portion of their study area along the railroad and this road were on dry, elevated land. Archaeological potential was assessed as limited to the original elevated ground. Disturbances cited include the railroad lines, the development and expansion of the Waverly Yard freight operations, and industrial development in the near vicinity. It concluded that a structure labeled as a "hospital" on an early 20th century map, probably an infirmary for the Carnegie Steel Company, was disturbed by grading and excavating, and was unlikely to be represented by significant archaeological deposits. The site of the Waverly Railroad Yard, both to the north and south of Haynes Avenue, was found to lack research potential due to significant disturbances. The report describes conditions in 1993 as follows (Lenik et al. 1994:36):

  > The landscape within the yard to the north of Haynes Avenue Viaduct is highly disturbed. The land is overgrown with weeds, brush and a few young trees. Bulldozed piles of earth and large blocks of concrete are present on site. Ground surface evidence of the former railyard is clearly visible; scattered across the landscape are railroad ties, concrete posts, poles, coal cinders, and segments of former track beds with stone ballast.
  >
  > The landscape within the Waverly Yard on the south side of Haynes Avenue is also highly disturbed. It too is overgrown with weeds and brush. Piles of stone and concrete are present on site and are clear evidence of recent clearing and grading. Some surface evidence of the former track beds is visible in this area as well.
  >
  > An overhead power line extends north-south along the eastern end of the Waverly Yard. Sign posts indicate the presence of buried …cables within the property.
  >
  > Five areas within Waverly Yard, some within the project bounds, were the scene of environmental clean-up which was reportedly completed in 1989 and 1990. The clean-up activities included the excavation and removal of contaminated soil from the five identified areas….These activities, together with previous soil sampling within the yards, have resulted in further landscape disturbances in some areas.

The survey concluded that the locations that would have been sensitive for Pre-Contact archaeological resources had undergone extensive disturbances and no longer had potential.

Finally, the survey report (Lenik et al. 1994) addressed the Newark City Cemetery, pointing out that although the parcel that was identified as the cemetery (although used as a dump at the time) covered 5.2 acres at the time of the survey, the original city acquisition extended to the west and covered 15.44 acres. The western portion was subsumed by the railroad through a small purchase in 1879 and a much larger acquisition in 1903. Although the report did not rule out the potential for burials in the western areas that were taken over by the railroad yard, it does note that the present cemetery area is the high ground today and may have been during the 19th century, making it most suitable for use. The Historical Perspectives survey recommended that the entire original property be avoided. A 50-foot buffer was recommended on the south, east, and north sides of the cemetery, and that a "much larger area should be allowed along the western boundary of the property since this boundary is known to have changed locations through time (Lenik at al. 1994:40).

- A Phase IA study was conducted for the Newark-Elizabeth Rail Link Project by Joan H. Geismar (1995). The Newark International Airport sub-section of that survey covered the present project area between the NEC Line and the Peripheral Ditch that runs approximately north-south just west of the airport. The Geismar study addressed the Newark City Cemetery in some detail, and, as in the Historical Perspectives study discussed above, it identified potential for burials not only in the 5.2-acre parcel that contained the cemetery in its later years but also adjacent to the west in an area that was subsumed by the rail yard by 1906. It also recommended avoidance of impacts to the known cemetery parcel as well as to the entire 15.44 acre site that may originally have been used for burials. Geismar mentions a Star Ledger article (but does not provide a citation) that reported burials being unearthed to the west of the present-day cemetery during sewer construction (Geismar 1995:37).

- Eugene Boesch (1999) conducted a thorough historical and archaeological study of the Newark City Cemetery, which, as noted above, abuts the proposed alignment where it curves eastward from the Rail Link Station toward the airport. The Boesch report contains details about the cemetery property over time. Boesch postulates that the earliest burials at the cemetery (which were reinterments from other city plots) may have been in the southeast section near the present intersection of Bessemer Street and the drainage ditch. He cites a description written three years after the cemetery was opened which described it as occupying a "plot of rising ground on the verge of the meadows" and stated that at that time the area so far used for burials lay near Johnson's glue factory (Whitehead and Gordon 1872, cited in Boesch 1999). The glue factory, as Boesch notes, was apparently the Johnson property which abutted the cemetery on the south as depicted on the 1874 Hughes map reproduced in Figure 3.1. Boesch continues as follows:

  > The location of the Johnson house suggests that the burials from the Hamburg Place burial ground and the almshouse [the earliest burials, which were reinterments from other city cemeteries] were reinterred in the southeastern portion of the study area, possibly in the vicinity of Bessemer Street and the drainage ditch. This is the closest that the formal extent of the burial ground comes to the former Johnson house site. Given the general accuracy and scale of the Hughes map, however, it is difficult to pin-point the former location of that house precisely.

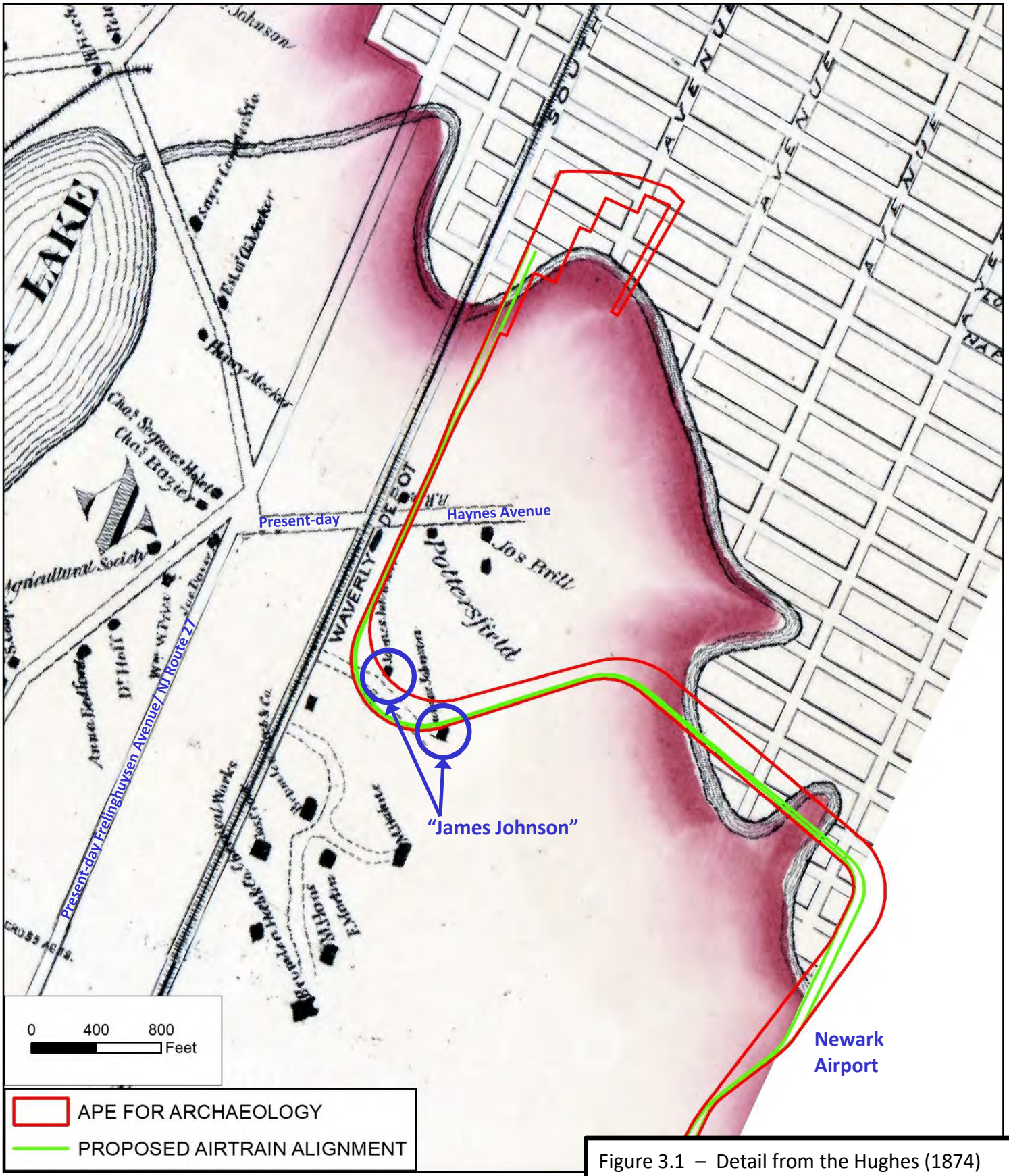


Figure 3.1 – Detail from the Hughes (1874) Map of Essex County

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Note that the house labeled "Pottersfield" was the cemetery keeper's house, which was actually located slightly further east of the study corridor. There are two buildings labeled "James Johnson" immediately adjacent to the Project APE.

Boesch considers it likely that the western part of the city parcel was not used for early interments. The railroad purchased a small, half-acre strip at the west side of the city parcel in 1879 which may not have been used yet at that time for burials. In 1903, the United New Jersey Railroad and Canal Company purchased a much larger 10.23-acre parcel, comprising the entire western part of the city's cemetery property. The resolution enabling the city's sale of the land stated that the "property was not needed for burial purposes," and Boesch found no evidence that graves were disinterred and relocated following this sale, but he does introduce a caveat:

> It is reasonable to expect that construction associated with the railroad's use of the 10.23 acres would have disinterred human remains, at least occasionally, if any were located there and that such an event would have been noted in local newspaper or other accounts. Disturbance associated with such construction, however, may not have consistently extended to depths below grade…necessary to reach any burials present. An occasional disinterment may not have been noted, either by workmen, or in contemporary accounts.

Boesch thus leaves open the possibility that there are intact burials to the west of the present cemetery, within the former rail yard. As noted above, Geismar (1995:37) mentions a newspaper article describing burials being unearthed to the west of the present cemetery during sewer construction.

- A Phase I archaeological survey for the Haynes Avenue at U.S. Route 1/9 Project was conducted for the New Jersey Department of Transportation by Michael Baker Jr., Inc. (Lombardi et al. 2001). That survey, like earlier ones, identified archaeological potential only within the higher, better drained areas bordering the former salt marshes, which would have been attractive habitation and resource-procurement sites. It assessed that potential only as moderate, however, due to historic-period disturbances. Five sub-areas within the project's APE were identified as testable and were subjected to 50'-interval bucket-auger testing. Testing pertinent to the current AirTrain survey included:

  - Test Area 1, within ramp infields along U.S Route 1/9 where the AirTrain will parallel and run within 50' of the existing monorail;
  - Test Area 3, a small area west of the Holiday Inn and adjacent to the south side of the existing Monorail and proposed AirTrain alignments;
  - Test Area 5, an alignment approximately parallel to and 200' to 400' east of the present project's APE, from Haynes Avenue northward.

  No archaeological resources were identified in the Michael Baker Jr., Inc. study, and the report concludes that "the area has been radically altered over the years and that preservation of significant prehistoric or historic archaeological resources within the [project's] archaeological APE is unlikely" (Lombardi et al. 2001:5-11). Avoidance of the Newark City Cemetery was recommended, and, though historic-period resources were not identified in the testing within Test Area 5 north of Haynes Avenue, archaeological monitoring was recommended for possible remains associated with several mapped historic properties: the Bond and Brill houses, Meadow Road (present-day Haynes Avenue), and the Wheeler Paper Mill. None of these sites are within the APE for the AirTrain project.

4 ASSESSMENT OF ARCHAEOLOGICAL POTENTIAL

The majority of the project area has undergone substantial prior disturbance, and most is within former wetlands now covered by landfill. Although it is not impossible that deeply buried deposits containing evidence of human occupation prior to the formation of the wetlands exist within the filled marshlands, previous construction episodes associated with the airport within the present project area would have substantially disturbed any such deposits, and in any case testing for such deposits, which might be quite ephemeral, is not considered feasible.

Archaeological potential closer to the present surface was carefully evaluated in the northern section of the proposed alignment where it cross areas that were upland adjacent to the historic wetlands, as shown on Figure 2.2 and as identified in the previous studies cited above. The historic maps and aerials in Figures 4.1 through 4.7 should also be referred to for the following discussion. Two specific areas of interest with regard to archaeological sensitivity were further assessed:

1) where the alignment passes closest to the *known* Newark City cemetery;

2) where the alignment swings south-southwestward of the existing monorail within Block 5090, Lots 1.05 and 44.01

Area of Interest 1 – Newark City Cemetery

The potential for cemetery-related resources – i.e., burials – in any location of new disturbance requires careful evaluation. The archaeological study conducted prior to construction of the existing Newark Liberty International Airport monorail (Lenik et al. 1994) found that a 50-foot buffer between the construction impact area and the southern cemetery property line (i.e., the boundary of Block 5090, Lot 44.02) would be sufficient to protect any unmarked interments from adverse project effects, and a much wider avoidance area was recommended for the west side. Subsequent transportation-related archaeological studies also addressed the cemetery and also recommended measures be taken to avoid impacts to it (Geismar 1995; Lombardi et al. 2001). A full archaeological investigation of the Newark City Cemetery was undertaken (Boesch 1999) prior to its rehabilitation. Evidence suggests that the southeastern portion of the original cemetery property, (i.e., at and near the south end of Bessemer Street) may have been the earliest area used for burials. The Proposed Action will be sited to the south of the existing monorail and approximately 100 feet to the south of the southeastern corner of the cemetery (Figure 4.8). This buffer appears to be more than sufficient, although its adequacy should be verified through consultation with NJHPO. Current conditions in this area are shown in street views obtained online in Plates 4.1 through 4.3 and views taken from the overhead monorail during an escorted January 2018 site visit in Plates 4.4 and 4.5.

The land lying to the west of the present-day cemetery may have been used for burials prior to 1903, in which year the western portion of the city land was sold to the railroad and subsumed by the Waverly Yard. The proposed alignment for the AirTrain in this area is along the far western edge of the former cemetery land, and is fully within the former rail yard and to the west of the existing monorail. It lies along either the west side or the east side of the site of a large freight house (depicted on the maps of 1906, 1912, and 1927 (Figures 4.2, 4.3, and 4.4 – the later maps are likely most accurate). Intensive railroad construction and use would have substantially disturbed or destroyed cemetery remains in that narrow corridor, if they ever extended along the west edge of the city property. Earlier archaeological studies conducted prior to monorail construction had evaluated this general area of the former Waverly Yard as having little or no remaining resource potential due to historic land use, including cutting and filling and

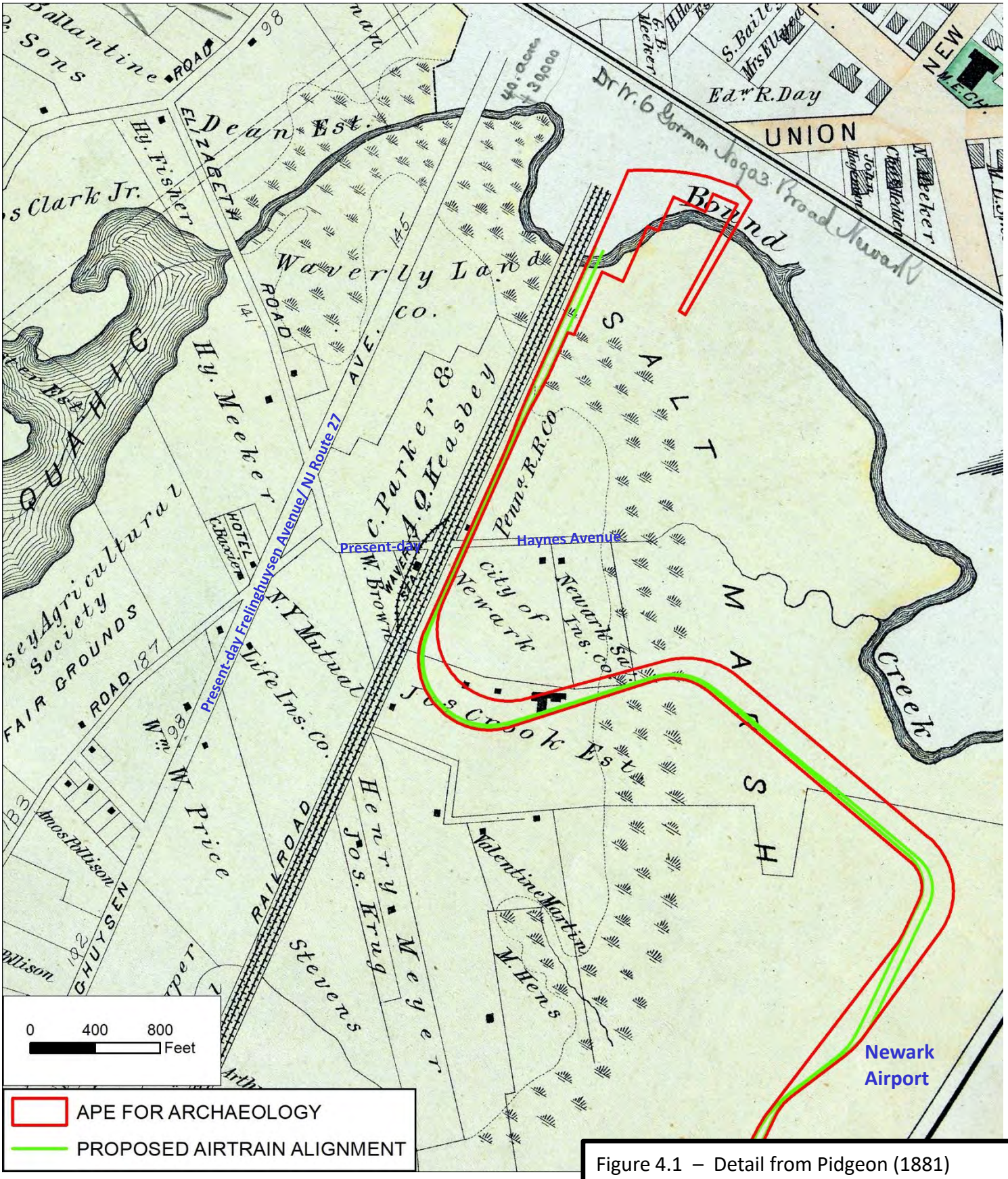


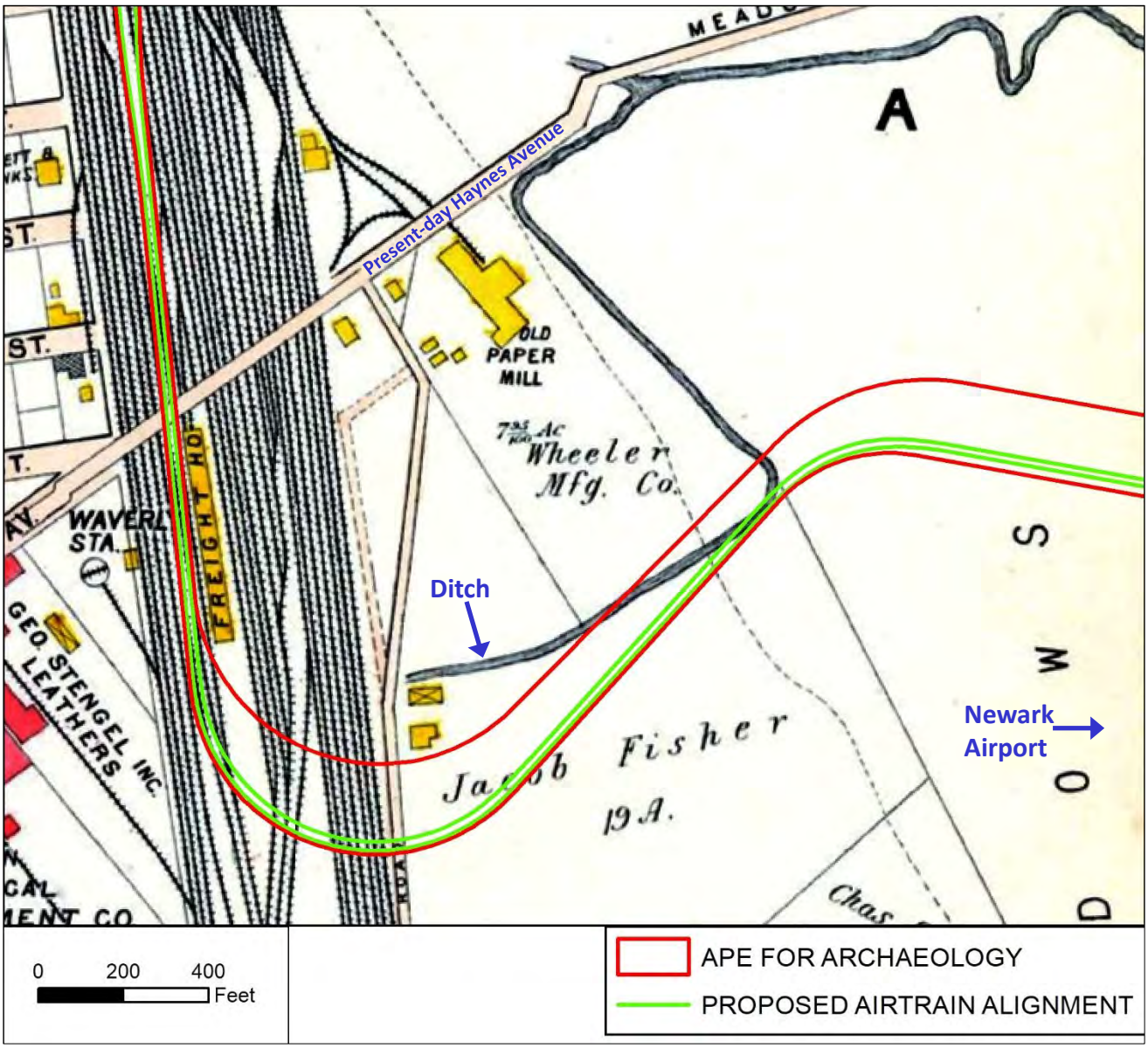
Figure 4.1 – Detail from Pidgeon (1881) Township of Clinton, Atlas of Essex County

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The 1881 Atlas shows the project alignment passing along the west side of the City of Newark property (the cemetery) and through the northern part of the Joseph Crook Estate.

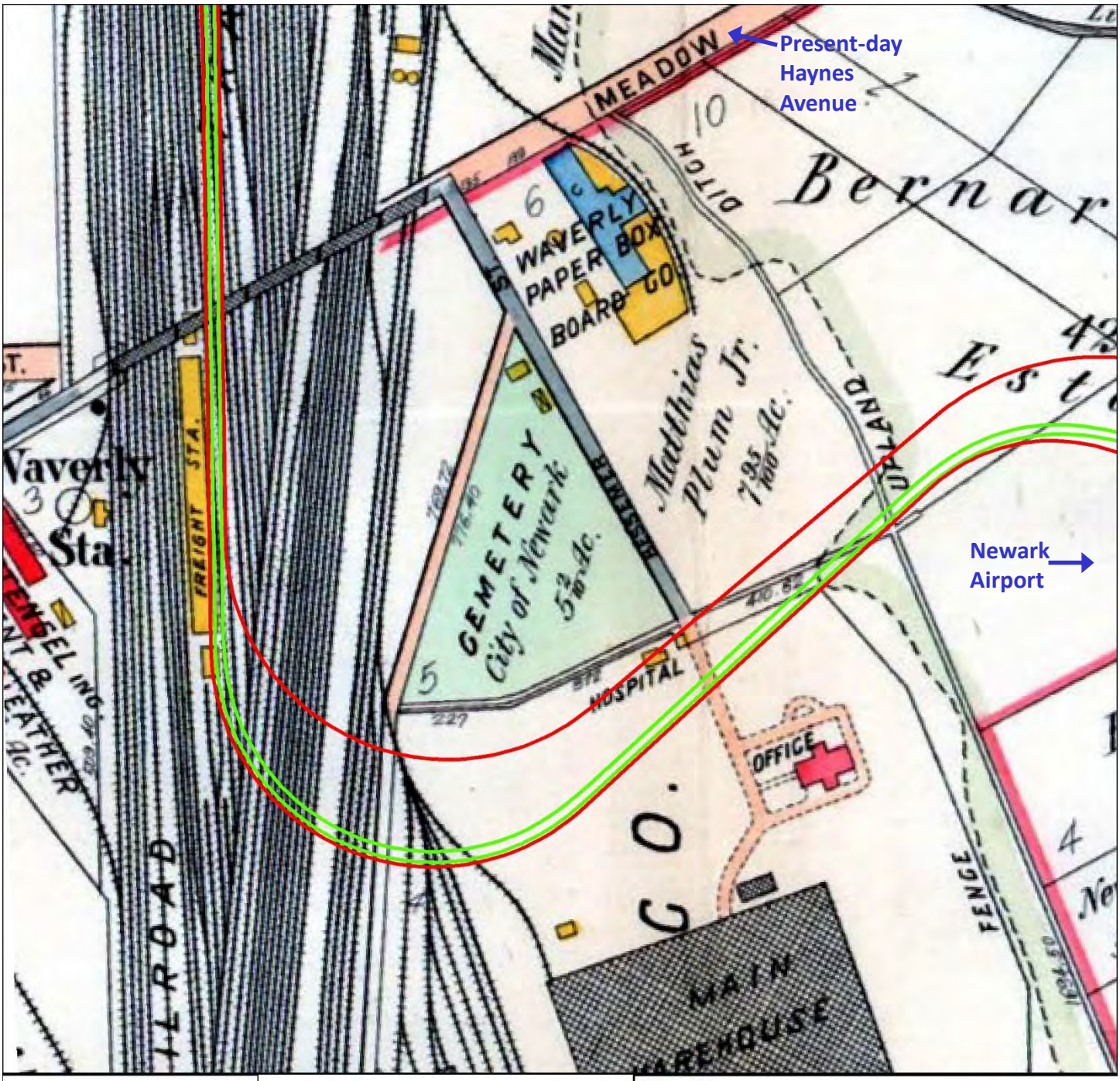


Note the ditch along the south side of the triangular parcel (the cemetery) at the center, which was the extent of the cemetery property by this time, following the sale in 1903 of 10.23 acres to the west. The house and outbuilding owned by Jacob Fisher are shown just below the southwest corner of the cemetery.

Figure 4.2 Detail from Kiser (1906) Atlas of Essex County published by A.H. Mueller & Co.

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Bessemer Street is in place by this time, and the ditch continues to mark the south property line of the cemetery. The hospital building is shown just below the southeast corner of the cemetery.

Figure 4.3 – Detail from Lathrop and Odgen (1912) Atlas of Essex County, Volume 2, Published by A.H. Mueller and Co.

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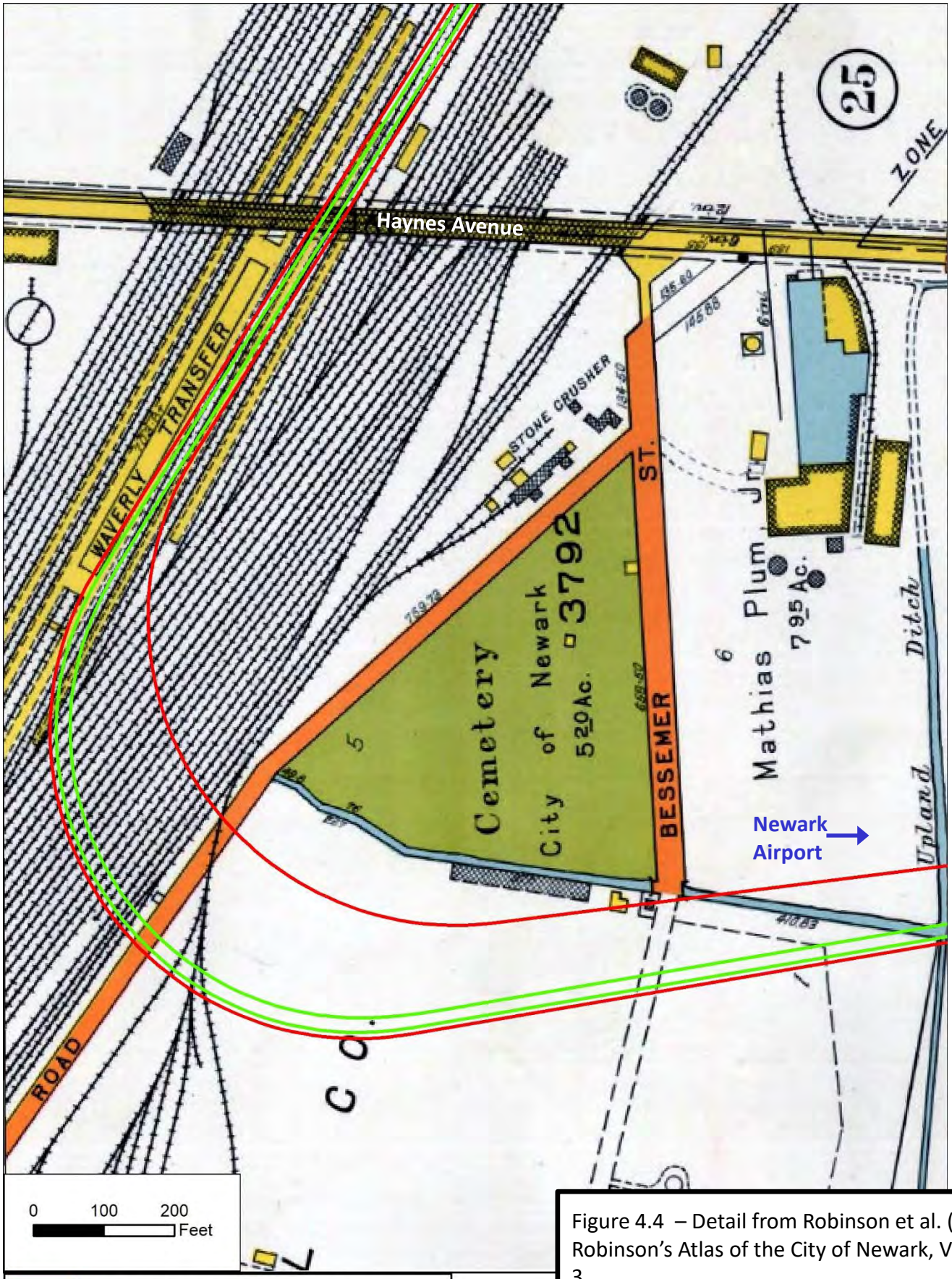


Figure 4.4 – Detail from Robinson et al. (1927) Robinson's Atlas of the City of Newark, Volume 3.

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The ditch is again shown bordering the cemetery on the south.

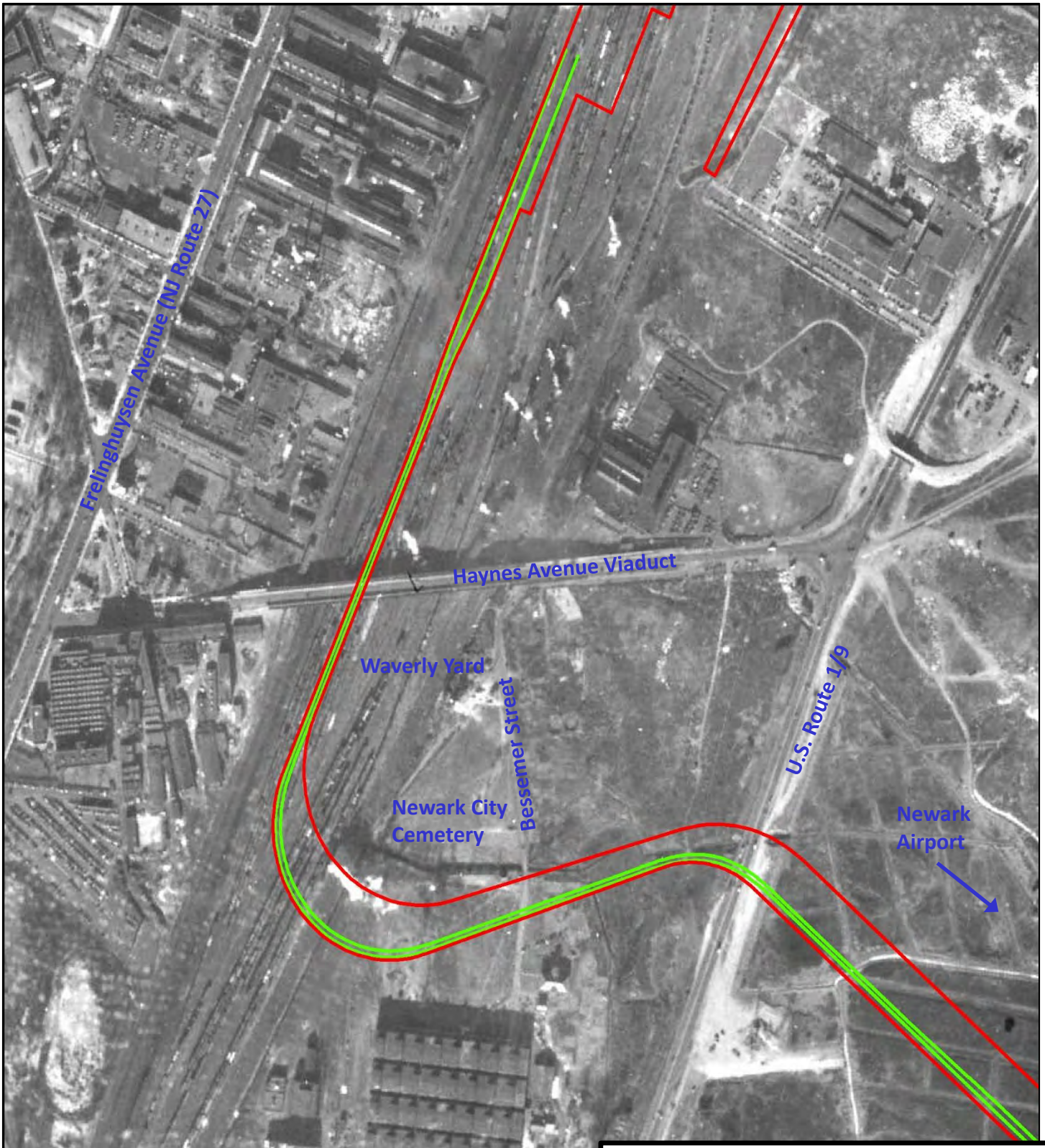


Figure 4.5 – 1943 Aerial Photograph Showing the Vicinity of the Newark City Cemetery, Haynes Avenue Viaduct, and the Waverly Yard

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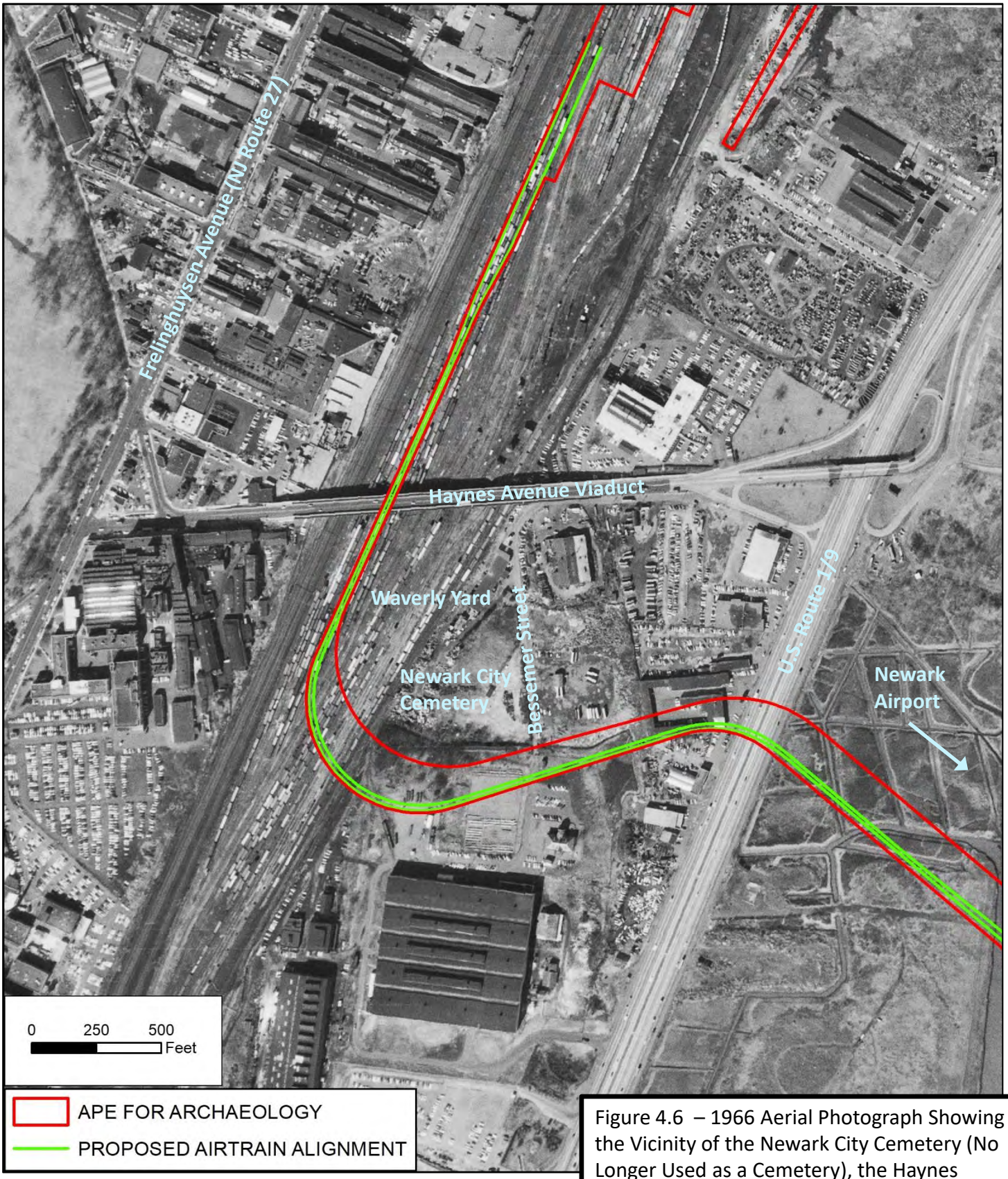


Figure 4.6 – 1966 Aerial Photograph Showing the Vicinity of the Newark City Cemetery (No Longer Used as a Cemetery), the Haynes Avenue Viaduct, and the Waverly Yard

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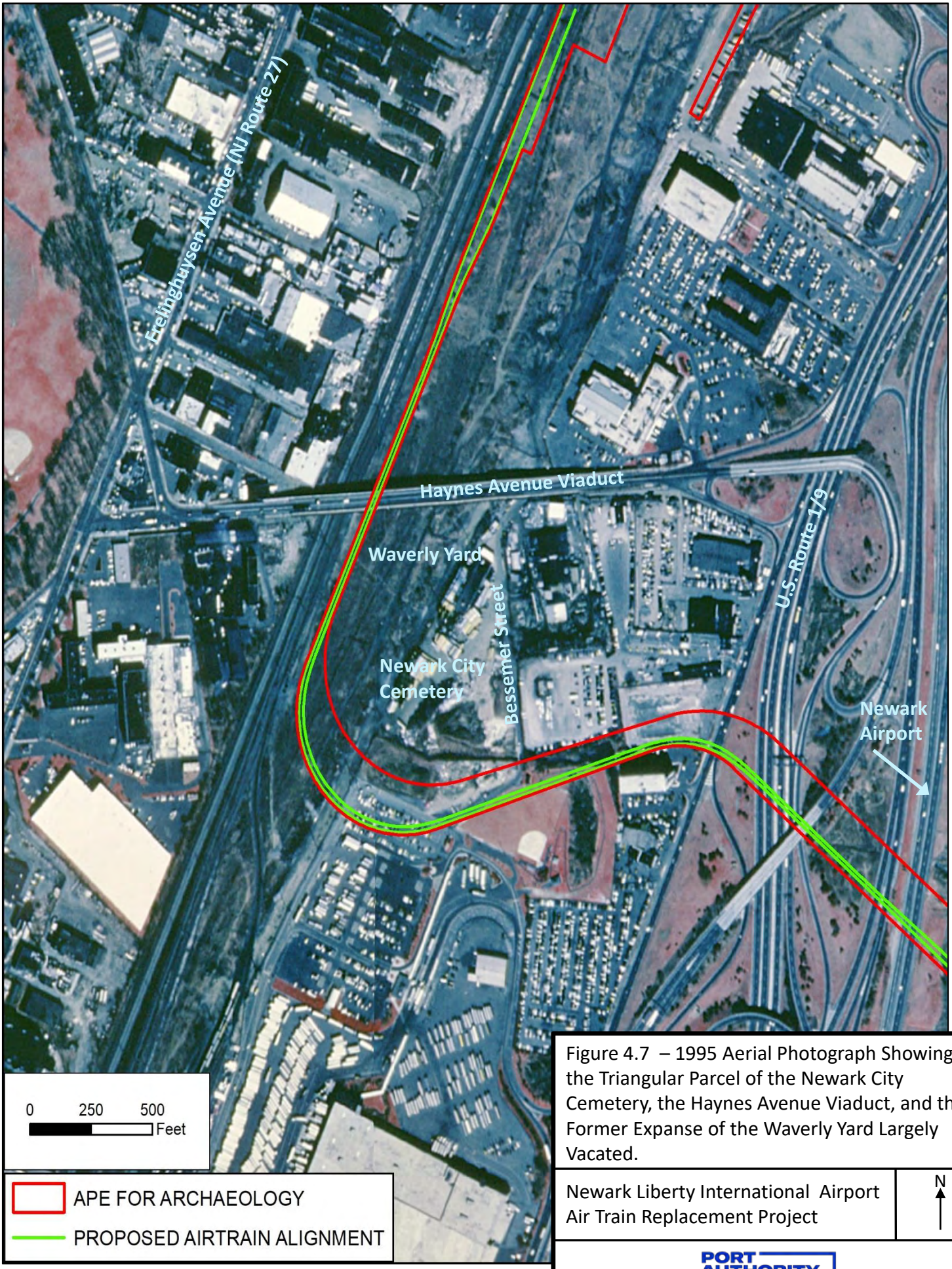


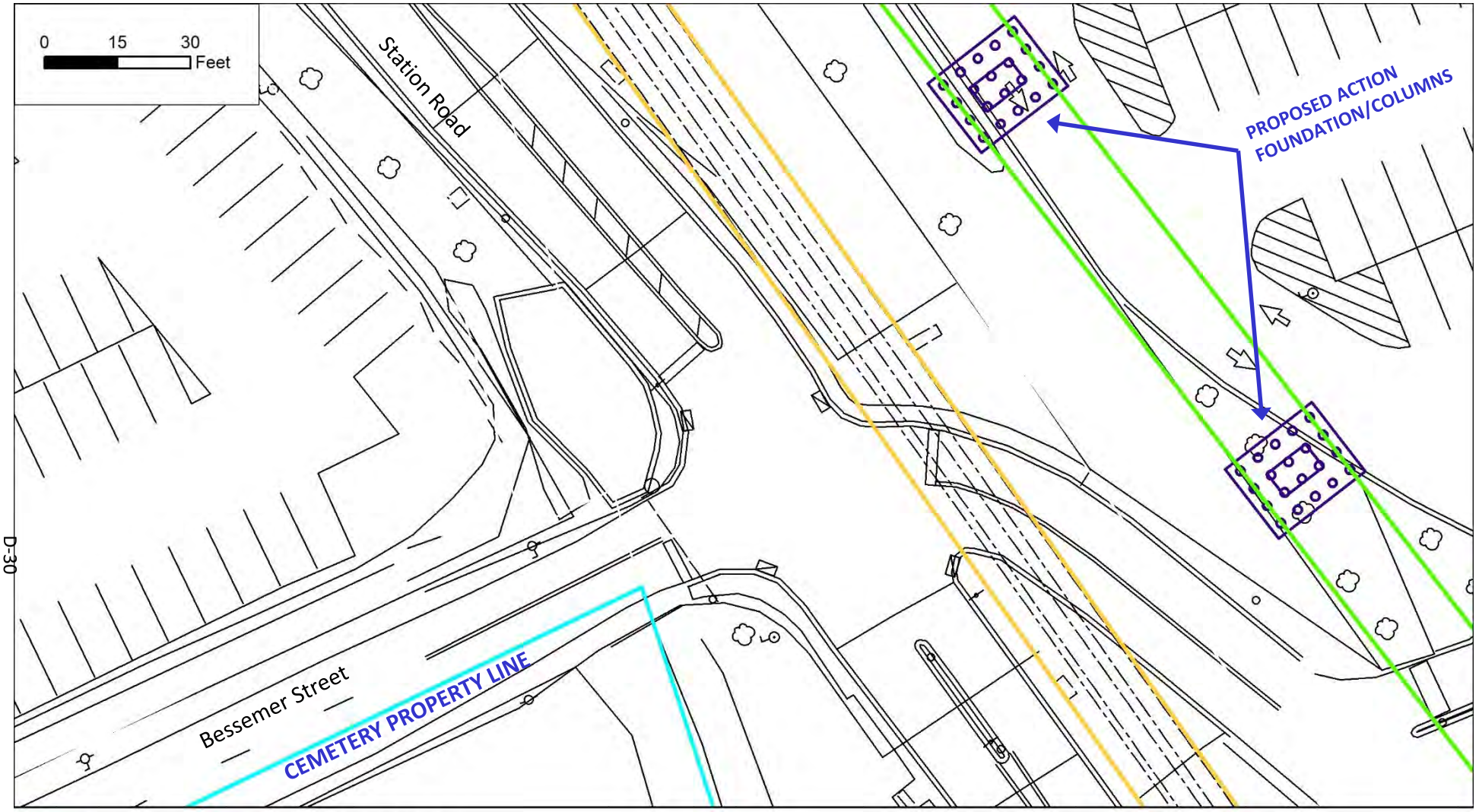
Figure 4.7 – 1995 Aerial Photograph Showing the Triangular Parcel of the Newark City Cemetery, the Haynes Avenue Viaduct, and the Former Expanse of the Waverly Yard Largely Vacated.

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Considerable construction and demolition had occurred in the immediate vicinity of the proposed alignments.



PROPOSED AIRTRAIN ALIGNMENT

EXISTING ALIGNMENT

Figure 4.8 – Plan Showing Proximity of the Proposed AirTrain Foundations to the Present-day Newark City Cemetery Property. Port Authority of New York and New Jersey 2017.

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Plate 4.1 View to south along Bessemer Street with Newark City Cemetery to right and the existing Newark Liberty International Airport monorail in the background. Source: Bing Maps Streetside (2018).



Plate 4.2 View to southwest near the southeast corner of the Newark City Cemetery on Bessemer Street by Station Road. Source: Bing Maps Streetside (2018).



Plate 4.3 View to the west along Station Road near Bessemer Street. The Newark Liberty International Airport monorail is at left. The Newark City Cemetery is to the right (out of view). Source: Bing Maps Streetside (2018).



Plate 4.4 View to north from existing monorail toward Newark City Cemetery. Photograph: Leonard Bianchi, January 2018.



Plate 4.5 View to northwest from the existing monorail toward Bessemer Street and Newark City Cemetery. Photograph: Leonard Bianchi, January 2018.

other actions associated with construction and demolition of former tracks and factory sidings, and other impacts, as reported by Historical Perspectives and summarized in Section 3 above (Lenik and Gibbs 1993; Lenik et al. 1994.

A soil boring conducted for the current project was within the former extent of cemetery land, near the pre-1903 western boundary. Boring locations and logs are contained in Appendix A of this report. The soil boring that lay within the former cemetery land, number 4-865, encountered miscellaneous fill containing roots and bricks in the top 2 feet, followed by soil characterized as fill to a depth of 15 feet, with water appearing at 4 feet below the surface. While the boring results do not preclude the presence of early fill, it is possible this location would never have been used for burials due to wet conditions. Field observation indicates fill and disturbed soils throughout this area with municipal waste and construction material visible at the surface. The preponderance of evidence points to high levels of prior disturbance and little or no potential for cemetery remains along the proposed alignment.

Area of Interest 2 – Block 5090, Lots 1.05 and 44.01

Within the second area of interest – south and southwest of the existing monorail within Block 5090, Lots 1.05 and 44.01 – archaeological potential also is reduced due to historic land use, including cutting and filling and other actions associated with construction and demolition of former tracks and factory sidings, and other impacts (Lenik and Gibbs 1993; Lenik et al. 1994 – see summary provided in Section 3 above). The currently vegetated area was part of the extremely active Waverly Yard rail transfer station from the late 19th century through the 1970s. Sidings and utilities serving the former steel warehouse complex located to the south of the existing monorail (currently Anheuser-Busch) and construction of a now-defunct weigh station, would have also disturbed the area. Utilities mapping, which would allow for a better understanding of disturbance levels, has not been made available for this study, but utilities mark-outs visible on the pavement indicate several underground lines (water, sewer, and gas) are present.

The Proposed Action, while moving away from the Newark City Cemetery, has moved into an area encompassing several other potential historic archaeological resources formerly located to the south of the cemetery. In 1872 it was noted that Johnson's Glue Factory was located immediately to the south of the cemetery (Hand Book and Guide for the City of Newark 1872:63), and a historic map published in 1874 shows two buildings owned by James Johnson at this location (see Figure 3.1). In 1870 Johnson and his sons George Johnson and James Johnson Jr. were all recorded as glue manufacturers residing in Newark in the federal census (United States Census of New Jersey 1870). Mapping produced in 1881 and 1890 depicts the glue factory and two buildings on a property owned by members of the Crook family (see Figure 4.1; see also Robinson 1890). These buildings were demolished circa 1900, and in 1906 a dwelling and outbuilding owned by Jacob Fisher were shown just south of the southwest corner of the cemetery, outside the APE (see Figure 4.2). These buildings were removed shortly thereafter with the expansion of the railroad into the area (Figure 4.3). As shown on 1912 and 1927 maps, a hospital apparently associated with the Carnegie Steel Company was sited just south of the southeast corner of the cemetery (Figures 4.3 and 4.4). The hospital site was partly within or immediately adjacent to the path of the existing monorail. Although included within the mapped APE for the current project, new subsurface disturbances associated with demolition of the monorail will not exceed disturbances that have already taken place, and the hospital site is not considered archaeologically sensitive.

The archaeological survey completed for the New Jersey Department of Transportation Haynes Avenue at U.S. Route 1/9 Project by Michael Baker Jr. (Lombardi at al. 2001) included testing that proved negative, but nevertheless recommended monitoring by a professional archaeologist during construction. That recommendation for monitoring differed from the conclusions of the study conducted for the existing

monorail by Historical Perspectives (Lenik at al. 1994 – see summary provided in Section 3 of this report), which characterized the disturbances within the area as substantial enough to have negated archaeological potential. The 2001 study, although focused on historic structures to the north of our Area of Interest 2, reflects an understandable reluctance to write off archaeological potential despite the substantial disturbance seen in this area.

Soil borings were conducted for the present project within the APE for archaeology on the former Johnson/Crook property (see location map and logs in Appendix A). Two of the borings (numbers 4-862 and 4-863) were along the proposed alignment at the present Anheuser-Busch property, and one (number 4-864) was placed further to the west in the wooded area owned by Hartz Mountain. Borings 4-862 and 4-863 encountered water at a depth of 6'. Each also encountered fill to a depth of 10'. Tile, brick, and glass fragments were noted in the fill in 4-862, which may indicate remains associated with one of the structures labelled as "James Johnson" in 1874 (see Figure 3.1). Boring 4-863 also noted traces of brick to a depth of 4'. Boring 4-864, located to the west of another structure shown on the 1874 map (now within the wooded area owned by Hartz Mountain), indicated fill and traces of fibers. The "fill" noted in the borings may be introduced fill, but because it may also represent in-situ remains of historic residences or factories this characterization does not rule out archaeological potential. There remains a low-to-moderate potential for the presence of historic archaeological remains in the former Johnson-Crook property.

5 CONCLUSIONS AND RECOMMENDATIONS

The APE for archaeology includes only those locations where subsurface impacts are anticipated at this time. These include where the proposed AirTrain guideway foundations will be built and where new buildings and other facilities will be built along the proposed AirTrain alignments, along with the area that will be impacted during demolition of the existing monorail. There are no *known* archaeological resources within the archaeological APE as defined.

Most of the APE has little potential for archaeological resources as it is within a vast, filled marshland on Newark Bay. While Paleo-Indian through Archaic occupation of this area prior to the formation of the wetlands is possible, archaeological deposits from the early periods would lie beneath both the fill and the marsh layer and are unlikely to be identified through conventional testing. None of the previous archaeological surveys of the Newark Liberty International Airport vicinity have called for testing to address such deposits and no testing in the filled area is recommended for the AirTrain project.

The sole area viewed to have archaeological potential within and adjacent to the APE is on the small extent of fast land that existed in the project area in late prehistoric and historic times. This area includes the Newark City Cemetery and the sites of several former buildings sited immediately to the south of the cemetery. The cemetery as currently configured is outside the APE. Prior to 1903, however, the city property that contained the cemetery extended further to the west, and the APE passes along the far western edge of the original cemetery land.

The area to the south of the cemetery within the APE, formerly the site of a glue factory, several dwellings, and a hospital, is now characterized by a large parking lot and a defunct weigh station, and contained tracks within the Waverly Yard in the 20th century. The construction of the parking lot may not have involved significant subsurface disturbances and may have involved filling over earlier surfaces. A program of machine-assisted Phase I subsurface testing may be necessary within this part of the APE to determine the presence or absence of any archaeological resources. The need for these possible

further investigations will be determined through consultation with the New Jersey Historic Preservation Office.

Although the Proposed Action is sited to the south and west of the Newark City Cemetery as currently defined on the ground, this resource still requires special attention. It is imperative that AirTrain plans provide for the adequate protection of the cemetery, both as it is currently configured and in its pre-1903 extent. The stretch of the project APE that runs along the far western edge of former cemetery land is considered to be too highly disturbed to retain potential for cemetery remains. Along the south side of the cemetery, the existing Station Road and the drainage ditch that borders the cemetery property may provide an adequate buffer. However, uncertainties remain about the precise areas of the city's original parcel that were used for burials, and consultation with the New Jersey Historic Preservation Office should be sought in order to determine adequate buffers and other measures to avoid any direct impacts or secondary impacts such as vibration. In the event that project plans are changed to create more direct impacts to the cemetery than the current Proposed Action, it may be possible to determine the extent of burials through non-invasive techniques or limited, shallow testing, as outlined in the Boesch study (1999).

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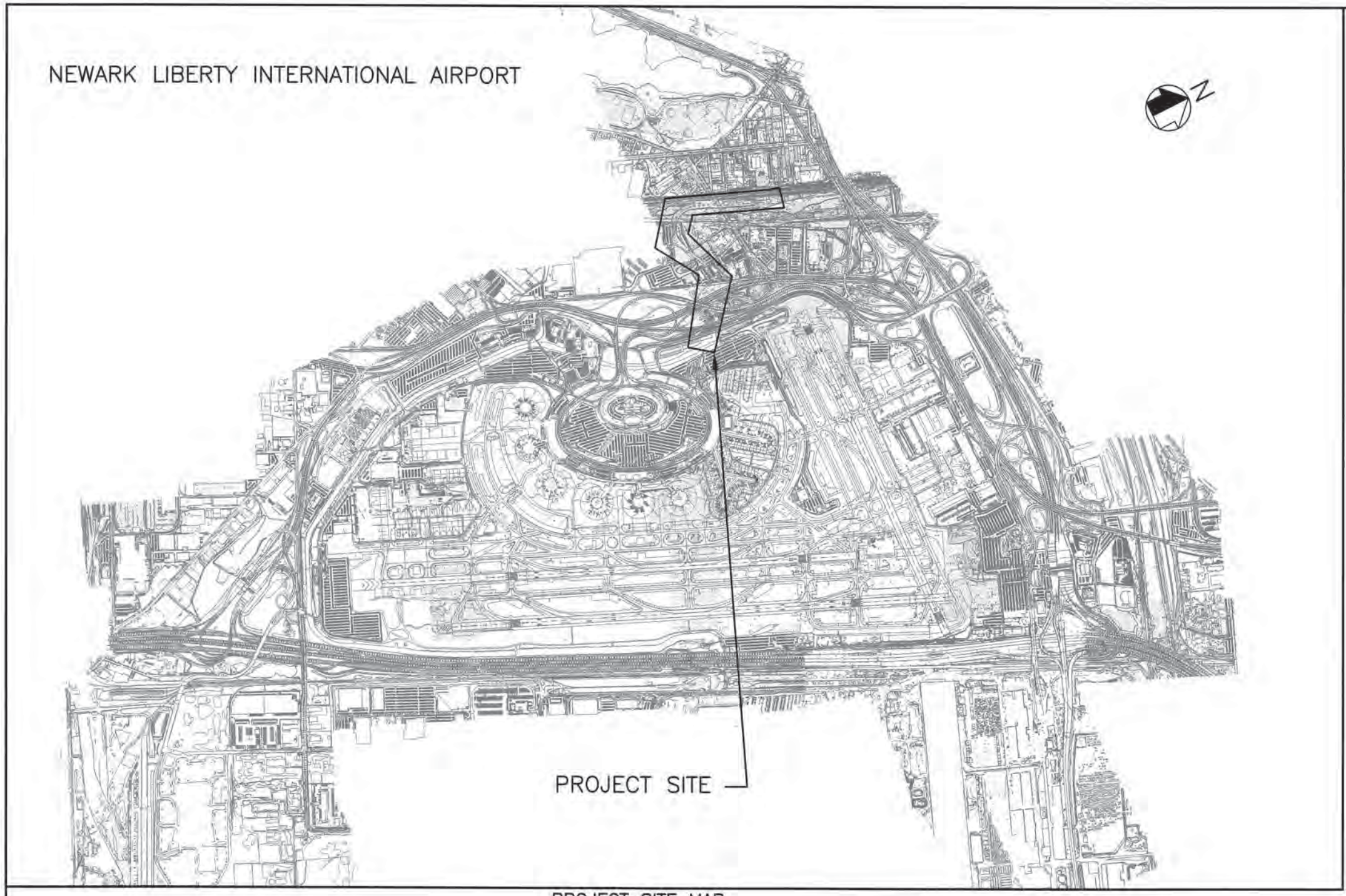
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APPENDIX A

SUBSURFACE BORINGS DATA

- **2003 Monorail NEC Connection Borings**
- **2020 AirTrain Replacement Borings**

2003 Monorail NEC Connection Borings



PROJECT SITE MAP

0 1000 2000

SCALE IN FEET

NEWARK INTERNATIONAL AIRPORT

HORIZONTAL CONTROL = NAD 83

COORDINATES ARE BASED ON THE STATE PLANE NAD 83 NEW JERSEY.

VERTICAL CONTROL = NGVD 29 + 297.347

ELEVATION 300.00 FEET IS EQUAL TO 2.653 FEET ABOVE THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29) AS ESTABLISHED BY THE NATIONAL OCEAN SURVEY.

NIA = 300.000

2.653

NGVD 29 = 0.000

NIA = 297.347

SOILS CLASSIFICATION TERMINOLOGY

COMPONENT PROPORTIONS	
AND	35% TO 50%
SOME	20% TO 35%
LITTLE	10% TO 20%
TRACE	1% TO 10%

FINE GRAINED SOILS

TERM	PLASTICITY INDEX
SILT	NON PLASTIC
CLAYEY SILT	1 TO 5
SILT & CLAY	5 TO 10
CLAY & SILT	10 TO 20
SILTY CLAY	20 TO 40
CLAY	40 PLUS

ABBREVIATIONS AND SYMBOLS

A	AUGER
AL	ATTERBERG LIMITS
BLK	BLACK
BR	BROWN
C	COARSE
CBR	CBR TEST
CD	CONSOLIDATED DRAINED TRIAXIAL SHEAR TEST
CM	LABORATORY COMPACTION TEST
CO	CONSOLIDATION TEST
CU	CONSOLIDATED UNDRAINED TRIAXIAL SHEAR TEST
DK	DARK
DS	DIRECT SHEAR TEST
F	FINE
GR	GRAY
GS	GRAIN SIZE TEST
GVL	GRAVEL
LL	LIQUID LIMIT
LT	LIGHT, LITTLE
LV	LABORATORY VANE TEST
M	MEDIUM
NE	NOT ENCOUNTERED/RECORDED
OER	OPEN END ROD
PI	PLASTICITY INDEX
PL	PLASTIC LIMIT
REC	RECOVERY
RQD	ROCK QUALITY DESIGNATION
T	TRAP USED
TR	TRACE
U	UNDISTURBED SAMPLE
UC	UNCONFINED COMPRESSION TEST
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL SHEAR TEST
V	FIELD VANE TEST
WOH	WEIGHT OF HAMMER
WOR	WEIGHT OF ROD

LEGEND

(FOR PRESENTATION OF BORINGS ONLY)

- ASPHALT
- MISCELLANEOUS AND MANMADE FILL
- GRAVEL OR CRUSHED STONE
- SAND
- SILT
- CLAY
- ORGANIC SILTS AND CLAYS
- PEAT
- DECOMPOSED ROCK
- SHALE

GENERAL NOTES

1. OVERBURDEN MATERIALS ARE CLASSIFIED IN ACCORDANCE WITH P.A. SOILS CLASSIFICATION SYSTEM (SF-92). SYMBOLS INDICATE MAJOR MATERIAL COMPONENTS ONLY (I.E., GENERALLY MORE THAN 35%).
2. THE DESCRIPTIVE TERM "SAME" REFERS TO THE SAMPLE DESCRIPTION LISTED IMMEDIATELY ABOVE (I.E., THE NUMERICALLY PRECEDING SAMPLE NUMBER). EXCEPTIONS TO THIS DESCRIPTION, IF ANY, ARE NOTED FOLLOWING A COMMA.
3. W.L. – INDICATES THE LEVEL OF FREE WATER SURFACE IN THE GROUND AT THE TIME BORING WAS MADE AND WAS DETERMINED BY OBSERVATION IN THE BORING HOLE OR IN A WELLPOINT. SEE BORING REPORT FOR METHOD OF OBSERVATION AND ADDITIONAL INFORMATION. THE INDICATED WATER LEVELS MAY OR MAY NOT HAVE STABILIZED AT THE TIME OF THE REPORTED OBSERVATIONS AND ALSO MAY NOT REFLECT SEASONAL CHANGES, TIDAL INFLUENCES OR THE EFFECTS OF INTENSE RAINFALL OR RUNOFF. THE OBSERVED DATA MAY NOT REFLECT PERCHED OR ARTESIAN WATER LEVELS THAT MAY BE PRESENT IN THE VARIOUS STRATA ENCOUNTERED.
4. THE BORINGS SHOWN ON THE PRESENTATION OF BORINGS DRAWINGS WERE MADE BY A DRILLING CONTRACTOR AND WERE INSPECTED BY PERSONNEL (INSPECTORS) OF THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY ENGINEERING DEPARTMENT. CERTAIN INFORMATION ON THESE DRAWINGS WAS OBTAINED FROM OBSERVATIONS BY THE INSPECTOR THAT ARE RECORDED ON FORMS ENTITLED BORING REPORT, DRILLING REPORT AND UNDISTURBED SAMPLES. SAMPLES HAVE ALSO BEEN EXAMINED AND CLASSIFIED IN THE LABORATORY. THE DESCRIPTIONS SHOWN ON THE PRESENTATION OF BORINGS DRAWINGS MAY NOT AGREE WITH THE DESCRIPTIONS SHOWN ON THE FORMS PREPARED BY THE INSPECTOR. THESE FORMS SHOULD BE CONSULTED FOR ADDITIONAL DETAILS REGARDING BORING OPERATIONS AND THE NATURE OF THE MATERIALS ENCOUNTERED. THESE FORMS AND A DESCRIPTION OF THE P.A. SOILS CLASSIFICATION SYSTEM (SF-92) ARE AVAILABLE FOR REFERENCE AND EXAMINATION IN THE DESIGN DIVISION OFFICES OF THE ENGINEERING DEPARTMENT.
5. THE SURFACE DATA REPORTED ON THE PRESENTATION OF BORINGS DRAWINGS AND THE FORMS ENTITLED BORING REPORT, DRILLING REPORT AND UNDISTURBED SAMPLES SHOW CONDITIONS ENCOUNTERED AND OBSERVED ONLY AT THE PARTICULAR POINTS FROM WHICH SOIL SAMPLES, ROCK CORE AND SUBSURFACE DATA WERE OBTAINED AT THE TIME THE TEST BORING WAS MADE.
6. SAMPLE NUMBERS DESIGNATED AS 'UA' AND 'UB' REPRESENT SHELBY TUBE TOP (UTOP) AND SHELBY TUBE BOTTOM (UBOT) RESPECTIVELY.
7. BORINGS NUMBERED 3-740 THROUGH 3-780 WERE COMPLETED IN CONJUNCTION WITH CONTRACT NUMBER EWR-004.007, "GUIDEWAY FOUNDATION AND SUPERSTRUCTURE."

NOTE: FOR BORING LOCATION PLAN SEE DRAWING EWR-SL-369.

FOR PRESENTATION OF BORINGS, SEE DRAWING EWR-SL-370 THRU EWR-SL-381.

Sheet 1 of 14

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

ENGINEERING DEPARTMENT

NEWARK LIBERTY INTERNATIONAL AIRPORT

GEOTECHNICAL

Title

MONORAIL NEC CONNECTION
GUIDEWAY FOUNDATION
AND SUPERSTRUCTURE

PROJECT SITE MAP, GENERAL NOTES, LEGEND, ABBREVIATIONS & SYMBOLS, SOIL CLASSIFICATIONS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS A. COFRANCESCO W. GIBBS

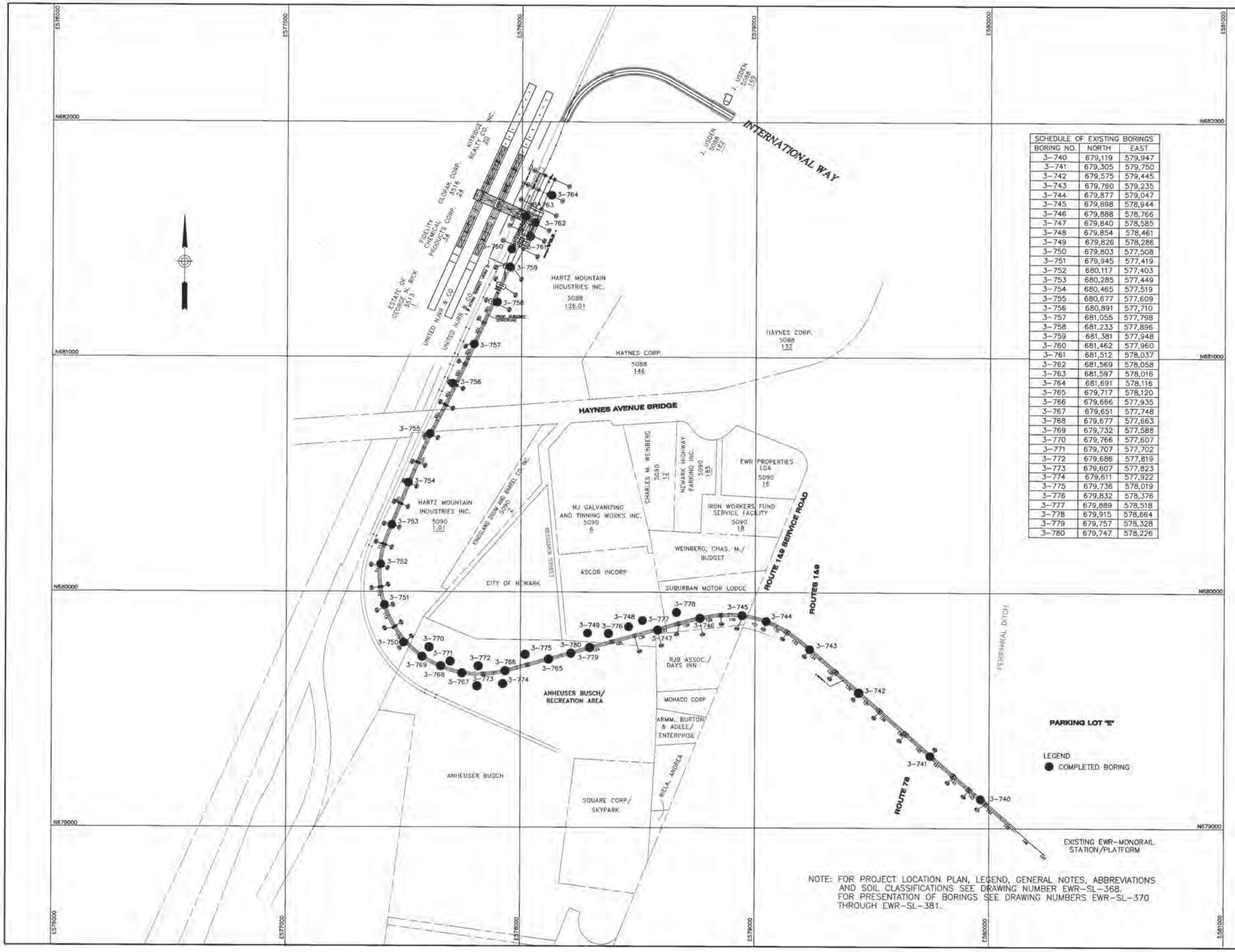
Designed by Drawn by Checked by

Date AUGUST 25, 2003

Contract Number

Drawing Number EWR-SL-368

PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES, INC.



SCHEDULE OF EXISTING BORINGS		
BORING NO.	NORTH	EAST
3-740	679,119	579,947
3-741	679,305	579,750
3-742	679,575	579,445
3-743	679,760	579,235
3-744	679,877	579,047
3-745	679,898	578,944
3-746	679,888	578,766
3-747	679,840	578,585
3-748	679,854	578,461
3-749	679,826	578,286
3-750	679,803	577,508
3-751	679,945	577,419
3-752	680,117	577,403
3-753	680,285	577,449
3-754	680,465	577,519
3-755	680,677	577,609
3-756	680,891	577,710
3-757	681,055	577,798
3-758	681,233	577,896
3-759	681,381	577,948
3-760	681,462	577,960
3-761	681,512	578,037
3-762	681,569	578,058
3-763	681,597	578,016
3-764	681,691	578,116
3-765	679,717	578,120
3-766	679,686	577,935
3-767	679,651	577,748
3-768	679,677	577,663
3-769	679,732	577,588
3-770	679,766	577,607
3-771	679,707	577,702
3-772	679,686	577,819
3-773	679,607	577,823
3-774	679,611	577,922
3-775	679,736	578,019
3-776	679,832	578,376
3-777	679,889	578,518
3-778	679,915	578,664
3-779	679,757	578,328
3-780	679,747	578,226

LEGEND
● COMPLETED BORING

NOTE: FOR PROJECT LOCATION PLAN, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR-SL-368. FOR PRESENTATION OF BORINGS SEE DRAWING NUMBERS EWR-SL-370 THROUGH EWR-SL-381.

Sheet Of

THE PORT AUTHORITY OF NY & NJ

AIRPORT ACCESS PROGRAM

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
Design Divisions

EWR Monorail NEC Connection

Title

GUIDEWAY FOUNDATION & SUPERSTRUCTURE

BORING LOCATION PLAN

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS	J. HEGARTY	W. GIBBS
Designed by	Drawn by	Checked by

Date 7/23/97 Scale AS NOTED

Contract Number EWR-154.001 Drawing Number EWR-SL-369

FILE NAME: EWRSL369.DWG

BORING NO. 3-740

DATE: 3-27-97

PROJECT: EWR MONORAIL EXTENSION PROJECT

LOCATION: N 679,119 E 579,946

SURFACE ELEVATION: 6.9 | WL ELEVATION: -1.6 | BY: C.L.P. | CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL — ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	6.9						
			20		HAND AUGER	1	MISC. FILL-CINDRS, GRAVEL, BRICK, CONCRETE	
	1		15		HAND AUGER	2	MISC. FILL-SAME	
			29		HAND AUGER	3	MISC. FILL-CINDERS, GRAVEL, CONCRETE, PLASTIC	
	2		62		2-3-2-2	4	MISC. FILL-CINDERS, GRAVEL, WOOD	
			35		2-2-1-1	5	MISC. FILL-CINDERS, GLASS	
10	3	-4.1	75		1-1-1-1	6 A	MISC. FILL-CINDERS, CONCRETE, BRICK, SILT	
			280			6 B	DARK BROWN PEAT	
	4		401		PRESSED	7u Box	SAME	
		-9.1	251		1-2-4-3	8	SAME	
	5		27		1-2-5-6	9	LIGHT GRAY FINE SAND, SOME SILT	
20	6	-13.1	27		3-6-5-3	10	SAME	
		-15.1	36		2-2-2	11	DARK BROWN SILT & CLAY, LITTLE FINE SAND SEAMS	
	7	-18.1	31		2-6-4	12	BROWN FINE SAND, SOME SILT	
	8		19		10-12-13	13	REDDISH BROWN SILT	
30	9	-23.1	25		4-9-9	14	REDDISH BROWN SILT & CLAY	
	10							
	11		18		4-7-8	15	REDDISH BROWN SILT & CLAY, TR. FINE SAND, TR. GRAVEL	
40	12				6-6-6	16	REDDISH BROWN CLAY & SILT	
	13		32					
	14		30		2-3-6	17	REDDISH BROWN SILT & CLAY, TR. FINE SAND	
50	15	-43.1						
	16	-48.1	27		5-6-5	18	REDDISH BROWN SILT, TR. FINE SAND	
	17		22		9-14-16	19	REDDISH BROWN FINE SAND, SOME SILT	
60	18	-53.1	27		4-6-6	20	REDDISH BROWN CLAY & SILT	
	19	-58.1						
	20		20		16-21-26	21	REDDISH BROWN FINE SAND, LITTLE SILT	
70	21	-63.1	21		18-19-19	22	REDDISH BROWN CLAY & SILT, TR. GRAVEL	
	22							
	23		24		12-12-17	23	SAME	
	24							
80	25		31		7-8-19	24	REDDISH BROWN SILT & CLAY	
		-78.1			100/0" 50/0"*			
	26				REC = 72% RQD = 48%	RUN #1	RED SHALE: MODERATELY TO SLIGHTLY FRACTURED	
90	27	-83.1						
	28				REC = 92% RQD = 72%	RUN #2	RED SHALE: TOP 4" EXTREMELY FRACTURED. SLIGHTLY FRACTURED	
		-88.1						

* 300 LBS. HAMMER USED

BORING NO. 3-741

DATE: 7-3-96

PROJECT: EWR MONORAIL EXTENSION PROJECT

LOCATION: N 679,305 E 579,750

SURFACE ELEVATION: 8.9 | WL ELEVATION: 1.7 | BY: C.L.P. | CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL — ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	8.9						
			9		HAND AUGER	1	FILL- BROWN C-F SAND, TRACE GRAVEL, TRACE SILT	
	1		9		HAND AUGER	2	FILL- BROWN C-F SAND, TRACE GRAVEL, TRACE SILT	
			12		HAND AUGER	3	FILL- BROWN C-F SAND, TRACE GRAVEL, TRACE SILT	
	2		12		8-8-8-9	4	FILL- SAME	
			17		7-6-5-6	5	FILL- SAME	
10	3		15		6-5-4-3	6	FILL- SAME	GS
	4	-5.3	21		1-1-1-1	7	FILL- SAME	GS
		-7.1	18		1-1-2-6	8 A	FILL- SAME	
	5		329			8 B	DARK BROWN DECOMPOSED PEAT	
			80		PRESSED 24"	9U Box	BROWN M-F SAND, TRACE GRAVEL, TRACE SILT	
	6		21		2-6-8	10	LIGHT GRAY M-F SAND, LITTLE SILT	GS
20			23		11-14-17	11	LIGHT GRAY FINE SAND, SOME SILT	GS
	7		19		12-15-17	12	BROWN FINE SAND, SOME SILT	
	8		19		9-15-15	13	BROWN SILT , SOME FINE SAND	
30	9		15		22-38-30	14	SAME	
	10							
	11		21		28-21-35	15	BROWN C-F SAND, LITTLE SILT, TR. GRAVEL	
40	12		22		14-16-18	16	BROWN M-F SAND, LITTLE SILT	GS
	13							
	14		21		8-19-16	17	BROWN SILT, SOME FINE SAND	
50	15		19		5-12-14	18	BROWN FINE SAND, LITTLE SILT, TRACE GRAVEL	
	16	-46.5						
	17		18		5-7-9	19	BROWN C-F SAND, TRACE SILT, TRACE GRAVEL	GS
60	18							
	19		24		9-6-10	20	BROWN CLAY AND SILT, TRACE GRAVEL	
	20		25		7-13-14	21	REDDISH BROWN CLAY AND SILT	
70	21							
	22		26		9-12-15	22	REDDISH BROWN SILT AND CLAY	
	23		23		9-15-18	23	REDDISH BROWN SILT AND CLAY, TRACE GRAVEL	
80	24		24		5-12-13	24	REDDISH BROWN SILT AND CLAY	
	25							
	26		24		7-8-10	25	SAME	
90	27		15		11-12-21	26	REDDISH BROWN-GRAY CLAY AND SILT, LITTLE GRAVEL	
	28	-86.1	11		100/3-100/0 *	27	REDDISH BROWN CLAY AND SILT, SOME GRAVEL, LITTLE C-F SAND	
	29	8.9			REC = 95% RQD = 61%	RUN #1	FRAGMENTED RED SHALE: (GRAVEL, SAND, SILT, CLAY SIZE)	
100	30	-91.4						
	31				REC = 100% RQD = 98%	RUN #2	RED SHALE: MODERATELY FRACTURED, SLIGHTLY WEATHERED	
	32	-96.4					RED SHALE: SLIGHTLY FRACTURED	

* 300 LB. HAMMER

BORING NO. 3-742

DATE: 7-18-96

PROJECT: EWR MONORAIL EXTENSION PROJECT

LOCATION: N 679,575 E 579,445

SURFACE ELEVATION: 6.7 | WL ELEVATION: 0.1 | BY: C.L.P. | CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL — ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	6.7						
			50		HAND AUGER	1	FILL- BROWN M-F SAND, SOME CLAYEY SILT BALLS, LITTLE SILT, TR. GRAVEL, TR. WOOD, CINDERS, AND ORGANIC FINES	
	1		74		HAND AUGER	2	FILL- DARK BROWN SILT AND CLAY, LITTLE M-F SAND, TR. DECOMPOSED PEAT FIBERS	
			51		HAND AUGER	3 A	FILL- SAME	
	2		158		PRESSED	3 B	FILL- DARK BROWN SILT AND CLAY, SOME DECOMPOSED PEAT FIBERS	
			36		6-8-4-3	4U Box	FILL- BROWN M-F SAND, LITTLE SILT, TRACE CLAYEY SILT BALLS, TRACE WOOD FIBERS	
			39		6-8-4-3	5	FILL- BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL	GS
10	3	-3.4	40		2-3-3-2	6	FILL- GRAY BROWN M-F SAND, SOME SILT, TRACE GRAVEL	GS
			153		1-0-0-0	7	BROWN PEAT FIBERS, SOME GRAY ORGANIC CLAY PARTINGS	
	4		439		PRESSED	8U Box	DARK GRAY ORGANIC CLAY, TRACE DECOMPOSED PEAT FIBERS	
			81			Top Box	DARK BROWN DECOMPOSED PEAT	
		-9.6	470		1-0-1	9	DARK BROWN DECOMPOSED PEAT	
	5		174		1-2-5	10 A	DARK BROWN DECOMPOSED PEAT, LITTLE GRAY ORGANIC CLAY PARTINGS, TR. GRAY FINE SAND	
			34			10 B	LIGHT GRAY FINE SAND, SOME SILT	GS
20	6		22		3-3-5	11	LIGHT GRAY FINE SAND, SOME SILT, LITTLE CLAYEY SILT PARTINGS	GS
			19		3-7-10	12	BROWN M-F SAND, TRACE SILT	GS
	7		19		13-15-17	13	BROWN FINE SAND, LITTLE SILT	
	8		22		3-8-8	14	SAME	
30	9		20		7-10-7	15	BROWN M-F SAND, LITTLE SILT	GS
	10							
	11		24		5-7-8	16	SAME	GS
40	12		20		6-7-8	17	BROWN SILT, LITTLE M-F SAND, TRACE GRAVEL	
	13	-36.3						
	14		30		4-3-3	18	REDDISH BROWN CLAY AND SILT	
50	15		23		4-4-8	19	REDDISH BROWN CLAY AND SILT, TRACE GRAVEL	
	16							
	17		20		4-8-9	20	REDDISH BROWN CLAY AND SILT, TRACE M-F SAND, TRACE GRAVEL	
60	18		23		7-10-10	21	REDDISH BROWN CLAY AND SILT	
	19							
	20		25		17-26-18	22	REDDISH BROWN SILT AND CLAY	
70	21	-52.3						
	22		22		11-19-13	23	REDDISH BROWN SILT	
	23	-68.3	24		10-6-10	24	REDDISH BROWN CLAY AND SILT, TRACE GRAVEL	
80	24							
	25		30		8-11-16	25	REDDISH BROWN SILT AND CLAY	
	26		27		7-12-9	26	SAME	
90	27		27		4-20-30	27	SAME	
	28		20		9-20-21	28	SAME	
	29	-93.4	17		SAME	29	DISINTEGRATED RED SHALE: (GRAVEL, SAND, SILT, CLAY SIZE)	
	30	-95.3	14		10-35-18			
100	31	-100.3	20		19-24-45	30	REDDISH BROWN SILT AND CLAY	
	32							
	33		9		50-51-60	31	DISINTEGRATED RED SHALE: (GRAVEL, SAND, SILT, CLAY SIZE)	
	34	-108.3	9		100/3"-50/0" *	32	DISINTEGRATED AND WEATHERED RED SHALE: (GRAVEL, SAND, SILT SIZE)	
110	35				REC = 90% RQD = 74%	RUN #1	RED SHALE: MODERATELY FRACTURED	
	36	-113.6						
	37				REC = 96% RQD = 64%	RUN #2	RED SHALE: MODERATELY FRACTURED	
120	38	-118.6						

* 300 LBS. HAMMER USED

NOTES: 1. FOR SITE LOCATION, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR-SL-368.
2. FOR BORING LOCATION PLAN, SEE DRAWING NUMBER EWR-SL-369.

Sheet Of

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
Design Divisions

EWR Monorail NEC Connection

Title

GUIDEWAY FOUNDATION & SUPERSTRUCTURE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS	J. HEGARTY	W. GIBBS
Designed by	Drawn by	Checked by

Date 7/23/97 Scale NONE

Contract Number EWR-154.001 Drawing Number EWR-SL-370

FILE NAME: SL-370.DWG

ROOF PATTERN

BORING NO. 3-743 | **DATE 8-1-96** | **PROJECT** EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,760 E 579,235 | SURFACE ELEVATION 13.1 | WL ELEVATION 0.6 | BY: C.L.P. | CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN, 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL. ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	13.1					ASPHALT CRUSHED STONE	
1		8		HAND AUGER	1	FILL- BROWN C-F SAND, LITTLE GRAVEL, TRACE SILT	
2		13		HAND AUGER	2	FILL- BROWN C-F SAND, LITTLE SILT, LITTLE CLAYEY SILT SLUGS, TR. GRAVEL	
3		6		TAPPED 3" SPOON	3	FILL- LIGHT BROWN M-F SAND, TR. SILT; 2" SILT AND CLAY LAYER,TR. GRAVEL	
4		6		28-52-75-32	4	FILL- LIGHT BROWN M-F SAND, TRACE SILT, TRACE GRAVEL	
5		6		24-36-36-28	5	FILL- BROWN-GRAY M-F SAND, TRACE SILT	
6		19		24-36-36-28	6	FILL- GRAY-BROWN M-F SAND, TRACE SILT	
7		22		WL 13-18-16-20	7	FILL- SAME	
8		16		12-19-26-28	8	FILL- LIGHT BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL	
9		15		24-20-19-16	9	FILL- SAME	GS
6	-8.3	18		4-9-10-10	10	FILL- SAME	GS
		21		4-4-2-6	11A 11B	LIGHT GRAY CLAY AND SILT; LITTLE BRICK BROWN DECOMPOSED PEAT	GS
7	-8.9	19		9-9-14-26	12A 12B	GRAY FINE SAND, SOME SILT, TRACE GRAVEL, TRACE ORGANIC FINES BROWN FINE SAND, LITTLE SILT, TRACE GRAVEL	
8		15		14-20-18-16	13	REDDISH BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL	GS GS
9		18		10-12-14	14	REDDISH BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
10							
11		15		10-11-15	15	SAME	
12							
13		16		7-10-11	16	SAME	
14		19		7-13-16	17	REDDISH BROWN FINE SAND, LITTLE SILT	
15	-36.9	25		4-6-6	18	REDDISH BROWN SILT AND CLAY	
16							
17		24		4-6-9	19	REDDISH BROWN CLAY AND SILT	
18							
19		20		3-5-8	20	REDDISH BROWN SILT AND CLAY, TRACE FINE SAND	
20		24		5-7-10	21	REDDISH BROWN CLAY AND SILT, TRACE GRAVEL	
21							
22	-59.9	22		7-10-10	22	SAME	
23		23		11-8-10	23	REDDISH BROWN SILT	
24							
25		23		10-11-12	24	SAME	
26		23		11-12-16	25	SAME	
27	-76.9						
28		9		22-29-22	26	REDDISH BROWN C-F SAND AND GRAVEL, TRACE SILT	
29	-81.9	15		4-10-10	27	REDDISH BROWN SILT AND CLAY, SOME GRAVEL	
30	-86.9						
31		17		17-26-19	28	RED SHALE: FRAGMENTED TO GRAVEL, SAND, SILT, AND CLAY SIZE	
32		8		100/8"-100/3"*-50/0"*	29	RED SHALE: FRAGMENTED TO GRAVEL, SAND, SILT SIZE	
33							
34		10		39-51-84	30	RED SHALE: SLIGHTLY WEATHERED, FRAGMENTED TO GRAVEL, SAND, SILT, AND CLAY SIZE	
35							
36		15		27-49-92	31	SAME	
37	-107.4	11		100/5"-50/0.7"*	32	SAME	
38	-112.4			REC = 86% RQD = 31%	RUN #1	RED SHALE: MODERATELY FRACTURED	

* 300 LBS. HAMMER USED

BORING NO. 3-744 | **DATE 7-26-96** | **PROJECT** EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,846 E 579,043 | SURFACE ELEVATION 10.3 | WL ELEVATION 1.9 | BY: C.L.P. | CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN, 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL. ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	10.3						
1		13		HAND AUGER	1	FILL - BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL, TRACE WEEDS	
2		8		HAND AUGER	2	FILL - BROWN C-F SAND, TRACE SILT, SOME GRAVEL, TRACE CINDERS	
3		22		WL HAND AUGER	3	FILL - BROWN CLAYEY SILT, LITTLE C-F SAND, TRACE GRAVEL, TRACE CINDERS	
4		16		2-4-6-5	4	FILL - BROWN C-F SAND, SOME SILT, LITTLE GRAVEL, TRACE CLAYEY SILT PARTINGS	
5		13		4-3-3-3	5	FILL - C-F SAND, LITTLE SILT, LITTLE GRAVEL	
4	-3.7	21		2-3-2-2	6	FILL - GRAVEL, LITTLE BROWN C-F SAND, SOME SILT, LITTLE CLAY AND SILT	GS
5	-6.7	26		4-4-2-2	7	FILL - GRAVEL, LITTLE BROWN C-F SAND, LITTLE SILT, TRACE CINDERS	GS
		342		2-3-4-3	8	DARK BROWN DECOMPOSED PEAT	
		99		PRESSED	SU 009	DARK BROWN PEAT	
6		20		14-13-12	10	BROWN SILT, TRACE M-F SAND	GS
		20		4-5-6	11	BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL	GS
7		18		5-12-10	12	SAME	
8		19		7-15-15	13	SAME	
9		18		9-14-22	14	BROWN M-F SAND, TRACE SILT	
10							
11		19		8-12-14	15	SAME	GS
12		22		22-35-29	16	BROWN M-F SAND, SOME SILT	
13							
14		18		9-15-12	17	BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
15	-38.7						
16		21		5-7-9	18	REDDISH BROWN CLAY AND SILT, TRACE FINE SAND	
17		23		12-15-17	19	REDDISH BROWN CLAY AND SILT, TRACE FINE SAND, TRACE GRAVEL	
18		27		14-15-12	20	SILT AND CLAY, TRACE FINE SAND	
19							
20	-54.7	27		12-12-18	21	FINE SAND, SOME SILT, LITTLE CLAY AND SILT SEAMS	
21	-58.7						
22		40		4-5-7	22	REDDISH-BROWN SILT AND CLAY	
23	-66.7	28		4-7-9	23	SAME	
24		23		9-12-15	24	FINE SAND, SOME SILT	GS
25	-74.7						
26		20		14-22-22	25	SILT AND CLAY, LITTLE GRAVEL, 1 BIG PIECE OF GRAVEL	
27		15		9-14-23	26	SILT AND CLAY, SOME GRAVEL	
28		19		10-42-83	27	SILT AND CLAY, TRACE GRAVEL	
29							
30	-89.7	9		44-98-74	28	RED SHALE: C-F SAND, SOME SILT, SOME GRAVEL	
31	-94.7						
32		9		75-100/4"-29/3"*-79*	29	FRAGMENTED AND SLIGHTLY WEATHERED RED SHALE: (GRAVEL, SAND, SILT SIZE)	
33	-99.7						
34		11		34-56-29	30	RED SHALE: GRAVEL, SOME SILT AND CLAY	
35	-104.8			50/1"-50/0"*			
36	-109.8			REC = 46% RQD = 0%	RUN #1	RED SHALE: EXTREMELY FRACTURED, SLIGHTLY WEATHERED, RQD = 0%	
37				REC = 96% RQD = 25%	RUN #2	RED SHALE: EXTREMELY FRACTURED, SLIGHTLY WEATHERED, RQD = 25%	
38	-114.8						
39	-119.8			REC = 82% RQD = 25%	RUN #3	RED SHALE: EXTREMELY FRACTURED, SLIGHTLY WEATHERED, RQD = 25%	

* 300 LBS. HAMMER USED

BORING NO. 3-745 | **DATE 3-11-97** | **PROJECT** EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,898 E 578,944 | SURFACE ELEVATION 10.8 | WL ELEVATION 2.8 | BY: C.L.P. | CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN, 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL. ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	10.8						
1		16		HAND AUGER	1	FILL-BROWN M-F SAND, LITTLE SILT, TR. GRAVEL	
2		13		HAND AUGER	2	FILL-BROWN M-F SAND, LITTLE SILT, TR. GRAVEL	
3		17		HAND AUGER	3	FILL-BROWN FINE SAND, SOME SILT, TR. GRAVEL.	
4		14		WL 3-3-1-3	4	MISC. FILL-BROWN FINE SAND, SILT, GRAVEL, BRICK	
5		19		4-2-2-2	5	FILL-BROWN FINE SAND, SOME SILT, TR. GRAVEL.	GS
4	-2.2	37		2-0-1-0	6	MISC. FILL BROWN FINE SAND, CINDERS, SILT & CLAY	GS
	-4.2	480		1-1-1-1	7A 7B	FILL-CINDERS DARK BROWN PEAT	
	-5.2	116		PRESSED	SU 009	SAME	
5	-7.2	30		3-4-4-5	9	BROWN-GRAY M-F SAND, SOME SILT, LITTLE CLAY PARTINGS, TR. GRAVEL	
6	-9.2	32		6-7-8-8	10	BROWN CLAYEY SILT, TR. FINE SAND, TR. GRAVEL	
		23		4-4-5	11	REDDISH BROWN C-F SAND, LITTLE SILT, TR. GRAVEL	
7		22		5-6-7	12	SAME	
8		21		6-5-12	13	SAME	
9	-19.2	21		2-3-3	14	REDDISH BROWN CLAY & SILT, TR. GRAVEL	
10							
11		22		2-3-3	15	REDDISH BROWN CLAY & SILT	
12							
13		22		3-3-4	16	REDDISH BROWN CLAY & SILT, TR. FINE SAND, TR. GRAVEL	
14	-35.7	22		3-6-10	17	SAME	
15	-39.7	27				REDDISH BROWN FINE SAND, LITTLE SILT	
		21		7-7-8	18A 18B	REDDISH BROWN CLAY & SILT	
16							
17		20		9-11-16	19	SAME	
18							
19		23		6-9-11	20	REDDISH BROWN CLAY & SILT	
20		25		11-18-11	21	SAME	
21							
22	-64.2	24		14-16-17	22	REDDISH BROWN SILT & CLAY	
23		24		17-17-26	23	REDDISH BROWN FINE SAND, SOME SILT	
24							
25		26		13-16-16	24	REDDISH BROWN FINE SAND, LITTLE SILT	
26		23		10-14-20	25	REDDISH BROWN FINE SAND, SOME SILT, TR. GRAVEL	
27							
28		13		16-18-32	26	REDDISH BROWN C-F SAND, SOME CLAY & SILT, LITLE GRAVEL	
29		11		57-79-122	27	REDDISH BROWN C-F SAND, LITTLE GRAVEL, TR. CLAY & SILT	
30							
31		10		68-98-111	28	REDDISH BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL	
32		13		98-100-100/0"*	29	REDDISH BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
33	-99.2			100/0"-50/0"*			
34				REC = 100% RQD = 52%	RUN #1	RED SHALE: MODERATELY FRACTURED; SLIGHTLY WEATHERED	
35	-104.2						
36	-109.2			REC = 90% RQD = 72%	RUN #2	RED SHALE: MODERATELY FRACTURED	

* 300 LBS. HAMMER USED

BORING NO. 3-745A | **DATE 3-11-97** | **PROJECT** EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,893 E 578,942 | SURFACE ELEVATION 10.3 | WL ELEVATION NR | BY: C.L.P. | CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN, 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL. ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	10.3 10.0					ASHPALT	
7.3		13 13		HAND AUGER HAND AUGER	1 2	FILL-BROWN M-F SAND, LITTLE GRAVEL, TR. SILT FILL-BROWN M-F SAND, LITTLE SILT, TR. GRAVEL	

NOTES: 1. FOR SITE LOCATION, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR-SL-368.
2. FOR BORING LOCATION PLAN, SEE DRAWING NUMBER EWR-SL-369.

Sheet Of

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No. Date Revision Approved

Engineering Department
Design Divisions

EWR Monorail NEC Connection

Title

GUIDEWAY FOUNDATION & SUPERSTRUCTURE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS Designed by | J. HEGARTY Drawn by | W. GIBBS Checked by

Date 7/23/97 Scale NONE

Contract Number EWR-154.001 Drawing Number EWR-SL-371

FILE NAME: SL-371.EWG

BORING NO. 3-746 — DATE 3-8-97 — PROJECT: EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,888 E 578,766 — SURFACE ELEVATION 12.2 — WL ELEVATION 4.2 — BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	12.2					ASPHALT	
		12.0						
			16		HAND AUGER	1	MISC. FILL- M-F SAND, BRICK, CONCRETE, GRAVEL, SILT	
	-1		13		HAND AUGER	2	MISC. FILL-SAME	
			18		HAND AUGER	3	MISC. FILL- M-F SAND, BRICK, CINDERS, GRAVEL, SILT & CLAY	
	-2		29		5-4-2-2	4	MISC. FILL-CONCRETE, SAND, GRAVEL, SILT	
			22		2-1-1-1	5	MISC. FILL- SILT & CLAY, CINDERS, SAND, GRAVEL	GS
10	-3		61		2-1-1-1	6	MISC. FILL-CINDERS, PAPER	GS
	-4	-1.8	41		3-2-2-4	7	MISC. FILL-CINDERS, GRAVEL, BRICK, SILT	GS
		-3.8	458		3-1-1-2	8	DARK BROWN PEAT	
	-5		21		PRESSED	9u	BROWN FINE SAND, SOME SILT	
							JAR SAMPLE ONLY (SEE BORING REPORT)	
20	-6		23		5-6-10-10	10	REDDISH BROWN M-F SAND, LITTLE SILT	
			24		6-7-5	11	SAME	
	-7	-10.3	20		4-6-7	12	REDDISH BROWN CLAY & SILT, TR. FINE SAND	
	-8		22		3-6-10	13	SAME	
30	-9	-17.8	25		7-8-6	14	REDDISH BROWN FINE SAND, SOME SILT	
		-18.8	20				REDDISH BROWN CLAY & SILT, TR. GRAVEL	
	-10							
	-11		30		7-7-10	15	REDDISH BROWN CLAY & SILT	
40	-12	-27.8						
	-13		24		8-11-13	16	REDDISH BROWN FINE SAND, LITTLE SILT	
		-33.3	25				SAME	
	-14		24		5-8-10	17	REDDISH BROWN CLAY & SILT	
50	-15	-37.8						
		-39.3	26		11-11-11	18	REDDISH BROWN FINE SAND, LITTLE SILT	
	-16							
	-17		25		3-3-4	19	REDDISH BROWN CLAY & SILT	
60	-18	-47.8						
	-19		35		6-5-7	20	REDDISH BROWN VARVED CLAY & SILT	
	-20		33		11-14-15	21	SAME	
70	-21	-57.8						
	-22		38		8-10-20	22	REDDISH BROWN CLAY & SILT, TR. FINE SAND	
	-23	-62.8	21		8-13-14	23	REDDISH BROWN SILT, TR. FINE SAND, TR. GRAVEL	
80	-24							
	-25		20		16-17-28	24	SAME	
	-26		21		9-10-13	25	REDDISH BROWN SILT, TR. FINE SAND	
	-27							
90	-28		21		20-23-34	26	REDDISH BROWN SILT & CLAY	
	-29	-82.8	10		28-32-48	27	REDDISH BROWN C-F SAND, SOME SILT, LITTLE GRAVEL	
	-30							
100	-31		10		66-100/5"* 27/1"* -77*	28	SAME	
	-32		15		28-34-95	29	REDDISH BROWN M-F SAND, SOME SILT, TR. GRAVEL	
		-97.8			100/0" 50/0"*			
110	-33				REC = 57% RQD = 0%	RUN #1	RED SHALE: EXTREMELY FRACTURED AND HIGHLY WEATHERED	
	-34							
	-35	-102.8			REC = 100% RQD = 87%	RUN #2	RED SHALE: MODERATELY FRACTURED	
	-36	-107.8						
120								

* 300 LBS. HAMMER USED

BORING NO. 3-747 — DATE 3-5-97 — PROJECT: EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,840 E 578,585 — SURFACE ELEVATION 13.4 — WL ELEVATION 6.4 — BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	13.4						
			14		HAND AUGER	1	FILL-BROWN M-F SAND, LITTLE GRAVEL, TR. SILT	
	-1		17		HAND AUGER	2	FILL-BROWN M-F SAND, LITTLE SILT, LITTLE GRAVEL	
			42		HAND AUGER	3	MISC. FILL-CINDERS, SAND, SILT	
	-2		47		4-4-4-5	4	MISC. FILL-CINDERS, SAND, SILT	
			28		2-1-1-1	5	MISC. FILL-BROWN M-F SAND, SILT & CLAY LAYERS, CINDERS, BRICK	GS
10	-3		40		2-2-2-1	6	MISC. FILL-CINDERS, BRICK, SAND, SILT	GS
	-4	-0.6	40		3-4-5-1	7	MISC. FILL-SAME	
			190		1-2-2-1	8	DECOMPOSED DARK BROWN PEAT, LITTLE CLAY PARTINGS	
	-5	-3.6	141			9u	DARK BROWN PEAT	
			19		PRESSED		BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL	
20	-6		15		7-10-11-8	10	REDDISH BROWN C-F SAND, LITTLE GRAVEL, TR. SILT	
			20		7-7-8	11	REDDISH BROWN FINE SAND, AND SILT	
	-7		26		5-5-7	12	REDDISH BROWN M-F SAND, TR. SILT	
	-8		25		5-7-9	13	SAME	
30	-9		25		9-10-10	14	REDDISH BROWN FINE SAND, LITTLE SILT	
	-10	-21.6						
	-11		28		3-4-6	15	REDDISH BROWN CLAY & SILT	
40	-12	-26.6						
			24		9-9-6	16	REDDISH BROWN FINE SAND, LITTLE SILT	
	-13		25				REDDISH BROWN CLAY & SILT	
	-14		32		5-12-14	17	SAME	
50	-15	-37.1	24				REDDISH BROWN CLAY & SILT	
			25		7-17-17	18	REDISH BROWN SILT	
	-16	-41.6						
	-17		19		11-13-14	19	REDDISH BROWN FINE SAND, SOME SILT, LITTLE CLAY & SILT	
60	-18	-46.6						
	-19		18		11-13-16	20	REDDISH BROWN SILT & CLAY, TR. FINE SAND	
	-20		21		11-13-18	21	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
70	-21							
	-22		31		14-16-21	22	REDDISH BROWN SILT & CLAY, LITTLE FINE SAND SEAMS	
	-23	-61.6	20		9-10-18	23	REDDISH BROWN FINE SAND, SOME SILT, LITTLE GRAVEL	
80	-24	-66.6						
	-25		15		26-26-33	24	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
	-26	-71.6	18		42-51-59	25	REDDISH BROWN FINE SAND, LITTLE SILT	
	-27	-76.6						
90	-28		17		100-33* -29*	26	GRAVEL, SOME REDDISH BROWN CLAY & SILT	
	-29	-81.6	16		33-44-89	27	REDDISH BROWN SILT & CLAY, SOME GRAVEL	
	-30	-86.6						
100	-31		13		83-100-51*	28	FRAGMENTED RED SHALE (C-F SAND, SOME GRAVEL, LITTLE SILT)	
	-32		12		57-85-100/5* 16/1*	29	SAME	
	-33	-96.6			100/0" 25/0"*			
110	-34				REC = 76% RQD = 23%	RUN #1	RED SHALE: MODERATELY TO EXTREMELY FRACTURED, SLIGHTLY WEATHERED	
	-35	-101.6						
	-36	-106.6			REC = 80% RQD = 38%	RUN #2	RED SHALE: MODERATELY FRACTURED AND WEATHERED	
120								

* 300 LBS. HAMMER USED

BORING NO. 3-748 — DATE 3-13-97 — PROJECT: EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,854 E 578,461 — SURFACE ELEVATION 13.5 — WL ELEVATION 5.5 — BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	13.5						
			18		HAND AUGER	1	MISC. FILL-BROWN M-F SAND, BRICK, CINDERS, GRAVEL, SILT	
	-1		17		HAND AUGER	2	MISC. FILL-CINDERS, CONCRETE, BRICK, SAND, SILT, GRAVEL	
			22		HAND AUGER	3	MISC. FILL-SAME	
	-2		20		2-1-1-1	4	MISC. FILL-SAME	
			33		1-0-1-5	5	MISC. FILL-SAME	GS
10	-3		21		4-6-8-3	6	MISC. FILL-CINDERS, BRICK, GLASS, SILT	
	-4	0.5	27			7	MISC. FILL-CINDERS, BRICK, GRAVEL, SILT	
		-2.5	160		3-4-3-3	7a	DARK BROWN CLAY, SOME BROWN PEAT FIBERS	
	-5		101		10-5-12-12	8	SAME	
			31		20-14-10-10	9	REDDISH BROWN FINE SAND, SOME SILT, LITTLE GRAVEL	
20	-6		29		16-14-8-12	10	SAME	
			26		3-6-6	11	REDDISH BROWN FINE SAND, SOME SILT	
	-7		25		6-8-8	12	REDDISH BROWN M-F SAND, LITTLE SILT	
	-8		28		5-4-5	13	REDISH BROWN FINE SAND, SOME SILT	
30	-9							
	-10		57		3-4-4	14	REDDISH FINE SAND, LITTLE SILT	
	-11		34		6-5-6	15	SAME	
40	-12	-27.5	29		5-8-5	16	REDDISH BROWN FINE SAND, SOME SILT	
	-13		21			16a	REDDISH BROWN CLAY & SILT	
	-14		26		8-6-8	17	REDDISH BROWN CLAY & SILT, TR. FINE SAND	
50	-15							
	-16		24		4-7-10	18	REDDISHN BROWN CLAY & SILT	
	-17		24		2-1-2	19	SAME	
60	-18	-46.5						
	-19		17		8-14-16	20	REDDISH BROWN FINE SAND, LITTLE SILT & CLAY, TR. GRAVEL	
	-20		25		6-11-13	21	REDDISH BROWN M-F SAND, LITTLE SILT & CLAY, TR. GRAVEL	
70	-21							
	-22		22		9-9-16	22	REDDISH BROWN FINE SAND, LITTLE SILT	
	-23		22		23-26-34	23	SAME	
80	-24							
	-25		22		29-36-38	24	SAME	
	-26		22		18-27-32	25	SAME	
	-27							
90	-28		25		22-26-32	26	SAME	
	-29	-81.5	17		25-44-65	27	REDDISH BROWN CLAY & SILT, LITTLE GRAVEL	
	-30	-86.5						
100	-31		10		51-52-92	28	FRAGMENTED RED SHALE (GRAVEL, C-F SAND, TR. CLAY & SLT)	
	-32				100/0" 25/0"*			
	-33	-96.5			REC = 92% RQD = 18%	RUN #1	RED SHALE: EXTREMELY FRACTURED, MODERATELY WEATHERED	
110	-34				REC = 100% RQD = 50%	RUN #3	RED SHALE: MODERATELY FRACTURED, SLIGHTLY WEATHERED	
	-35	-101.5						

* 300 LBS. HAMMER USED

NOTES: 1. FOR SITE LOCATION, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR-SL-368.
2. FOR BORING LOCATION PLAN, SEE DRAWING NUMBER EWR-SL-369.

Sheet 01

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
Design Divisions

EWR Monorail NEC Connection

Title

GUIDEWAY FOUNDATION & SUPERSTRUCTURE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS — Designed by | J. HEGARTY — Drawn by | W. GIBBS — Checked by

Date 7/23/97 — Scale NONE

Contract Number **EWR-154.001** — Drawing Number **EWR-SL-372**

FILE NAME: SL-372.DWG

BORING NO. 3-749

DATE 3-18-97

PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,826 E 578,286

SURFACE ELEVATION 13.2 | WL ELEVATION 5.2 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL — ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	13.2						
			22		HAND AUGER	1	MISC. FILL-CINDERS, CONCRETE, SAND, SILT	
1			22		HAND AUGER	2	MISC. FILL-CINDERS, CONCRETE, BRICK	
2			25		HAND AUGER	3	MISC. FILL-CINDERS, CONCRETE, BRICK, GLASS	
			25		3-1-1-2	4	MISC. FILL- C-F SAND, CINDERS, GRAVEL, GLASS, SILT	
3		3.2	38		3-1-5-2	5	MISC. FILL-CONCRETE, SAND, BRICK, WOOD	DS
		1.2	65		3-2-3-3	6	BROWN CLAY & SILT, TR. PEAT FIBERS	
4			17		3-2-4-13	7	BROWN M-F SAND, LITTLE SILT, LITTLE GRAVEL	
5			25		9-7-7-7	8	REDDISH BROWN FINE SAND, LITTLE SILT	
			21		5-5-6-7	9	REDDISH BROWN M-F SAND, LITTLE SILT, TR. GRAVEL	
6			29		5-5-5-5	10	REDDISH BROWN FINE SAND, LITTLE SILT	
			26		5-5-5	11	REDDISH BROWN FINE SAND, SOME SILT	
7			27		2-2-6	12	SAME	
8			27		4-5-8	13	REDDISH BROWN FINE SAND, LITTLE SILT	
9			27		4-3-3	14	SAME	
10								
11			28		5-7-8	15	SAME	
12			29		5-6-7	16	REDDISH BROWN FINE SAND, AND SILT	
13								
14			29		23-39-45	17	REDDISH BROWN FINE SAND, SOME SILT	
15								
16		-41.8	26		13-15-18	18	REDDISH BROWN FINE SAND, TR. SILT	
17			13		13-15-23	19	REDDISH BROWN SILT & CLAY, LITTLE GRAVEL	
18			18		21-19-28	20	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
19		-51.8						
20			18		25-38-49	21	REDDISH BROWN FINE SAND, SOME SILT, TR. CLAY SEAMS	
21								
22			22		27-35-47	22	REDDISH BROWN FINE SAND, TR. SILT	
23								
24			24		18-20-24	23	REDDISH BROWN FINE SAND, TR. SILT	
25		-71.8	20		20-25-36	24	REDDISH BROWN FINE SAND, LITTLE SILT	
26		-74.8	16		22-27-31	25	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
27		-76.8	17		100/1" 100/1"*	26	FRAGMENTED RED SHALE: (SAND, GRAVEL, SILT & CLAY)	
28					REC = 100% RQD = 76%	RUN #1	RED SHALE: MODERATELY FRACTURED	
29		-81.8						
30		-86.8			REC = 92% RQD = 52%	RUN #2	RED SHALE: MODERATELY FRACTURED, SLIGHTLY WEATHERED	

* 300 LBS. HAMMER USED

BORING NO. 3-750

DATE 11-7-96

PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,803 E 577,508

SURFACE ELEVATION 13.2 | WL ELEVATION 9.2 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL — ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	13.2						
			16		6-5-5-4	1	FILL - CINDERS, COAL	
1			72		7-3-4-3	2	FILL - CINDERS, ASHES, COAL	
			48		2-2-2-3	3	FILL - SAME	
2			26		7-2-2-3	4 A	MISC. FILL - CINDERS, ASHES, TRACE BROWN M-F SAND, LITTLE SILT	
			26		7-2-2-3	4 B	FILL - BROWN C-F SAND, SOME SILT, TRACE CLAYEY SILT, LITTLE GRAVEL	
3			18		1-1-7-5	5	FILL - REDDISH BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL	
			69		5-2-2-3	6	FILL - YELLOWISH BROWN SILT AND CLAY, TRACE M-F SAND, TRACE GRAVEL	
4		-2.8			4-4-2-2		NO RECOVERY	
			32		4-5-8-12	7	FILL - GRAVEL, LITTLE YELLOWISH BROWN C-F SAND, SOME SILT (POOR REC.)	
5			22		9-24-17-15	8	REDDISH BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL	
6			16		7-9-7-10	9	SAME	
			13		5-8-9-9	10	REDDISH BROWN C-F SAND, LITTLE SILT AND CLAY, SOME GRAVEL	
7		-10.8	16		8-10-10-13	11	REDDISH BROWN C-F SAND, SOME CLAYEY SILT, LITTLE GRAVEL	
8			18		10-13-15	12	REDDISH BROWN CLAYEY SILT, LITTLE FINE SAND	
9		-16.8						
10			23		18-26-31	13	REDDISH BROWN FINE SAND, SOME SILT, TRACE SILT AND CLAY SEAMS	
		-21.8						
11			22		22-16-17	14	REDDISH BROWN CLAYEY SILT, LITTLE FINE SAND	
12			26		9-12-13	15	REDDISH BROWN SILT	
13								
14			19		34-35-40	16	REDDISH BROWN CLAYEY SILT, LITTLE FINE SAND, TRACE GRAVEL	
15								
16			18		17-25-32	17	REDDISH BROWN CLAYEY SILT, LITTLE FINE SAND, TRACE GRAVEL (POOR REC.)	
17			18		27-46-50	18	SAME	
18								
19		-51.8	18		47-61-87	19	REDDISH BROWN SILT AND CLAY, TRACE GRAVEL	
20			13		34-40-34	20	REDDISH BROWN C-F SAND, SOME SILT, LITTLE GRAVEL	
21		-56.8			100/0"-25/0"*			
22					REC = 94% RQD = 40%	RUN #1	RED SHALE: EXTREMELY FRACTURED	
23								
24		-66.8			REC = 96% RQD = 24%	RUN #2	RED SHALE: EXTREMELY FRACTURED	

* 300 LBS. HAMMER USED

BORING NO. 3-751

DATE 11-5-96

PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,945 E 577,419

SURFACE ELEVATION 14.3 | WL ELEVATION 10.3 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL — ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	14.3						
			20		3-8-5-4	1	FILL - CINDERS, ASHES	
1			16		7-7-6-5	2 A	FILL - SAME	
			12			2 B	FILL - YELLOWISH BROWN C-F SAND, TRACE SILT, TRACE GRAVEL	
2			17		7-8-5-4	3	FILL - BROWN C-F SAND, LITTLE SILT, TRACE CLAYEY SILT, LITTLE GRAVEL	
			19		5-4-4-7	4	FILL - BROWN M-F SAND, LITTLE SILT, LITTLE CLAYEY SILT, LITTLE GRAVEL	
3			NO REC.		5-7-8-4	5	NO RECOVERY	
					3-4-4-5	6	FILL - BROWN C-F SAND, LITTLE SILT, TRACE CLAYEY SILT, SOME GRAVEL	
4			23		10-6-8-7	7	MISC. FILL - BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL, CINDERS, ASHES	
		-1.8	20		7-5-4-3	8	FILL - BROWN C-F SAND, LITTLE SILT, TRACE CLAYEY SILT, TRACE GRAVEL	
5			382		2-1-1-2	9	DARK BROWN DECOMPOSED PEAT, LITTLE ORGANIC CLAY PARTINGS	
6		-5.8	297		PRESSED	10u	DARK BROWN DECOMPOSED PEAT, SOME ORGANIC CLAY PARTINGS, TRACE GRAVEL	
			28		PRESSED	11u	BROWN CLAY AND SILT, TRACE FINE SAND, TRACE ORGANIC FINES	
7			31				SAME	
8			44		2-1-2	12	BROWN CLAY AND SILT, TRACE FINE SAND, TRACE GRAVEL	
9		-15.8						
10			18		9-12-12	13	REDDISH BROWN C-F SAND, SOME SILT, LITTLE SAND	
		-20.8						
11			14		6-6-8	14	GRAVEL, LITTLE C-F SAND, TRACE SILT	
12		-27.2	13		5-12-8	15	GRAVEL, SOME F-C SAND, TRACE SILT	
			10				REDDISH BROWN SILT AND CLAY	
13								
14			17		12-15-15	16	REDDISH BROWN SILT AND CLAY, TRACE GRAVEL	
15								
16		-40.8	25.2		11-13-12	17	SILT AND CLAY	
17			12.7		19-39-50	18	REDDISH BROWN C-F SAND, LITTLE SILT AND CLAY, LITTLE GRAVEL	
18		-45.8						
19		-50.8	17		19-28-48	19	REDDISH BROWN SILT AND CLAY, TRACE GRAVEL	
20			13		19-20-38	20	DISINTEGRATED RED SHALE (GRAVEL, SAND SILT, CLAY SIZE)	
21		-55.8						
22					25/0"*			
		-59.8			REC = 40% RQD = 20%	RUN #1	RED SHALE: TOP 12" MODERATELY FRACTURED RED SHALE: BOTT 6" EXTREMELY FRACTURED	
23								
24		-65.8			REC = 97% RQD = 78%	RUN #2	RED SHALE: MODERATELY FRACTURED	

* 300 LBS. HAMMER USED

BORING NO. 3-750B

DATE 11-7-96

PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,785 E 577,500

SURFACE ELEVATION 13.2 | WL ELEVATION 8.4 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL — ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0							
			14		HAND AUGER	1	FILL - CINDERS, COAL	
1			15		HAND AUGER	2	FILL - CINDERS, ASHES, COAL	
			48		HAND AUGER	3	FILL - CINDERS, ASHES, COAL	

BORING NO. 3-751A

DATE 11-5-96

PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,945 E 577,422

SURFACE ELEVATION 10.3 | WL ELEVATION 6.6 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL — ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0							
			19		HAND AUGER	1	FILL - CINDERS, ASHES	
1			18		HAND AUGER	2	FILL - CINDERS, ASHES	
			17		HAND AUGER	3	FILL - BROWN C-F SAND, LITTLE SILT, SOME GRAVEL	

NOTES: 1. FOR SITE LOCATION, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR-SL-368.
2. FOR BORING LOCATION PLAN, SEE DRAWING NUMBER EWR-SL-369.

Sheet Of

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
Design Divisions

EWR Monorail NEC Connection

Title

GUIDEWAY FOUNDATION & SUPERSTRUCTURE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods therein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS Designed by | J. HEGARTY Drawn by | W. GIBBS Checked by

Date 7/23/97 Scale NONE

Contract Number EWR-154.001 Drawing Number EWR-SL-373

FILE NAME: SL-373.DWG

D-47

BORING NO. 3-752 | DATE 11-11-96 | PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 680,116 E 577,402 | SURFACE ELEVATION 11.5 | W.L. ELEVATION 8.5 | BY: C.L.P. | CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	11.5						
1		26		5-7-9-10	1	FILL – CINDERS, ASHES, COAL	
		46		12"/6" 6-5-6-6	2	FILL – SAME	
		17		5-7-8-12	3	FILL – REDDISH BROWN C–F SAND, LITTLE SILT, LITTLE GRAVEL	
3.5		18		10-8-5-6	4	FILL – SAME	
10 3		197		5-2-1-1	5	BROWN DECOMPOSED PEAT, LITTLE ORGANIC CLAY PARTINGS	
		275 361		PRESSED 24"	6u	DARK BROWN DECOMPOSED PEAT	
4	-2.5	131		W.O.R.	7	BROWN DECOMPOSED PEAT, SOME ORGANIC CLAY PARTINGS	
	-4.5	16		9-7-3-3	8	BROWN C–F SAND, LITTLE SILT, LITTLE GRAVEL	
5		45		3-2-3-2	9	BROWN CLAY AND SILT, TRACE FINE SAND SEAMS, TRACE BROWN C–F SAND	
20 6		50		2-2-1-2	10	BROWN CLAY AND SILT, TRACE FINE SAND,	
		35 28		1-1-3	11	BROWN CLAY AND SILT, TRACE FINE SAND / BROWN CLAYEY SILT, TRACE FINE SAND	
7	-11.0	21		4-4-6	12	REDDISH BROWN C–F SAND, LITTLE SILT, SOME GRAVEL	
8		18		4-4-4	13	SAME	GS
30 9							
10		19		5-5-6	14	SAME	
11		21		4-3-7	15	SAME	
40 12	-28.5	19		10-14-16	16	REDDISH BROWN SILT AND CLAY, TRACE GRAVEL	
13							
14		23		16-16-20	17	REDDISH BROWN SILT AND CLAY, TRACE FINE SAND	
50 15	-38.5	25		13-14-17	18	REDDISH BROWN SILT, LITTLE FINE SAND	
16							
17		24		33-24-23	19	SAME	
60 18	-48.5	13		23-42-62	20	REDDISH BROWN C–F SAND, LITTLE SILT AND CLAY, SOME GRAVEL	
19					21	DISINTEGRATED AND DECOMPOSED RED SHALE (GRAVEL, SAND, SILT, CLAY SIZE)	
20	-53.5 -54.0	16		100/5"-50/1"*			
70 21	-59.0			REC = 64% RQD = 14%	RUN # 1	RED SHALE: EXTREMELY FRACTURED, SLIGHTLY WEATHERED	
22				REC = 74% RQD = 26%	RUN # 2	RED SHALE: EXTREMELY FRACTURED	
23	-64.0						

* 300 LBS. HAMMER USED

BORING NO. 3-753 | DATE 11-13-96 | PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 680,285 E 577,449 | SURFACE ELEVATION 11.3 | W.L. ELEVATION 7.8 | BY: C.L.P. | CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	11.3						
1		22		4-6-5-10	1	FILL – CINDERS, ASHES, COAL	
		14		12"/6" 9-9-9-10	2	FILL – REDDISH BROWN C–F SAND, LITTLE SILT, SOME GRAVEL	
2		24 30		9-5-3-3	3	FILL – REDDISH BROWN CLAYEY SILT, TR. FINE SAND, TR. C–F SAND, LITTLE SILT, TR. GRAVEL	
		21		4-7-7-7	4	FILL – REDDISH BROWN C–F SAND, LITTLE SILT, TRACE GRAVEL	
10 3		29		5-4-5-6	5	FILL – BROWN M–F SAND, TRACE SILT, TRACE GRAVEL,	
		25		2-2-4-6	6	FILL – BROWN C–F SAND, TRACE SILT, TRACE GRAVEL	GS
4		27		9-10-12-12	7	FILL – BROWN C–F SAND, TRACE SILT, TRACE GRAVEL	
	-4.7	29		3-3-4-5	8	FILL – BROWN M–F SAND, TRACE SILT	GS
5		23		3-6-9-8	9	REDDISH BROWN M–F SAND, LITTLE SILT	
20 6		29		5-4-4-5	10	REDDISH BROWN FINE SAND, SOME SILT	GS
		25		7-8-9	11	REDDISH BROWN M–F SAND, TRACE SILT	
7		27		10-10-13	12	SAME	
8		27		8-9-7	13	SAME	
30 9							
10	-23.7	28		5-7-10	14	REDDISH BROWN FINE SAND, LITTLE SILT	
11		16		8-10-11	15	REDDISH BROWN SILT AND CLAY, TRACE SILT, TRACE GRAVEL	
40 12		17		26-40-46	16	REDDISH BROWN CLAYEY SILT, LITTLE SILT	
13							
14		19		25-21-29	17	SAME	
50 15		19		16-26-40	18	SAME	
16	-43.7						
17		20		23-33-30	19	REDDISH BROWN SILT, TRACE FINE SAND	
60 18	-48.7			100/0"-25/0"*			
19	-53.7			REC = 92% RQD = 70%	RUN # 1	RED SHALE: MODERATELY FRACTURED	
20							
70 21	-58.7			REC = 86% RQD = 70%	RUN # 2	RED SHALE: MODERATELY TO SOUND FRACTURED	

* 300 LBS. HAMMER USED

BORING NO. 3-754 | DATE 11-14-96 | PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 680,465 E 577,519 | SURFACE ELEVATION 11.0 | W.L. ELEVATION 7.0 | BY: C.L.P. | CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	11.0						
1		34		4-7-8-8	1	FILL – CINDERS, ASHES, COAL, WEEDS	
		13		12"/6" 7-8-9-9	2	FILL – REDDISH BROWN C–F SAND, TRACE SILT, SOME GRAVEL	
2		17		10-10-11-7	3	FILL – REDDISH BROWN C–F SAND, LITTLE SILT, SOME GRAVEL	
		31		6-5-4-4	4	FILL – REDDISH BROWN FINE SAND, LITTLE SILT	
10 3		16		6-4-4-4	5	FILL – C–F SAND, LITTLE SILT AND CLAY, TRACE GRAVEL	
	-1.0	15		4-4-3-5	6	FILL – SAME	
4		24		5-7-6-6	7	REDDISH BROWN C–F SAND, TRACE SILT, TRACE GRAVEL	
		27		4-6-7-7	8	REDDISH BROWN M–F SAND, TRACE SILT, TRACE GRAVEL	
5		22		5-6-11-8	9	REDDISH BROWN M–F SAND, LITTLE SILT, TRACE GRAVEL	
20 6		28		4-4-4-7	10	REDDISH BROWN C–F SAND, LITTLE SILT, TRACE GRAVEL	
		26		4-6-8	11	REDDISH BROWN M–F SAND, LITTLE SILT, TRACE GRAVEL	
7		27		3-6-6	12	SAME	
8		23		5-8-12	13	SAME	
30 9							
10		36		7-7-8	14	REDDISH BROWN C–F SAND, TRACE SILT, TRACE GRAVEL	
11		28		5-7-8	15	SAME	
40 12		30		3-4-2	16	REDDISH BROWN FINE SAND, SOME SILT	GS
13							
14		26		3-4-13	17	SAME REDDISH BROWN FINE SAND, TRACE SILT	
50 15	-39.0	14		36-62-65	18	REDDISH BROWN SILT AND CLAY, TRACE FINE SAND, TRACE GRAVEL	
16							
17		21		23-25-42	19	REDDISH BROWN SILT AND CLAY	
60 18							
19		16		13-16-39	20	REDDISH BROWN CLAY AND SILT, TRACE GRAVEL	
20	-54.0			100/0" 25/0"*			
70 21	-59.0			REC = 86% RQD = 50%	RUN # 1	RED SHALE: MODERATELY FRACTURED	
22				REC = 72% RQD = 25%	RUN # 2	RED SHALE: TOP 9" DECOMPOSED BOTT 16" EXTREMELY FRACTURED	
	-64.0						

* 300 LBS. HAMMER USED

NOTES: 1. FOR SITE LOCATION, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR-SL-368.
2. FOR BORING LOCATION PLAN, SEE DRAWING NUMBER EWR-SL-369.

Sheet Of

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
Design Divisions

EWR Monorail NEC Connection

Title
GUIDEWAY FOUNDATION & SUPERSTRUCTURE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS (Designed by) J. HEGARTY (Drawn by) W. GIBBS (Checked by)

Date 7/23/97 Scale NONE

Contract Number EWR-154.001 Drawing Number EWR-SL-374

FILE NAME: SL-374.DWG

BORING NO. 3-755

DATE: 11-15-96

PROJECT: EWR MONORAIL EXTENSION PROJECT

LOCATION: N 680,677 E 577,609

SURFACE ELEVATION: 10.5 | WL ELEVATION: 6.5 | BY: C.L.P. | CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	10.5						
		6.5	20		4-6-5-5	1	FILL – CINDERS, ASHES, COAL	
5	1		24		WL 6-7-11-8	2	REDDISH BROWN M-F SAND, TRACE SILT, TRACE GRAVEL	
	2		25		7-7-8-5	3	REDDISH BROWN FINE SAND, TRACE SILT	
			26		5-8-8-7	4	REDDISH BROWN FINE SAND, LITTLE SILT	
10	3		26		6-6-8-6	5	SAME	GS
	4		32		4-3-2-9	6	REDDISH BROWN FINE SAND, SOME SILT, LITTLE CLAYEY SILT BALLS	
			22		8-8-11-11	7	REDDISH BROWN C-F SAND, TRACE SILT, TRACE GRAVEL	
	5		21		3-5-6-5	8	SAME	
			26		5-5-5-4	9	REDDISH BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
20	6		24		2-1-1-4	10	REDDISH BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL	GS
			28		7-8-10	11	SAME	
	7		29		8-9-12	12	REDDISH BROWN M-F SAND, TRACE SILT	
	8		20		8-11-12	13	REDDISH BROWN C-F SAND, SOME GRAVEL, TRACE SILT	
30	9							
	10		19		10-10-8	14	REDDISH BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
	11		27		8-8-6	15	REDDISH BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
40	12		29		5-8-9	16	REDDISH BROWN FINE SAND, TRACE SILT	
	13							
	14		26		6-6-10	17	REDDISH BROWN C-F SAND, TRACE SILT, TRACE GRAVEL	
50	15		24		9-15-20	18	REDDISH BROWN M-F SAND, SOME SILT, TRACE GRAVEL	
	16	-44.5						
	17		30		6-6-4	19	REDDISH BROWN SILT AND CLAY, LITTLE FINE SAND	
60	18	-50.5	23 / 15		8-10-24	20	REDDISH BROWN C-F SAND, SOME SILT, LITTLE CLAYEY SILT BALLS, LITTLE GRAVEL; GRAVEL, LITTLE REDDISH BROWN C-F SAND, TRACE SILT	
	19	-54.5						
	20		24		23-50-45	21	REDDISH BROWN SILT AND CLAY, SOME GRAVEL	
70	21	-59.5			100/0" 25/0"*			
	22				REC = 82% RQD = 74%	RUN # 1	RED SHALE: MODERATELY FRACTURED	
	23	-64.5						
80	24	-69.5			REC = 90% RQD = 78%	RUN # 2	RED SHALE: MODERATELY FRACTURED	

* 300 LBS. HAMMER USED

BORING NO. 3-756

DATE: 11-16-96

PROJECT: EWR MONORAIL EXTENSION PROJECT

LOCATION: N 680,891 E 577,710

SURFACE ELEVATION: 10.3 | WL ELEVATION: 6.3 | BY: C.L.P. | CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	10.3						
		6.8	18		8-10-10-7	1	FILL – CINDERS	
	1		20		WL 6-5-6-4	2	FILL – SAME REDDISH BROWN C-F SAND, TRACE GRAVEL, TRACE SILT	
		6.3	25		3-3-5-4	3	REDDISH BROWN SILT AND FINE SAND	
	2		19		3-5-14-14	4	REDDISH BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL	
10	3		23		11-8-8-6	5	REDDISH BROWN M-F SAND, LITTLE SILT	
	4		27		4-5-6-4	6	SAME	
			26		4-4-6-4	7	REDDISH BROWN M-F SAND, TRACE SILT	
	5		27		3-5-7-8	8	REDDISH BROWN M-F SAND, TRACE SILT	
			20		5-6-6-11	9	REDDISH BROWN M-F SAND, SOME SILT, TRACE GRAVEL	
20	8		17		10-11-12-15	10	REDDISH BROWN FINE SAND, SOME SILT,	
			20		11-12-8	11	SAME	
	7	-12.2	ROCK REC.		11-6-3	12	GRAVEL (RED SHALE AND WHITE SANDSTONE FRAGS)	
	8		ROCK REC.		3-5-8	13	SAME	
30	9	-19.7						
	10		22		5-7-8	14	REDDISH BROWN SILT AND CLAY, SOME FINE SAND, LITTLE GRAVEL	
	11		18		12-16-14	15	REDDISH BROWN CLAYEY SILT, LITTLE FINE SAND, TRACE GRAVEL	
40	12		19		9-13-16	16	SAME	
	13							
	14		19		13-21-16	17	REDDISH BROWN CLAYEY SILT, LITTLE FINE SAND	
50	15		ROCK REC.		22-25-27	18	REDDISH BROWN CLAYEY SILT, LITTLE FINE SAND, TRACE GRAVEL	
	16							
	17		22		25-45-47	19	SAME	
60	18		22		21-25-26	20	SAME	
	19							
	20		26		45-45-61	21	REDDISH BROWN CLAYEY SILT, SOME FINE SAND, TRACE GRAVEL	
70	21							
	22		26		15-15-20	22	SAME	
	23	-64.7			*25/0" REC = 75% RQD = 58%	RUN # 1	RED SHALE: MODERATELY FRACTURED	
		-66.7						
80	24				REC = 79% RQD = 64%	RUN # 2	RED SHALE: MODERATELY FRACTURED	
	25	-74.7						

* 300 LBS. HAMMER USED

BORING NO. 3-757

DATE: 11-18-96

PROJECT: EWR MONORAIL EXTENSION PROJECT

LOCATION: N 681,054 E 577,798

SURFACE ELEVATION: 10.0 | WL ELEVATION: 6.5 | BY: C.L.P. | CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	10.0						
			28		3-4-8-7	1	FILL – CINDERS	
	1		38		WL 8-9-7-4	2	FILL – SAME	
		4.0	WH		3-3-3-3	3 A	FILL – SAME	
	2		20		4-8-10-11	4	REDDISH BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL	
10	3		22		9-9-10-10	5	REDDISH BROWN FINE SAND, LITTLE SILT	
	4	-4.0	31		9-5-5-4	6	SAME	
			50		5-5-4-5	7	SAME	
	5		30		3-4-3-3	8	REDDISH BROWN SILT, SOME FINE SAND	GS
			30		4-2-2-2	9	SAME	GS
20	6		18		3-8-10-10	10	REDDISH BROWN SILT, SOME FINE SAND, TRACE GRAVEL	GS
			18		10-12-12	11	SAME	
	7	-15.0	18		11-17-17	12	SAME	
	8		18		12-14-13	13	REDDISH BROWN FINE SAND, LITTLE SILT, TRACE GRAVEL	
30	9	-20.0						
	10		21		6-8-6	14	GRAVEL, SOME FINE SAND, LITTLE SILT	
	11	-25.0	23		5-5-8	15	REDDISH BROWN FINE SAND, TRACE SILT	
40	12		31		3-3-3	16	SAME	
	13							
	14		26		6-9-6	17	REDDISH BROWN C-F SAND, TRACE SILT, TRACE GRAVEL	
50	15		19		8-9-7	18	REDDISH BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
	16							
	17		25		11-13-11	19	REDDISH BROWN FINE SAND, TRACE SILT, TRACE GRAVEL	
60	18	-50.0						
	19		16		13-22-82	20	REDDISH BROWN SILT AND CLAY, SOME GRAVEL	
	20		13		28-30-33	21	REDDISH BROWN SILT AND CLAY, LITTLE GRAVEL	
70	21							
	22		20		18-25-31	22	REDDISH BROWN SILT AND CLAY, TRACE GRAVEL	
	23		21		36-36-53	23	REDDISH BROWN SILT AND CLAY	
80	24							
	25		15		20-45-22	24	REDDISH BROWN SILT AND CLAY, LITTLE GRAVEL	
	26		19		70-57-82	25	REDDISH BROWN SILT AND CLAY	
90	27	-80.0			100/0" 25/0"*			
	28				REC = 55% RQD = 1%	RUN # 1	RED SHALE: EXTREMELY FRACTURED BOTTOM 7" FRAGMENTED AND DECOMPOSED	
	29	-86.0						
100	30	-90.0			REC = 80% RQD = 33%	RUN # 2	RED SHALE: MODERATELY FRACTURED BOTTOM 5" FRAGMENTED AND DECOMPOSED	

* 300 LBS. HAMMER USED

NOTES: 1. FOR SITE LOCATION, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR-SL-368.
2. FOR BORING LOCATION PLAN, SEE DRAWING NUMBER EWR-SL-369.

Sheet Of

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
Design Divisions

EWR Monorail NEC Connection

Title

GUIDEWAY FOUNDATION & SUPERSTRUCTURE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS	J. HEGARTY	W. GIBBS
Designed by	Drawn by	Checked by

Date 7/23/97 Scale NONE

Contract Number: EWR-154.001 Drawing Number: EWR-SL-375

FILE NAME: SL-375.DWG

D-48

BORING NO. 3-758

DATE: 11-30-96

PROJECT: EWR MONORAIL EXTENSION PROJECT

LOCATION: N 681,233 E 577,896

SURFACE ELEVATION: 9.6 WL ELEVATION: 6.6 BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL. ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	9.6						
1			34		4-5-5-3	1	FILL – CINDERS	
			45		4-3-4-3	2	FILL – SAME	
		3.6	42		3-3-3-3	3	FILL – SAME	
2			19		3-6-6-5	4	REDDISH BROWN C-F SAND, LITTLE GRAVEL, TRACE SILT	
10 3			17		8-8-7-8	5	REDDISH BROWN C-F SAND AND GRAVEL, TRACE SILT	
4			17		10-7-8-7	6	SAME	
			20 REC		7-8-11-11	7	SAME	
5			25		10-8-6-6	8	REDDISH BROWN M-F SAND, LITTLE SILT	
			23		6-5-6-6	9	REDDISH BROWN FINE SAND, SOME SILT	
20 6			23		5-5-6-5	10	SAME	
7			22		5-6-6	11	SAME	
			22		4-5-5	12	REDDISH BROWN FINE SAND, LITTLE SILT	
8			21		6-6-6	13	REDDISH BROWN FINE SAND, SOME SILT	
30 9								
10			16		9-11-11	14	REDDISH BROWN FINE SAND AND SILT	
		-25.5						
11			25		4-5-6	15	REDDISH BROWN SILT, SOME FINE SAND	
40 12		-30.5	19		7-6-6	16	REDDISH BROWN M-F SAND, TRACE SILT, TRACE GRAVEL	
13								
14			27		3-5-7	17	REDDISH BROWN CLAYEY SILT, TRACE M-F SAND	
50 15								
16			21		7-11-13	18	REDDISH BROWN M-F SAND, TRACE SILT	
17			10 ROD		60-61-70	18	REDDISH BROWN GRAVEL AND C-F SAND, TRACE SILT	
60 18			21		20-22-32	20	REDDISH BROWN M-F SAND, LITTLE SILT	
19								
20			13		23-45-35	21	REDDISH BROWN SILT AND CLAY, SOME C-F SAND, LITTLE GRAVEL	
70 21		-60.5						
22			17		13-35-30	22	REDDISH BROWN SILT AND CLAY, LITTLE GRAVEL, LITTLE C-F SAND	
23			17		25-45-46	23	SAME	
24								
80 25			20		48-75-62	24	REDDISH BROWN SILT, LITTLE FINE SAND	
26			21		23-33-38	25	SAME	
27								
90			20		62-100/5"	26	REDDISH BROWN SILT AND CLAY, LITTLE FINE SAND	
28								
29		-85.5			50/0"*			
100 30		-90.5			REC = 50% RQD = 10%	RUN # 1	RED SHALE: MODERATELY FRACTURED	
31					REC = 100% RQD = 22%	RUN # 2	RED SHALE: MODERATELY FRACTURED	
32		-95.9						

* 300 LBS. HAMMER USED

BORING NO. 3-759

DATE: 11-25-96

PROJECT: EWR MONORAIL EXTENSION PROJECT

LOCATION: N 681,381 E 577,948

SURFACE ELEVATION: 9.4 WL ELEVATION: 8.4 BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL. ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	9.4						
1			43		4-4-3-3	1	FILL – CINDERS, COAL	
		4.4	46		3-2-1-1	2	FILL – CINDERS, COAL	
			22		3-8-7-4	3 A/B	FILL – SAME	
2			17		4-4-6-7	4	FILL – REDDISH BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL	
10 3			15		6-6-7-8	5	FILL – REDDISH BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
		-2.6	21		4-12-6-8	6	FILL – GRAVEL, SOME C-F SAND, LITTLE SILT	
4			29		7-5-4-3	7	REDDISH BROWN FINE SAND, LITTLE SILT	
					3-5-5-5	8	GRAVEL	
5			22		4-4-5-6	9	REDDISH BROWN SILT, LITTLE FINE SAND	
20 6			29		6-7-6-7	10	REDDISH BROWN SILT, TRACE FINE SAND	
			20		8-10-11	11	REDDISH BROWN SILT, TRACE LAYER SILT AND CLAY, TRACE FINE SAND	
7			20		14-17-17	12	REDDISH BROWN M-F SAND, TRACE SILT, TRACE GRAVEL, TRACE SILT BALLS	
8			18		5-5-10	13	REDDISH BROWN SILT, LITTLE FINE SAND	
30 9								
10			23		6-6-8	14	GRAVEL, TRACE C-F SAND, TRACE SILT	
11			26		2-2-2	15	REDDISH BROWN FINE SAND, SOME SILT	GS
40 12					4-6-8	16	GRAVEL	
13								
14		14.2			8-12-16	17	GRAVEL, TRACE FINE SAND, TRACE SILT	
50		-40.6						
15 16			16		16-42-65	18	REDDISH BROWN SILT AND CLAY, LITTLE C-F SAND, LITTLE GRAVEL, TR. FRAGMENTED RED SHALE	
17			16		42-46-56	19	REDDISH BROWN SILT AND CLAY, LITTLE GRAVEL	
60 18			13		23-37-42	20	SAME	
19								
20			16		27-38-75	21	SAME	
70 21								
22			24		30-40-65	22	REDDISH BROWN SILTLY CLAY, TRACE FINE SAND	
23			24		43-40-52	23	SAME	
24								
80 25			20		25-42-47	24	REDDISH BROWN FINE SAND, SOME SILT	
26			15		17-29-39	25	REDDISH BROWN SILT AND CLAY, LITTLE GRAVEL	
27								
90			23		40-55-80	26	REDDISH BROWN CLAYEY SILT	
28								
29		-85.6	15		100/5" *25/0"	27	DISINTEGRATED RED SHALE (GRAVEL, SAND, SILT, CLAY SIZE)	
100 30		-87.6			REC = 74% RQD = 33%	RUN # 1	RED SHALE: MODERATELY TO EXTREMELY FRACTURED, MODERATELY WEATHERED	
31		-92.6						

* 300 LBS. HAMMER USED

BORING NO. 3-760

DATE: 11-19-96

PROJECT: EWR MONORAIL EXTENSION PROJECT

LOCATION: N 681,462 E 577,960

SURFACE ELEVATION: 8.4 WL ELEVATION: 6.4 BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL. ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	8.4						
1			34		7-7-6-6	1	FILL – CINDERS, ASHES, COAL	
			41		5-4-3-6	2 A/B	FILL – SAME	
		2.4	39		10-11-9-9	3	FILL – BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL, TRACE CLAYEY SILT	
2			23		7-8-9-9	4	REDDISH BROWN FINE SAND, LITTLE SILT	
10 3			24		10-10-9-8	5	SAME	
			29		6-4-4-5	6	REDDISH BROWN SILT, TRACE FINE SAND, TRACE GRAVEL	
4			28		3-3-3-3	7	REDDISH BROWN FINE SAND, LITTLE SILT	GS
		-7.6	–		5-5-5-3	8	NO RECOVERY	
5		-9.6	21		3-3-2-2	9	GRAVEL, SOME COARSE SAND, TRACE SILT, LITTLE SILT AND CLAY SLUG	GS
			22		4-4-3-2	10	REDDISH BROWN C-F SAND, LITTLE SILT	GS
20 6			24		3-2-3	11	REDDISH BROWN C-F SAND, TRACE SILT	GS
7			28		2-3-3	12	REDDISH BROWN C-F SAND, TRACE SILT, TRACE GRAVEL	GS
8			31		2-3-2	13	REDDISH BROWN M-F SAND, TRACE SILT	GS
30 9								
10			26		2-2-3	14	REDDISH BROWN FINE SAND, TRACE SILT	GS
11			25		3-4-7	15	REDDISH BROWN M-F SAND, LITTLE SILT, TRACE GRAVEL	
40 12			15		12-13-14	16	REDDISH BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
13		-36.6						
14			16		14-16-21	17	REDDISH BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
50 15								
16			14		27-32-30	18	SAME	
17			20		27-38-50	19	REDDISH BROWN SILT AND CLAY, TRACE GRAVEL	
60 18			22		21-31-32	20	REDDISH BROWN SILT AND CLAY, TRACE GRAVEL	
19								
20			27		16-24-27	21	SAME	
70 21								
22			24		26-34-34	22	REDDISH BROWN SILT AND CLAY	
23			29		24-34-45	23	SAME	
24								
80 25			23		14-21-26	24	REDDISH BROWN SILT AND CLAY, TRACE FINE SAND	
26			18		21-22-30	25	REDDISH BROWN SILT AND CLAY, TRACE GRAVEL	
27								
90			22		21-22-30	26	REDDISH BROWN SILT AND CLAY	
28								
29		-86.6			100/0" *25/0"			
100 30		-91.6			REC = 88% RQD = 55%	RUN # 1	RED SHALE: MODERATELY FRACTURED	
21					REC = 98% RQD = 78%	RUN # 2	RED SHALE: MODERATELY FRACTURED	
32		-98.6						

* 300 LBS. HAMMER USED

NOTES: 1. FOR SITE LOCATION, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR-SL-368.
2. FOR BORING LOCATION PLAN, SEE DRAWING NUMBER EWR-SL-369.

Sheet Of

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
Design Divisions

EWR Monorail NEC Connection

Title

GUIDEWAY FOUNDATION & SUPERSTRUCTURE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS Designed by | J. HEGARTY Drawn by | W. GIBBS Checked by

Date 7/23/97 Scale NONE

Contract Number EWR-154.001 Drawing Number EWR-SL-376

FILE NAME: SL-376.DWG

BORING NO. 3-761 | DATE 11-29-96 | PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 681,512 E 578,037 | SURFACE ELEVATION 8.6 | W.L. ELEVATION 6.1 | BY: C.L.P. CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	8.6						
1		36 (9)		4-5-5-6	1 A B	MISC. FILL – CINDERS, SILT, PEAT	
		24		9-5-5-3	2	MISC. FILL – REDDISH BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
2	2.6	25		4-4-11-8	3	MISC. FILL – C-F BROWN SAND, CINDERS, LITTLE GRAVEL, LITTLE SILT	
	2.1	19		2-3-5-5	4 A B	MISC. FILL – SAME	
3	-1.5	15		3-6-14-16	5	SAND, GRAY ORGANIC CLAY, SOME BROWN PEAT, TRACE FINE SAND	
	-2.0	22		3-7-7-7	6 A B	BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
4		24		5-6-3-4	7	BROWN GRAY SILT AND CLAY	
5		25		4-5-5-6	8	REDDISH BROWN C-F SAND, TRACE SILT, TRACE GRAVEL	
		24		4-5-5-7	9	SAME	
6		25		4-5-5-8	10	SAME	
		23		5-8-7	11	REDDISH BROWN M-F SAND, TRACE SILT	
7		25		9-8-10	12	SAME	
8	-18.0	24		12-9-7	13	SAME	

BORING NO. 3-762 | DATE 11-23-96 | PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 681,569 E 578,058 | SURFACE ELEVATION 8.4 | W.L. ELEVATION 5.9 | BY: C.L.P. CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	8.4						
1		16		4-7-8-10	1	MISC. FILL – BROWN M-F SAND, TRACE SILT, CINDERS, GRAVEL	
		19		24-16-12-12	2	MISC. FILL – BROWN M-F SAND, TRACE SILT, WOOD, CINDERS, GRAVEL	
2	0.9	24		9-7-6-5	3	MISC. FILL – CINDERS, GRAVEL	
		22		3-3-2-X	4 A B	MISC. FILL – CINDERS DARK BROWN DECOMPOSED PEAT, LITTLE ORGANIC CLAY PARTINGS	
3	0.4	22 (18)		PRESSED	Top Sample	BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL, PEAT FIBERS	
		23		7-7-6-4	6	REDDISH BROWN C-F SAND AND GRAVEL, LITTLE SILT SAME	
4		22		5-4-5-8	7	REDDISH BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
		18		4-4-7-8	8	REDDISH BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
5	-9.3	22		8-6-8-8	9 A B	REDDISH BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL, TRACE SILT AND CLAY SLUGS REDDISH BROWN CLAY AND SILT	
		21		2-2-2-3	10	REDDISH BROWN CLAY AND SILT, TRACE GRAVEL	
6	-14.1	18		11-8-9	11	REDDISH BROWN SILT AND CLAY, LITTLE FINE SAND	
7	-16.1	26		5-6-6	12	REDDISH BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
8				12-13-14	13	GRAVEL, LITTLE REDDISH BROWN SILT AND CLAY	
9	-21.6	24		6-3-4	14	REDDISH BROWN SILT AND CLAY REDDISH BROWN M-F SAND, TRACE SILT	OS
10		22		13-20-27	15	REDDISH BROWN M-F SAND, TRACE SILT, LITTLE GRAVEL, TRACE SILT AND CLAY BALLS	
11							
12		23		16-20-21	16	REDDISH BROWN FINE SAND, TRACE SILT	
13	-36.8						
14		24		10-17-20	17	REDDISH BROWN SILT AND CLAY	
15		15		23-46-47	18	REDDISH BROWN SILT AND CLAY, LITTLE GRAVEL	
16							
17		21		31-44-46	19	REDDISH BROWN CLAYEY SILT, TRACE GRAVEL	
18							
19		19		23-31-39	20	REDDISH BROWN CLAYEY SILT, TRACE FINE SAND	
20		22		26-31-36	21	SAME	
21		21		26-27-26	22	REDDISH BROWN CLAYEY SILT	
22		22		26-33-34	23	SAME	
23							
24		27		16-21-26	24	REDDISH BROWN SILT AND CLAY	
25	-76.6						
26		22		19-30-32	25	REDDISH BROWN FINE SAND, SOME SILT	
27	-81.6						
28		23		20-25-30	26	REDDISH BROWN SILT AND CLAY TRACE FINE SAND	
29	-86.6			* 50/0"			
30	-91.6			REC = 38% RQD = 0%	RUN # 1	RED SHALE: EXTREMELY TO MODERATELY FRACTURED, SLIGHTLY WEATHERED	
31				REC = 100% RQD = 77%	RUN # 2	RED SHALE: TOP 5" EXTREMELY FRACTURED, MODERATELY FRACTURED	
32	-98.6						

* 300 LBS. HAMMER USED

BORING NO. 3-763 | DATE 11-29-96 | PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 681,597 E 578,016 | SURFACE ELEVATION 8.3 | W.L. ELEVATION 6.8 | BY: C.L.P. CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	8.3						
1		38		3-4-5-4	1	FILL – CINDERS	
		26		7-8-12-7	2 A B	FILL – SAME FILL – BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
2	0.8	37		5-5-3-3	3	MISC. FILL – CINDERS, M-F SAND, SILT AND CLAY, GRAVEL	
		30		4-3-2-1	4 A B	FILL – CINDERS BROWN DECOMPOSED PEAT, LITTLE ORGANIC CLAY PARTINGS	
3	-1.8	21 (18)		4-4-6-8	5 A B	BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL, TRACE PEAT FIBERS SAME	
		22		4-5-7-8	6 A B	REDDISH BROWN SILT AND CLAY, LITTLE C-F SAND, TRACE GRAVEL REDDISH BROWN CLAY AND SILT, TRACE FINE SAND	
4		23		6-5-4-9	7	SAME	
5	-7.2	23		10-11-11-11	8	REDDISH BROWN CLAY SILT, TRACE FINE SAND	
		24		5-7-7-8	9	REDDISH BROWN C-F SAND, TRACE SILT, TRACE GRAVEL	
6	-11.7	21		8-7-8-8	10	SAME	
		22		5-6-5	11 A B	REDDISH BROWN SILTY CLAY, TRACE FINE SAND REDDISH BROWN C-F SAND, LITTLE SILT	
7		17		6-7-10	12	REDDISH BROWN SILT AND CLAY, TRACE FINE SAND,TRACE GRAVEL	
8	-18.2	16		6-6-8	13	SAME	

BORING NO. 3-764 | DATE 11-21-96 | PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 681,690 E 578,116 | SURFACE ELEVATION 8.2 | W.L. ELEVATION 5.4 | BY: C.L.P. CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	8.2						
1		26		3-6-7-8	1	FILL – CINDERS, ASHES	
		17		8-9-9-10	2	FILL – BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL	
2		18		10-10-10-9	3	FILL – BROWN C-F SAND, LITTLE SILT, TRACE GRAVEL	
		16		6-6-5-5	4	FILL – SAME	
3	-1.6	18		2-3-2-3	5 A B	FILL – BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL DECOMPOSED DARK BROWN PEAT	OS
	-1.9	24 (18)		PRESSED	6a Top 6a Bot	BROWN-GRAY M-F SAND, SOME SILT, TRACE PEAT FIBERS, SOME GRAVEL ON TOP OF SPOON BROWN C-F SAND, LITTLE SILT, TRACE FIBERS, TRACE PEAT FIBERS	
4		18		2-4-10-10	7	BROWN-GRAY C-F SAND, TR. SILT, TR. CLAYEY SILT BALLS, TR. GRAVEL, TR. PEAT FIBERS	
		24		6-10-6-7	8	REDDISH BROWN M-F SAND, LITTLE SILT	
5	-9.4	17		6-9-8-13	9 A B	REDDISH BROWN M-F SAND, LITTLE GRAVEL REDDISH BROWN SILT AND CLAY, TRACE GRAVEL	
		23		4-5-8-9	10	REDDISH BROWN CLAY AND SILT, TRACE GRAVEL	
6		19		10-14-13	11	REDDISH BROWN CLAY AND SILT, LITTLE GRAVEL (RED SHALE)	
7	-14.4	10		17-87-57	12	REDDISH BROWN C-F SAND, SOME SILT, SOME GRAVEL	
8	-16.9	18		9-11-23	13	REDDISH BROWN SILT AND CLAY, TRACE GRAVEL	
9		17		18-27-33	14	REDDISH BROWN SILT AND CLAY, TRACE FINE SAND, TRACE GRAVEL	
10	-26.9						
11		15		47-72-85	15	REDDISH BROWN C-F SAND, SOME SILT, SOME GRAVEL (RED SHALE)	
12		16		22-29-92	16	REDDISH BROWN C-F SAND, TRACE SILT, TRACE GRAVEL	
13							
14		21.8		18-24-24	17	REDDISH BROWN FINE SAND, TRACE SILT	
15		24		18-18-24	18	REDDISH BROWN FINE SAND, LITTLE SILT, TRACE GRAVEL	
16							
17		22		20-21-22	19	REDDISH BROWN FINE SAND, LITTLE SILT	
18	-51.0						
19		15		17-24-37	20	REDDISH BROWN SILT AND CLAY, LITTLE GRAVEL	
20		18		47-48-76	21	REDDISH BROWN CLAYEY SILT, LITTLE FINE SAND	
21							
22		18		31-50-45	22	REDDISH BROWN CLAYEY SILT	
23		21		24-46-42	23	REDDISH BROWN SILT AND CLAY	
24							
25		22		44-34-36	24	REDDISH BROWN CLAYEY SILT	
26		24		20-25-30	25	REDDISH BROWN CLAYEY SILT, LITTLE FINE SAND, TRACE GRAVEL	
27							
28		17		26-45-32	26	REDDISH BROWN SILT AND CLAY, TRACE GRAVEL	
29							
30	-91.8	22		18-38-44	27	SAME	
31	-95.4			25/0" *			
32				REC = 46% RQD = 0%	RUN # 1	RED SHALE: MODERATELY FRACTURED	
33	-101.8			REC = 82% RQD = 72%	RUN # 2	RED SHALE: MODERATELY TO EXTREMELY FRACTURED	

* 300 LBS. HAMMER USED

NOTES: 1. FOR SITE LOCATION, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR-SL-368.
2. FOR BORING LOCATION PLAN, SEE DRAWING NUMBER EWR-SL-369.

Sheet Of

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
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EWR Monorail NEC Connection

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GUIDEWAY FOUNDATION & SUPERSTRUCTURE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS Designed by | J. HEGARTY Drawn by | W. GIBBS Checked by

Date 7/23/97 Scale NONE

Contract Number EWR-154.001 Drawing Number EWR-SL-377

TILE NAME: SL-377.DWG

D-50

D-51

BORING NO. 3-765

DATE 5-21-97

PROJECT EWR: MONORAIL - NEC CONNECTION

LOCATION N 679,717 E 578,120

SURFACE ELEVATION 13.1 | WL ELEVATION 6.0 | BY: C.L.P. CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	13.1						
		10		HAND AUGER	1	FILL-DARK BROWN C-F SAND, TRACE SILT, TRACE GRAVEL	
1		8		HAND AUGER	2	FILL-BROWN M-F SAND, TRACE SILT TRACE GRAVEL	
2		10		HAND AUGER	3	FILL-DARK BROWN C-F SAND, TR. SILT, TR. GRAVEL	
		16		▽WL 14-8-5-3	4	FILL-DARK BROWN C-F SAND, LITTLE SILT, TR. GRAVEL	
3	0.6	16		4-10-15-10	5	FILL-SAME	
		21		7-10-13	6	FILL-SAME	
4		23		5-6-4	7	REDDISH BROWN M-F SAND, TRACE SILT, TRACE GRAVEL	
5		24		6-7-8	8	SAME	
		23		5-5-5	9	SAME	
6		26		5-6-8	10	REDDISH BROWN M-F SAND, TR. SILT	
7		26		2-5-6	11	SAME	
8		24		3-4-6	12	SAME	
9		26		5-6-8	13	REDDISH BROWN M-F SAND, TR. SILT	
10							
11		27		5-9-9	14	REDDISH BROWN FINE SAND, LITTLE SILT	
12	-27.0	25		5-7-10	15	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
13							
14		17		6-4-7	16	REDDISH BROWN SILT, LITTLE M-F SAND	
15		19		5-6-10	17	REDDISH BROWN CLAYEY SILT	
16							
17		16		25-25-27	18	REDDISH BROWN SILT & CLAY, LITTLE GRAVEL	
18	-47.0						
19		21		10-11-12	19	REDDISH BROWN FINE SAND, LITTLE SILT	
20	-52.0	15		45-35-36	20	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
21		15		27-33-50	21	SAME	
22							
23		17		17-28-28	22	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
24	-67.0	13		47-76-52	23	RED SHALE C-F SAND, LITTLE GRAVEL, LITTLE SILT & CLAY	
25	-72.0	11		100/3, 50/3*	24	DISINTEGRATED RED SHALE (GRAVEL, SAND, SILT SIZE)	
26	-72.5			REC = 50% RQD = 15%	RUN #1	RED SHALE: TO 10" EXTREMELY FRACTURED REST MODERATELY FRACTURED	
27	-77.5						
28				REC = 86% RQD = 19%	RUN #2	RED SHALE: MODERATELY FRACTURED, SLIGHTLY WEATHERED	
29	-82.5						

LABORATORY TESTING

* 300 LBS. HAMMER USED

BORING NO. 3-766

DATE 5-12-97

PROJECT EWR: MONORAIL - NEC CONNECTION

LOCATION N 679,666 E 577,935

SURFACE ELEVATION 12.9 | WL ELEVATION 5.7 | BY: C.L.P. CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	12.9						
		8		HAND AUGER	1	FILL-CRUSHED ROCK, SOME BROWN C-F SAND, TR. SILT	
1		14		HAND AUGER	2	FILL-DARK BROWN M-F SAND, TR. SILT, TR. GRAVEL	
		21		HAND AUGER	3	FILL-BROWN-GRAY M-F SAND, LITTLE SILT, TR. CLAY & SILT PARTINGS, TR. GRAVEL	
2		21		▽WL 1-2-3-3	4	FILL-BROWN M-F SAND, SOME SILT, TR. GRAVEL	
		25		3-3-5-6	5	FILL-REDDISH BROWN M-F SAND, SOME SILT, TR. GRAVEL	
3		31		4-5-8	6	FILL-REDDISH BROWN M-F SAND, TR. SILT, TR. GRAVEL	GS
4		29		2-3-5	7	FILL-SAME	GS
5		25		3-4-6	8	FILL-REDDISH BROWN C-F SAND, SOME SILT, TR. GRAVEL	
		21		11-10-7	9	FILL-REDDISH BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL	
6	-9.7	20		13-12-6	10	FILL-SAME	
7		27		6-6-7	11	REDDISH BROWN FINE SAND, LITTLE SILT, TR. GRAVEL	
8		30		4-3-2	12	REDDISH BROWN FINE SAND, SOME SILT	
9	-17.2			5-7-32	13	REDDISH BROWN CLAYEY SILT	
10							
11		16		29-16-17	14	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
12		15		13-17-22	15	SAME	
13	-32.2						
14		11		11-28-18	16	GRAVEL, REDDISH BROWN FINE SAND, LITTLE SILT	
15	-37.2	15		31-28-30	17	REDDISH BROWN CLAYEY SILT	
16							
17		19		19-21-30	18	REDDISH BROWN FINE SAND, LITTLE SILT	
18							
19	-52.2	21		17-21-23	19	REDDISH BROWN FINE SAND, TR. SILT	
20		17		13-18-29	20	REDDISH BROWN SILT & CLAY	
21							
22		22		18-28-48	21	SAME	
23	-62.2						
24	-67.2	12		36-59-97	22	DISINTEGRATED RED SHALE (GRAVEL, SAND SILT SIZE)	
				100/0, 50/0*			
25				REC = 98% RQD = 82%	RUN #1	RED SHALE: SLIGHTLY TO MODERATELY FRACTURED	
26	-72.1						
27	-77.1			REC = 93% RQD = 42%	RUN #2	RED SHALE: MODERATELY FRACTURED	

* 300 LBS. HAMMER USED

BORING NO. 3-767

DATE 5-27-97

PROJECT EWR: MONORAIL - NEC CONNECTION

LOCATION N 679,651 E 577,748

SURFACE ELEVATION 11.5 | WL ELEVATION 6.5 | BY: C.L.P. CHECKED BY: W.G.

(FEET) DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	11.5						
		9		HAND AUGER	1	FILL-REDDISH BROWN C-F SAND, TR. SILT, TR. GRAVEL	
1		8		HAND AUGER	2	FILL-SAME	
		21		▽WL HAND AUGER	3	FILL-REDDISH BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL	
2		17		2-3-5-4	4	FILL-SAME	
		19		4-4-5-7	5	FILL-SAME	
3		20		4-6-8	6	FILL-REDDISH BROWN C-F SAND, TR. GRAVEL	
4		24		4-4-4	7	FILL-REDDISH BROWN C-F SAND, LITTLE SILT, TR. GRAVEL	GS
5	-6.0	22		5-8-7	8	FILL-SAME	
		31		4-4-5	9	REDDISH BROWN FINE SAND, LITTLE SILT, TR. GRAVEL	
6		15		9-20-19	10	REDDISH BROWN C-F SAND, LITTLE SILT, LITTLE SILT & CLAY LAYERS, LITTLE GRAVEL	
7	-11.0	16		8-10-12	11	REDDISH BROWN SILT & CLAY, LITTLE GRAVEL	
8		14		8-10-10	12	SAME	
9	-18.5	16		5-8-12	13	BROWN C-F SAND, LITTLE SILT & CLAY, LITTLE WEATHERED GRAVEL REDDISH BROWN FINE SAND, SOME SILT, LITTLE GRAVEL	
10							
11		24		9-11-15	14	REDDISH BROWN FINE SAND, LITTLE SILT	
12		22		12-16-20	15	SAME	
13	-33.5						
14		17		15-17-21	16	REDISH BROWN SILT & CLAY, TR. GRAVEL	
15		18		18-26-37	17	REDDISH BROWN CLAYEY SILT, TR. GRAVEL	
16	-43.5						
17		21		50-52-59	18	REDDISH BROWN SILT	
18	-48.8						
19		17		17-27-42	19	REDISH BROWN SILT & CLAY, TR. GRAVEL	
20	-53.8	17		100/2, 50/1*	20	DISINTEGRATED RED SHALE: (GRAVEL, SAND, SILT SIZE)	
	-53.8			REC = 97% RQD = 90%	RUN #1	RED SHALE: MODERATELY FRACTURED	
21	-58.8						
22				REC = 97% RQD = 72%	RUN #2	RED SHALE: MODERATELY FRACTURED	
	-63.8						

* 300 LBS. HAMMER USED

NOTES: 1. FOR SITE LOCATION, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR-SL-368.
2. FOR BORING LOCATION PLAN, SEE DRAWING NUMBER EWR-SL-369.

Sheet Of

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
Design Divisions

EWR Monorail NEC Connection

Title

GUIDEWAY FOUNDATION & SUPERSTRUCTURE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS Designed by | J. HEGARTY Drawn by | W. GIBBS Checked by

Date 7/23/97 Scale NONE

Contract Number EWR-154.001 Drawing Number EWR-SL-378

FILE NAME: SL-378.DWG

BORING NO. 3-768 | DATE 5-29-97 | PROJECT EWR: MONORAIL - NEC CONNECTION

LOCATION N 679,677 E 577,663 | SURFACE ELEVATION 11.1 | WL ELEVATION 6.1 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET) (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	11.1						
		8		HAND AUGER	1	FILL-REDDISH BROWN C-F SAND, TR. SILT, TR. GRAVEL	
		8		HAND AUGER	2	FILL-SAME	
		20		HAND AUGER	3	FILL-REDDISH BROWN C-F SAND, SOME SILT, TR. GRAVEL	
		21		▽WL 14-8-5-3	4	FILL-REDDISH BROWN C-F SAND, LITTLE SILT, TR. GRAVEL	
		19		4-10-15-10	5	FILL-SAME	
10		11		7-10-13	6	FILL-REDDISH BROWN C-F SAND, TR. SILT, TR. GRAVEL	
	-1.5						
		16		5-8-4	7	REDDISH BROWN SILT & CLAY, LITTLE GRAVEL	
	-6.5	17		6-7-8	8	SAME	
	-9.0	23		5-5-5	9	REDDISH BROWN SILT	
20		22		5-6-8	10	REDDISH BROWN FINE SAND, TR. SILT	
		21		2-5-8	11	SAME	
		22		3-4-6	12	SAME	
30		24		5-6-8	13	REDDISH BROWN FINE SAND, LITTLE SILT	
		22		5-9-9	14	SAME	
	-34.0	21		5-7-10	15	REDDISH BROWN FINE SAND, LITTLE SILT, TR. 3" LAYER SILT & CLAY	
		23		6-4-7	16	REDDISH BROWN SILT & CLAY	
50		21		5-8-10	17	REDDISH BROWN SILT & CLAY	
		16		25-25-27	18	REDISHN BROWN SILT & CLAY, TR. GRAVEL	
60	-49.0	11		10-11-12	19	GRAVEL, REDDISH BROWN M-F SAND, LITTLE SILT	
	-54.0	12		45-35-36	20	RED SHALE: (GRAVEL, SOME C-F SAND, LITTLE SILT & CLAY)	
70	-59.0			100/0" 50/0"*			
	-64.0			REC = 81% RQD = 60%	RUN #1	RED SHALE: SLIGHTLY TO MODERATELY FRACTURED	
	-69.0			REC = 98% RQD = 60%	RUN #2	RED SHALE: MODERSATELY FRACTURED	
80							

*300 LBS. HAMMER USED

BORING NO. 3-769 | DATE 5-30-97 | PROJECT EWR: MONORAIL - NEC CONNECTION

LOCATION N 679,732 E 577,588 | SURFACE ELEVATION 9.4 | WL ELEVATION 6.5 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET) (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	9.4						
		14		HAND AUGER	1	FILL-DARK BROWN M-F SAND, LITTLE SILT, TR. GRAVEL	
		19		▽WL HAND AUGER	2	FILL-DARK BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL	
		19		10-9-5-5	3	FILL-REDDISH BROWN C-F SAND, TR. SILT, TR. GRAVEL	
		19		5-4-4-5	4	FILL-SAME	
10		20		5-4-5-5	5	FILL-REDDISH BROWN C-F SAND, LITTLE SILT, TR. GRAVEL	
	-2.7	21		3-5-5-5	6	FILL-SAME	
		30		3-3-3-3	7	REDDISH BROWN FINE SAND, SOME SILT	GS
		39		2-3-4	8A	REDDISH BROWN SAND & SILT, SOME FINE SAND	GS
		23		4-5-6	8B	REDDISH BROWN M-F SAND, TR. SILT	GS
20	-10.7	23		4-5-6	9	REDDISH BROWN C-F SAND, TR. SILT, TR. GRAVEL	
		18		4-10-12	10	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
	-15.7	20		7-13-18	11	REDDISH BROWN CLAYEY SILT, TR. FINE SAND	
		20		10-14-16	12	REDDISH BROWN SILT	
30		21		12-12-18	13	SAME	
		25		11-18-20	14	SAME	
40	-30.7	25		7-7-9	15	REDDISH BROWN SILT & CLAY	
		22		14-18-21	16	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
50	-40.7	20		15-25-29	17	REDDISH BROWN SILT	
	-45.7	18		7-10-19	18	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
60	-50.7	10		100/2" 50/1"*	19	DISINTEGRATED RED SHALE (GRAVEL, SAND, SILT SIZE)	
	-51.0			REC = 76% RQD = 52%	RUN #1	RED SHALE: TOP 10" EXTREMELY FRACTURED MODERATELY FRACTURED	
	-56.0			REC = 98% RQD = 62%	RUN #2	RED SHALE: MODERATELY FRACTURED	
70	-60.7						

*300 LBS. HAMMER USED

BORING NO. 3-770 | DATE 5-29-97 | PROJECT EWR: MONORAIL - NEC CONNECTION

LOCATION N 679,767 E 577,607 | SURFACE ELEVATION 8.6 | WL ELEVATION 7.2 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET) (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	8.6						
		22		▽WL HAND AUGER	1	FILL-DARK BROWN FINE SAND, SOME SILT, TR. GRAVEL	
		14		2-9-16-19	2	FILL-REDDISH BROWN C-F SAND, SOME GRAVEL, TR. SILT	
		18		13-13-13-13	3	FILL-REDDISH BROWN C-F SAND, LITTLE GRAVEL, TR. SILT	
		21		8-9-11-11	4	FILL-REDDISH BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL	
10		19		3-6-8-7	5	FILL-SAME	
		22		3-4-5-5	6	FILL-REDDISH BROWN C-F SAND, TR. SILT, TR. GRAVEL	
	-6.5	23		3-3-2-3	7	FILL-SAME	
		17		3-2-4	8	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
		16		5-5-9	9	SAME	
20		9		9-15-16	10	SAME	
	-14.0	16		9-12-13	11	REDDISH BROWN SILT, LITTLE FINE SAND	
		25		6-7-12	12	SAME	
30	-21.5	18		9-11-10	13	REDDISH BROWN CLAYEY SILT	
		18		8-10-12	14	REDDISH BROWN SILT & CLAY	
40	-33.0	18		8-12-17	15	SAME	

BORING NO. 3-773 | DATE 6-3-97 | PROJECT EWR: MONORAIL - NEC CONNECTION

LOCATION N 679,607 E 577,823 | SURFACE ELEVATION 12.1 | WL ELEVATION NR | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET) (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	12.1						
	10.6	11		HAND AUGER	1	FILL-DARK BROWN C-F SAND, LITTLE GRAVEL, TR. SILT	

BORING NO. 3-771 | DATE 5-28-97 | PROJECT EWR: MONORAIL - NEC CONNECTION

LOCATION N 679,707 E 577,702 | SURFACE ELEVATION 7.9 | WL ELEVATION 7.2 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET) (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	7.9						
		19		▽WL HAND AUGER	1	FILL-REDDISH BROWN C-F SAND, LITTLE GRAVEL, TR. SILT	
		18		2-2-3-3	2	FILL-REDDISH BROWN C-F SAND, LITTLE GRAVEL, LITTLE SILT	
		25		3-3-3-4	3	FILL-REDDISH BROWN C-F SAND, TR. SILT, TR. GRAVEL	
		33		8-7-2-1	4A	FILL-REDDISH BROWN C-F SAND, LITTLE SILT, TR. GRAVEL	
		37		1-8-10-10	4B	FILL-REDDISH BROWN FINE SAND, LITTLE SILT	
10	-2.1	18			5	FILL-REDDISH BROWN CLAYEY SILT, TR. M-F SAND	
		21		4-3-4	6	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
		20		5-6-8	7	REDISH BROWN CLAYEY SILT	
	-9.7	20		11-13-8	8	REDDISH BROWN CLAYEY SILT, TR. FINE SAND	
20		25		11-10-13	9	REDDISH BROWN FINE SAND, LITTLE SILT	
		24		13-13-17	10	SAME	
		24		12-14-15	11	SAME	
		26		13-15-15	12	SAME	
30		23		11-13-18	13	SAME	
		24		11-14-16	14	SAME	
40	-32.2						
	-33.7	22		9-11-17	15	REDDISH BROWN SILT & CLAY	

BORING NO. 3-772 | DATE 5-28-97 | PROJECT EWR: MONORAIL - NEC CONNECTION

LOCATION N 679,686 E 577,819 | SURFACE ELEVATION 7.9 | WL ELEVATION 6.9 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET) (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	7.9						
		15		▽WL HAND AUGER	1	FILL-REDDISH BROWN M-F SAND, LITTLE SILT, TR. GRAVEL	
		18		2-4-4-5	2	FILL-REDDISH BROWN C-F SAND, LITTLE SILT, LITTLE GRAVEL	
		28		1-2-3-5	3	FILL-REDDISH BROWN M-F SAND, TR. SILT, TR. GRAVEL	
	-0.1	29		3-3-3-4	4	FILL-REDDISH BROWN M-F SAND, LITTLE SILT	
10		31		2-2-2-2	5	REDDISH BROWN FINE SAND, LITTLE SILT	
		33		2-2-2	6	SAME	
	-7.1	29		2-2-5	7	SAME	
		17		4-11-12	8	REDDISH BROWN SILT & CLAY, LITTLE GRAVEL	
		15		9-12-15	9	SAME	
20	-14.7	18		7-10-25	10	SAME	
		21		5-7-10	11	REDDISH BROWN FINE SAND, LITTLE SILT	
				7-10-12	12	REDDISH BROWN SILT, LITTLE FINE SAND	
				12-15-22	13	SAME	
				11-21-23	14	SAME	
40	-33.7	22		11-18-24	15	REDDISH BROWN FINE SAND, TR. SILT	

BORING NO. 3-773A | DATE 6-3-97 | PROJECT EWR: MONORAIL - NEC CONNECTION

LOCATION N 679,611 E 577,823 | SURFACE ELEVATION 12.1 | WL ELEVATION 7.1 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET) (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	12.1						
		8		HAND AUGER	1	FILL-DARK BROWN C-F SAND, LITTLE GRAVEL, TR. SILT	
		10		HAND AUGER	2	FILL-REDDISH BROWN M-F SAND, TR. SILT, TR. GRAVEL	
		17		▽WL HAND AUGER	3	FILL-REDDISH BROWN C-F SAND, LITTLE SILT, TR. GRAVEL	
		18		3-4-5-8	4	FILL-SAME	
		21		4-7-5-5	5	FILL-REDDISH BROWN C-F SAND, LITTLE SAND, TR. SILT	
10		29		4-4-4	6	REDDISH BROWN M-F SAND, TR. SILT, TR. GRAVEL	
	-0.5						
		29		2-2-3	7	REDDISH BROWN C-F SAND, TR. SILT TR. GRAVEL	
		21		7-7-8	8	REDDISH BROWN C-F SAND, SOME GRAVEL, LITTLE SILT	
		25		3-3-4	9	REDDISH BROWN FINE SAND, SOME SILT	
20		27		3-4-5	10	REDDISH BROWN FINE SAND, LITTLE SILT	
		30		4-4-5	11	SAME	
		33		4-3-6	12	REDDISH BROWN FINE SAND, SOME SILT	
30	-17.0						
		14		10-7-7	13	REDDISH BROWN SILT & CLAY, LITTLE GRAVEL, TR. C-F SAND	
		17		9-12-18	14	REDDISH BROWN SILT & CLAY, LITTLE GRAVEL	
40	-28.0	24		10-14-15	15	REDDISH BROWN FINE SAND, SOME SILT	
	-33.0						
		17		19-23-19	16	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
50	-38.0	19		30-30-33	17	REDDISH BROWN FINE SAND, TR. SILT	
	-43.0						
		16		19-31-43	18A	REDDISH BROWN SILT & CLAY	
		25			18B	REDDISH BROWN SILT	
60		27		31-33-35	19	SAME	
	-53.0			100/0" 25/0"*			
				REC = 86% RQD = 56%	RUN #1	RED SHALE: MODERATELY FRACTURED	
70	-58.0						
				REC = 80% RQD = 50%	RUN #2	RED SHALE: MOERATELY FRACTURED, SLIGHTLY WEATHERED	
	-63.0						

*300 LBS. HAMMER USED

NOTES: 1. FOR SITE LOCATION, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR-SL-368.
2. FOR BORING LOCATION PLAN, SEE DRAWING NUMBER EWR-SL-369.

Sheet Of

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
Design Divisions

EWR Monorail NEC Connection

Title

GUIDEWAY FOUNDATION & SUPERSTRUCTURE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS | J. HEGARTY | W. GIBBS
Designed by | Drawn by | Checked by

Date 7/23/97 Scale NONE

Contract Number EWR-154.001 Drawing Number EWR-SL-379

FILE NAME: SL-379.DWG

CORE DATUM X

BORING NO. 3-774 — DATE 5-7-97 — PROJECT EWR: MONORAIL – NEC CONNECTION

LOCATION N 679,611 E 577,922 — SURFACE ELEVATION 13.8 — WL ELEVATION 6.3 — BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	13.8	9		HAND AUGER	1	FILL–BROWN C–F SAND, TR. SILT, TR. GRAVEL	
	1		18		HAND AUGER	2	FILL–BROWN C–F SAND, SOME SILT, LITTLE CLAYEY SILT, TR. GRAVEL	
	2		20		HAND AUGER	3	FILL–BROWN C–F SAND, SOME SILT, TR. GRAVEL	
			19		WL 2-1-2-3	4	FILL–BROWN M–F SAND, LITTLE SILT, TR. CLAYEY SILT, TR. GRAVEL	
10	3	3.8	17		2-4-6-8	5	FILL–REDDISH BROWN C–F SAND, LITTLE SILT, LITTLE GRAVEL	
			24		3-4-5	6	REDDISH BROWN M–F SAND, LITTLE SILT, TR. GRAVEL	
	4		26		2-4-5	7	SAME	
	5		24		4-5-6	8	REDDISH BROWN M–F SAND, LITTLE SILT, TR. GRAVEL	
20	6		26		3-5-6	9	REDDISH BROWN M–F SAND, TR. SILT	
	7		23		4-6-7	10	SAME	
	8		26		8-8-9	11	SAME	
			26		4-5-7	12	SAME	
30	9		15		5-6-7	13	REDDISH BROWN M–F SAND, TR. SILT, TR. GRAVEL	
	10							
	11		18		18-21-24	14	REDDISH BROWN M–F SAND, TR. SILT	
40	12	-26.2	14		7-9-14	15	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
	13							
	14		17		5-9-14	16	SAME	
50	15							
	16		15		18-20-29	17	SAME	
	17	-41.2	17		18-23-29	18	REDDISH BROWN SILT, SOME FINE SAND	
60	18	-46.2	19		18-23-35	19	REDDISH BROWN FINE SAND, LITTLE SILT	
	19							
	20	-51.2	20		12-25-49	20	REDDISH BROWN CLAYEY SILT	
70	21		21		20-30-33	21	REDDISH BROWN SILT & CLAY	
	22	-61.2			100/3, 50/0*	22	DISINTEGRATED RED SHALE: (GRAVEL, SAND, SILT SIZE)	
		-61.6	13		REC = 20% 50/0* RQD = 0%	RUN 1	RED SHALE: 2" RECOVERY (1 PIECE)	
	23	-62.5			REC = 70% RQD = 50%	RUN #2	RED SHALE: MODERATELY FRACTURED	
80	24							
	25	-67.5			REC = 12% RQD = 0%	RUN #3	RED SHALE: 5" RECOVERY (MODERATELY FRACTURED)	
	26	-72.5						
	27	-75.5			REC = 90% RQD = 12%	RUN #4	RED SHALE: MODERATELY FRACTURED	

* 300 LBS. HAMMER USED

BORING NO. 3-775 — DATE 5-14-97 — PROJECT EWR: MONORAIL – NEC CONNECTION

LOCATION N 679,736 E 578,019 — SURFACE ELEVATION 12.7 — WL ELEVATION 6.7 — BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	12.7	11		HAND AUGER	1	FILL–DARK BROWN C–F SAND, LITTLE GRAVEL, TR. SILT	
	1		15		HAND AUGER	2	FILL–REDDISH BROWN C–F SAND, LITTLE GRAVEL, TR. SILT	
	2		18		HAND AUGER	3	FILL–REDDISH BROWN C–F SAND, LITTLE SILT, TR. GRAVEL	
			17		WL 1-2-2-2	4	FILL–REDDISH BROWN C–F SAND, SOME SILT, TR. CLAYEY SILT, TR. GRAVEL	
10	3		25		4-5-5-5	5	FILL–REDDISH BROWN C–F SAND, TR. SILT, TR. GRAVEL	
		0.2	19		4-5-5	6	FILL–REDDISH BROWN C–F SAND, LITTLE SILT, TR. GRAVEL	
	4		30		1-2-3	7	REDDISH BROWN M–F SAND, TR. SILT	
	5		27		3-4-6	8	SAME	
20	6		26		5-19-14	9	SAME	
	7		27		4-5-8	10	SAME	
	8		25		7-7-8	11	SAME	
			27		5-5-6	12	REDDISH BROWN FINE SAND, LITTLE SILT	
30	9		26		5-7-11	13	SAME	
	10							
	11		18		27-28-28	14	REDDISH BROWN M–F SAND, LITTLE SILT	
40	12		15		18-15-16	15	REDDISH BROWN M–F SAND, LITTLE SILT, TR. CLAYEY SILT	
	13							
	14		20		25-25-27	16	REDDISH BROWN M–F SAND, TR. SILT	
50	15							
	16		24		18-21-33	17	SAME	
	17		21		18-23-25	18	SAME	
60	18							
	19		21		16-17-22	19	REDDISH BROWN FINE SAND, LITTLE SILT	
	20		22		18-22-24	20	SAME	
70	21	-57.3	15		12-14-18	21	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
	22	-62.3			29-100/3,	22	RED SHALE (GRAVEL, SAND, SILT & CLAY SIZE)	
	23	-63.6	12		17/3" -100/3"			
	24	-66.6			REC = 72% RQD = 45%	RUN #1	RED SHALE: MODERATELY FRACTURED	
80	25	-71.6			REC = 11% RQD = 0%	RUN #2	RED SHALE: EXTREMELY FRACTURED	
	26	-73.6			REC = 100% RQD = 33%	RUN #3	RED SHALE: MODERATELY FRACTURED	

* 300 LBS. HAMMER USED

BORING NO. 3-776 — DATE 3-7-97 — PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,832 E 578,375 — SURFACE ELEVATION 13.3 — WL ELEVATION 5.3 — BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	13.3						
		11.3	20		HAND AUGER	1	FILL–DARK BROWN M–F SAND, LITTLE SILT, TR. GRAVEL	
	1		19		HAND AUGER	2	MISC. FILL–BROWN C–F SAND, TR. SILT, BRICKS	
	2		22		HAND AUGER	3	MISC. FILL–CONCRETE, SAND, GRAVEL	
			24		WL 3-2-0-1	4	MISC. FILL–BRICK, CONCRETE, SAND, GLASS, GRAVEL	
10	3		24		1-0-1-0	5	MISC. FILL–GLASS, CERAMIC, SAND, GRAVEL, SILT	
			36		1-2-1-0	6	MISC. FILL–SAME	
	4	-0.7	38		1-0-1-1	7	MISC. FILL–SAME	
	5		24		6-6-7-7	8	REDDISH BROWN M–F SAND, LITTLE SILT	
			23		5-6-6-7	9	SAME	
20	6		27		3-3-4-4	10	REDDISH BROWN FINE SAND, LITTLE SILT	
	7		24		3-5-6	11	REDDISH BROWN M–F SAND, TR. SILT	
	8		35		2-1-1	12	REDDISH BROWN FINE SAND, SOME SILT	
			28		3-4-5	13	SAME	
30	9		31		4-4-4	14	REDDISH BROWN M–F SAND, LITTLE SILT	
	10							
	11		24		6-7-10	15	REDDISH BROWN FINE SAND, LITTLE SILT	
	12	-26.7						
40		-28.2	31		5-7-12	16	REDDISH BROWN SILT & CLAY, TR. FINE SAND	

BORING NO. 3-777 — DATE 3-7-97 — PROJECT EWR MONORAIL EXTENSION PROJECT

LOCATION N 679,889 E 578,518 — SURFACE ELEVATION 14.6 — WL ELEVATION 6.6 — BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN. I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	14.6	7		HAND AUGER	1	FILL–GRAVEL, SOME BROWN M–F SAND, TR. SILT	
	1		31		HAND AUGER	2	MISC. FILL–CINDERS, CONCRETE, BRICK, SAND, SILT	
	2		23		HAND AUGER	3	MISC. FILL–CINDERS, GLASS	
			21		1-1-1-1	4	MISC. FILL–CINDRES, SAND, CONCRETE, SILT	
10	3		32		WL 1-1-1-1	5	MISC. FILL–CINDERS, SAND, GRAVEL, SILT	
			37		1-1-0-3	6	MISC. FILL–CINDERS, GRAVEL, GLASS, SILT	
	4		27		3-3-2-2	7	MISC. FILL–CINDERS, SAND, GLASS, GRAVEL, SILT	
	5	-3.4	31		3-3-4-2	8	MISC. FILL–BRICK, GRAVEL, GLASS	
			31		3-2-4-8	9	MISC. FILL–CINDERS, CERAMIC, GLASS	
20	6		25		9-7-9-8	10	REDDISH BROWN FINE SAND, LITTLE SILT	
			20		10-9-10	11	SAME	
	7		27		4-2-5	12	REDDISH BROWN FINE SAND, SOME SILT	
	8		28		7-7-8	13	REDDISH BROWN FINE SAND, LITTLE SILT	
30	9		26		9-9-10	14	SAME	
	10	-20.4						
	11		25		5-11-13	15	REDDISH BROWN CLAY & SILT	
40	12	-26.9	25		4-4-7	16	SAME	

NOTES: 1. FOR SITE LOCATION, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR–SL–368.
2. FOR BORING LOCATION PLAN, SEE DRAWING NUMBER EWR–SL–369.

Sheet Of

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
Design Divisions

EWR Monorail NEC Connection

Title
GUIDEWAY FOUNDATION & SUPERSTRUCTURE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

W. GIBBS	J. HEGARTY	W. GIBBS
Designed by	Drawn by	Checked by

Date 7/23/97 Scale NONE

Contract Number EWR-154.001 Drawing Number EWR-SL-380

FILE NAME: SL-380

D-53

BORING NO. 3-778 | **DATE 3-7-97** | **PROJECT** EWR: MONORAIL EXTENSION – NEC CONNECTION

LOCATION N 679,915 E 578,664 | SURFACE ELEVATION 12.8 | WL ELEVATION 4.8 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	12					ASPHALT	
		12	12		HAND AUGER	1	MISC. FILL–CINDERS, GRAVEL, SAND, BRICK, SILT	
	1		15		HAND AUGER	2	FILL–BROWN C–F SAND; LITTLE SILT, TR. GRAVEL	
			15		HAND AUGER	3	MISC. FILL–BROWN C–F SAND, BRICK, CONCRETE, SILT	
	2		30		WL 7-4-3-4	4	MISC. FILL–CINDERS, SAND, BRICK, GLASS, SILT	
10			69		1-1-1-1	5	MISC. FILL–CINDERS, ASHES, SAND, SILT	
	3		49		1-2-1-1	6	MISC. FILL–CINDERS; GLASS, SILT; BRICK	
		-1.2	49		2-2-2-2	7	MISC. FILL–BRICK, CINDERS, SILT, GLASS	
	4		410		3-2-1-2	8	DARK BROWN PEAT	
		-4.2	190			8U	SAME	
	5		24		PRESSED	9U	LIGHT BROWN M–F SAND, SOME SILT	
20		-7.2	21		7-7-5-9	10	REDDISH BROWN FINE SAND, SOME SILT, TR. GRAVEL	
	6		25		5-8-11	11	REDDISH BROWN SILT & CLAY, TR. FINE SAND	
		-9.7						
	7		25		6-7-9	12	REDDISH BROWN FINE SAND, TR. SILT	
	8		25		7-8-10	13	SAME	
30	9		28		8-8-9	14	REDDISH BROWN FINE SAND, SOME SILT	
	10	-22.2						
	11		23		7-6-7	15	REDDISH BROWN CLAY & SILT	
40	12	-28.7	24		6-6-7	16	SAME	

BORING NO. 3-779 | **DATE 6-10-97** | **PROJECT** EWR: MONORAIL EXTENSION – NEC CONNECTION

LOCATION N 679,757 E 578,328 | SURFACE ELEVATION 11.6 | WL ELEVATION 6.6 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	11.6						
			14		HAND AUGER	1	FILL–DARK BROWN M–F SAND, LITTLE GRAVEL, TR. SILT	
	1		18		HAND AUGER	2	FILL–DARK BROWN M–F SAND, TR. SILT, TR. GRAVEL	
			28		WL HAND AUGER	3	FILL–BROWN M–F SAND, SOME SILT, LITTLE SILT & CLAY, TR. GRAVEL	
	2		30		5-7-3-3	4	FILL–SAME	
10	3	1.6	22		3-3-9-5	5	FILL–BROWN C–F SAND, SOME SILT, LITTLE SILT & CLAY, TR. GRAVEL	
		0.1	96		1-1-2	6	BLACK ORGANIC CLAY, TR. DECOMPOSED PEAT	
	4	-2.8	115		PRESSED	7U	DARK BROWN SILTY CLAY	
			34		PRESSED	8U	DARK BROWN CLAY & SILT	
	5		24			8	BROWN–GRAY M–F SAND, LITTLE SILT, TR. GRAVEL	
20			20		8-12-13	9	REDDISH BROWN FINE SAND, SOME SILT	
	6		23		5-5-6	10	REDDISH BROWN M–F SAND, LITTLE SILT	
	7		26		2-3-5	11	SAME	GS
	8		21		7-15-18	12	SAME	
30	9		30		2-3-5	13	REDDISH BROWN FINE SAND, SOME SILT	GS
	10	-23.3						
	11		29		4-4-4	14	REDDISH BROWN CLAY & SILT	
40	12	-28.3	28		3-4-5	15	REDDISH BROWN FINE SAND, SOME SILT	
	13							
	14		21		22-23-24	16	REDDISH BROWN FINE SAND, LITTLE SILT	
50	15							
	16		25		20-20-19	17	REDDISH BROWN FINE SAND, SOME SILT	
	17		24		11-15-18	18	REDDISH BROWN FINE SAND, LITTLE SILT	
60	18	-48.3	14		13-16-18	19	REDDISH BROWN SILT & CLAY, LITTLE GRAVEL	
	19							
	20		17		22-31-33	20	REDDISH BROWN SILT & CLAY	
70	21	-58.3						
	22		23		22-24-25	21	REDDISH BROWN FINE SAND, LITTLE SILT	
	23		20		21-23-30	22	REDDISH BROWN FINE SAND, LITTLE SILT	
80	24	-68.3	19		22-25-29	23	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
	25	-73.3						
	26	-74.0	12		28-100/3, 50/0*	24	FRAGMENTED RED SHALE (GRAVEL, SAND, SILT, CLAY SIZE)	
	27	-79.0			REC = 88% RQD = 64%	RUN #1	RED SHALE: MODERATELY FRACTURED	
90	28	-82.0			REC = 78% RQD = 20%	RUN #2	RED SHALE: EXTREMELY TO MODERATELY FRACMENTED, SLIGHTLY WEATHERED	

* 300 LBS. HAMMER USED

BORING NO. 3-780 | **DATE 6-6-97** | **PROJECT** EWR: MONORAIL EXTENSION – NEC CONNECTION

LOCATION N 679,747 E 578,226 | SURFACE ELEVATION 11.2 | WL ELEVATION 4.9 | BY: C.L.P. CHECKED BY: W.G.

DEPTH (FEET)	DEPTH (METERS)	ELEVATION (FEET)	WATER CONTENT (%)	SYMBOL	BLOWS PER 6 IN I 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT	SAMPLE NUMBER	SAMPLE CLASSIFICATION	LABORATORY TESTING
0	0	11.2						
			14		HAND AUGER	1	FILL–DARK BROWN C–F SAND, LITTLE GRAVEL, TR. SILT	
	1		15		HAND AUGER	2	FILL–SAME	
			13		WL HAND AUGER	3	FILL–SAME	
	2		25		1-1-1-1	4	FILL–BROWN CLAYEY SILT, AND M–F SAND, LITTLE GRAVEL	GS
10	3	3.2	19		1-2-2-3	5	REDDISH BROWN C–F SAND, LITTLE SILT, TR. GRAVEL	GS
			25		7-7-6	6	REDDISH BROWN FINE SAND, LITTLE SILT	
	4		28		6-6-6	7	REDDISH BROWN M–F SAND, LITTLE SILT	
	5		28		4-5-6	8	REDDISH BROWN M–F SAND, TR. SILT	
			30		3-4-4	9	SAME	GS
20	6		27		3-3-3	10	SAME	GS
	7		24		4-5-9	11	SAME	
	8		21		12-15-16	12	SAME	
30	9		28		3-5-7	13	REDDISH BROWN FINE SAND, SOME SILT	
	10							
	11		28		4-6-11	14	SAME	
40	12		12		17-22-23	15	REDDISH BROWN FINE SAND, SOME SILT, LITTLE GRAVEL	
	13							
	14		17		14-14-15	16	REDDISH BROWN C–F SAND, SOME SILT, LITTLE GRAVEL	
50	15							
	16		24		12-14-14	17	REDDISH BROWN M–F SAND, LITTLE SILT, TR. GRAVEL	
	17	-43.8	18		12-16-8	18	REDDISH BROWN SILT & CLAY, LITTLE FINE SAND, LITTLE GRAVEL	
60	18							
	19		20		12-18-13	19	REDDISH BROWN SILT & CLAY, LITTLE FINE SAND	
	20	-53.8	23		21-29-36	20	REDDISH BROWN M–F SAND, LITTLE SILT	
70	21							
	22		21		17-31-36	21	REDDISH BROWN FINE SAND, LITTLE SILT	
	23	-63.8	16		18-18-25	22	REDDISH BROWN SILT & CLAY, TR. GRAVEL	
80	24	-68.8	24		18-25-36	23	REDDISH BROWN SILT	
	25							
	26	-73.8 -74.0	21		100/2, 50/1*	24	DISINTEGRATED RED SHALE (GRAVEL, SAND SIZE)	
	27	-79.0			REC = 100% RQD = 70%	RUN #1	RED SHALE: MODERATELY FRACTURED	
90	28	-83.8			REC = 96% RQD = 36%	RUN #2	RED SHALE: MODERATELY TO EXTREMELY FRACTURED	

* 300 LBS. HAMMER USED

NOTES: 1. FOR SITE LOCATION, LEGEND, GENERAL NOTES, ABBREVIATIONS AND SOIL CLASSIFICATIONS SEE DRAWING NUMBER EWR–SL–368.
2. FOR BORING LOCATION PLAN, SEE DRAWING NUMBER EWR–SL–369.

Sheet Of

THE PORT AUTHORITY OF NY & NJ

CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved

Engineering Department
Design Divisions

EWR Monorail NEC Connection

Title

GUIDEWAY FOUNDATION & SUPERSTRUCTURE

PRESENTATION OF BORINGS

This drawing subject to conditions in contract. All inventions, ideas, designs and methods herein are reserved to Port Authority and may not be used without its written consent.

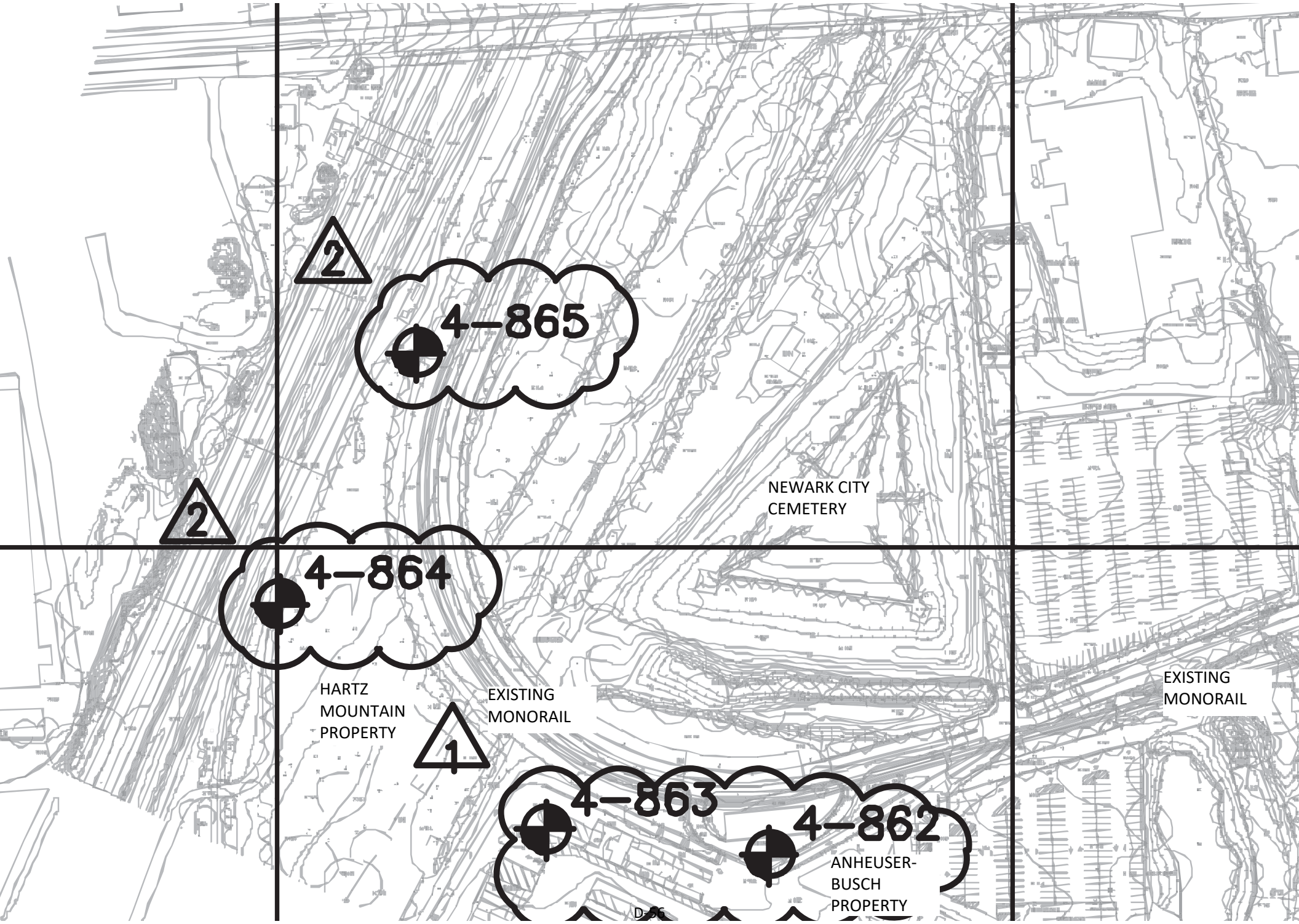
W. GIBBS | J. HEGARTY | W. GIBBS
Designed by | Drawn by | Checked by

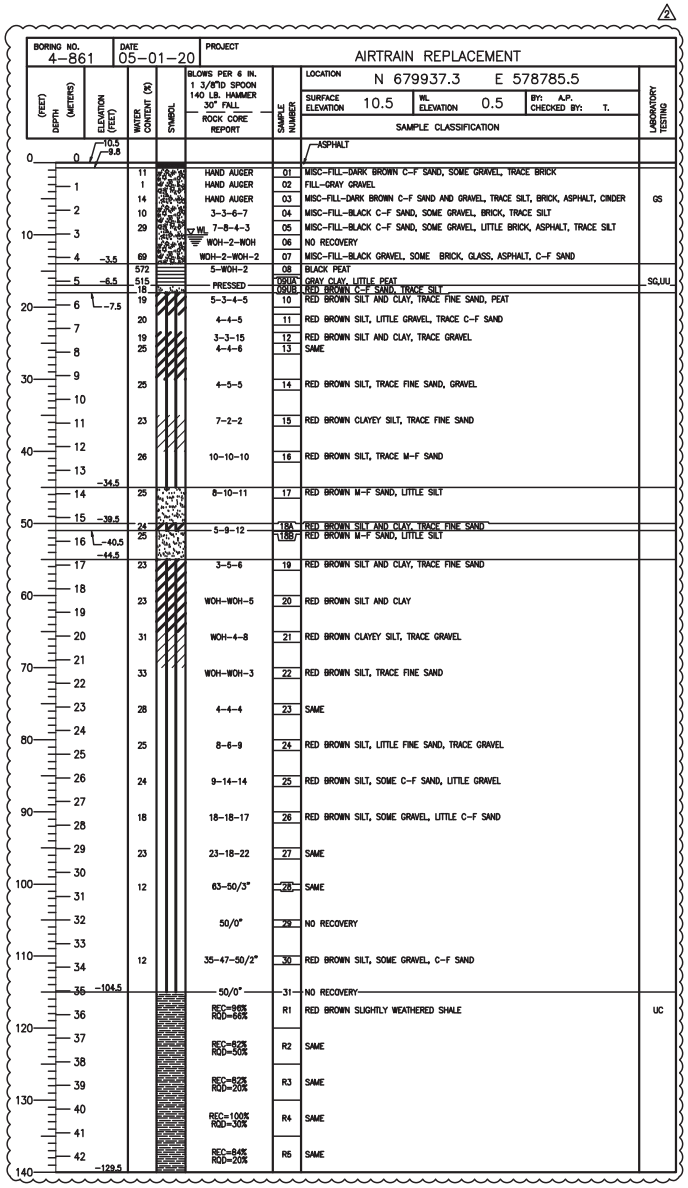
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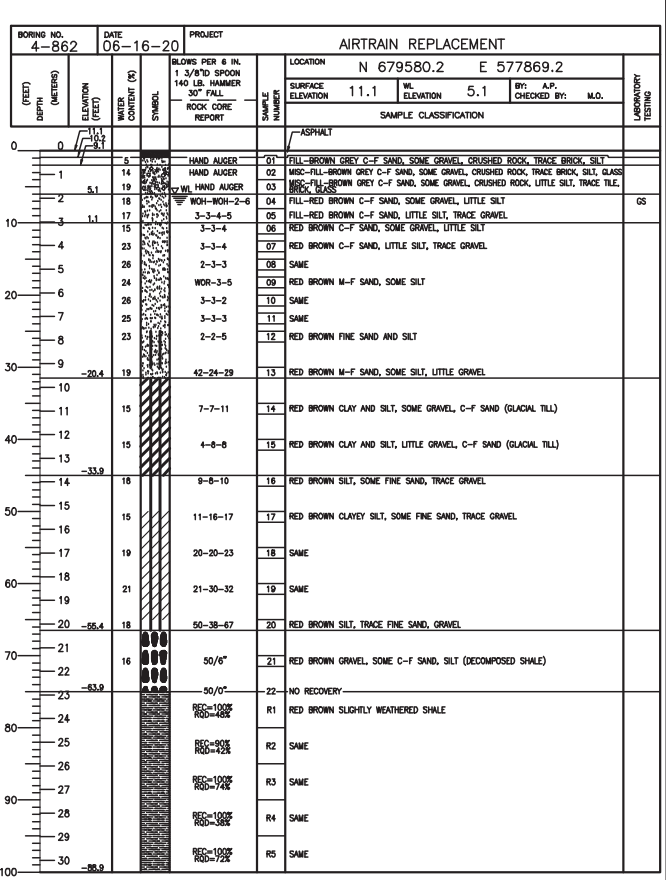
Contract Number EWR–154.001 Drawing Number EWR–SL–381

FILE NAME: SL-381.DWG

2020 AirTrain Replacement Borings


2
4–865
2
4–864
NEWARK CITY
CEMETERY
HARTZ
MOUNTAIN
PROPERTY
EXISTING
MONORAIL
1
4–863
4–862
ANHEUSER-
BUSCH
PROPERTY
EXISTING
MONORAIL





NOTES: FOR PROJECT SITE MAP, LEGEND, GENERAL NOTES, ABBREVIATIONS, AND SOIL CLASSIFICATIONS, SEE DRAWING EWR-SL-659.

FOR BORING LOCATION PLAN, SEE DRAWING EWR-SL-660.

Sheet 9 of 13

THE PORT AUTHORITY OF NY & NJ

ORIGINAL SIGNED BY

FERNANDO BERMUDEZ FOR
CHIEF GEOTECHNICAL ENGINEER

No.	Date	Revision	Approved
2	9/8/2020	Added Boring 4-861	F.B.
1	7/29/2020	Updated Total Sheet #	F.B.

ENGINEERING DEPARTMENT

NEWARK LIBERTY INTERNATIONAL AIRPORT

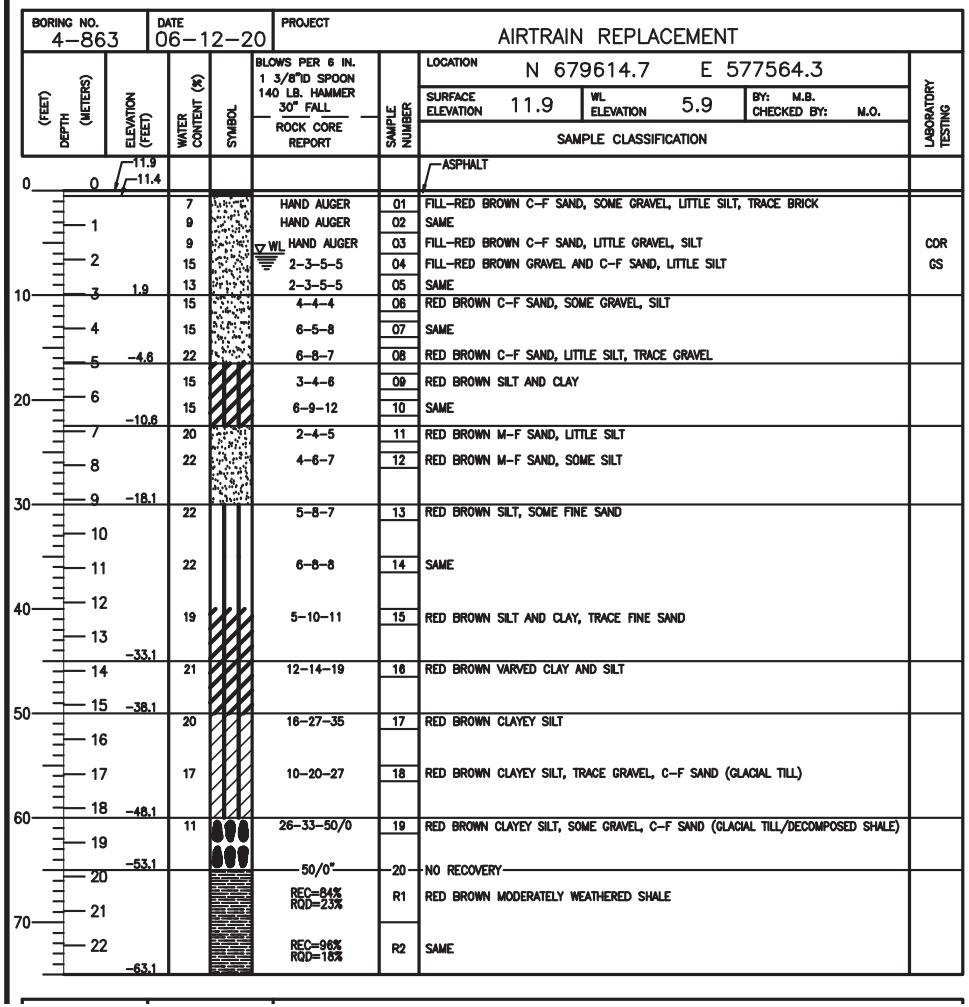
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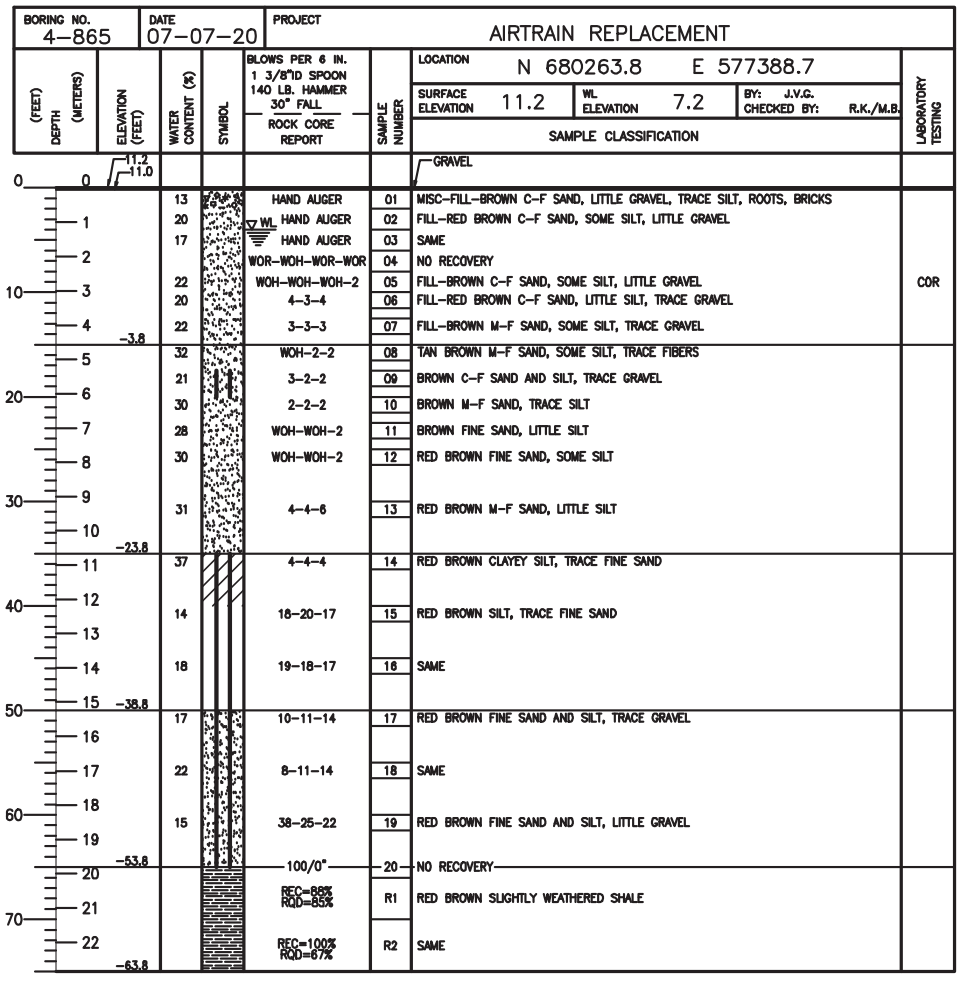
Title
AIRTRAIN REPLACEMENT

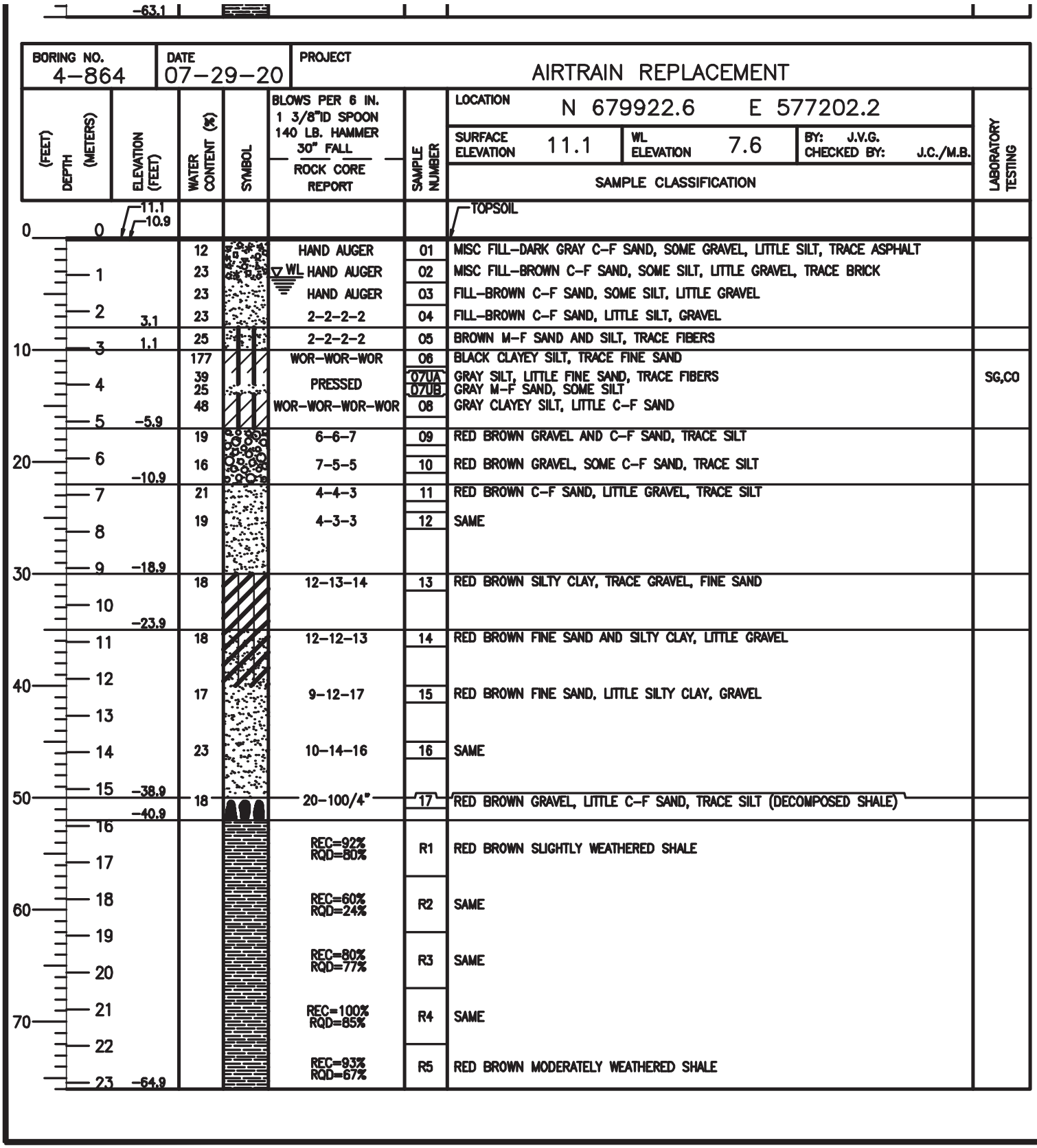
PRESENTATION OF BORINGS

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Designed by	F.BERMUDEZ
Drawn by	A. COFRANCESCO
Checked by	S. LAW
Date	05/28/2020
Contract Number	
Drawing Number	EWR-SL-667
PID#	


BORING NO. 4–863
DATE 06–12–20
PROJECT AIRTRAIN REPLACEMENT
LOCATION N 679614.7 E 577564.3
SURFACE ELEVATION 11.9
WL ELEVATION 5.9
BY: M.B.
CHECKED BY: M.O.
BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT
SAMPLE CLASSIFICATION
LABORATORY TESTING
DEPTH (FEET) (METERS)
ELEVATION (FEET)
WATER CONTENT (%)
SYMBOL
SAMPLE NUMBER
11.9
11.4
ASPHALT
HAND AUGER 01 FILL–RED BROWN C–F SAND, SOME GRAVEL, LITTLE SILT, TRACE BRICK
HAND AUGER 02 SAME
WL HAND AUGER 03 FILL–RED BROWN C–F SAND, LITTLE GRAVEL, SILT COR
2–3–5–5 04 FILL–RED BROWN GRAVEL AND C–F SAND, LITTLE SILT GS
2–3–5–5 05 SAME
1.9
4–4–4 06 RED BROWN C–F SAND, SOME GRAVEL, SILT
6–5–8 07 SAME
–4.6
6–8–7 08 RED BROWN C–F SAND, LITTLE SILT, TRACE GRAVEL
3–4–6 09 RED BROWN SILT AND CLAY
6–9–12 10 SAME
–10.6
2–4–5 11 RED BROWN M–F SAND, LITTLE SILT
4–6–7 12 RED BROWN M–F SAND, SOME SILT
–18.1
5–8–7 13 RED BROWN SILT, SOME FINE SAND
6–8–8 14 SAME
5–10–11 15 RED BROWN SILT AND CLAY, TRACE FINE SAND
–33.1
12–14–19 16 RED BROWN VARVED CLAY AND SILT
–38.1
18–27–35 17 RED BROWN CLAYEY SILT
10–20–27 18 RED BROWN CLAYEY SILT, TRACE GRAVEL, C–F SAND (GLACIAL TILL)
–48.1
26–33–50/0 19 RED BROWN CLAYEY SILT, SOME GRAVEL, C–F SAND (GLACIAL TILL/DECOMPOSED SHALE)
–53.1
50/0" 20 NO RECOVERY
REC=84% RQD=23% R1 RED BROWN MODERATELY WEATHERED SHALE
REC=96% RQD=18% R2 SAME
–63.1


BORING NO. 4–865
DATE 07–07–20
PROJECT AIRTRAIN REPLACEMENT
LOCATION N 680263.8 E 577388.7
SURFACE ELEVATION 11.2
WL ELEVATION 7.2
BY: J.V.G.
CHECKED BY: R.K./M.B.
BLOWS PER 6 IN. 1 3/8"ID SPOON 140 LB. HAMMER 30" FALL / ROCK CORE REPORT
SAMPLE CLASSIFICATION
LABORATORY TESTING
DEPTH (FEET) (METERS)
ELEVATION (FEET)
WATER CONTENT (%)
SYMBOL
SAMPLE NUMBER
11.2
11.0
GRAVEL
HAND AUGER 01 MISC–FILL–BROWN C–F SAND, LITTLE GRAVEL, TRACE SILT, ROOTS, BRICKS
WL HAND AUGER 02 FILL–RED BROWN C–F SAND, SOME SILT, LITTLE GRAVEL
HAND AUGER 03 SAME
WOR–WOH–WOR–WOR 04 NO RECOVERY
WOH–WOH–WOH–2 05 FILL–BROWN C–F SAND, SOME SILT, LITTLE GRAVEL COR
4–3–4 06 FILL–RED BROWN C–F SAND, LITTLE SILT, TRACE GRAVEL
–3.8
3–3–3 07 FILL–BROWN M–F SAND, SOME SILT, TRACE GRAVEL
WOH–2–2 08 TAN BROWN M–F SAND, SOME SILT, TRACE FIBERS
3–2–2 09 BROWN C–F SAND AND SILT, TRACE GRAVEL
2–2–2 10 BROWN M–F SAND, TRACE SILT
WOH–WOH–2 11 BROWN FINE SAND, LITTLE SILT
WOH–WOH–2 12 RED BROWN FINE SAND, SOME SILT
4–4–6 13 RED BROWN M–F SAND, LITTLE SILT
–23.8
4–4–4 14 RED BROWN CLAYEY SILT, TRACE FINE SAND
18–20–17 15 RED BROWN SILT, TRACE FINE SAND
19–18–17 16 SAME
–38.8
10–11–14 17 RED BROWN FINE SAND AND SILT, TRACE GRAVEL
8–11–14 18 SAME
38–25–22 19 RED BROWN FINE SAND AND SILT, LITTLE GRAVEL
–53.8
100/0" 20 NO RECOVERY
REC=88% RQD=85% R1 RED BROWN SLIGHTLY WEATHERED SHALE
REC=100% RQD=67% R2 SAME
–63.8



PREPARED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES. INC.

APPENDIX B

Resume

JEAN HOWSON, Ph.D.

Supervising Principal Archaeologist
Cultural Resource Unit

Education Ph.D., Anthropology, 1995, New York University
M.A., Anthropology, 1987, New York University
B.A., Anthropology, 1977, Vassar College

Memberships Society for Historical Archaeology
Council for Northeast Historical Archaeology

Dr. Howson has over 30 years of professional experience as an archaeologist including both consulting and academic teaching positions. Her areas of expertise include cultural resource surveys, archaeological survey and data recovery, historical studies, and National Register of Historic Places nominations. Project experience includes:

NJ Turnpike Authority Facilities Improvement Program, Parkway South Maintenance District - Principal Archaeologist responsible for coordination of field and lab staff, research, and report preparation for project with site locations in Monmouth, Ocean, Burlington, Atlantic, and Cape May Counties.

NJ Route 173/Pohatcong River Bridge Replacement, Greenwich Township, Warren County, NJ - Principal Archaeologist responsible for coordination of field and lab staff, research, and report preparation for this NJDOT bridge project. Responsible for Phase II investigation of project area, including National Register listed and eligible properties.

NJ Route 34 over Edgar Felix Memorial Bikeway Bridge Replacement Project, Wall Township, Monmouth County, NJ - Principal Archaeologist responsible for coordination of field and lab staff, research, and report preparation for NJDOT bridge project.

West Thames Street Pedestrian Bridge Project (NYCEDC) - Principal Archaeologist responsible for cultural resource analysis for lower Manhattan project.

US 1&9T Extension Project (NJDOT) - Principal Archaeologist responsible for Phase I/II investigation of complex urban project area, including numerous transportation-related resources.

Picatinny Arsenal Historic Districts Web Site (Picatinny Arsenal, NJ) - Cultural Resources specialist responsible for research, oral history, design, and content for client-hosted interactive, multimedia web site on 5 National Register eligible historic districts on military installation. Responsible for coordinating SHPO review as part of facilities reduction program of U.S. Army Garrison Picatinny. Recipient of Distinguished Award from the American Council of Engineering Companies, NJ.

Route 8 Northbound Temporary Bypass, Waterbury, CT, HNTB Corporation for CT DOT
Project Manager and Principal Archaeologist for Phase I/II survey of 19th-century residential site; prepared technical report.

Waterbury Naugatuck River Greenway Phase I, City of Waterbury.
Project Manager for Phase I/II survey for Greenway project in Waterbury. Coordinated with the City of Waterbury and Connecticut Department of Transportation. Prepared technical reports for Section 106 compliance.

Waterbury Active Transportation and Economic Resurgence (W.A.T.E.R.) Project, City of Waterbury
Project Manager for preparation of Archaeological Assessments for 3 project areas in Waterbury for FHWA compliance with Section 106. Planned and managed subsequent Phase I/II survey. Prepared technical reports. Planned and implemented mitigation measures including video documentation.

Garden State Parkway Interchanges 41 and 44 Improvements Project (NJ Turnpike Authority) - Principal Archaeologist responsible for overall project management, archaeological research, and report preparation for Phase I archaeological and intensive-level architectural survey for this interchange project in Atlantic County.

Garden State Parkway Interchange 105 Improvements Project (NJ Turnpike Authority) - Principal Archaeologist responsible for overall project management, archaeological research, and report preparation for Phase I archaeological and intensive-level architectural survey for this interchange project in Monmouth County.

River Road Path Project (Town of Brookhaven, NY) - Principal Archaeologist responsible for Phase I investigation of bicycle/pedestrian path alignment, including assessment of prehistoric and historic resources.

NJ Route 36 Highlands Bridge Replacement, Boroughs of Highlands and Sea Bright, NJ (NJDOT) - Principal Archaeologist and Project Manager for multi-faceted cultural resources mitigation including archaeological data recovery, public exhibits development, and HABS/HAER recordation.

NJ Route 21 Viaduct Rehabilitation Project, Newark, NJ (NJDOT) - Responsible for sensitivity survey of adjacent portion of Mount Pleasant Cemetery.

Route I-280/NJ Route 21 Interchange Improvements Project, Newark, NJ (NJDOT) - Responsible for Phase I archaeological survey of urban project area.

Neshanic Valley Golf Course, Somerset County, NJ (Somerset County Parks Commission) - Project management for archaeological survey for golf course development, including investigation of early farmstead sites; responsible for development and implementation of mitigation measures including exhibits and preservation easement.

Seaview Drive Extension, Jersey City Aqueduct Relocation, and New County Road Grade Separation Project, Secaucus, NJ (NJ Turnpike Authority) - Project management for archaeological survey of project area and data recovery of two historic sites, design of mitigation measures related to the Jersey City Water Works Historic District, including documents inventory and research and writing for narrative report.

Routes 1 and 9T Improvements Project, Jersey City, NJ (NJDOT) - Principal Archaeologist and Project Manager for all phases of evaluative survey and multi-faceted cultural resources mitigation including archaeological data recovery of a 19th-century working-class neighborhood; HABS/HAER recordations; and preparation of a resource package for a documentary on the Pulasky Skyway.

Route I-280/First Street Improvements Project, Newark, NJ (NJDOT) - Principal Archaeologist and Project Manager for cultural resources survey and data recovery for 8 19th-century urban residential sites.

African Burial Ground Project, New York
Archaeological Analysis and Report (Howard University, under contract to General Services Administration, New York District) - Served as Associate Director for Archaeology and co-wrote and edited final report. **Interpretive Media (Amaze Design, under contract to National Park Service)** Subject Matter Expert for design team creating interpretive media for the Visitor's Center at the African Burial Ground National Monument.

WORK PLAN

PHASE IB AND CONTINGENCY FOR PHASE II ARCHAEOLOGICAL TESTING

AIRTRAIN NEWARK REPLACEMENT PROGRAM

HPO Project No. 20-0602-7
HPO-E2020-48

Area of Potential Effects (APE):

The APE for the **Proposed Action** alignment for the AirTrain is shown on Figure 1. Subsurface work within the Design and Construction Limits and Construction Easements are described as follows:

> Subsurface work is limited to the foundations of the guideway. Foundation activities include pile driving, sheet pile driving, concrete work, erection of the guideway structure, staging and movement of materials and equipment. These activities throughout the construction area may damage the existing asphalt (Anheuser Busch) or grassy areas (Hartz). For properties both inside and outside of the new Port Authority property line, the contractor will be required to restore to the existing conditions. For example, asphalt will remain asphalt and pervious areas will remain pervious. The existing weigh station will be demolished. Following construction, a new fence will be installed parallel to the AirTrain.

The APE avoids the historic and present footprint of the Newark City Cemetery. It includes property that was mapped in the 19th century as the Johnson and later Crook property, which contained an early glue factory and likely residences (Figure 2). While previous disturbances from construction of the existing Monorail would have disturbed portions of the historic property, there is potential for intact subsurface historic remains in the area beneath the Anheuser Busch lot and the adjacent vegetated area within Hartz Mountain property (formerly part of the Waverly Yard).

Research Goals and Project Guidelines:

Phase IB field testing will be conducted in order to determine the presence or absence of resources related to the historic Johnson/Crook property within the APE. It is noted that if any intact early surfaces are extant, careful examination will be made for traces of precontact occupation.

If indicated, the fieldwork will proceed to Phase II testing in order to provide for evaluation of the National Register eligibility of the site(s) and assessment of project impacts. Evaluation to determine the National Register eligibility of archaeological sites will be in keeping with the National Park Service's 2000 National Register Bulletin, *Guidelines for Evaluating and Registering Archeological Properties*.

Due to the logistical difficulty of accessing the properties for subsurface testing, it is anticipated that we will proceed directly to Phase II if the Phase IB investigation identifies archaeological resources within the APE. Consultation with HPO will be sought if needed during the field program. Although visibility will be limited due to the necessarily limited number of test trenches, every effort will be made to expose deposits and features sufficiently to allow for eligibility determinations.

All phases of the archaeological survey and reporting will need to be in keeping with the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation*, and the HPO's *Guidelines*

for Phase I Archaeological Investigations: Identification of Archaeological Resources and *Guidelines for Preparing Cultural Resources Management Archaeological Reports Submitted to the Historic Preservation Office*.

Documentary research:

Historical research will be focused on primary documentation, notably land titles (to include deed, mortgage, and surrogate's records) and census records (both state and federal), with some supplementary secondary source research.

Fieldwork General Assumptions:

Geotechnical borings will be completed and the results will be provided prior to conducting archaeological testing.

Access for machine excavations will be provided by the property owners. Test locations are shown on attached maps, Figures 3a and 3b. At least one lane of the entrance driveway to the Anheuser-Busch facility will remain open during the archaeological test excavation work. Traffic cones will be used to delineate the closure of a single lane.

It is anticipated that test trenches will be backfilled the same day as excavated. If it is necessary to leave a trench open overnight, steel plates will be installed by the excavation contractor. If there is an unanticipated delay in scheduling further testing (e.g. between Phase IB and Phase II), trenches may need to be backfilled and re-opened at a later date.

Backhoe excavation trenches will be backfilled with original material and compacted by backhoe. In paved areas, the excavation will be brought to level with a 6-inch gravel layer. Pavement patching will be accomplished after all tests in paved areas are completed. Pavement and striping will be restored to original condition. Asphalt will be of the same quality as currently in place (i.e. strong enough for truck traffic).

Phase IB Archaeological Testing:

Proposed test locations are shown on Figure 3.

Anheuser-Busch Property (paved active truck lot) - Testing will involve excavation of four (4) trenches measuring approximately 4' x 8' x 4'(depth). The pavement will be cut and excavation will proceed with a backhoe. If an intact original surface or other features are identified, small shovel test units will be hand-excavated at the bottom of the trenches. Soils from hand excavations will be screened through ¼-inch mesh. Locations of proposed tests are shown on the accompanying map.

Hartz Mountain Property (vegetated area) -Testing will involve excavation of three (3) trenches measuring approximately 4' x 8' x 4'(depth). If an intact original surface or other features are identified, small shovel test units will be hand-excavated at the bottom of the trenches. Soils from hand excavations will be screened through ¼-inch mesh. Approximate locations of proposed tests along the proposed AirTrain foundation are shown on the accompanying map.

Phase II Archaeological Testing:

If archaeological resources that have the potential to provide information about the historic use of the properties are identified, Phase II testing will be necessary. The decision to recommend Phase II testing will be made by the project archaeologist, who will immediately inform the client. Phase II will not be

undertaken without client authorization. The project archaeologist, at their discretion, may consult with the New Jersey Historic Preservation Office regarding the need for Phase II testing. Any excavation that will remain open for more than one day will be covered with steel plates.

Phase IB trenches will be widened by 2 to 4 feet, and 3-foot-square hand-excavated units will be placed in the bottom of the widened trenches. Hand excavated soils will be screened through ¼-inch mesh. It is anticipated that the larger exposure and hand excavations will provide sufficient information on the nature, dating, and integrity of deposits or features to allow for a recommendation as to National Register eligibility.

Protocol for Human Remains:

If potential human burials or human skeletal remains are encountered, all ground disturbing activities in the vicinity will cease immediately and the Historic Preservation Office and Regional Medical Examiner will be contacted. Burials and potential burials shall be left in place unless imminently threatened by human or natural displacement.

HPO contact: Vincent Maresca, 609-633-2395, Vincent.Maresca@dep.nj.gov

Medical Examiner: NJ Northern Regional Medical Examiner Office, 973-648-7259

Analysis and Reporting:

Artifacts recovered from excavations during Phase IB and Phase II will be bagged according to provenience and transported to the NV5 laboratory for analysis. A full report of all research, archaeological testing, and analysis will be prepared, meeting all requirements of the New Jersey Historic Preservation Office (NJHPO). The report will provide information for evaluating the eligibility of any identified resources for inclusion in the National Register of Historic Places and assessments of project effects on such resources.

The draft report will be submitted for review by HPO. Review comments will be addressed and a final report will be submitted as a bound volume and a pdf.

If a site is considered to be eligible for National Register inclusion, recommendations for avoidance of impacts will be provided. If impacts cannot be avoided, analyses must be provided exploring alternatives to minimize and/or mitigate impacts. Means to avoid, minimize and/or mitigate impacts to National Register eligible properties will need to be developed and undertaken prior to project implementation. If eligible resources are identified and project actions will result in adverse effects, consultation with the NJHPO regarding mitigation measures will be necessary.

LEGEND:
- LIMIT OF CONSTRUCTION EASEMENTS
- PA PROPERTY
- ADJACENT PROPERTY OWNERS
- DESIGN & CONSTRUCTION LIMITS
- CONCEPTUAL REPLACEMENT AIRTRAIN

EXISTING AIRTRAIN

CONCEPTUAL COLUMN/FOUNDATION LOCATIONS (TYP.)

STATION ROAD

PANYNJ PROPERTY LOT LINE (TYP.)

HAYNES AVE

LIMIT OF CONSTRUCTION EASEMENTS (TYP.)

ANHEUSER-BUSCH INC PROPERTY LOT LINE BLOCK: 5090 LOT: 44.01

DESIGN & CONSTRUCTION LIMITS

HARTZ MOUNTAIN PROPERTY LOT LINE BLOCK: 5090 LOT: 1.05

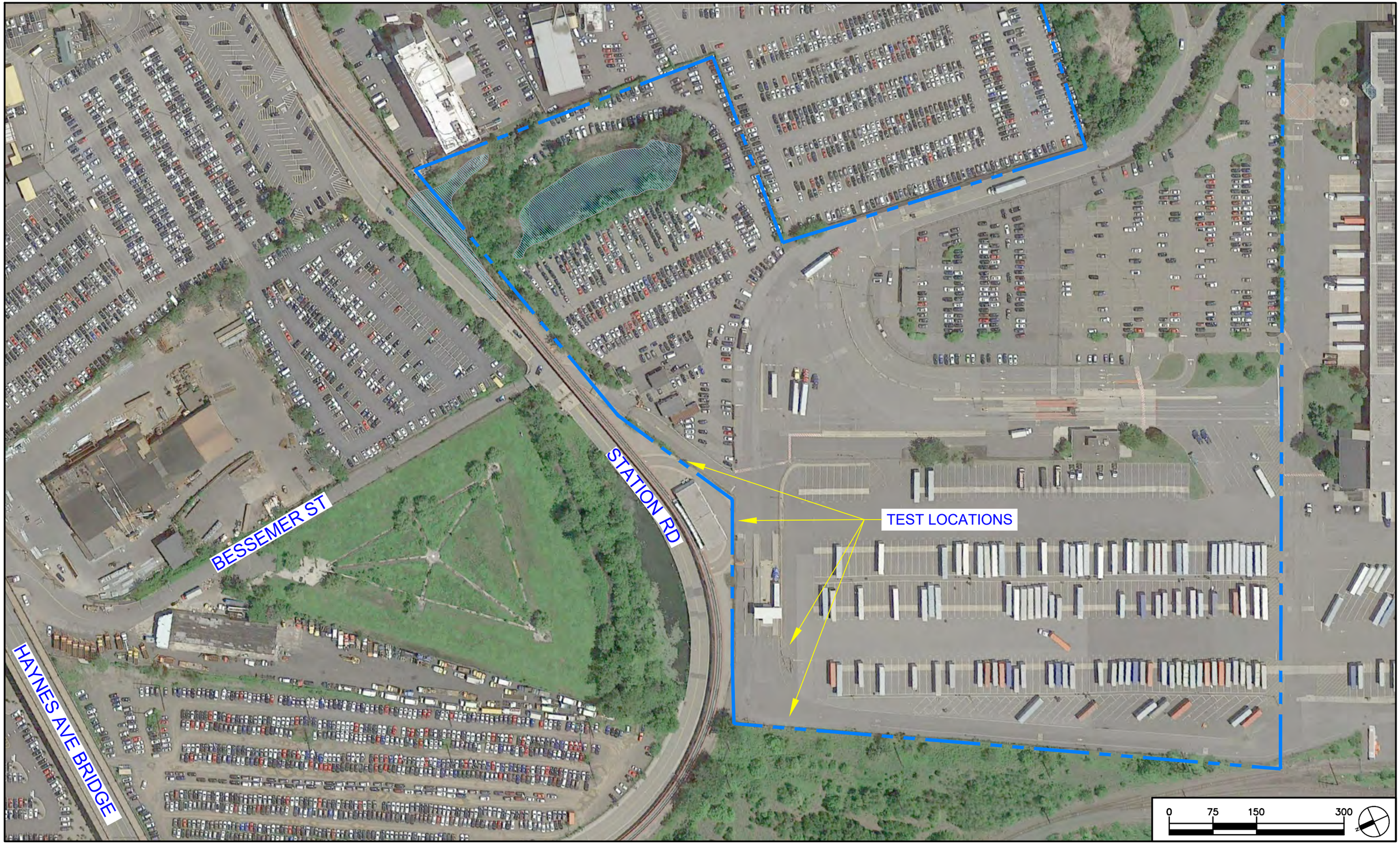
0 87.5 175 350

Sk-306_03Jun20_Map for Archaeological Survey.dwg Jun 03, 2020 dsoder
XREFS: 2019-06-25 Preferred Alignment 2015-245_EWR_082916_Overall-

THE PORT AUTHORITY OF NY & NJ	NEWARK AIRTRAIN REPLACEMENT PLANNING	FIGURE 1	MAP FOR ARCHAEOLOGICAL SURVEY HARTZ MOUNTAIN & ANHEUSER-BUSCH	Drg. No. Sk-306	03Jun20
				SH 1 of 1	Rev 0

FIGURE 2.
Proposed alignment shown on aerial photograph with overlay of 1874 Hughes Map of Essex County, showing “James Johnson” buildings within the APE.





THE PORT AUTHORITY OF NY & NJ	NEWARK AIRTRAIN REPLACEMENT PLANNING	FIGURE 3A	EXHIBIT A-3 ARCHAEOLOGICAL TESTING	Drg. No. Sk-290	17Apr20
				SH 2 of 2	Rev 0



THE PORT AUTHORITY OF NY & NJ	NEWARK AIRTRAIN REPLACEMENT PLANNING	FIGURE 3B	ARCHAEOLOGICAL TESTING, BLOCK 5090, LOT 1.05	Drg. No. Sk-289	24Apr20
				SH 1 of 1	Rev 0

M) 917-951-9112

From: Marcopul, Kate <Kate.Marcopul@dep.nj.gov>
Sent: Tuesday, September 22, 2020 10:55 AM
To: Knoesel, Edward (FAA) <Edward.Knoesel@faa.gov>
Cc: Pepe, David <David.Pepe@dep.nj.gov>; jean.howson@nv5.com; Maresca, Vincent <Vincent.Maresca@dep.nj.gov>
Subject: HPO Project #20-0602 Newark Lib. Int. Airport (EWR) AirTrain Replacement; Phase I/II Archaeological Survey Work Plan

This e-mail serves as the official correspondence of the New Jersey Historic Preservation Office as we switch to a temporary remote work environment in response to the ongoing novel coronavirus (COVID-19) outbreak.

HPO Project No. 20-0602-4

HPO-I2020-110

Ed Knoesel
Environmental Protection Specialist
Federal Aviation Administration
New York Airports District Office
159-30 Rockaway Blvd, Suite 111
Jamaica, New York 11434
Edward.Knoesel@faa.gov

Dear Mr. Knoesel:

As Deputy State Historic Preservation Officer for New Jersey, in accordance with 36 CFR Part 800: Protection of Historic Properties, as published with amendments in the Federal Register on 6 July 2004 (69 FR 40544-40555), I am providing **Consultation Comments** for the following proposed undertaking:

Essex County, Newark City
Newark International Airport
EWR AirTrain Replacement Program
Phase I/II Archaeological Survey Work Plan
Federal Aviation Administration (FAA)

800.4 Identifying Historic Properties

The Historic Preservation Office (HPO) was provided the opportunity to review and comment on the following cultural resource survey reports for the above-referenced undertaking:

Howson, Jean

No date *Work Plan: Phase IB and Contingency for Phase II Archaeological Testing, AirTrain Newark Replacement Program.* Prepared for the FAA. Prepared by NV5.

Upon review, the HPO concurs with the FAA's assessment that the program of Phase IB archaeological survey backhoe trenching (four trenches within the active Anheuser Busch parking lot and three backhoe trenches within the Hartz property) and any subsequent Phase II archaeological testing of any identified, potentially significant archaeological resources is appropriate. Finally, the provisions for treating any inadvertent discovery of human remains or burials is appropriate.

Additional Comments

Thank you for providing the opportunity to review and comment on the potential for the above-referenced project to affect historic properties. The HPO looks forward to additional consultation with FAA, any consulting parties, and the results of Phase IB/II archaeological survey for review and comment. Please reference HPO project number **20-0602** in any future calls, emails, submissions or written correspondence to help expedite your review and If you have any questions, and If you have any questions, please feel free to contact Lindsay Thivierge of my staff at Lindsay.Thivierge@dep.nj.gov. with questions regarding historic architecture, historic districts, or historic landscapes or Vincent Maresca of my staff at vincent.maresca@dep.nj.gov with questions regarding archaeology.

Sincerely,

Katherine J. Marcopul, Ph.D., CPM
Administrator and
Deputy State Historic Preservation Officer
Historic Preservation Office
NJ Department of Environmental Protection
501 East State Street, Trenton, NJ 08625
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PORT AUTHORITY NY NJ
AIR LAND RAIL SEA

Newark Liberty International Airport (EWR)
AirTrain Replacement Program

PHASE IB ARCHAEOLOGICAL SURVEY

November 2020

Prepared By:

NV5 Infrastructure East
800 Lanidex Plaza, Suite 300
Parsippany, NJ 07054

AVI-15-032

Abstract

A Phase IB Archaeological Survey, consisting of historic research and field testing, was undertaken by NV5, Inc. for the proposed AirTrain Replacement Project at Newark Liberty International Airport in the City of Newark, Essex County, and the City of Elizabeth, Union County, New Jersey. The survey addressed an Area of Potential Effect (APE) for archaeology that was defined in a Phase IA survey, along the alignment of the proposed elevated guideway, within Block 5090, Lots 1.05 and 44.01 in the City of Newark. The area tested was identified as historic fastland, and on or near the site of several historic structures dating to the latter half of the 19th century and the early part of the 20th century. It was viewed to have a low-to-moderate potential for the presence of archaeological resources.

Testing included the machine excavation of six trenches under the supervision of the Project Archaeologist. The tests measured approximately 4' by 8' and extended approximately 4' to 5' below the surface. Hand-excavated shovel test units were placed in the bottom of the two westernmost trenches to sample an apparent former topsoil layer. The former topsoil layer produced a small number of late 19th-century artifacts but no features or concentrations of artifacts were found in the shovel tests. No archaeological resources requiring further evaluation were identified.

Because no deposits likely to yield important information were identified during Phase IB testing, no Phase II testing is recommended. Phase II testing to expose a larger area of the former surface in search of features or artifact concentrations is not warranted. Although the foundation piers for the proposed elevated guideway will penetrate the fill and extend through the identified former ground surface, construction plans call for pile driving and sheet pile driving for the foundations. These actions will not result in the disturbance (or exposure) of large areas beneath the fill.

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1 INTRODUCTION

1.1 Project Background

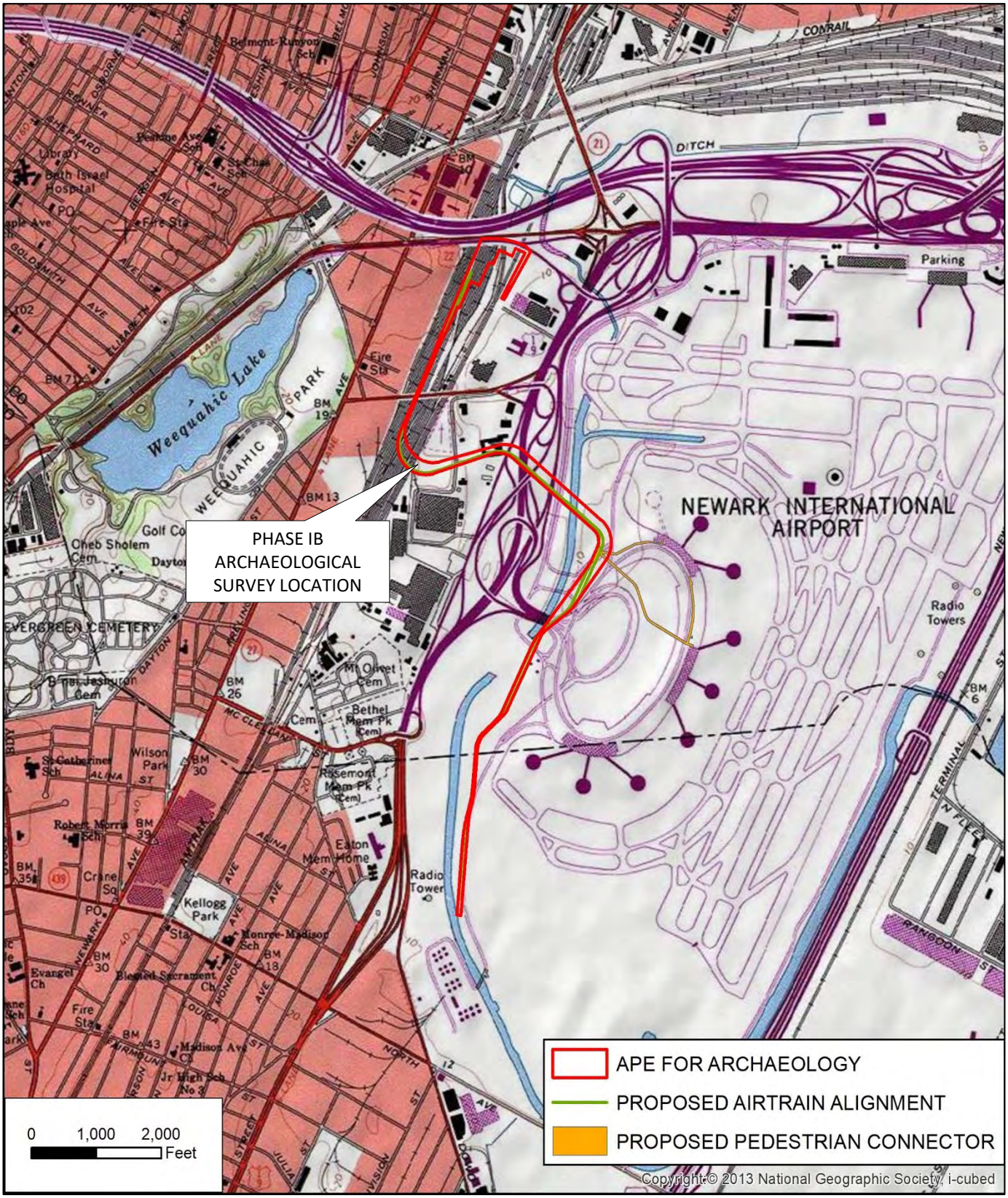
The Phase IB archaeological survey reported herein follows on a Phase IA Cultural Resources Survey conducted by NV5, Inc. for the proposed Newark Liberty Airport AirTrain Replacement Project, in the City of Newark, Essex County, and City of Elizabeth, Union County, New Jersey. The Phase IA and IB surveys were conducted for Radin Consulting, Inc., consultant to Lea+Elliott/Port Authority of New York and New Jersey (PANYNJ), pursuant to requirements under Section 106 of the National Historic Preservation Act; 23 CFR 771, as amended October 30, 1980; the guidelines developed by the Advisory Council on Historic Preservation published November 26, 1980; the amended procedures for the Protection of Historic and Cultural Properties as set forth in 36 CFR § 800 (October 1, 1986); and the amended procedures for the Protection of Historic Properties as set forth in 36 CFR § 800 (May 18, 1999). The Phase IA survey report was reviewed by The New Jersey Historic Preservation Office (HPO) and is filed under HPO Project No. 20-0602-7, HPO-E2020-48.

The Airtrain Project is located in a major metropolitan area within the Cities of Newark and Elizabeth along the boundary between Essex and Union Counties (Figure 1). The Proposed Action would include replacing the existing system with a new automated people mover (APM) system. This replacement system will enhance reliability and capacity, provide service between on-airport facilities, and maintain the connection to the NJ TRANSIT and Amtrak lines via an improved Rail Link Station. The new AirTrain EWR will serve Terminals B and C and the new Terminal 1 as well as parking areas (with hotel shuttle transportation), the Consolidated Rental Car Facility and Parking Garage (ConRAC), and the Rail Link Station.

The Phase IA survey report identified one area within the overall Project as having low to medium potential for the presence of archaeological resources for which Phase IB field testing was indicated. Figure 2 shows this area in detail on an aerial map. A Work Plan for the Phase IB (and contingency for Phase II) was submitted to HPO by PANYNJ on August 24, 2020, and approved by HPO on September 22, 2020 (see Appendix A). The Phase IB survey was conducted by Richard L. Porter, Historian, and Leonard G. Bianchi, Principal Archaeologist. Jean Howson assisted with report writing, and graphics were prepared by Jason R. Nargiz.

The archaeological Area of Potential Effect (APE) for the Airtrain Proposed Action within the potentially sensitive area is shown on Figure 3. Subsurface work within the Design and Construction Limits and Construction Easements is limited to the foundations of the guideway. Foundation activities include pile driving, sheet pile driving, concrete work, erection of the guideway structure, staging and movement of materials and equipment. These activities throughout the construction area may damage the existing asphalt (Anheuser-Busch) or grassy areas (Hartz Mountain). For properties both inside and outside of the new Port Authority property line, the contractor will be required to restore to the existing conditions. For example, asphalt will remain asphalt and pervious areas will remain pervious. The existing weigh station will be demolished. Following construction, a new fence will be installed parallel to the AirTrain.

The APE includes property that was mapped in the 19th century as the Johnson and later Crook property, which contained an early glue factory and likely residences. This property was further researched for the Phase IB survey, and is now identified as the Bond/Johnston property (see Section 1.3 below for the summary history and Appendix B for a detailed chronology). While previous disturbances from construction of the existing monorail would have disturbed portions of the historic property, the Phase IA survey identified potential for intact subsurface historic remains in the area beneath the Anheuser-Busch lot (Block 5090, Lot 44.01) and the adjacent vegetated area within Hartz Mountain property (formerly part



Newark Liberty International Airport
Air Train Replacement Project

PORT AUTHORITY NY NJ
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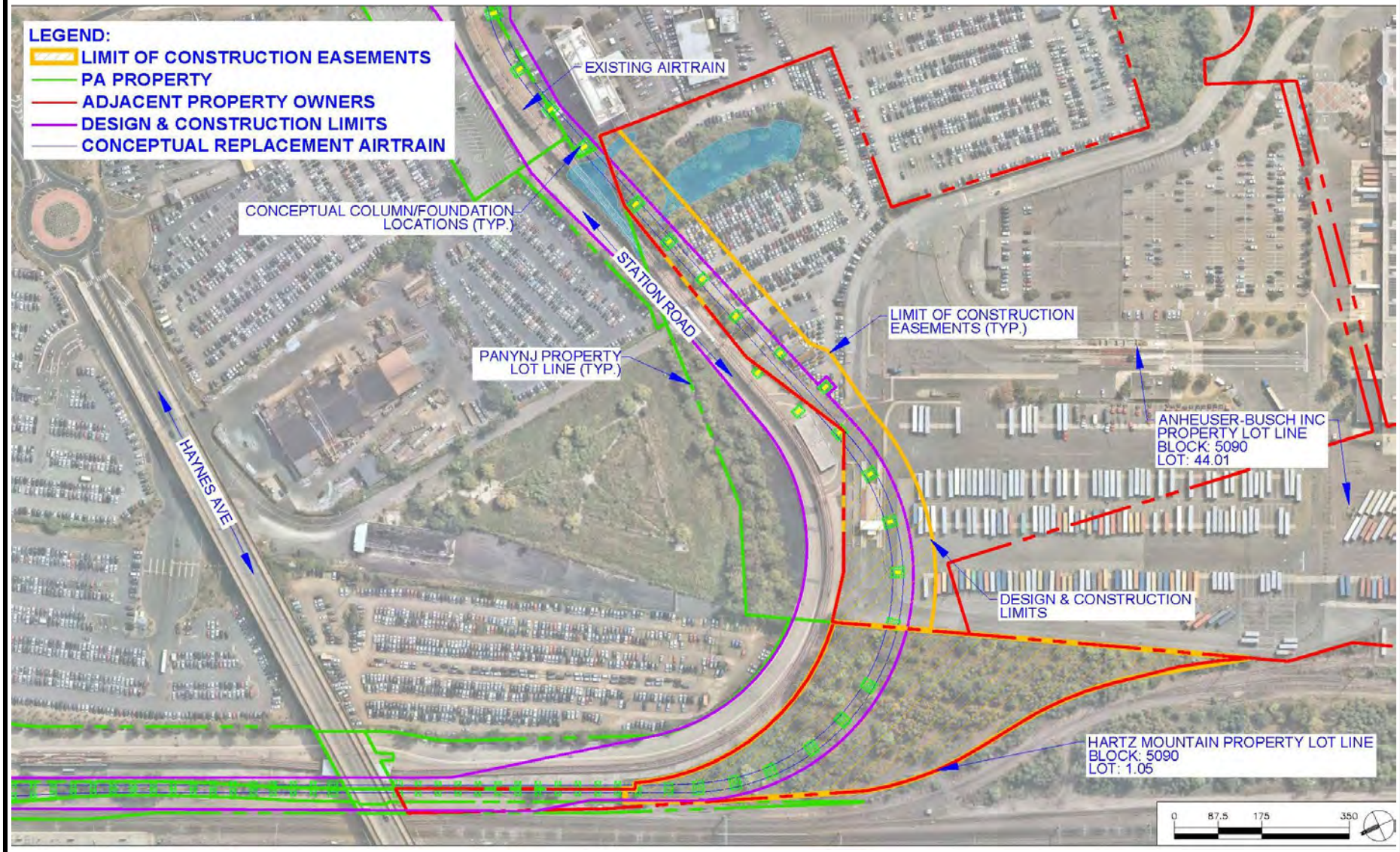
Figure 1 – Newark Liberty International Airport AirTrain Replacement Project shown on U.S.G.S. Elizabeth, New Jersey/ New York Quadrangle. The area targeted for Phase IB testing is indicated.



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Figure 2 – Detailed location of Phase IB survey area showing property parcels (outlined in red) and proposed alignment of AirTrain elevated guideway.



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Figure 3 – Map showing preliminary plan for Proposed Action in the archaeologically sensitive area (PANYNJ 2020).

of the Waverly Yard) (Block 1590, Lot 1.05). Phase IB field testing was conducted in order to determine the presence or absence of resources related to the historic property within the APE.

1.2 Scope of Work

Historical research was undertaken to better understand 19th century land use and possibly identify specific potential resources. It focused on primary documentation, notably land titles (deed, mortgage, and surrogate's records) and census records (both state and federal), with some supplementary secondary source research.

The scope of work for field testing initially called for excavation by machine of seven (7) trenches, three (3) on Block 5090, Lot 1.05 (the Hartz Moutain property) and four (4) on Block 5090, Lot 44.01 (the Anheuser-Busch property). Prior to the fieldwork, however, utility plans for the Anheuser-Busch property were made available and a 54"-diameter sewer line was shown running along interior side of the western fence of the property. One of the originally-proposed trenches was therefore deemed unnecessary, as installation of this utility would have disturbed the location selected for testing. Because of the numerous other subsurface utilities on the Anheuser-Busch property, it was determined that a fourth test on the property was not feasible and no alternate test location was selected. The test trenches were placed along the proposed Elevated Guideway, which will see the greatest subsurface disturbance from construction. They were spaced judgmentally so as to avoid utilities and provide adequate coverage of the alignment.

Test trenches were to measure approximately 4' by 8' and extend at least 4' in depth. If an intact original surface or other features were identified, small shovel test units were to be hand-excavated at the bottom of the trenches. Soils from hand excavations will be screened through ¼-inch mesh. The scope of work called for Phase II testing, if deemed necessary by the Project Archaeologist, to proceed while trenches were open. Phase II would involve expansion of the trenches and placement of 3' by 3' hand excavated units at the bottom (no Phase II was deemed necessary).

Artifact analysis and a full report of all research, archaeological testing, and analysis followed fieldwork. The archaeological survey and reporting conform to the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation*, and the HPO's *Guidelines for Phase I Archaeological Investigations: Identification of Archaeological Resources and Guidelines for Preparing Cultural Resources Management Archaeological Reports Submitted to the Historic Preservation Office*.

1.3 Summary Property History

As outlined in the Phase IA survey, prior to historic-period development the Phase IB study area was on fast land adjacent to vast marshlands (since filled). It would have been an excellent location for habitation by Native Americans in the Precontact period, though no documentary evidence of an Indian settlement here was found, and subsequent development may have disturbed any remaining archaeological evidence. Block 5090, Lots 1.05 and 44.01 lie within lands that were developed in the third quarter of the 19th century and are here referred to as the Bond/Johnson Property. The following summarizes the findings of the documentary research conducted for this archaeological survey (see Appendix B for a detailed chronology and all citations).

The Bond/Johnston Property was an undeveloped portion of a larger landholding conveyed by Elihu Bond to his son David Bond in 1829. The younger Bond lived in a house on the south side of the Meadow Road (now Haynes Avenue) to the east of the Essex & Middlesex Turnpike (this right-of-way is now occupied by the Northeast Corridor), with the remainder of his property extending southward and characterized by

agricultural fields and small segments of marshland. In 1841, Bond subdivided a 16-acre parcel from the southern section of his property and sold it to his son Robert Bond, and it was this tract that would make up the bulk of the Bond/Johnston Property. By mid-century this tract was held by Robert Bond's brother William Bond, and land records, both deeds and mortgages, suggest that the initial development of the property, likely involving the construction of a dwelling, occurred during the latter's ownership tenure. The property was sold out of the Bond family in 1851, and primary documentation suggests that a second dwelling was added by subsequent owners at some point during the ensuing decade.

In 1859 the Bond/Johnston Property was purchased by James Johnston, a glue manufacturer from New York City who had recently relocated to Newark. In 1862 Johnston was listed in the Newark city directory as a glue manufacturer with a factory on his property near the "toll gate" on the "Elizabeth Road." As the latter refers to the Essex & Middlesex Turnpike and the toll house was sited in the northeast angle of the turnpike and the Meadow Road, it is clear that Johnston's glue factory had been built on the land he acquired in 1859. Later that same year Johnston conveyed this valuable property to his son James P. Johnston, but operations at the factory appear to have ended shortly thereafter as references disappear from the city directory. The younger Johnston sold the property to businessmen from Trenton in 1870, and it is somewhat unclear exactly what the situation was on the Bond/Johnston Property during the next several years. The Johnston family remained in the glue manufacturing business elsewhere in Newark and in New York City, although the Johnston glue factory on the Bond/Johnston Property was still referenced in 1872 and the property was shown on mapping dating from 1874 as being under Johnston ownership. The factory building and two dwellings were represented on historic maps into the 1880s.

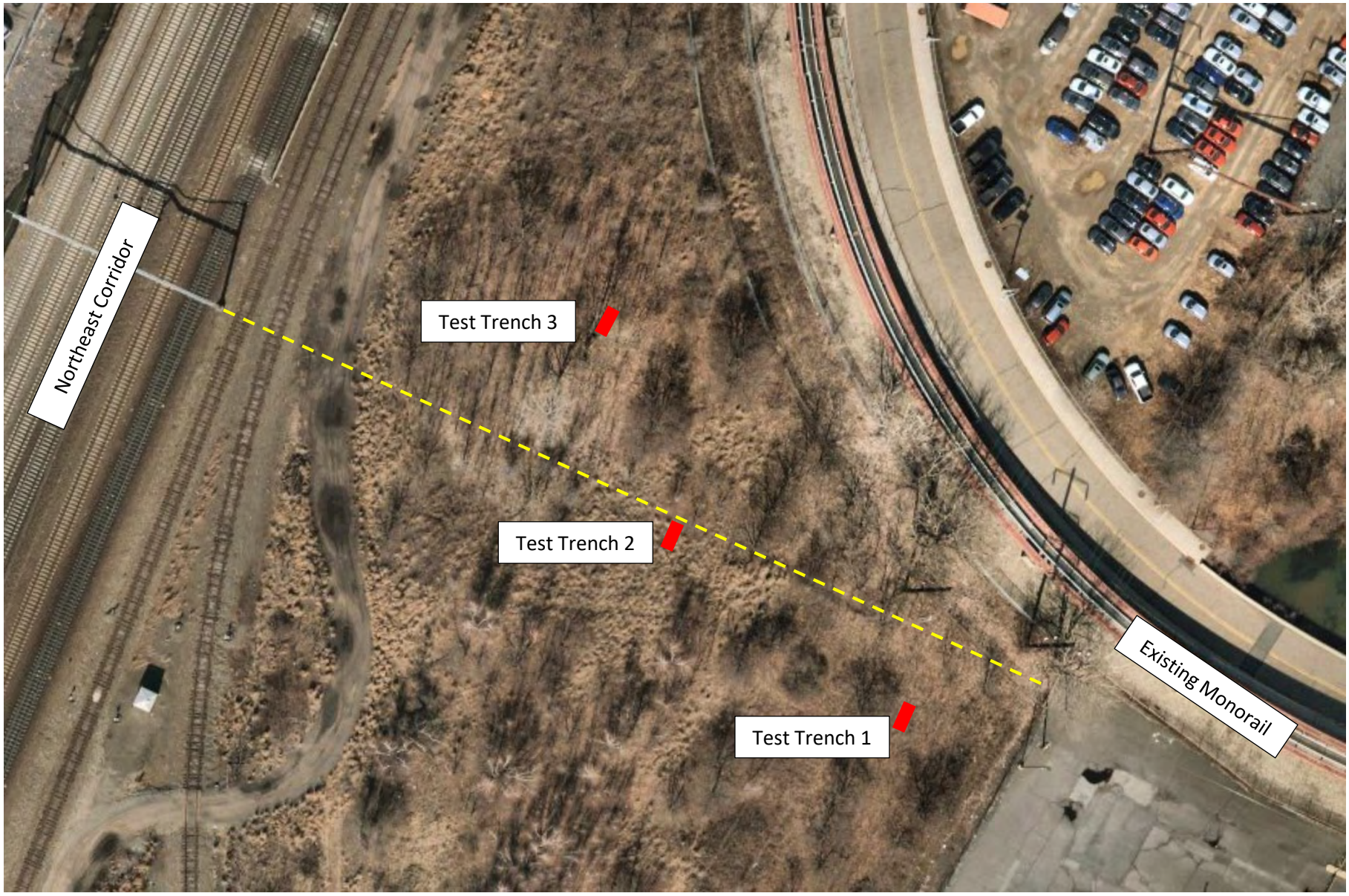
Jacob Fisher acquired the Bond/Johnston Property in 1886, and during his tenure all buildings that had stood on the property were demolished, with a new dwelling built in the northwestern corner of the parcel. In 1907 Fisher sold the tract to the Carnegie Steel Company, who used it (and additional land to the south) as the site of a large warehouse complex. The company removed the Fisher dwelling and built a small hospital, a gatehouse, and a shed in the northeastern part of the property. The hospital was removed prior to mid-century, with the gate house and the shed demolished circa 1970.

2 FIELD TESTING

2.1 Methods

Archaeological field investigations involved walkovers of each property and a systematic program of subsurface testing designed to assess current conditions and recent impacts, and determine the presence or absence of archaeological resources. In addition to structural remains, the area targeted was considered to have low to moderate potential for archaeological features, such as debris concentrations (i.e. trash pits) or shaft features (such as privies, cisterns, and drywells) associated with the day-to-day historic use of the site. Field investigators also kept in mind that the area had a low potential for traces of pre-contact habitation.

Walkovers of the target areas on Block 5090, Lot 1.05 (Hartz Mountain) and Lot 44.01 (Anheuser-Busch) properties took place on August 26, 2020 and again on October 26, 2020. Subsurface testing was accomplished over two days between October 29th and November 3rd of 2020. A total of six (6) backhoe-assisted test trenches (TTs) were excavated, three (3) each at the Hartz Mountain Property (Block 5090 - Lot 1.05) and the Anheuser-Busch Property (Block 5090 - Lot 44.01). All test units, which measured approximately 4' in width and 8' in length, were placed at irregular intervals between 80' to 230' apart due to local disturbances and active utilities. Test unit stratigraphy was recorded on standardized forms and selected trench sidewalls were photographed.



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Figure 4 – Locations of archaeological Test Trenches 1, 2 and 3 on Hartz Mountain property (Block 5090, Lot 1.05). Trenches measured approximately 4' x 8'. The dashed yellow line represents the base line established for recording test locations.



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Figure 5 – Locations of archaeological Test Trenches 1, 2 and 3 on Anheuser-Busch property (Block 5090, Lot 44.01). Trenches measured approximately 4’ x 8’.

Test trenches were consecutively numbered within each area (i.e. Hartz Mountain TT 1, TT 2, etc.) and located on project maps (Figures 4 and 5). The units were number so as to conform to the Work Plan (the actual sequence of excavation was in reverse order). A continuous provenience catalog of individual stratigraphic contexts was kept in the field and can be found in Appendix C-1. For test units excavated at the Hartz Mountain Property the catalog begins with number "0100" and the Anheuser-Busch Property catalog starts with number "0200". As most of the deposits encountered in tests units were determined to be relatively recent fill strata, only those contexts that appeared to be relatively undisturbed were screened in the field and material retained for laboratory processing. Some artifacts from recent deposits were noted in the field but not collected. Labeled bags were transported to the NV5's Parsippany laboratory for analysis. Laboratory processing consisted of cleaning, identifying, and counting and/or weighing of all materials retained in the field. No items in need of conservation were recovered during the field effort.

A small quantity of material, including fragments of household ceramics (n=3), glass bottles and commercial containers (n=2), and construction materials (n=13) was inventoried in the lab. Faunal remains included marine shellfish (Oyster shell fragments) and a single large mammal bone. All of the material was recovered from an informal, hand-excavated test placed within the base of TT 2 on the Hartz Mountain Property. A more detailed description and interpretation of the assemblage will follow the description of the test unit. An inventory of all cultural material identified during the project is provided in Appendix C-2.

2.2 Testing on Block 5090 Lot 1.05 (Hartz Mountain Property)

The targeted test location within the Hartz Mountain Property was a wooded area, completely covered with secondary growth hardwoods, low shrubs, and grasses (Plate 1 shows a small grassy clearing). In general, the area's topography is level with elevations at about 10.0' above sea level (ASL) and exhibiting no appreciable slope in any direction. As shown on cartographic sources, higher elevations are recorded to the south and west in the vicinity of Weequahic Lake and Park. The level topography is most likely a reflection of the property's use as a railroad yard (originally associated with Waverly Station of the Pennsylvania Railroad and later known as the Waverly Yard – Waverly Station was named for Waverly Neck, upland that extended into the Newark Meadows). The project area was entirely covered by the rail yard as late as the 1980s. The lot is bounded by the monorail on the north and east and by the Anheuser-Busch property on the east. The north and east property lines are marked by chain link security fences. The western boundary is an unpaved access road along the Northeast Corridor railroad tracks. Figure 4 shows the archaeological Test Trench (TT) locations within the Hartz Mountain Property (Block 5090 Lot 1.05) study area. Preparation for testing was limited to machine and hand clearing and cutting of small trees, shrubs, and undergrowth.

In the course of our walkovers of the project's APE a number of surface features, probably related to the former railroad yard, were noted. These features included a rectangular concrete box, measuring approximately 2.0' by 3.0', covered with an iron plate, which appears to have been a junction box for an abandoned electrical service; and the remains of a steel I-beam set in a concrete base, probably a vertical stanchion in the former railroad yard serving overhead facilities, such as electrical service, signage, etc. Both features were located along the western portion of the lot adjacent to the unpaved access road that borders the Northeast Corridor rail lines and west of areas where archaeological tests were undertaken. A section of multi-stranded steel wire with an attached turn-buckle was also located near the cut I-beam. No systematic recording or identification of these features was considered to be warranted.

Active utilities in the APE include overhead electrical lines and a gas main, both of which extend in a north-south direction along the eastern property line of the Hartz Mountain sub-area. The electrical lines, which



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Plate 1 – General view of overgrown clearing , Block 5090, Lot 1.05 (Hartz Mountain property) test area. NV5, August 2020.

run parallel to and approximately 20.0' to 75.0' west of the east property line, are supported by two lines of large vertical, steel I-Beam stanchions set in concrete footings and anchored with diagonal guide wires (the guide lines were similar in size and manufacture to the steel wire noted to the west). Each stanchion contains multiple electrical transmission lines on steel cross-ties. An underground 8" diameter gas main was located approximately 15' feet west of the chain-link fence and slightly offset to the east of the overhead electrical lines. The gas main's right-of-way has been cleared of vegetation and the line's right-of-way (ROW) is marked with above ground posts.

Prior to the start of excavation an east-west baseline was established to facilitate placement of test units and for recording purposes. The line extended eastward from a power line gantry on the Northeast Corridor tracks located west of the project's APE (see Figure 4). All tests within the Hartz Mountain Property were located to the east of the railroad gantry and north or south of the baseline. The east end of the gantry was designated as our datum (North 0.0/East 0.0).

Test Trench 1

Test Trench 1, situated to the south of the baseline, was located at coordinates East 355.0'/South 35.0' at a distance of approximately 55.0 feet from the lot's east property line (see Figure 4). The test unit was placed within the corridor of the overhead electrical lines and approximately 10.0' to 15.0' west of the buried gas main to avoid any associated disturbances. Initial preparation of the area was limited to removal of low-lying vegetation.

Strata A and B of TT 1 consisted of a thick black (010YR-2/1) loam that extended to an overall depth of 2.8' below the surface. The upper humus and topsoil deposit, labeled stratum A, contained an angular gravel deposit, possibly associated with the construction and/or maintenance of the utility lines in the area. The lower 1.4' of the deposit, while of similar composition and color as the upper portion, was designated stratum B due to the presence of coal and coal ash. Strata A and B extended across the entire test unit. Underlying Stratum B was a 1.45'-thick deposit of mottled soil, composed of a yellowish brown (010YR-5/6) sand mottled with reddish brown (005YR-4/4) silt, labeled stratum C. The lower extent of stratum C, which ended at a depth of 4.25' below the surface, was generally lighter in color. A large-diameter (> 3.0' OD) stoneware drain pipe fragment was noted this fill along the test unit's east wall.

Stratum C, in turn, was followed by stratum D, a 0.5' thick deposit of more consistent light yellowish brown (010YR-6/4) clay loam covered by a thin layer of organic material that varied in thickness. The relatively thin lens of organic material, which did not extend across the entire base of the test unit, was not designated a separate layer. Thickest in the southwest corner of the test unit, the deposit thinned out to the north and east (Plate 2). Stratum D ended at a depth of 4.75' below the surface and was underlain by the subsoil, a reddish brown (005YR-4/4) silty clay (Stratum E). The test unit was closed at a final depth of 4.95' below the surface.

The location of TT 1 appears to have been cut and filled to subsoil, though the lens of organic material in stratum D may represent a redeposited former topsoil deposit With the exception of the drain pipe fragment in the fill, no other artifacts were noted, nor were any archaeological features or deposits of historic or precontact cultural material encountered.

Test Trench 2

Test Trench 2 was also situated slightly south of the baseline at coordinates East 232.0'/South 10.0', in a sparsely wooded area (see Figure 4). Initial preparation of the area was limited to machine-assisted



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Plate 2 – Test Trench 1, Block 5090, Lot 1.05 (Hartz Mountain property). The arrows point to possible redeposited topsoil. NV5, October 29, 2020.

clearing of small trees and shrubs. TT 2, like TT 1, also contained numerous, relatively thick and level strata that extended across the full extent of the unit.

The uppermost layers within TT 2, labelled in the field as strata A through C, consisted of a 1.7' thick deposit of a black (010YR-2/1) loam with varying amounts of coal and coal ash. The fill layer(s) were similar to the upper deposits in TT 1. Other than waste coal, coal ash and cinder, no other cultural material was noted. A yellowish brown (010YR-5/6) sand, stratum D, followed, contrasting sharply both in terms of composition and color with both the overlying and underlying strata (Plate 3). The lower portion of the roughly 1.0' thick stratum exhibited a slight amount of inter-bedding with an underlying layer of coal and coal ash in a black (010YR-2/1) sand. The interface of the two deposits appears to be the result of the mechanical cutting and filling actions. The lower black sand deposit, designated stratum E, extended to a depth of 3.3' below the surface.

Beneath stratum E was a more compact, 0.9'-thick deposit of reddish brown (005YR-4/4) silty clay loam, stratum F, which covered the entire test trench to a depth of 4.20' below the surface. While the deposit was initially thought to be possible subsoil, continued excavation determined that the layer was also a fill deposit. Stratum G was a dark gray (005YR-4/1) clay loam noted in the southwest portion of the test unit. Due to the very rainy conditions and safety considerations (the depth of the deposit was greater than 4.0' deep) it was impossible to completely uncover this soil over the entire base of the test unit. Stratum G appeared to slope downward to the east in the southern end of the test unit. As the deposit was interpreted to be a former topsoil stratum, which was concealed by more recent filling, a decision was made to conduct an informal shovel probe to quickly determine the depth of the deposit and obtain a sample of any cultural material. A hand-excavated test, measuring roughly 1.0' square, was placed near the southwest corner of the unit. Excavated soil from the test was screened through ¼" steel mesh.

The presumed buried topsoil deposit measured 1.8' thick, ending at a depth of 6.05' below the surface. The lower 0.8' portion of the deposit, while of similar composition (i.e. a clayey loam), appeared to be slightly darker in color. The lower portion of the deposit was designated stratum H, but was not excavated as a separate component. A very small quantity of what appears to be household material including ceramics (n=3), bottle glass (n=2), construction material (n=13), and faunal remains (shell: n=6, bone: n=1) was recovered from strata G and H. The most diagnostic items include a single sherd of an unidentifiable Rockingham ceramic vessel (post-1850s) and a wire cut, common nail (post-1890s). See Appendix C-2 for a complete list of material. Subsoil, a reddish brown (005YR-4/4) silty clay loam (Stratum I) was found beneath Stratum H. The shovel test was closed at a depth of 6.2' below the surface as ground water pooled into the base of the shovel test.

In summary, TT 2 uncovered fill layers that extended to a depth approximately 4.0' below the surface. Underlying the fill was an apparent former surface layer that started at a depth of approximately 4.25' below the surface and measured slightly less than 2.0' thick. As the bottom of the deposit was slightly darker it would appear that the deposit was the result of grading of adjacent areas and filling in this particular location. The buried topsoil, which evidently predates the expansion of the Waverly Yard in the last decade of the 19th century and early 20th century, contained a small amount of possible household material dating to the latter half of the 19th century, and possibly, the first decade of the 20th century. No historic features or concentrations of material were identified, and no precontact material was found.

Test Trench 3

Test Trench 3 was situated north of the east/west baseline at coordinates East 170.0'/North 70.0' in a sparsely wooded area. The unit contained a total of eight distinct fill strata in the upper 4.40' (Plate 4). The stratum designation, soil composition, and opening and closing depths are as follows:



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Plate 3 – Test Trench 2, Block 5090, Lot 1.05 (Hartz Mountain property). The thick former topsoil was sampled with a hand-excavated shovel test unit. NV5, October 29, 2020.



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Plate 4 – Test Trench 3, Block 5090, Lot 1.05 (Hartz Mountain property). The reddish layer was determined to be a thin fill layer above a buried former topsoil. NV5, October 29, 2020.

A - black (010YR-2/1) silt loam - 0.00' to 0.50' – humus layer
B - black (010YR-2/1) silt loam - 0.50' to 0.90' – topsoilC - black (010YR-2/1) loam - 0.90' to 2.00'
D - yellowish brown (010YR-5/6) silt - 2.00' - 2.40'
E - white (005Y -8/2) - 2.40' to 2.90' – primarily coal ash
F - black (010YR-2/1) -, 2.90' to 3.10' primarily coal ash
G - yellowish brown (010YR-5/6) sand - 3.10' to 4.20' - coarse sand
H - reddish brown (005YR-4/4) silt - 4.20' to 4.40' – a thin, compact deposit

Machine excavation of TT 3 was suspended upon reaching a compact, reddish brown (005YR-4/4) silt loam, Stratum H, which was originally interpreted as being the start of culturally sterile subsoil. Prior to recordation and backfilling of TT 3, however, TT 2, located to the east, was excavated. Based on the presence of a buried, former surface stratum in TT 2 (see above), a decision was made to conduct a shovel test at the base of TT 3 to confirm if subsoil had, in fact, been reached. Stratum H, the reddish soil shown at the base of the unit in Plate 4, was determined to be a thin, 0.2' thick layer of fill that covered a buried topsoil layer, Stratum I. Stratum I was composed of a dark gray (005YR-4/1) clay loam that measured 0.55' thick. The deposit was screened, but no material was recovered from the layer. Underlying Stratum I was the subsoil, a reddish brown (005YR-4/4) silty clay loam that started at a depth of 4.95' below the surface. Designated Stratum J, the deposit was excavated to a depth of 5.2'.

In summary, TT 3 uncovered thick fill layers that extended to a depth more than 4.0' below the surface. A buried former surface was identified starting at a depth of approximately 4.4' below the surface and measuring 0.5' thick. A hand excavated test unit within the base of TT 2 failed to retrieve any cultural material. No historic features or concentrations of material were identified, nor were any precontact artifacts found.

Discussion

Most of the deposits encountered in the test trenches within Block 5090, Lot 1.05 (Hartz Mountain property) are likely associated with the cutting and filling of the local landscape to serve the purposes of the railroad yard. A pre-railroad surface was identified in TTs 2 and 3. The old surface is buried just over 4' below grade. Screened soils from a shovel test excavated into this layer in TT 2 produced a small number of 19th-century artifacts. The layer, which doubtless extends horizontally across the area, is likely to contain additional evidence of the 19th-century occupation of the property, and may also retain traces of earlier, possibly precontact period, occupation. However, no archaeological features requiring further excavation were identified within the test units. A large aerial exposure of the buried surface would be needed to verify the existence of any significant resources, such as more concentrated and datable artifact deposits or features associated with the Bond/Johnston property or earlier occupation.

The proposed action does not call for excavation of this area to depths of 4' or more, but instead involves driving piles and sheet piles for the foundations of the elevated guideway. It is therefore concluded that additional testing of the buried surface through broad excavation with removal of huge amounts of overlying fill is neither feasible nor warranted.

2.3 Testing on Block 5090, Lot 44.01 (Anheuser-Busch Property)

The test area on Block 5090 - Lot 44.01 (the Anheuser-Busch property), like the adjacent Hartz Mountain lot to the west, was generally level with elevations also at about 10.0' ASL. In marked contrast to the Hartz Mountain property, however, the entire APE within the Anheuser-Busch property was paved with concrete or asphalt. Located in the northwest corner of the large Anheuser-Busch facility, the proposed elevated guideway cuts across roadways leading to or flanking the brewery's former weigh station. The

one-story metal frame weigh station with access ramps and platform scale is no longer in service. Tractor-trailers are occasionally parked in the area. Adjacent to the south of the weigh station is a large, active parking lot for trailer trucks and other vehicles. The northeastern section of the proposed alignment runs along the westerly side of Bessemer Street (apparently named by Carnegie Steel Company, one of the local area's early 20th century industrial establishments).

Based on mark-outs and utility plans provided to the archaeological team, locations of buried utility lines were noted prior to the start of excavation. Patched trench cuts for some of the utilities were apparent on the surface. Active utilities in the project's APE include buried electrical and drainage lines. A 54" drainage line runs along the western property line (inside the chain link fence). A 36" RCP pipe runs parallel to the fence approximately 50' east of the property line. The selection of areas to test archaeologically was constrained by the number and variety of utility lines and the presence of the inactive weigh station within the project APE. Test units were sited, for the most part, to avoid probable disturbance associated with the construction of the weigh station and active utilities. Test unit locations were mapped by tying in to local structures. See Figure 5 and Plates 5 through 8 for views of each test location. Each test was marked off on the pavement, the unit perimeter was saw-cut, and the paving was removed by the backhoe. All asphalt was carted off-site. Barriers were erected during excavation to isolate areas and insure the safety of the facility's employees while not obstructing the use of the parking lot. All test units were backfilled and subsequently patched with asphalt on the day of excavation.

Test Trench 1

Test Trench 1 was located along the west side of Bessemer Street at a distance of approximately 110' north of the access lane on the north side of the weigh station. The test unit was placed along the edge of roadway with its long axis oriented northeast to southwest.

The pavement was underlain by thick fill strata that extended across the entire test trench (Plate 9). The asphalt and the underlying 0.9'-thick prepared gravel base deposit in a dark grayish brown (2.5Y -4/2) sandy loam was designated stratum A. Beneath it was a dark brown (7.5YR-3/2) sandy clay loam, designated stratum B, which measured 1.4' thick and contained fragments of brick, asphalt, and a small quantity of more diagnostic material including fragments of "Hotel" china, glass, bottle glass, and metal. Stratum C consisted of a 3.4' thick layer of dark reddish brown (005YR-3/2) silty clay mottled with black (010YR-2/1) sandy clay. It contained decaying organic material, and was very different from other soils encountered across the test area. A small quantity of mid- to late-20th-century ceramics, bottle glass, and a few objects of more recent manufacture (including a plastic cup lid) was noted during excavation and within the backfill soil. Excavation of TT 1 was taken to an overall depth of 5.9' below the road surface at which point water started to pool at the base of the test trench.

TT 1 appeared to be in a location that was filled in the latter part of the 20th century, possibly with soils dredged from nearby in the vicinity of the low ponding area and historic drainage ditch on Port Authority property to the north (see Figures 2 and 3). It may have been lower-lying and marshy compared to the other test trench locations. The full depth of the fill was not determined due to the infiltration of water.

Test Trench 2

Test Trench 2 was located at the north property line of Block 5090 - Lot 44.01 approximately 10.0' east and 25.0' north of the weigh station's east ramp (see Figure 5). The test unit was placed along the north edge of roadway with its long axis oriented east/west. Preparation included the cutting and removal of two layers of asphalt.



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Plate 5 – General view of Block 5090, Lot 44.01(Anheuser-Busch property) Test Trench 1 area. View is toward the northeast up the access drive. The existing monorail is visible in the background. NV5, August 2020.



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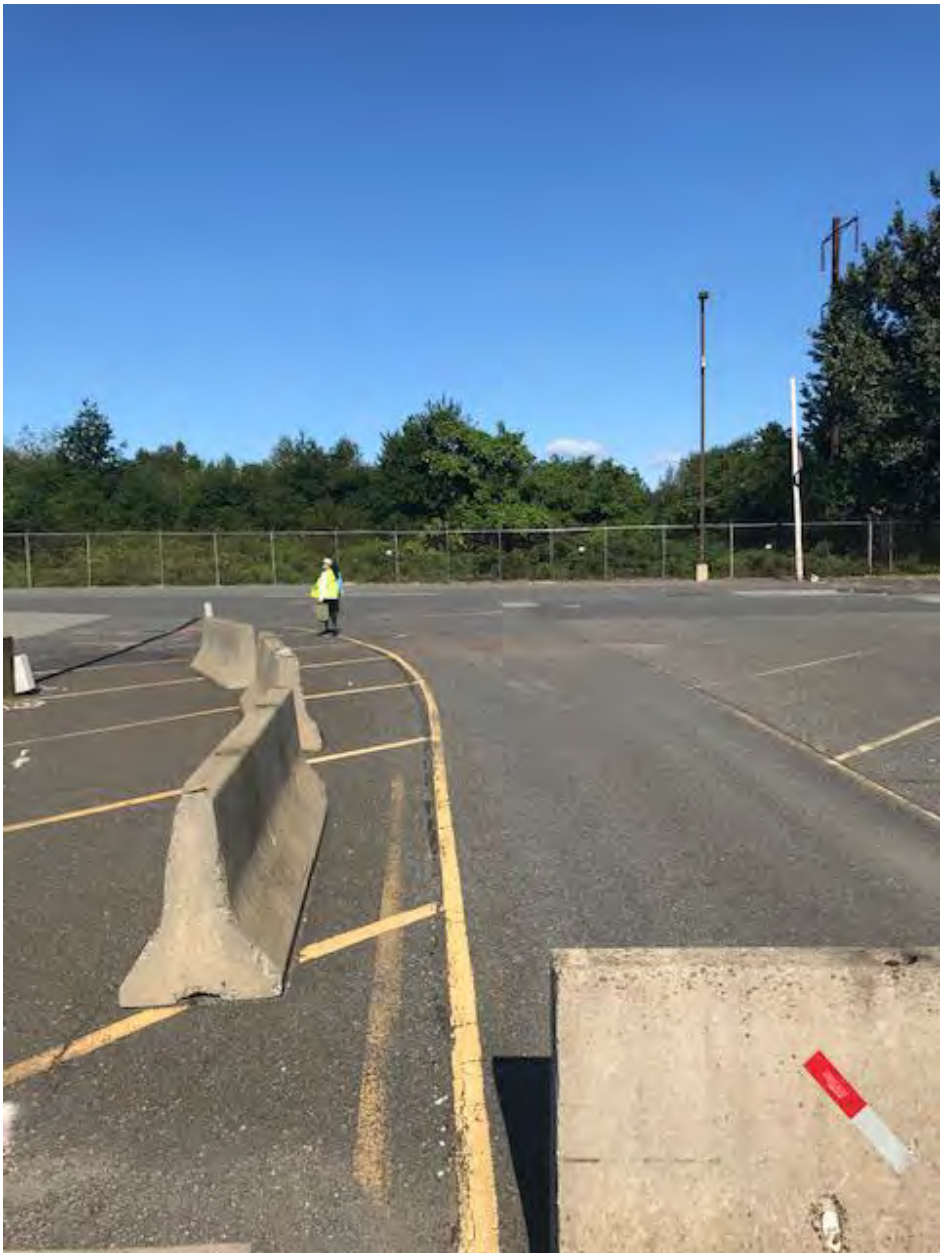
Plate 6 – General view of Block 5090, Lot 44.01(Anheuser-Busch property) Test Trench 2 area. View is toward the east . Test Trench 2 was placed in front of the parked van. NV5, August 2020.



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Plate 7 – General view of Block 5090, Lot 44.01(Anheuser-Busch property) Test Trench 3 area. View is to east toward the old weigh station. Note manhole in foreground. NV5, August 2020.



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Plate 8 – General view of Block 5090, Lot 44.01(Anheuser-Busch property) Test Trench 3 area. View is from the old weigh station to west toward the wooded Hartz Mountain property (beyond the fence). NV5, August 2020.



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Plate 9 – Test Trench 1, Block 5090, Lot 44.01(Anheuser-Busch property). NV5, November 2, 2020.

In sharp contrast to the test trench to its east (and the units undertaken on the Hartz Mountain property), TT 2 contained few strata before the culturally sterile subsoil was reached (Plate 10). Stratum A designated two layers of asphalt and an underlying gravel base in a weak red (2.5YR-4/2) sand that extended to a depth of 1.10' below the road surface. Underlying stratum A was a 0.8' thick zone of mottled soil partially covered by a lens of brownish yellow (010YR-6/6) sandy loam. Designated stratum B, the mottled soils included a reddish brown (2.5YR-4/4) sandy loam mixed with a very dark gray (005YR-3/1) sandy loam that ended at a depth of 1.9' below the surface. Underlying stratum B was a reddish brown (005YR-4/3) sand that measured approximately 3.6' thick that remained consistent in color and composition to the base of the test unit. This was subsoil. Excavation of TT 2 was taken to an overall depth of 5.5' below the road surface at which point water slowly pooled into the base of the test trench. No historic or precontact period artifacts were noted during the excavation of the test unit or in the backfill soil.

In summary, in sharp contrast to much of the project area which has undergone filling to level up the grade, TT 2 was apparently located in an upland area that was evidently cut and filled to subsoil.

Test Trench 3

Test Trench 3 was located 60.0' west of the weigh station's southwest ramp, adjacent to the south access road to the former facility (see Figure 5). The test unit was located in area with numerous active utilities, including a drainage line to the south that connects to a manhole located southwest of TT 3. Adjacent to the north of the test unit was a buried electrical line for a light post located to the west. Due to the active utilities in close proximity to the test unit the size of TT 3 was slightly shorter (approximately 6.0' in length) and excavation proceeded at a slower pace.

Stratum A included a thick asphalt layer and a thin deposit of dark grayish brown (2.5Y -4/2) sand with gravel, the base layer for the asphalt pavement (Plate 11). Stratum B, reddish brown (005YR-4/3) loamy sand mottled with dark reddish brown (005YR-3/3) loamy sand, started at a depth of 0.9' below the surface. At a depth of 2.8', the top of a large diameter concrete drainpipe was uncovered in the eastern portion of the test unit. The pipe had a slight downward slope to the north and extended to the north and south beyond the limits of the test unit. Its full diameter was not determined. As the test unit was located entirely within the pipe trench, and utilities constrained the testing to the west, south, and north, no further excavation was attempted and the test was closed.

In summary, TT 3 uncovered a large diameter concrete drain pipe that extended across and beyond the limits of the test unit from north to south. The drainage line does not appear on utility plans, nor was it identified by mark-outs in area. Additional research would be needed to determine if the line has been abandoned in place or is in active service. Other than the concrete drainpipe, which apparently dates to the 20th century, no archaeological features or deposits of historic or precontact period cultural material were encountered.

Discussion

The testing within Block 5090, Lot 44.01 (Anheuser-Busch property) provides no evidence of pre-20th-century use of the parcel. Disturbances from utilities and construction of the weigh station have severely limited the archaeological potential of this portion of the APE. No historic or precontact artifact-bearing deposits were identified.



Newark Liberty International Airport
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Plate 10 – Test Trench 2, Block 5090, Lot 44.01(Anheuser-Busch property). Fill layers overlay subsoil (reddish soil) which extended to the base of the trench at 4.5’ below grade, where water began to infiltrate. NV5, November 2, 2020.



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Plate 11 – Test Trench 3, Block 5090, Lot 44.01(Anheuser-Busch property). NV5, November 2, 2020.

3 CONCLUSIONS AND RECOMMENDATIONS

No archaeological resources requiring further evaluation were identified in this Phase IB field survey. A buried former topsoil layer was identified in two of the test trenches, TTs 2 and 3 on Block 5090, Lot 1.05 (the Hartz Mountain property). The layer produced a small number of late 19th-century artifacts from one unit (TT 2), but no features or concentrations of artifacts were found. At least 4' of fill deposits overlay the former topsoil.

Artifacts recovered from the former topsoil layer in TT 2 on Block 5090, Lot 1.05 may be related to the historic occupation of the property, possibly to a residence in the vicinity during the Johnston ownership. In order to further investigate the topsoil deposit, a large area would need to be stripped of several feet of fill. Had the Phase IB testing identified specific features that could be evaluated for National Register eligibility, broader exposure and Phase II testing of such features would be indicated. However, Phase II testing to expose a larger area of the former surface in search of features or artifact concentrations is not warranted. Although the foundation piers for the proposed elevated guideway will penetrate the fill and extend through the identified former ground surface, construction plans call for pile driving and sheet pile driving for the foundations. These actions will not result in the disturbance (or exposure) of large areas beneath the fill.

It is worth noting that the testing described herein proves that the rail yards that once covered the area did not result in the obliteration of the old surface, and in fact may have preserved it beneath layers of fill brought in to level the rail yard. Should project plans be developed that require excavation of a larger area to depths below the fill (i.e. approximately 4' below grade) within Block 5090, Lot 1.05, a program of construction monitoring, Phase II testing, or comparable investigation and analysis should be undertaken to investigate the former ground surface for deposits and features that may yield information about the historic use of this land.

APPENDIX A

NJHPO Correspondence and Work Plan for Phase IB

U.S. Department
of Transportation
**Federal Aviation
Administration**

New York Airports District Office
1 Aviation Plaza, Suite 111
Jamaica, NY 11434
Telephone: 718-995-5770
Fax: 718-995-5790

August 24, 2020

Mr. Vincent Maresca
New Jersey Historic Preservation Office
501 East State Street
Trenton, New Jersey 08609

Re: HPO project number 20-0602
AirTrain Newark Replacement Program
Phase 1B/II Work Plan
Newark, New Jersey

Dear Mr. Maresca:

In connection with the Port Authority of New York and New Jersey's (PANYNJ) AirTrain Newark Replacement Program (the Program), please find attached a Work Plan for Phase 1B and Contingency for Phase II Archaeological Testing. Consultation Comments on the Phase 1A survey were previously provided by the New Jersey Historic Preservation Office on May 12, 2020. This Work Plan complies with Section 106 of the Historic Preservation Act and has been prepared by NV5, Inc., who is a consultant on PANYNJ's Environmental Assessment team.

The Federal Aviation Administration respectfully requests that your office review the attached Work Plan and, if found acceptable, document and forward said approval to our office. If you have any questions on the attached Work Plan, please feel free to contact me at Edward.knoesel@faa.gov, or on my cell phone at (917) 951-9112. Thanks very much.

Sincerely,

Environmental Protection Specialist
Federal Aviation Administration
New York Airports District Office
159-30 Rockaway Blvd, Suite 111
Jamaica, New York 11434

CC: C. Cronin, PANYNJ
R. D'Apuzzo, PANYNJ
K. Lamond, PANYNJ
J. Howson, NV5

WORK PLAN

PHASE IB AND CONTINGENCY FOR PHASE II ARCHAEOLOGICAL TESTING

AIRTRAIN NEWARK REPLACEMENT PROGRAM

HPO Project No. 20-0602-7
HPO-E2020-48

Area of Potential Effects (APE):

The APE for the **Proposed Action** alignment for the AirTrain is shown on Figure 1. Subsurface work within the Design and Construction Limits and Construction Easements are described as follows:

> Subsurface work is limited to the foundations of the guideway. Foundation activities include pile driving, sheet pile driving, concrete work, erection of the guideway structure, staging and movement of materials and equipment. These activities throughout the construction area may damage the existing asphalt (Anheuser Busch) or grassy areas (Hartz). For properties both inside and outside of the new Port Authority property line, the contractor will be required to restore to the existing conditions. For example, asphalt will remain asphalt and pervious areas will remain pervious. The existing weigh station will be demolished. Following construction, a new fence will be installed parallel to the AirTrain.

The APE avoids the historic and present footprint of the Newark City Cemetery. It includes property that was mapped in the 19th century as the Johnson and later Crook property, which contained an early glue factory and likely residences (Figure 2). While previous disturbances from construction of the existing Monorail would have disturbed portions of the historic property, there is potential for intact subsurface historic remains in the area beneath the Anheuser Busch lot and the adjacent vegetated area within Hartz Mountain property (formerly part of the Waverly Yard).

Research Goals and Project Guidelines:

Phase IB field testing will be conducted in order to determine the presence or absence of resources related to the historic Johnson/Crook property within the APE. It is noted that if any intact early surfaces are extant, careful examination will be made for traces of precontact occupation.

If indicated, the fieldwork will proceed to Phase II testing in order to provide for evaluation of the National Register eligibility of the site(s) and assessment of project impacts. Evaluation to determine the National Register eligibility of archaeological sites will be in keeping with the National Park Service's 2000 National Register Bulletin, *Guidelines for Evaluating and Registering Archeological Properties*.

Due to the logistical difficulty of accessing the properties for subsurface testing, it is anticipated that we will proceed directly to Phase II if the Phase IB investigation identifies archaeological resources within the APE. Consultation with HPO will be sought if needed during the field program. Although visibility will be limited due to the necessarily limited number of test trenches, every effort will be made to expose deposits and features sufficiently to allow for eligibility determinations.

All phases of the archaeological survey and reporting will need to be in keeping with the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation*, and the HPO's *Guidelines*

for Phase I Archaeological Investigations: Identification of Archaeological Resources and *Guidelines for Preparing Cultural Resources Management Archaeological Reports Submitted to the Historic Preservation Office*.

Documentary research:

Historical research will be focused on primary documentation, notably land titles (to include deed, mortgage, and surrogate's records) and census records (both state and federal), with some supplementary secondary source research.

Fieldwork General Assumptions:

Geotechnical borings will be completed and the results will be provided prior to conducting archaeological testing.

Access for machine excavations will be provided by the property owners. Test locations are shown on attached maps, Figures 3a and 3b. At least one lane of the entrance driveway to the Anheuser-Busch facility will remain open during the archaeological test excavation work. Traffic cones will be used to delineate the closure of a single lane.

It is anticipated that test trenches will be backfilled the same day as excavated. If it is necessary to leave a trench open overnight, steel plates will be installed by the excavation contractor. If there is an unanticipated delay in scheduling further testing (e.g. between Phase IB and Phase II), trenches may need to be backfilled and re-opened at a later date.

Backhoe excavation trenches will be backfilled with original material and compacted by backhoe. In paved areas, the excavation will be brought to level with a 6-inch gravel layer. Pavement patching will be accomplished after all tests in paved areas are completed. Pavement and striping will be restored to original condition. Asphalt will be of the same quality as currently in place (i.e. strong enough for truck traffic).

Phase IB Archaeological Testing:

Proposed test locations are shown on Figure 3.

Anheuser-Busch Property (paved active truck lot) - Testing will involve excavation of four (4) trenches measuring approximately 4' x 8' x 4'(depth). The pavement will be cut and excavation will proceed with a backhoe. If an intact original surface or other features are identified, small shovel test units will be hand-excavated at the bottom of the trenches. Soils from hand excavations will be screened through ¼-inch mesh. Locations of proposed tests are shown on the accompanying map.

Hartz Mountain Property (vegetated area) -Testing will involve excavation of three (3) trenches measuring approximately 4' x 8' x 4'(depth). If an intact original surface or other features are identified, small shovel test units will be hand-excavated at the bottom of the trenches. Soils from hand excavations will be screened through ¼-inch mesh. Approximate locations of proposed tests along the proposed AirTrain foundation are shown on the accompanying map.

Phase II Archaeological Testing:

If archaeological resources that have the potential to provide information about the historic use of the properties are identified, Phase II testing will be necessary. The decision to recommend Phase II testing will be made by the project archaeologist, who will immediately inform the client. Phase II will not be

undertaken without client authorization. The project archaeologist, at their discretion, may consult with the New Jersey Historic Preservation Office regarding the need for Phase II testing. Any excavation that will remain open for more than one day will be covered with steel plates.

Phase IB trenches will be widened by 2 to 4 feet, and 3-foot-square hand-excavated units will be placed in the bottom of the widened trenches. Hand excavated soils will be screened through ¼-inch mesh. It is anticipated that the larger exposure and hand excavations will provide sufficient information on the nature, dating, and integrity of deposits or features to allow for a recommendation as to National Register eligibility.

Protocol for Human Remains:

If potential human burials or human skeletal remains are encountered, all ground disturbing activities in the vicinity will cease immediately and the Historic Preservation Office and Regional Medical Examiner will be contacted. Burials and potential burials shall be left in place unless imminently threatened by human or natural displacement.

HPO contact: Vincent Maresca, 609-633-2395, Vincent.Maresca@dep.nj.gov

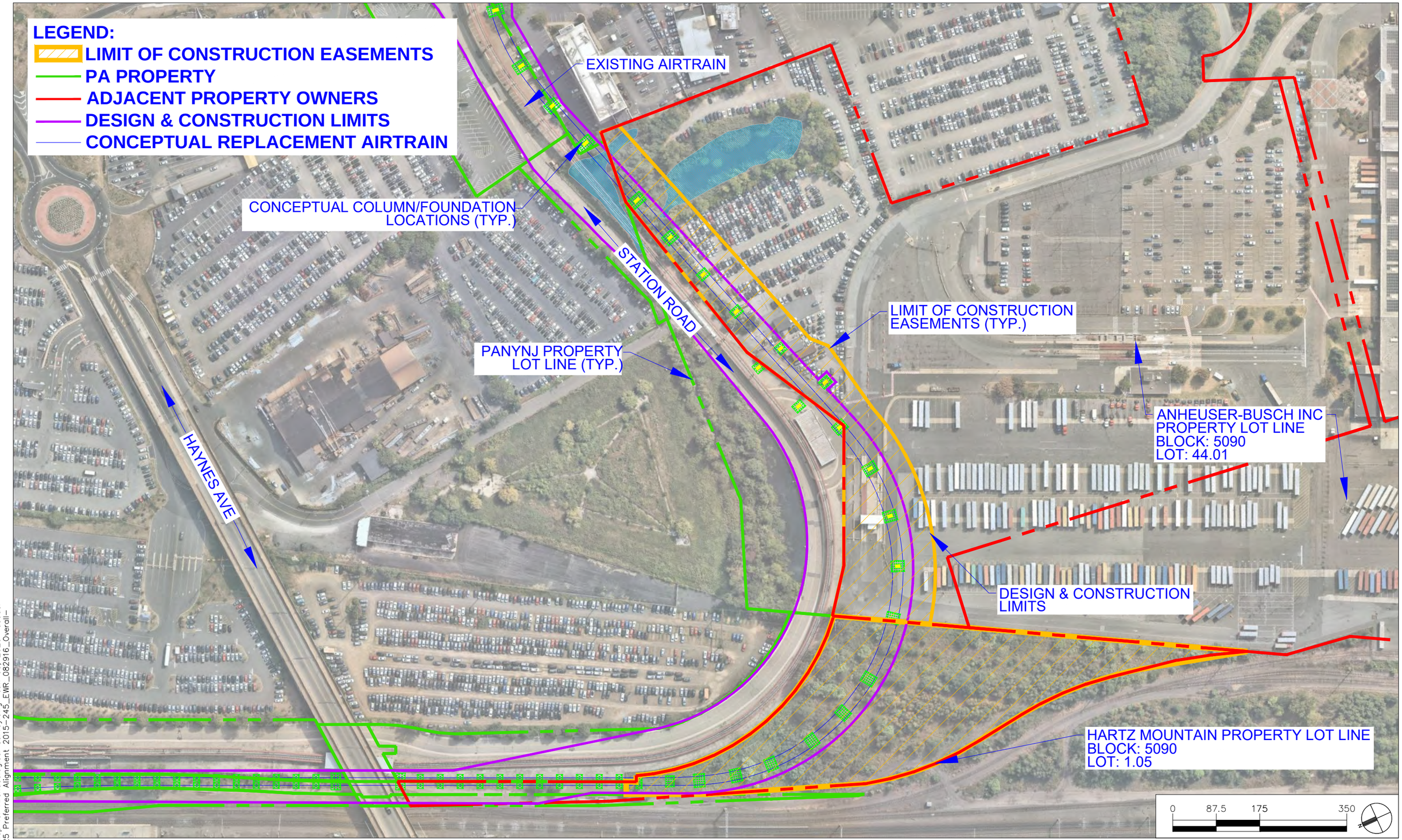
Medical Examiner: NJ Northern Regional Medical Examiner Office, 973-648-7259

Analysis and Reporting:

Artifacts recovered from excavations during Phase IB and Phase II will be bagged according to provenience and transported to the NV5 laboratory for analysis. A full report of all research, archaeological testing, and analysis will be prepared, meeting all requirements of the New Jersey Historic Preservation Office (NJHPO). The report will provide information for evaluating the eligibility of any identified resources for inclusion in the National Register of Historic Places and assessments of project effects on such resources.

The draft report will be submitted for review by HPO. Review comments will be addressed and a final report will be submitted as a bound volume and a pdf.

If a site is considered to be eligible for National Register inclusion, recommendations for avoidance of impacts will be provided. If impacts cannot be avoided, analyses must be provided exploring alternatives to minimize and/or mitigate impacts. Means to avoid, minimize and/or mitigate impacts to National Register eligible properties will need to be developed and undertaken prior to project implementation. If eligible resources are identified and project actions will result in adverse effects, consultation with the NJHPO regarding mitigation measures will be necessary.

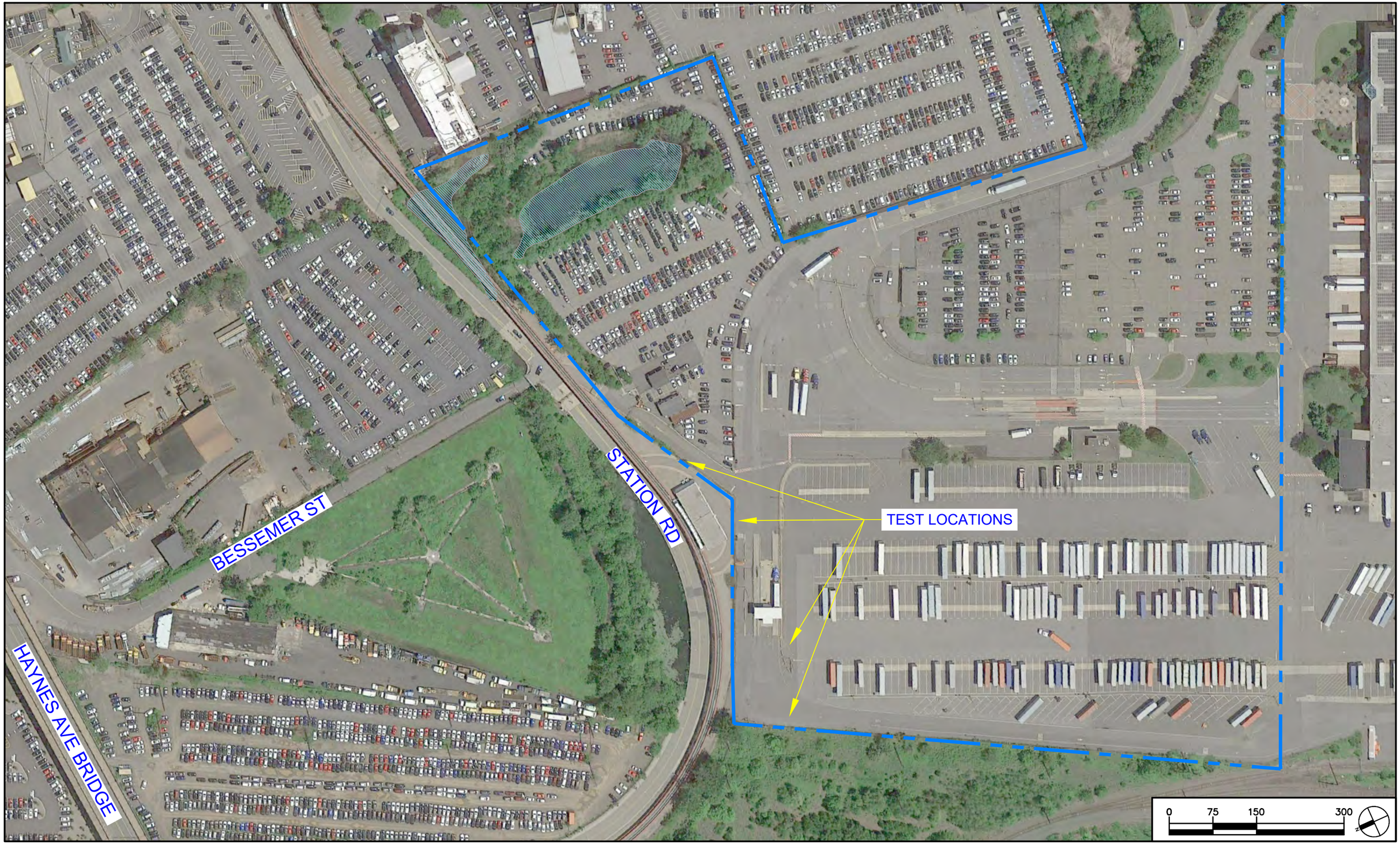


Sk-306_03Jun20_Map for Archaeological Survey.dwg Jun 03, 2020 dsoder
XREFS: 2019-06-25 Preferred Alignment 2015-245_EWR_082916_Overall-

THE PORT AUTHORITY OF NY & NJ	NEWARK AIRTRAIN REPLACEMENT PLANNING	FIGURE 1	MAP FOR ARCHAEOLOGICAL SURVEY HARTZ MOUNTAIN & ANHEUSER-BUSCH	Drg. No. Sk-306	03Jun20
				SH 1 of 1	Rev 0

FIGURE 2.
Proposed alignment shown on aerial photograph with overlay of 1874 Hughes Map of Essex County, showing “James Johnson” buildings within the APE.





THE PORT AUTHORITY OF NY & NJ	NEWARK AIRTRAIN REPLACEMENT PLANNING	FIGURE 3A	EXHIBIT A-3 ARCHAEOLOGICAL TESTING	Drg. No. Sk-290	17Apr20
				SH 2 of 2	Rev 0



THE PORT AUTHORITY OF NY & NJ	NEWARK AIRTRAIN REPLACEMENT PLANNING	FIGURE 3B	ARCHAEOLOGICAL TESTING, BLOCK 5090, LOT 1.05	Drg. No. Sk-289	24Apr20
				SH 1 of 1	Rev 0

Jean Howson

From: Marcopul, Kate <Kate.Marcopul@dep.nj.gov>
Sent: Tuesday, September 22, 2020 10:55 AM
To: Edward.Knoesel@faa.gov
Cc: Pepe, David; Jean Howson; Maresca, Vincent
Subject: HPO Project #20-0602 Newark Lib. Int. Airport (EWR) AirTrain Replacement; Phase I/II Archaeological Survey Work Plan

This e-mail serves as the official correspondence of the New Jersey Historic Preservation Office as we switch to a temporary remote work environment in response to the ongoing novel coronavirus (COVID-19) outbreak.

HPO Project No. 20-0602-4
HPO-I2020-110

Ed Knoesel
Environmental Protection Specialist
Federal Aviation Administration
New York Airports District Office
159-30 Rockaway Blvd, Suite 111
Jamaica, New York 11434
Edward.Knoesel@faa.gov

Dear Mr. Knoesel:

As Deputy State Historic Preservation Officer for New Jersey, in accordance with 36 CFR Part 800: Protection of Historic Properties, as published with amendments in the Federal Register on 6 July 2004 (69 FR 40544-40555), I am providing **Consultation Comments** for the following proposed undertaking:

Essex County, Newark City
Newark International Airport
EWR AirTrain Replacement Program
Phase I/II Archaeological Survey Work Plan
Federal Aviation Administration (FAA)

800.4 Identifying Historic Properties

The Historic Preservation Office (HPO) was provided the opportunity to review and comment on the following cultural resource survey reports for the above-referenced undertaking:

Howson, Jean
No date *Work Plan: Phase IB and Contingency for Phase II Archaeological Testing, AirTrain Newark Replacement Program.* Prepared for the FAA. Prepared by NV5.

Upon review, the HPO concurs with the FAA's assessment that the program of Phase IB archaeological survey backhoe trenching (four trenches within the active Anheuser Busch parking lot and three backhoe trenches within the Hartz property) and any subsequent Phase II archaeological testing of any identified, potentially

significant archaeological resources is appropriate. Finally, the provisions for treating any inadvertent discovery of human remains or burials is appropriate.

Additional Comments

Thank you for providing the opportunity to review and comment on the potential for the above-referenced project to affect historic properties. The HPO looks forward to additional consultation with FAA, any consulting parties, and the results of Phase IB/II archaeological survey for review and comment. Please reference HPO project number **20-0602** in any future calls, emails, submissions or written correspondence to help expedite your review and If you have any questions, and If you have any questions, please feel free to contact Lindsay Thivierge of my staff at Lindsay.Thivierge@dep.nj.gov. with questions regarding historic architecture, historic districts, or historic landscapes or Vincent Maresca of my staff at vincent.maresca@dep.nj.gov with questions regarding archaeology.

Sincerely,

Katherine J. Marcopul, Ph.D., CPM
Administrator and
Deputy State Historic Preservation Officer
Historic Preservation Office
NJ Department of Environmental Protection
501 East State Street, Trenton, NJ 08625
kate.marcopul@dep.nj.gov
T (609) 984-0176 | F (609) 984-0578



Connect with us:

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APPENDIX B

History of the Bond/Johnston Property

HISTORY OF THE BOND/JOHNSTON PROPERTY

Sequence of Ownership

-1829	Elihu Bond	See ECD C3 16
1829-1841	David Bond	ECD C3 16
1841-	Robert Bond	ECD N5 240
-1851	William S. Bond	See ECM T2 322
1851	George W. Roberts	ECD O7 197
1851-1853	Isaac M. Ward	ECD T7 322
1853-1859	Alexander Ross	ECD O8 117
1859-1862	James Johnston	ECD X10 321
1862-1870	James P. Johnston	ECD U11 338
1870-1872	John G. Stevens & Francis F. Patterson	ECD K15 292
1872	John G. Stevens	ECD D16 235
1872-1875	John G. Stevens & William G. Cook	ECD D16 578
1875-1886	John G. Stevens & William G. Cook Estate	See ECD A23 52
1886-1907	Jacob W. Fisher	ECD A23 52
1907-	Carnegie Steel Company	ECD Q41 94

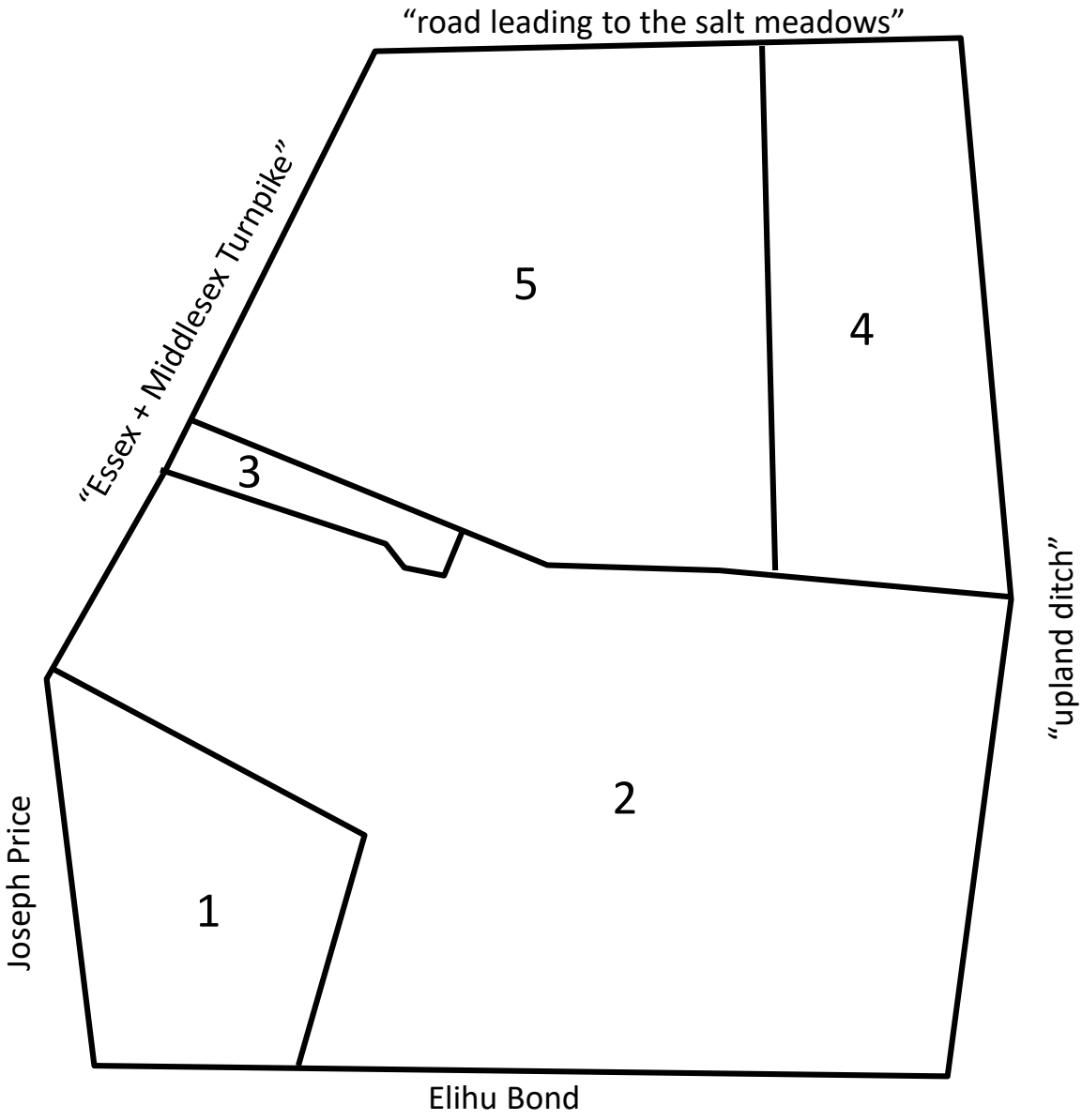
Abbreviations:
ECD = Essex County Deed
ECM = Essex County Mortgage
NJC = New Jersey Census
USCNJ = United States Census of New Jersey

Chronology

1829

In 1829 Elihu Bond (1756-1839), a resident of Union Township, sold a tract of land in Elizabeth Township described as including 40 acres to his son David Bond (1791-1884), who resided in the latter township, for $500. The property was described as being bounded on the west by the "Essex & Middlesex Turnpike" (along which the New Jersey Railroad [now the Northeast Corridor] was later built) and the land of Joseph Price, on the north by the "road leading to the salt meadows" (the present Haynes Avenue), on the east by "a ditch called the upland ditch," with the "salt meadows" beyond, and on the south by land retained by the elder Bond (ECD C3 16) (Biographical and Genealogical History of the City of Newark 1898; www.ancestry.com).

The property description in this deed is extremely vague, but David Bond would subsequently subdivide this landholding into five parcels and sell them off. The metes and bounds of Bond's original landholding can be discerned from these five parcels and inform that the property actually included approximately 52 acres (Figure B-1). The property consisted of two areas of upland separated by a narrow western extension of the large salt meadow to the east, with a small pond sited at the far western end of the wetland extension (Figure B-2).

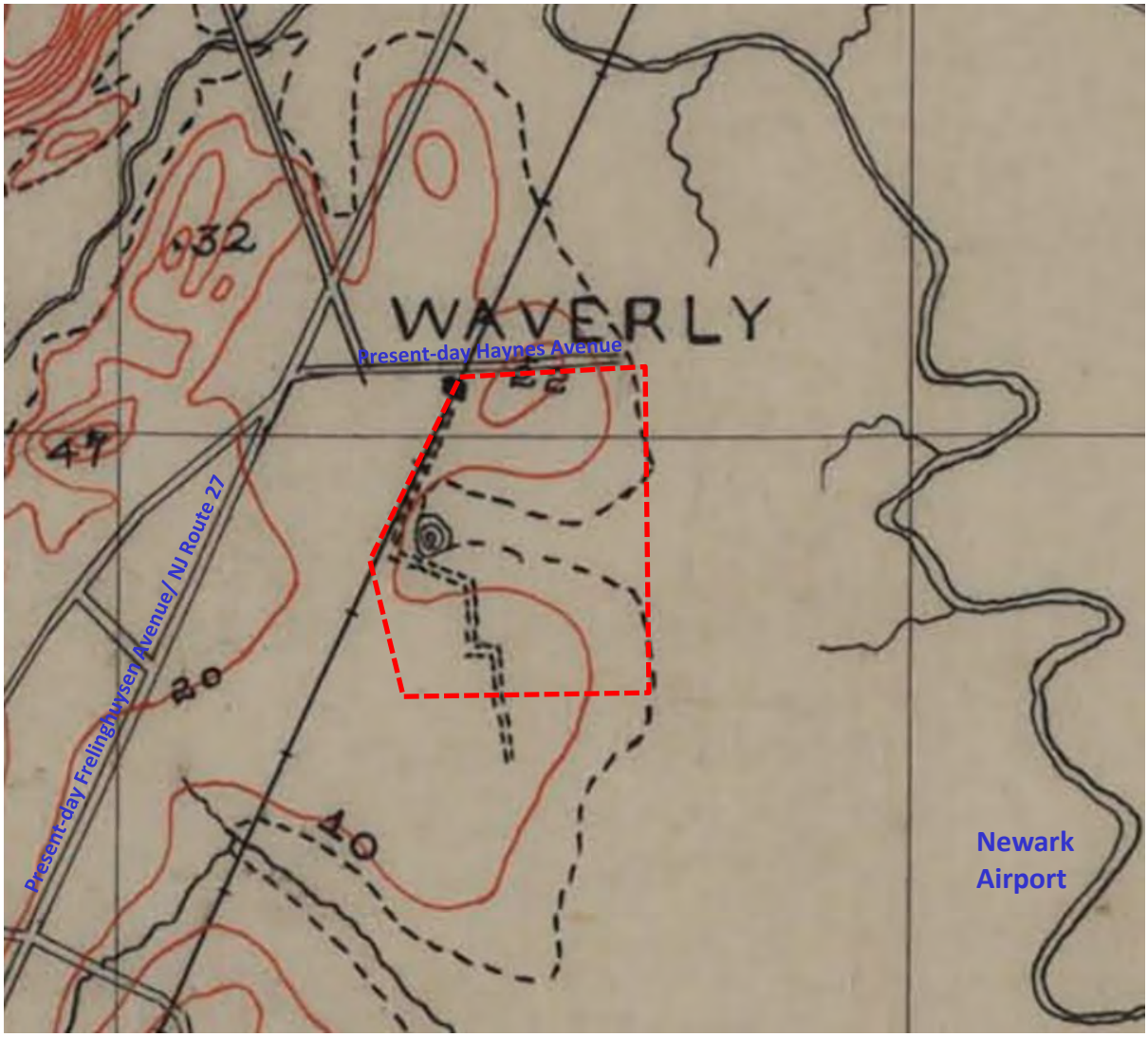


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Figure B.1 – Composite map showing the original tract sold by Elihu Bond to David Bond in 1829 and the five properties subsequently subdivided and sold off by David Bond. Sources: ECDs C3:16, O4:334, N5:240, T6:538, T11:305, and O14:250.



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Figure B.2 – Late 19th century manuscript topographic map showing the landforms within the property (dashed red outline) sold by Elihu Bond to David Bond in 1829. Source: Vermeule n.d.

The Meadow Road (now Haynes Avenue) provided access to both the salt meadow and to David Bond's house and dates, like the house, the period prior to the American Revolution. The Essex & Middlesex Turnpike was chartered by the New Jersey State Legislature in 1806 and completed to run between Newark and New Brunswick shortly thereafter. The New Jersey Railroad and Transportation Company, which was chartered in 1832, purchased the turnpike company in 1833 to serve as the right-of-way for the New Jersey Railroad (later the Pennsylvania Railroad and now the Northeast Corridor). This section of the railroad was completed along the west side of the turnpike in 1835. The turnpike remained in use into the Civil War period when the expansion of the rail line led to the abandonment of the road and its replacement by the present Frelinghuysen Avenue (New Jersey Secretary of State 1914; Coverdale & Colpitts 1947; Freeman 1953; Lenik and Gibbs 1993; Lenik et al. 1994; Boesch 1999; Netzlof 2001; Baer n.d.).

1836

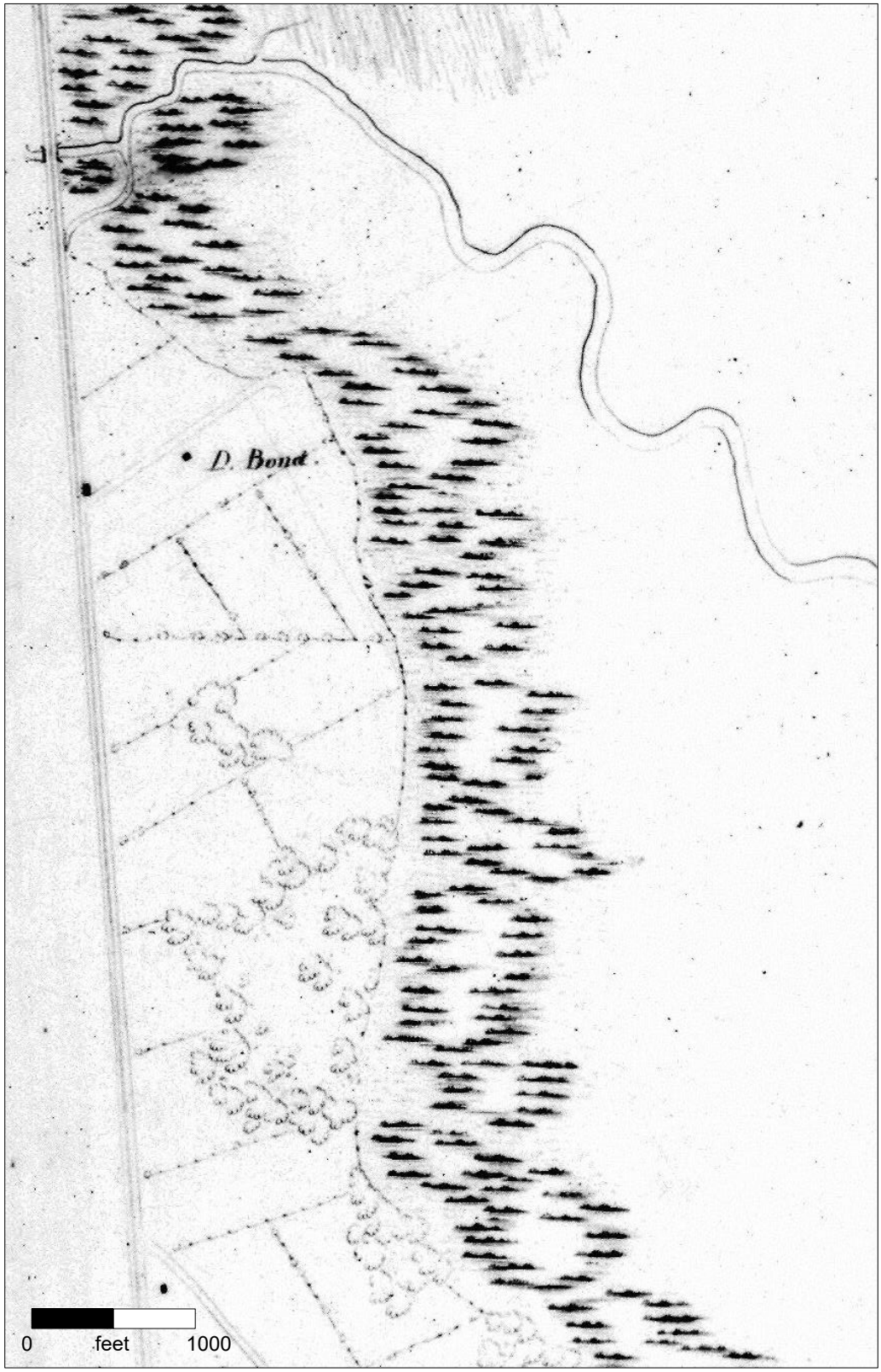
The house of "D. Bond" was shown on the south side of the Meadow Road and to the east of the Essex and Middlesex Turnpike and the New Jersey Railroad on a United States Coast Survey map produced in 1836 (Figure 3). The remainder of Bond's property was shown to be farm fields and marshland, with no additional buildings represented.

The first of the five parcels to be subdivided and sold off by David Bond (now described as a resident of the recently created Clinton Township) was conveyed to his brothers Elihu Bond Jr. and Lewis Bond for $200 in 1836. This property included 4.75 acres taken from the southwest corner of the larger tract and was bounded on the west by the Joseph Price landholding, on the south by tract formerly held by the elder Elihu Bond and now owned by the grantees, and on the west and north by the grantor (ECD O4 334) (see Tract 1 on Figure 1).

1841

The second subdivision involved the most of the southern half of the property that David Bond had acquired in 1829 and was said to include 16 acres of land. Bond sold this landholding to his son Robert Bond, with both men described as residents in Clinton Township, for $500 in 1841. This property was bounded on the west by the turnpike and the parcel sold to his brothers Elihu Bond Jr. and Lewis Bond in 1836, south by land also owned by the latter two Bonds, and east by the "upland ditch." The northern line separating this property from the lands retained by David Bond was formed by "the ditch draining the Pond" and, at the far eastern end adjacent to the turnpike, the pond itself. It was noted that the ditch was crossed by two bridges, referred to as the "lower Stone Bridge" and the "upper Stone Bridge" (ECD N5 240) (Figure 4; see also Tract 2 on Figure 1). It is this tract on which the several buildings sited within the present project area would later be built.

The subdivision of 1841 utilized the ditch draining the pond on the east side of the turnpike and running through the extension of the marsh as the line of division between the southern property conveyed to Robert Bond and the northern property retained by David Bond (see Figure 2). The courses of the ditch in the center section of the north line conform with the ditch that is sited along this property line today, which serves, most notably, as the south line of the Newark City Cemetery (see Figure 4; the section of the north line that conforms with the ditch is highlighted).

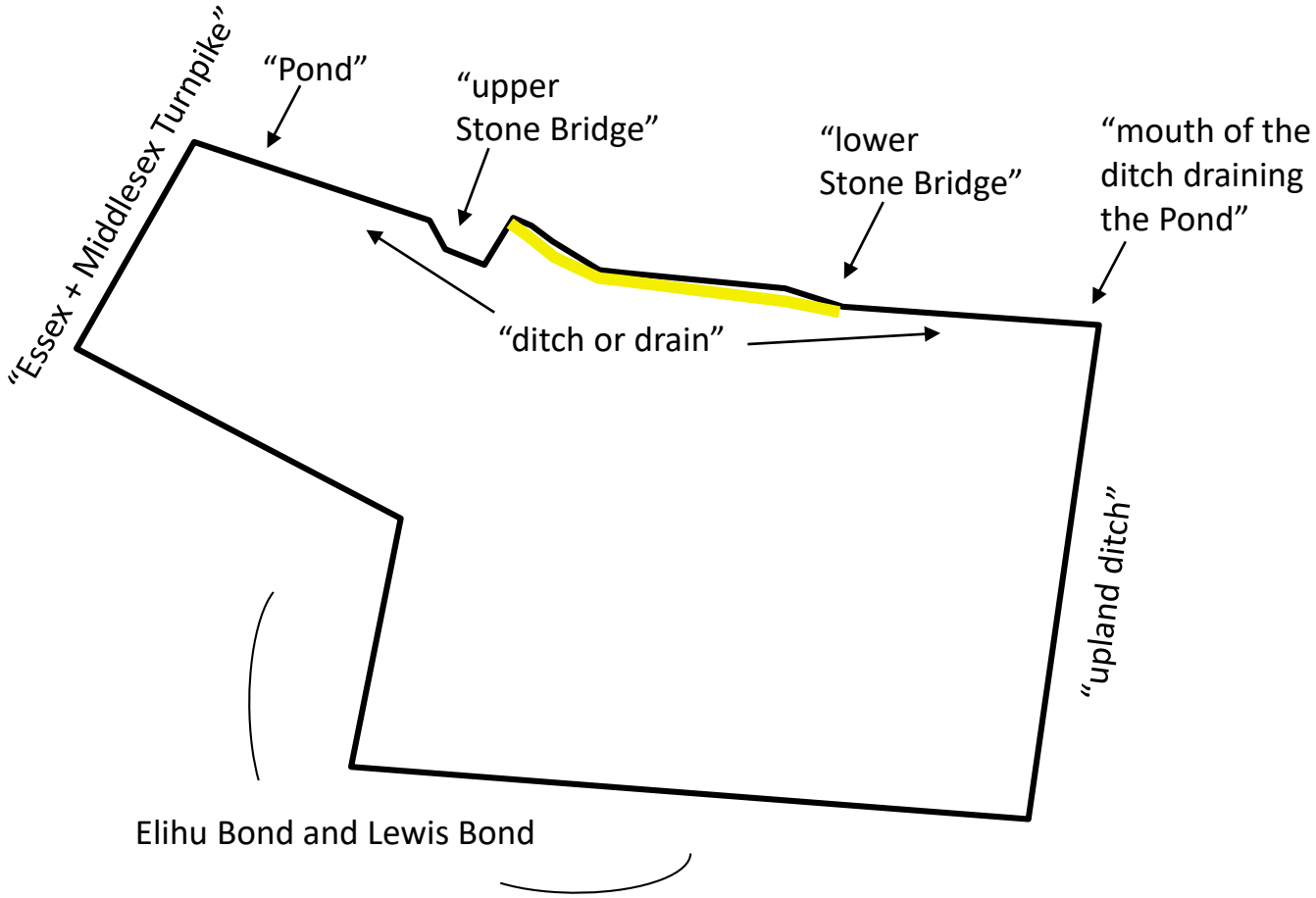


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Figure B.3 – Map showing the house of David Bond on the south side of the Meadow Road and his undeveloped land to the south in 1836. Source: Renard and Jenkins 1836.



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Figure B.4 – Composite map showing the tract sold by David Bond to Robert Bond in 1841. The section of the ditch that served as part of the north line of this tract and currently forms the south line of the Newark City Cemetery is highlighted. Sources: ECDs N5 240, T6 538, and O14 250.

1842

In 1842 Robert Bond mortgaged his new landholding to his uncle Lewis Bond for $500 (ECM K2 11).

1845

The house of David Bond was shown on the south side of the Meadow Road and to the east of the New Jersey Railroad and the turnpike on a second Coast Survey map published in 1845 (Figure 5). The lands to the south were again represented as farm fields, with the extensive Newark Meadows marsh to the east.

1848

The third subdivision created the smallest of the five properties, a lot of .88 of an acre that was conveyed by David Bond to his son Robert Bond for $25 in 1848. This parcel was bounded on the west by the turnpike, south by the tract created in the second subdivision and already owned by the younger Bond, and north by the land retained by David Bond (ECD T6 538) (Figure 6; see also Tract 3 on Figure 1.

1849

The house of David Bond was shown on the south side of the Meadow Road to the east of the turnpike and the railroad on a map published in 1849 (Figure 7). No additional buildings were depicted on the remainder of his property, or on the lands to the south that he had conveyed to his son Robert Bond in 1841 and 1848.

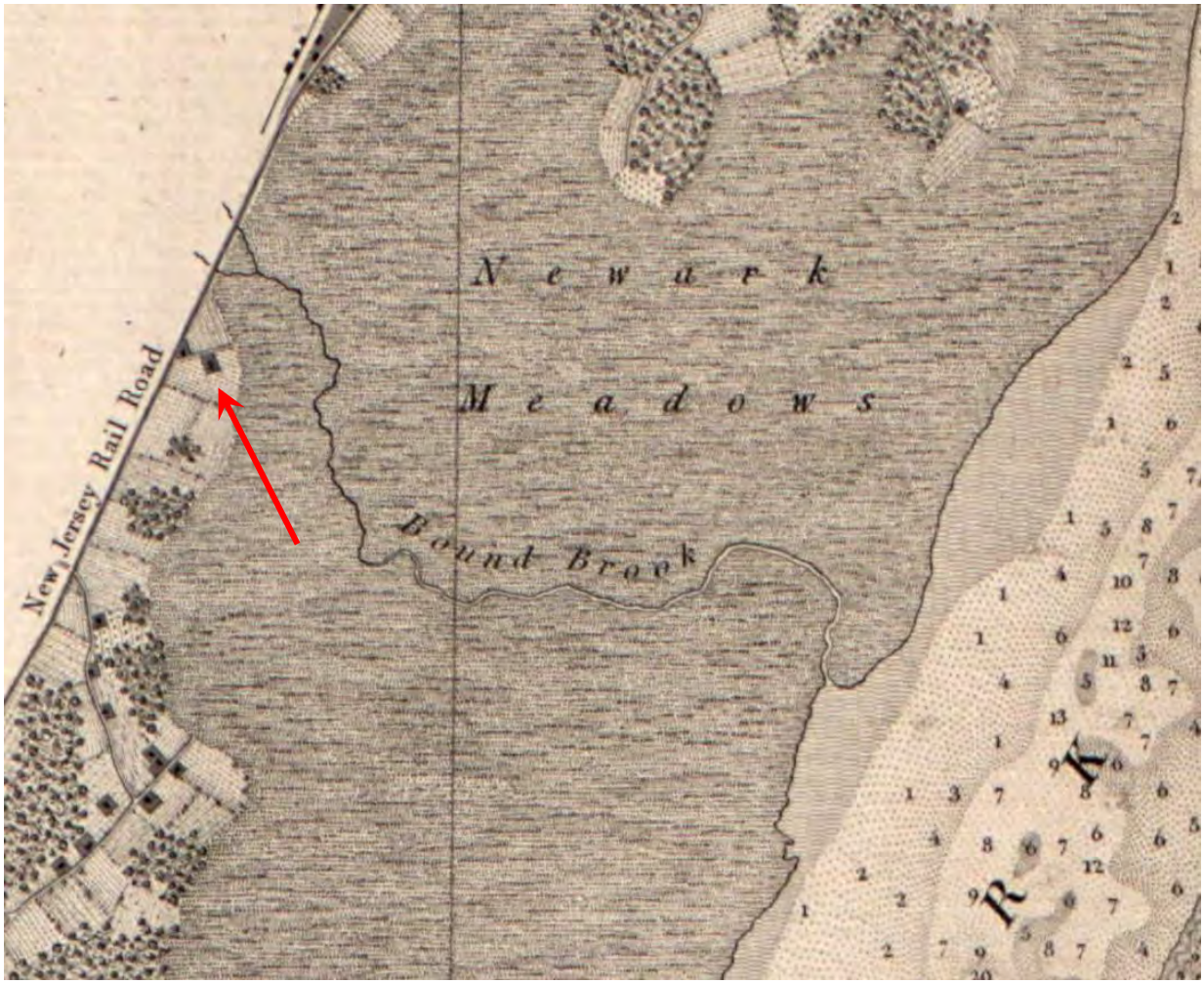
1850

David Bond house on the south side of the Meadow Road and the undeveloped lands to the south were depicted again on the map of Essex County published in 1850 (Figure 8).

David Bond was recorded in the federal census of 1850 as a 67-year old farmer, the head of a household that included his wife Mary and children Mary D. and Charles, and the owner of $3000 worth of real property. The sequence of enumeration makes it clear that he was living in the Meadow Road house at this time (USCNJ 1850).

Robert Bond died sometime between 1848 and 1850 (no resulting surrogate's records have been identified), with the property he had acquired from his father David Bond apparently passing to his brother William S. Bond and sister Mary D. Bond. In March of 1850 William S. Bond (1823-1894; www.findagrave.com), who was described as a resident of Newark, mortgaged his half share of the property from the second subdivision of 1841 to his uncle Lewis Bond for $500 (ECM T2 322) (www.ancestry.com).

In July of 1850 Lewis Bond sued William S. Bond and Mary D. Bond seeking the recovery of the $500 that was owed him from the 1842 mortgage given by Robert Bond (see ECM K2 11). In the resulting sheriff's sale, conducted in September of 1850, William S. Bond purchased full title to the property from the second subdivision of 1841 for $145 (ECD I7 230).



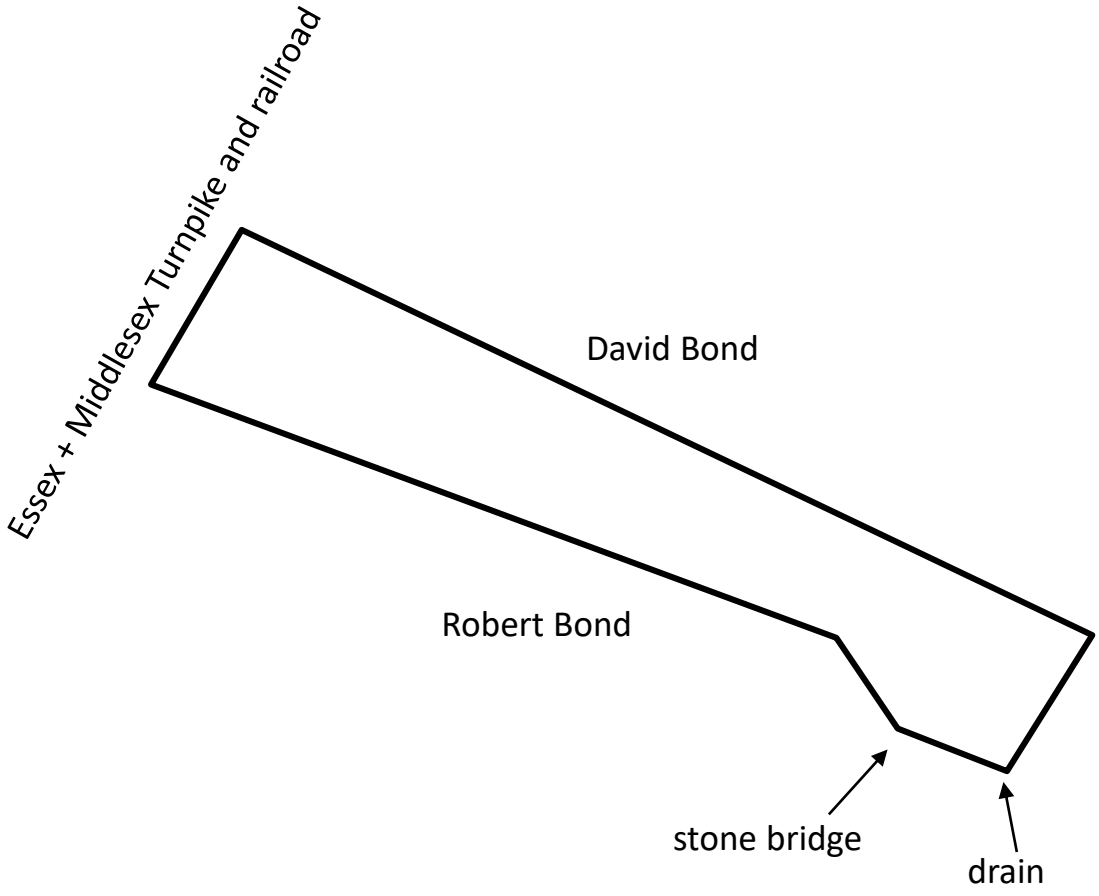
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Figure B.5 – Map showing the house of David Bond (arrow) on the south side of the Meadow Road on the narrow upland landform between the New Jersey Railroad and the Newark Meadows to the east in 1845. Bond's land to the south of his house was again shown to be undeveloped. Source: Hassler 1845.



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Figure B.6 – Map showing the .88-of-an-acre lot sold by David Bond to Robert Bond in 1848. Source: ECD T6 538.
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Figure B.7 – Map showing the house of David Bond (arrow) on the south side of the Meadow Road in 1850. The lands to the south owned by Bond and his son Robert Bond remain undeveloped. Source: Sidney 1849.



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Figure B.8 – Map showing the "D. Bond" house (arrow) on the south side of the Meadow Road in 1850, with the lands to the south of the house remaining undeveloped. Source: Sidney 1850.

On October 1st, 1850 William S. Bond mortgaged the second subdivision property to Lewis Bond for $1030 (ECM U2 200). This money allowed him to pay off the remainder of the debt from the 1842 mortgage (see ECM K2 11) and the mortgage he had taken on in March (see ECM T2 322).

1851

In 1851 William S. Bond of Newark sold the second subdivision tract of 1841 to George W. Richards of New York City for $1500, with Richards also assuming the responsibility for the payment of the $1030 mortgage. The property, formerly said to include 16 acres, was now described as totaling 20 acres (ECD O7 197).

Several months later Richards sold same property to Isaac M. Ward of Clinton Township for $2375 and the assumption of the mortgage responsibility. It was noted that with "some of the courses and distances being found erroneous" in the previous descriptions of the tract they "have been corrected in this deed," and that the property actually included 23.75 acres (ECD T7 322).

The increased size of the considerations in these deeds suggests that one or both of the two houses known to have been in place on this property by 1859 (see below) may have been built in the years 1850 and 1851.

1852

William S. Bond (who now lived in Lynchburg, Virginia) and Mary D. Bond had also received the small (.88 of an acre) third subdivision lot in the wake of the death of Robert Bond, and in 1852 they sold this property to their father David Bond for $75 (ECD E11 460).

1853

In 1853 Isaac M. Ward of Clinton Township sold the 23.75-acre second subdivision tract to Alexander Ross (1813-1886; www.findagrave.com) of Brooklyn for $4000 and the assumption of the $1030 mortgage (ECD O8 117).

1859

The map of Essex County published in 1859 is the first to show development within the 23.75-acre second subdivision property (Figure 9). The house of David Bond is again depicted on the Meadow Road, while to the south four dwellings and two lanes providing their connections to the turnpike are represented. The houses of Alexander Ross, now the owner of the property, and "M. Haines" (possibly a tenant) are both sited within the 23.75-acre tract, with the "J. Krug" and "H. Meyer" houses located further to the south.

Alexander Ross, now referenced as a resident of Clinton Township, sold the 23.75-acre second subdivision property to James Johnston of Newark for $4750 (with the mortgage responsibility still attached) in 1859 (ECD X10 321).

Johnston took out two mortgages on the property at the same time, one for $1000 (ECM W3 130) and the second for $2750 (ECM W3 131), with the latter held by Ross.

James Johnston (1810-1881; www.findagrave.com) had been listed as a 40-year old native of Scotland and as a carpet manufacturer living in a rental property in Ossining, New York in the federal census of 1850 (USCNJ 1850; his sons James P. and George Johnston were members of his household). In 1859 he was recorded in the directory for New York City as a producer of "glue, sandpaper, pumicestone, etc." in that city and as a resident of "Sing Sing," or Ossining, New York (Wilson 1859). Sometime after the publication of the directory he appears to have relocated to Newark.

1860

James Johnston was recorded as a resident of Newark and as a "Manufacturer" owning $3000 worth of real estate and $8000 of movable property in the federal census of 1860. Among the members of his large household was his wife Abby and his son George, a 19-year old "Machinist" who had been born in New York. Also enumerated was his son James P. Johnston, a 30-year old "dry good clerk" who, like his father, had been born in Scotland and was now living in an rental property elsewhere in Newark with his wife Ann (USCNJ 1860).

In September of 1860 James Johnston purchased the .88-of-an-acre third subdivision lot from David Bond for $150 (ECD U11 129).

1861

James Johnston was listed as a manufacturer of "glue & sand paper" in Newark and as a resident of the city in 1861 (Newark City Directory 1861).

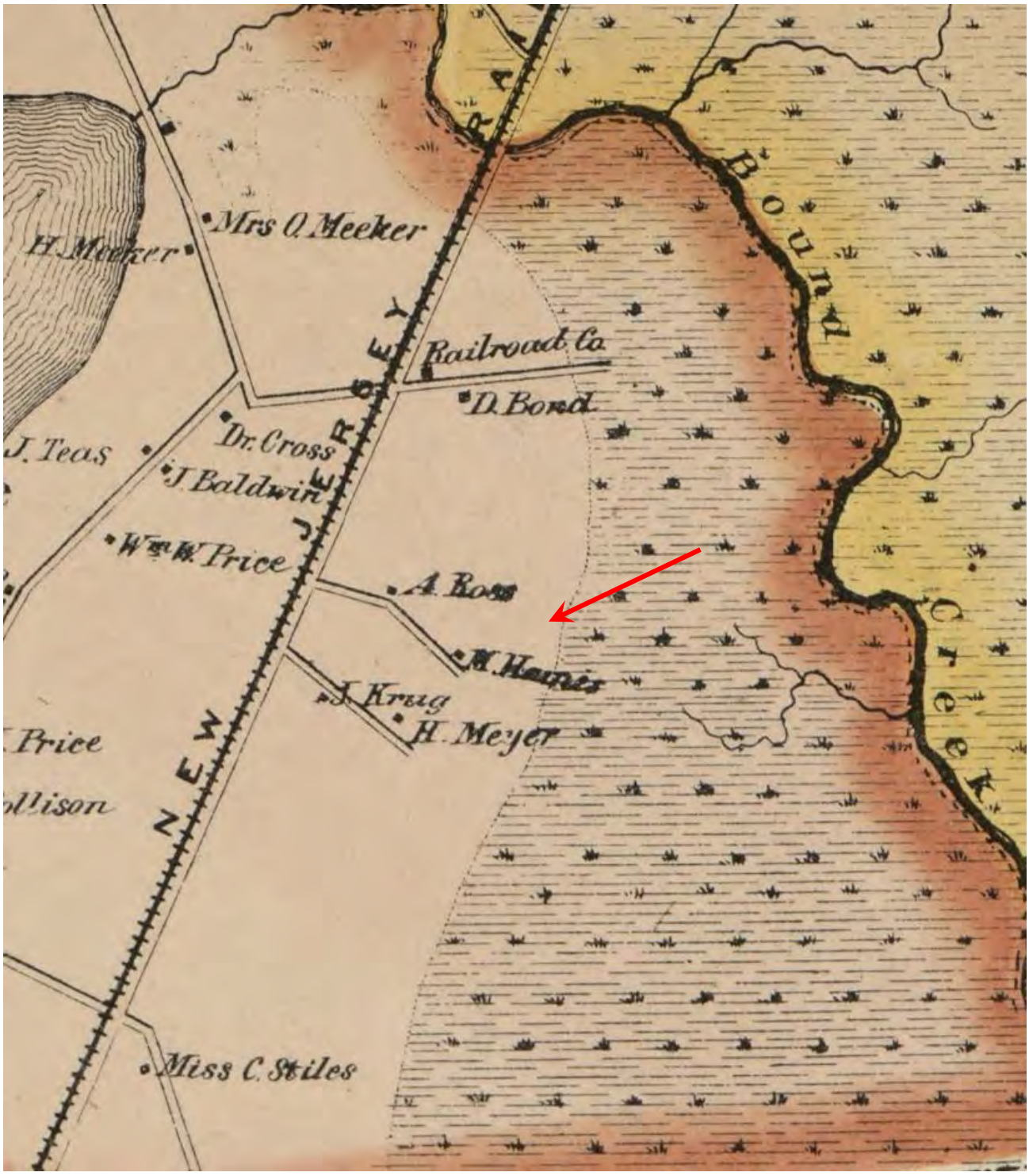
1862

In 1862 James Johnston was again listed as a "glue & sand paper" manufacturer, with his factory now recorded as being located at the "toll gate Elizabeth Road" (Newark City Directory 1862).

This reference makes it apparent that by 1862 Johnston had built a new glue factory on the property he had purchased from Alexander Ross. "Elizabeth Road" is a reference to the Essex and Middlesex Turnpike, which connected Newark and Elizabeth, and the "toll gate" (see Figures 7 and 8) and its associated toll house (now owned, like the entire turnpike, by the "Railroad Co." – see Figure 9) were sited in the northeast angle of the turnpike and the Meadow Road.

In November of 1862 James Johnston of Newark sold both the 23.75-acre second subdivision tract and the contiguous .88-of-an-acre third subdivision lot (these two properties would always be conveyed together going forward) to his son James P. Johnston (1837-1907; USCNJ 1900; www.findagrave.com) of New York City for $1000. The consideration also included the assumption of two mortgages on the property totaling to $10,000 (ECD U11 338). With this transaction the younger Johnston appears to have acquired control of the glue factory and the two dwellings that had been built on the property at mid-century (see Figure 9).

It is unclear which two mortgages this deed refers to here. The elder James Johnston had assumed responsibility for the mortgage taken by William S. Bond in 1850 (see ECM U2 200), and he had also taken out two mortgages on the property himself in 1859 (see ECMs W3 130 and 131). These three mortgages totaled $4750, with two of these totaling either $2000 or $3750, in either case falling short of the $10,000 obligation in the above deed. It seems perhaps most likely that a mortgage the elder



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Figure B.9 – Map showing the "A. Ross" and "M. Haines" houses (arrow) on the 23.75-acre second subdivision property to the south of the "D. Bond" house on the Meadow Road in 1859. Source: Walling 1859.

Johnston took out earlier in 1862 (see ECM E4 477; from Index – this document is not available online), prior to selling the property to his son, was one of the two mortgages referenced. It seems quite possible that a mortgage this large was utilized as part of the financing for the construction of the glue factory.

The fourth subdivision tract was sold off by David Bond in 1862. This property, which included 8.08 acres of land, was divided off from the northeast corner of Bond's original tract, to the east of his house, and was sold to Joseph Brill (ECD T11 305) (see Tract 4 on Figure 1).

1863

The three earlier (from 1850 and 1859) mortgages referenced above were paid off by James P. Johnston in January of 1863 (see ECMs U2 200 and W3 130 and 131).

The listing in the 1863 city directory was the same as it had been in 1862 – "Johnston James, glue and sand paper, toll gate, Elizabeth road." Johnston's place of residence was given, as it had been in 1862, as "22 Elm," but now living with him was his son George Johnston, who was described as a "clerk" (Newark City Directory 1863).

1864

Listings for 1864 – "Johnston James, glue and sand paper, n. [near] toll gate, Elizabeth road" and "Johnston George D., clerk, Elizabeth road."

1865

In 1865, for reasons that are not apparent in the documentary record, James Johnston, now given as a resident of Clinton Township, again sold the 23.75-acre tract and the associated .88-of-an-acre lot to his son James P. Johnston, who was still described as a resident of New York City, this time for a consideration of $3000, with no mortgage responsibilities attached. It was stated that this transaction included "the engine, boilers, vats, shafting, pullies and belting, and all the machinery contained in and appertaining to the Glue Factory." Interestingly, the younger Johnston was also to receive "all the growing crops upon the said lands," a statement as to a continuing use of the property for agricultural purposes (ECD O12 323).

As noted, it is unclear how the property came to be owned once again by the elder James Johnston. Financial difficulties is certainly a possibility, as James P. Johnston had been responsible for the 1862 mortgage noted above (see ECM E4 477) and he had also taken on two additional mortgages in 1863 (see ECMs F4 68 and 91; from Index). This may have led to the confiscation of the property, its reacquisition by the elder Johnson, and the second conveyance to his son. Another possibility is a simple son-to-father conveyance, again a possible reflection of financial issues. No transactions such as these posed here were recorded, however.

The city directory for 1865 no longer included a listing for either James Johnston, with George Johnston described as a "stitcher" (Newark City Directory 1865).

1867-1868

George Johnston was listed as a "harnessmaker" in 1867 and 1868 – again, there was no listing for either James Johnston (Newark City Directory 1867; 1868).

1869

The fifth and final subdivision parcel was sold off by David Bond in August of 1869. This 15.44-acre property, which included Bond's house on the Meadow Road, was sold to Charles Kase of Newark (ECD O14 250). Kase, a prominent Newark businessman who was certainly acting for the City, conveyed the same property to the "Mayor and Common Council of the City of Newark" in the following month (ECD O14 427) (see Tract 5 on Figure 1) (Price and Edson 1983).

This property was immediately put to use as a place of burial for Newark's poor that later came to be known as the Newark City Cemetery, and still later as Floral Rest. The house formerly occupied by David Bond is said to have been built prior to the American Revolution, and it came to be utilized as the residence of the superintendent of the cemetery. It was subsequently damaged by fire and subsequently demolished during the latter part of the 19th century (Lenik and Gibbs 1993; Lenik et al. 1994; Boesch 1999).

1869-1870

James Johnston, James P. Johnston, and George Johnston were not listed in the city directories of 1869 and 1870 (Newark City Directory 1869; 1870).

1870

The federal census of 1870 contradicts the listings of the city directories as James, James P., and George Johnston were all listed as residents of Newark and as members of the same household. James Johnston was recorded as a 58-year old "Glue Mfctr." and as the head of the household, although his son James P. Johnston, a 32-year old "Glue Mfctr.," was the only member of the household that was recorded as owning real property (valued at $18,000). George Johnston was 29 years old and also a "Glue Mfctr." The residence occupied by the Johnston household was located in the city's 9th Ward, which was located well to the north of glue factory on the Meadow Road within the triangle now formed by Broad Street, the Northeast Corridor, and Lafayette Street (USCNJ 1870).

In November of 1870 James P. Johnston, described again here as a resident of New York City, sold the associated 23.75-acre and .88-of-an-acre properties to John G. Stevens of Trenton and Francis Patterson of Newark for $32,000 and the assumption of a mortgage of $15,000 (ECD K15 292).

John G. Stevens (1820-1886; www.findagrave.com) was a member of the noted Stevens family of Hoboken, a prominent resident of the City of Trenton, and a civil engineer with a national reputation for his expertise in canal engineering. In 1862 he was appointed to serve as the Chief Engineer and Superintendent of the Delaware and Raritan Canal. In 1870 he was recorded as a resident of Trenton, the "Prest [was actually Superintendent] of Canal Co & Civil Engineer," and as the owner of $140,000 worth of real property and personal property valued at $40,000 (USCNJ 1870) (Died by His Own Hand 1886; John G. Stevens Killed 1886; Lee 1910; Baer n.d.).

1871

The elder James Johnston was listed as a "glue mfr" with a factory on Waverly (now Muhammed Ali) Avenue in Newark in the city directory of 1871. His son George Johnston was also listed, with both men given as residing on Green Street. James P. Johnston was no longer listed and was likely residing in New York City (Newark City Directory 1871).

1872

A description of the new "City Cemetery" on the former Bond property in 1872 noted the presence of "Johnson's glue factory" just to the south (Hand Book and Guide to for the City of Newark 1872).

On February 14, 1872 Francis Patterson sold his half-share of six tracts of land to his partner in those landholdings John G. Stevens, with the fifth and sixth tracts being the properties they had acquired from James P. Johnston in 1870 (ECD D16 235). Stevens immediately, on the same day, conveyed a quarter-share in the same six properties to William G. Cook, who was also a resident of Trenton (ECD D16 238). In March Stevens sold a second quarter-share to Cook, making them equal partners in the ownership of the six properties (ECD D16 578).

William G. Cook (1806-1875) was, like his new partner John G. Stevens, a wealthy and influential citizen of the City of Trenton. He had been listed in the federal census of 1870 as a "(ret.) Lumber Merchant" and the owner of real estate valued at $140,000 and personal property worth $60,000. He and Stevens both lived on West State Street, a short distance to the west of the New Jersey State House (USCNJ 1870) (Committee of the Board of Directors 1907; www.findagrave.com).

John G. Stevens was elected to serve as the President of the United New Jersey Railroad and Canal Company in 1872 (John G. Stevens Killed 1886; Baer n.d.).

1872-1874

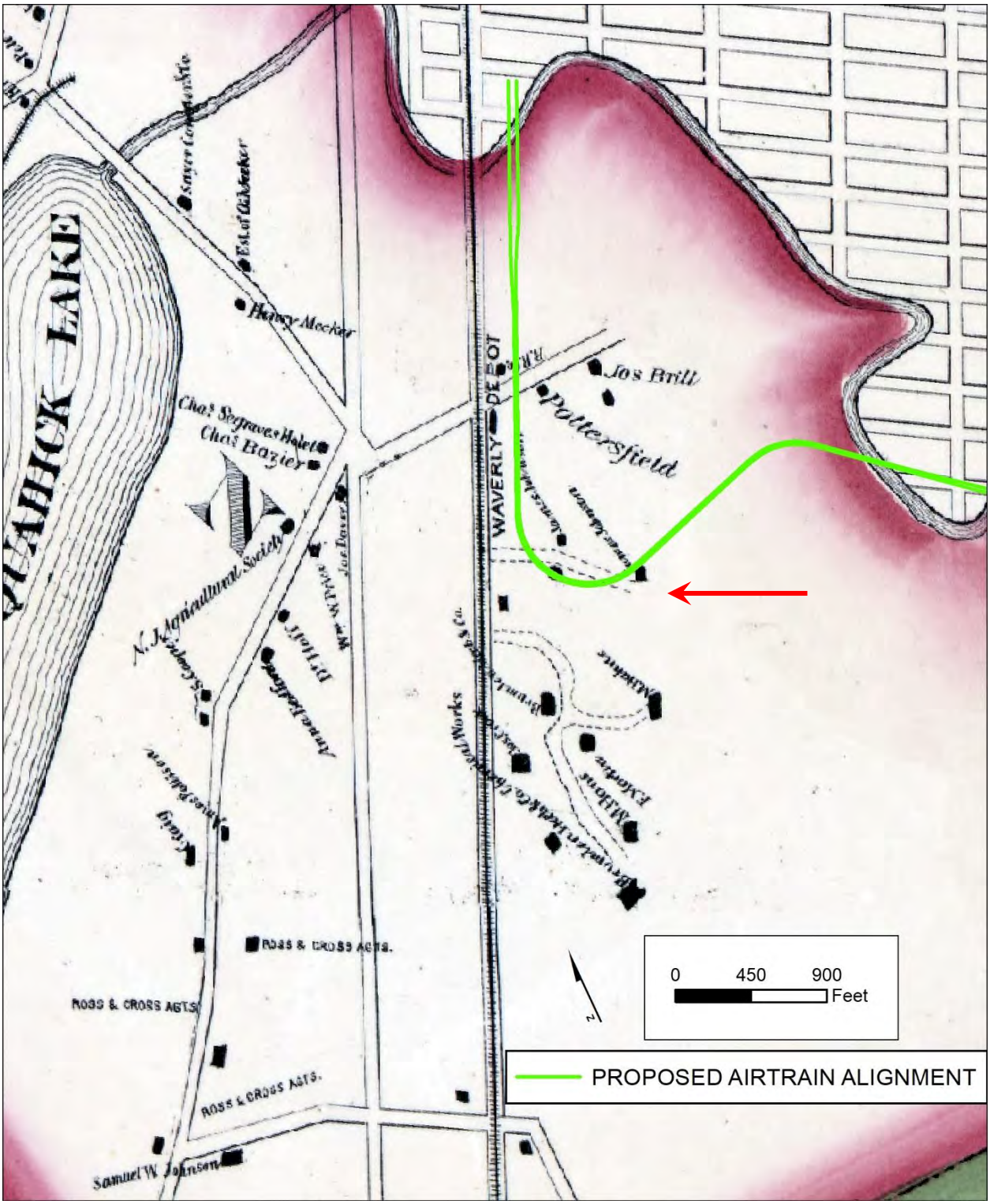
James Johnston was again listed as a glue manufacturer on Waverly Avenue in the city directory of 1872. He and his son George Johnston were now recorded as living on Mulberry Street. These listings were repeated in 1873 and 1874 (Newark City Directory 1872; 1873; 1874).

1874

Several buildings were represented on the 23.75-acre property formerly owned by James P. Johnston on the map of Essex County published in 1874 (Figure 10). The buildings were still marked "James Johnson," although Johnston had sold the property in 1870. The easternmost "Johnson" building is apparently the glue factory, with the three to the west (one marked "Johnson" and the other two unlabeled) are likely to have been dwellings, perhaps worker's housing. The Newark City Cemetery ("Pottersfield") was represented, along with the former Bond House, on the Meadow Road, as were two buildings owned by Joseph Brill on the property he had acquired from David Bond in 1862.

1875

William G. Cook died in 1875, with his half share in the Newark properties retained by his estate (see below) (www.findagrave.com).



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Figure B.10 – Map showing several buildings (arrow) on the 23.75-acre property to the south of the Newark City Cemetery ("Pottersfield") incorrectly identified as being owned by "James Johnson" in 1874 – James P. Johnston had sold the property in 1870. Source: Hughes 1874.

1875-1879

The elder James Johnston remained as a resident of Newark and as a glue manufacturer in the city, moving his factory from Waverly Avenue to a site on Ferry Street and the Morris Canal, close to the Passaic River, in 1876. George Johnston also continued to reside in Newark, moving out of his father's house and working in New York City, with his occupation given as "oils." James P. Johnston moved back to Newark in 1875, but his continuing involvement in the glue industry was focused solely in New York City (Newark City Directory 1875; 1876; 1877; 1878; 1879).

1880

In 1880 James Johnston was recorded as continuing as a resident of Newark, but he was now listed as a baker. James P. Johnston was enumerated as a "Salesman" living in Newark in the census, but the city directory continued to record his involvement in the glue industry in New York City. George Johnston was not enumerated in Newark (USCNJ 1880) (Newark City Directory 1880).

In 1880 John G. Stevens was listed as a "Civil Engineer" living on West State Street in Trenton in the federal census (USCNJ 1880).

1881

The 23.75-acre property owned by John G. Stevens and the estate of William G. Cook was shown on the map of Clinton Township included within the atlas of Essex County published in 1881 (Figure 11). The ownership of the property was incorrectly identified, however, with "Jos. Crook Est" apparently a reflection of the Cook estate's half share. Four buildings were depicted on the property, with the large easternmost building representing the glue factory. The Newark City Cemetery property was shown to the north, with the former Brill property now shown to be owned by the Newark Savings Institution.

1885

In July of 1885 John G. Stevens and the estate of William G. Cook were sued in the New Jersey Court of Chancery by the above mentioned Newark Savings Institution seeking payment on mortgages held on the 23.75-acre tract and the .88-or-an-acre lot they owned in Newark (see ECD A23 52).

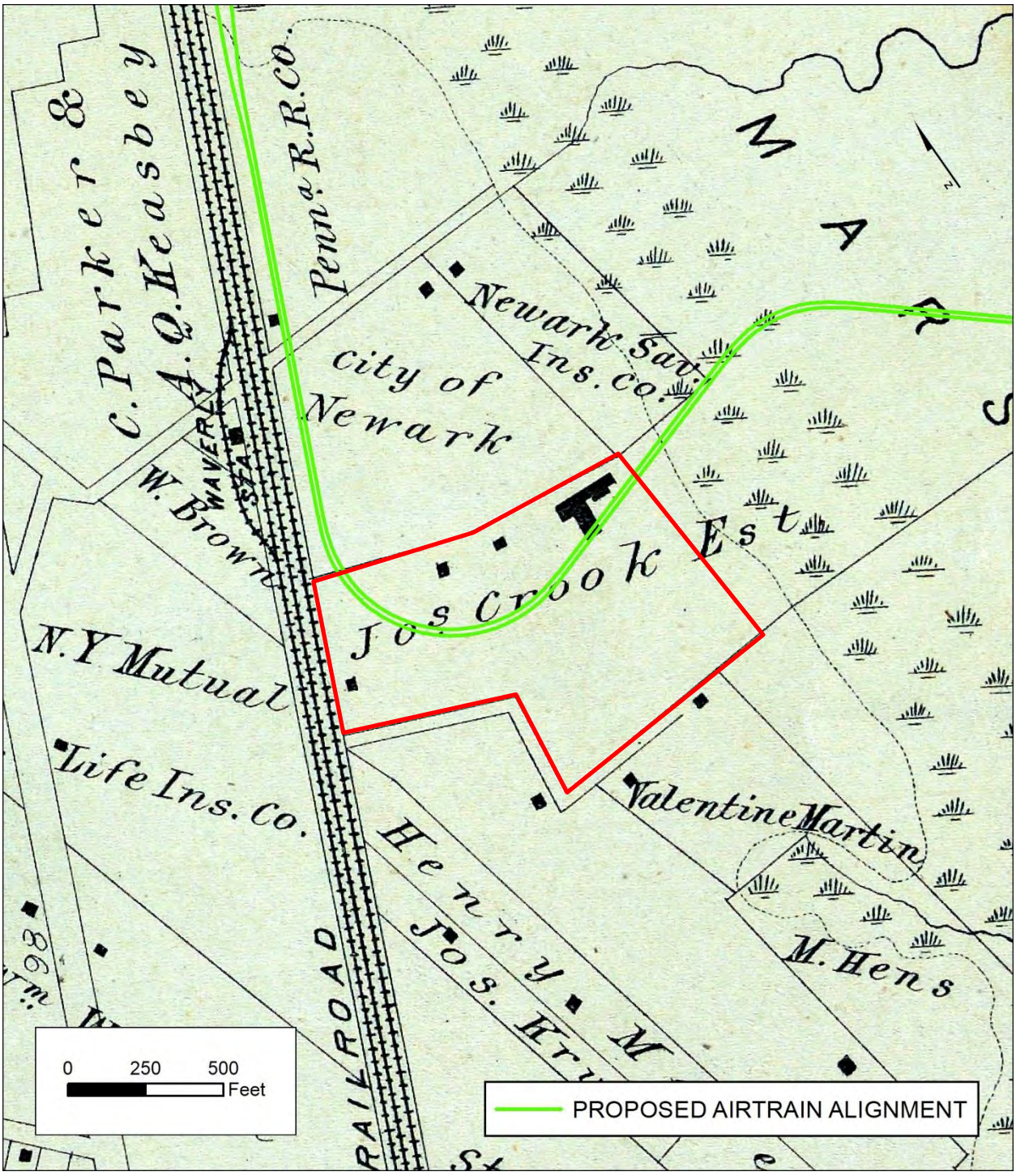
1886

On January 6, 1886 John G. Stevens committed suicide in his office in the Pennsylvania Railroad's Trenton headquarters. It was noted that he was in serious financial difficulty, and that he had attempted suicide on two previous occasions (Died by His Own Hand 1886; John G. Stevens Killed 1886; Baer n.d.; www.findagrave.com).

On February 26, 1886 the 23.75-acre tract and the .88-or-an-acre lot were purchased in the sheriff's sale resulting from the Newark Savings Institute suit by Jacob W. Fisher (ECD A23 52).

1900

Jacob W. Fisher was listed as a 55-year old resident of Clinton, with his occupation given as "Farme[r] &Building sand (dealer)," in the federal census of 1900 (USCNJ 1900).



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Figure B.11 – Map showing the glue factory and three additional buildings on the 23.75-acre property (red outline) to the south of the Newark City Cemetery in 1881. The property was incorrectly identified as being owned by the "Jos. Crook Est" – it was owned by John G. Stevens and the estate of William G. Cook at this time. Source: Pidgeon 1881.

1902

Jacob W. Fisher sold property to the United New Jersey Railroad and Canal Company in 1902 (ECD K35 554; from Index). The land conveyed here was from the western part of the combined 23.75-acre/.88-of-an-acre landholding (including all of the latter property) to allow for the expansion of the Pennsylvania Railroad's recently developed Waverly Yard.

1906

The property of Jacob Fisher was represented in the atlas of Essex County published in 1906 (Figure 12). All of the buildings formerly sited on the property had been demolished, with a dwelling and barn now sited in the northwest corner of the tract and a third building along the property's south line. Also represented was the ditch described in the 1841 subdivision that formed the north line of Fisher's property – this ditch remains in place as the south boundary of the Newark City Cemetery (the unidentified triangular parcel) and the Wheeler Manufacturing Company parcel (the former Brill property). The expansion of the Waverly Yard into what had been the western sections of the cemetery and the Fisher property was also represented.

1907

In Jacob W. Fisher sold his combined 23.75-acre and .88-of-an-acre properties to the Carnegie Steel Company (ECD Q41 94; from Index).

1909

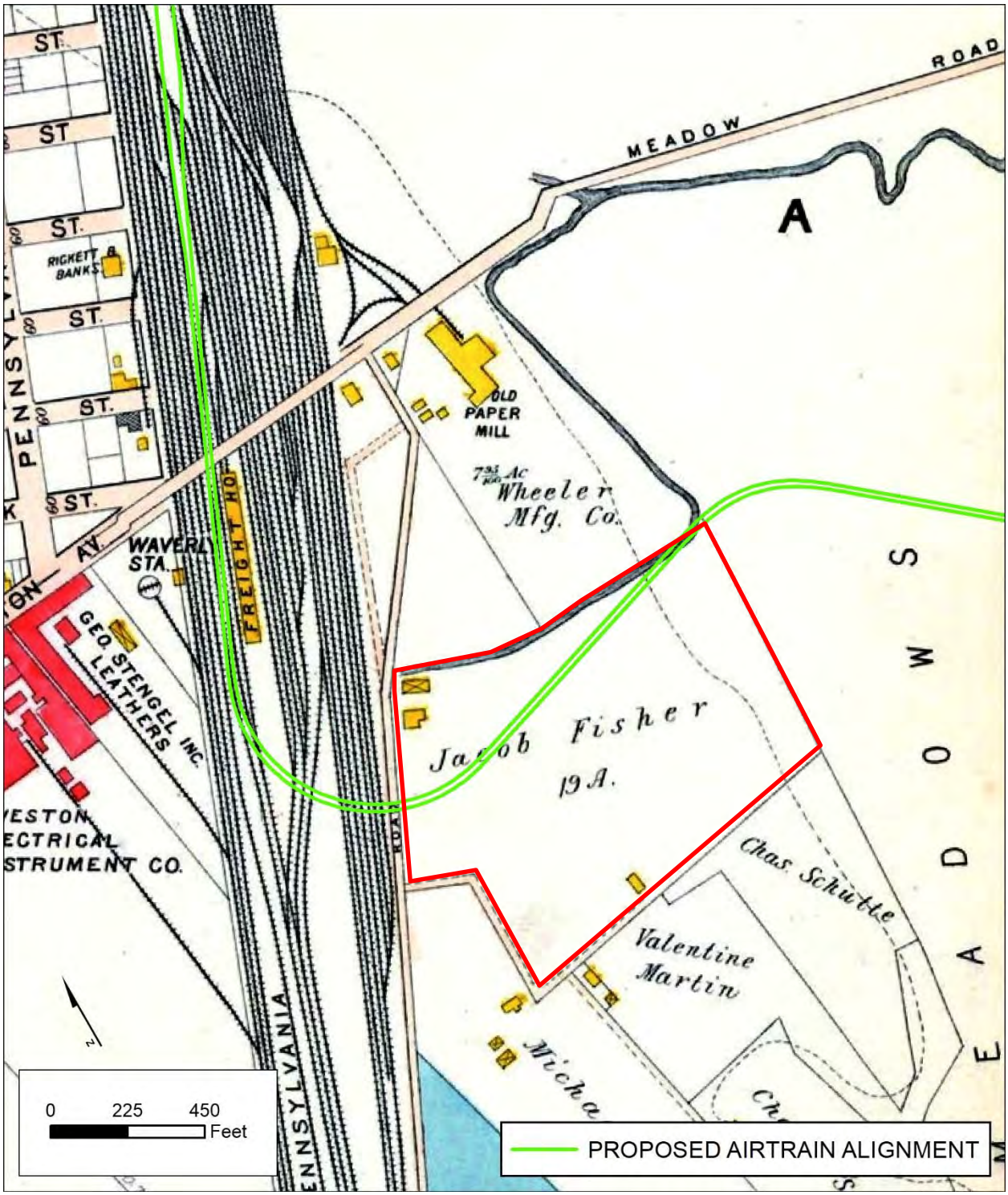
An engineering map drawn in 1909 laid out the present Bessemer Street, which was opened up at that time to run along the east side of the Newark City Cemetery to provide access to the Carnegie Steel property to the south (Boesch 1999).

1912

The Carnegie Steel Company warehouse complex on the former Fisher tract and additional properties located to the south was shown in the atlas of Newark published in 1912 (Figure 13). The only building now shown in the northern section of the former Fisher property was a small hospital sited in the southwestern angle of the recently opened Bessemer Street and the boundary ditch between the Newark City Cemetery and the Carnegie property. Also shown was the "Upland Ditch" that had first been described in 1829 as the eastern boundary of the David Bond property.

1927

The Carnegie Steel complex was again shown in the atlas of Newark produced in 1927 (Figure 14). The hospital building remained in place, with a small gate house now in place immediately to the east and a shed to the west. The ditch along the south side of the Newark City Cemetery was depicted, as was the "Upland Ditch" to the east.

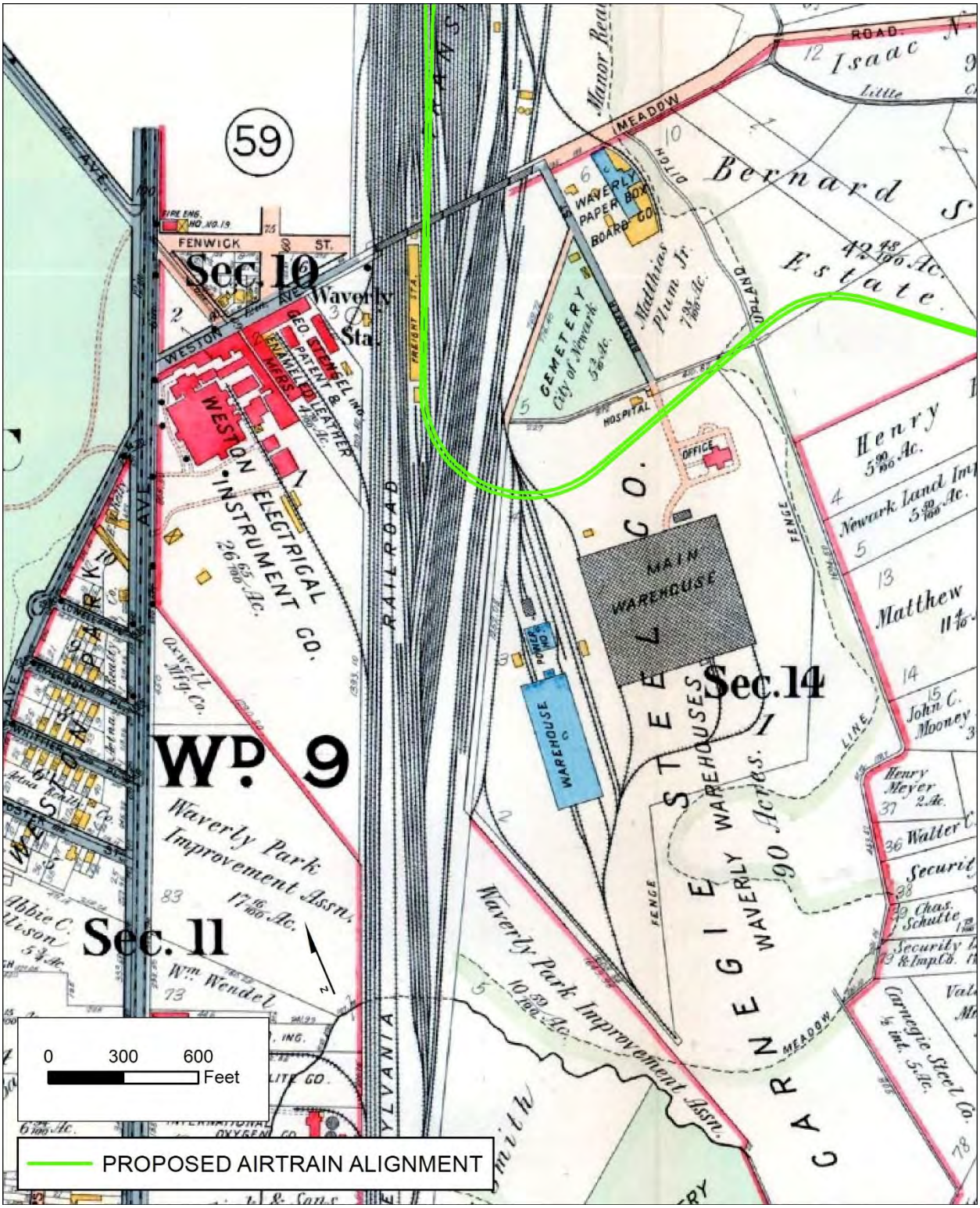


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Figure B.12 – Map showing the property (red outline) of Jacob Fisher in 1906 – the ditch described in the second subdivision of 1841 remained in place as the north boundary of this property (and as the southern boundary of the triangular Newark City Cemetery and the former Brill (now Wheeler Manufacturing Company) properties. Source: Kiser 1906.

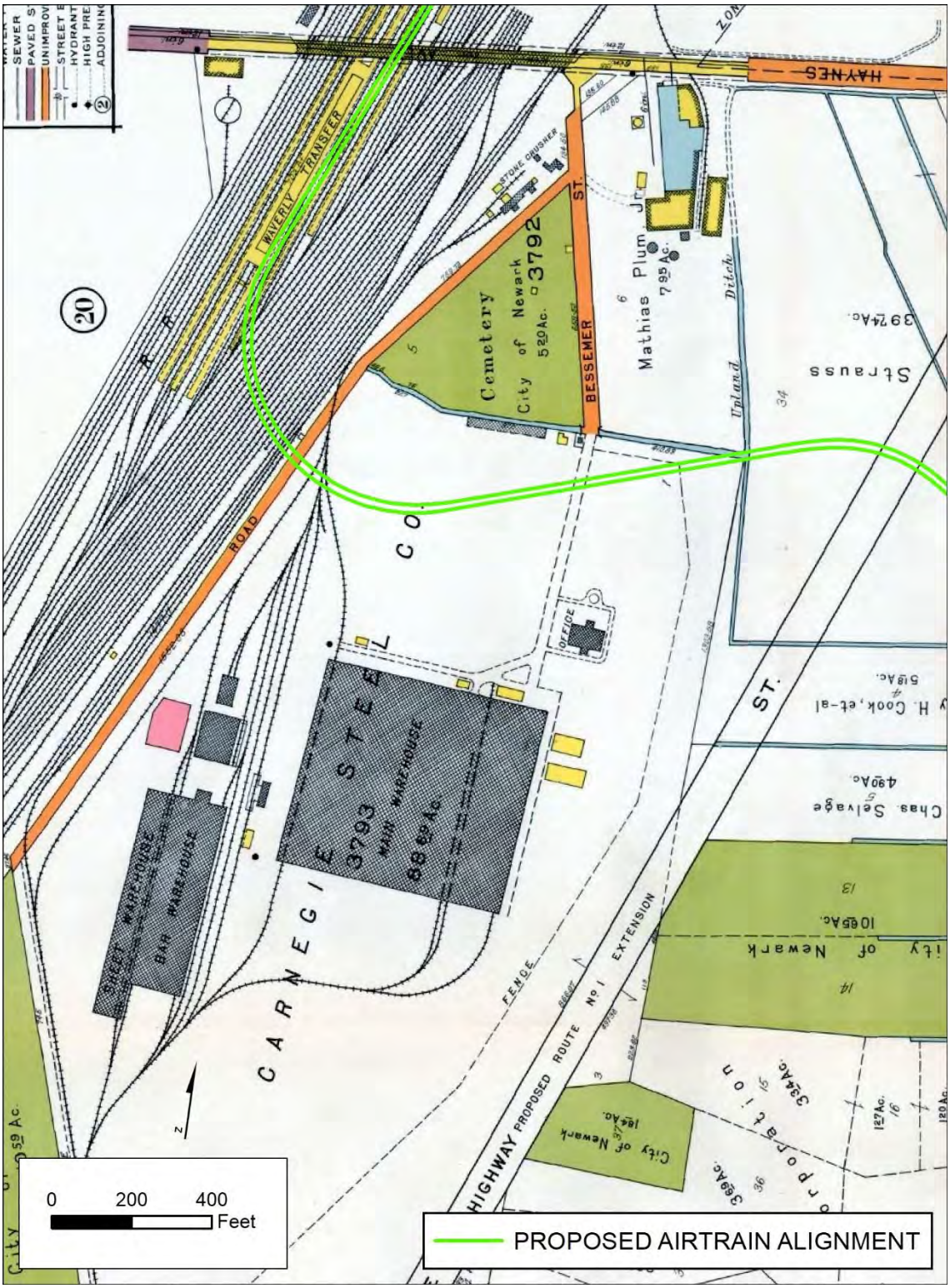


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Figure B.13 – Map showing the Carnegie Steel Company warehouse complex, with the small hospital building depicted adjacent to the southeast corner of the Newark City Cemetery. Source: Lathrop and Ogden 1912.



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Figure B.14 – Map showing the Carnegie Steel complex, with the hospital building and the adjacent gate house and shed on the south side of the ditch serving as the south boundary of the Newark City Cemetery. Source: Robinson et al. 1927.

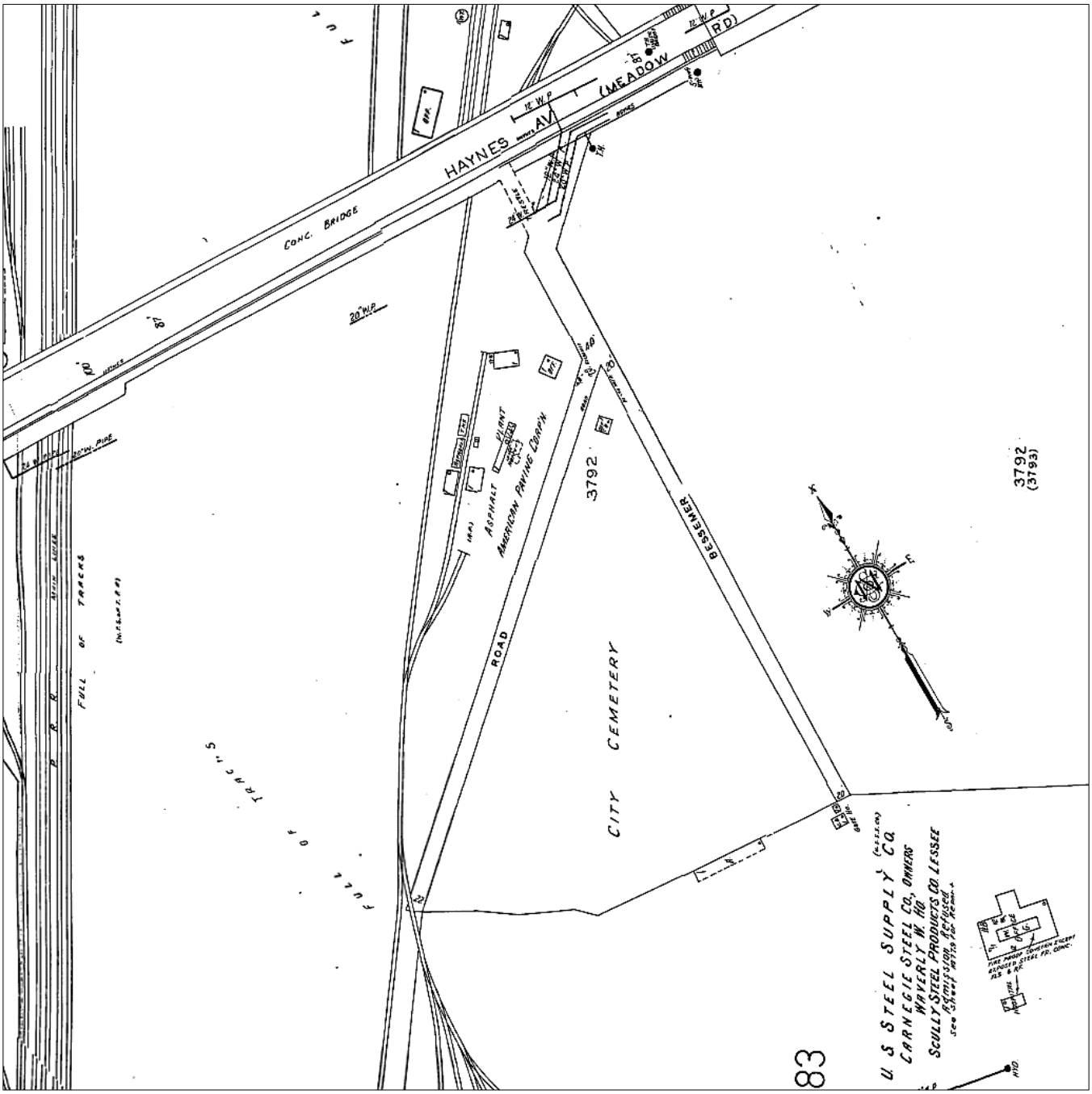
1928

The Newark Metropolitan Airport was completed to the east of the Carnegie Steel property within the former marshland of the Newark Meadows in 1928 (Laplante n.d.).

1950

By 1950 the hospital was no longer extant, but the gate house and the shed remained in place (Figure 15).

The gate house and the shed were both were demolished between 1966 and 1970, and the entire Carnegie complex was cleared between 1979 and 1984 to make way for the expansion of the Anheuser-Busch Newark Brewery. The Newark Airport AirTrain was completed to connect the airport and the Northeast Corridor in 1996, with a portion of the new monorail line constructed within the northern section of the 23.75-acre subdivision property surveyed in 1841 (EDR 2018; www.historicaerials.com).



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Figure B.15 - Map showing the Newark City Cemetery and the north end of the Carnegie Steel property in 1950, with two gate house buildings and the shed still in place on the south side of the boundary ditch. Source: Sanborn Map Company 1931 (1950).

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APPENDIX C

Field Provenience Catalog and Artifact Inventory

Appendix C-1 - Provenience Catalog - AirTrain Replacement Program

Site Name	Unit#	Catalog#	Stratum-Level	Date	Soil Description	Opening Depth	Closing Depth	Excavators	Comments
Hartz Mountain	TT #0001	0100	A-01	10/29/2020	black (010YR-2/1) loam	0.00'	1.40'	BH, LB	topsoil with humus
Hartz Mountain	TT #0001	0101	B-01	10/29/2020	black (010YR-2/1) loam	1.40'	2.80'	BH, LB	with coal ash and cinder
Hartz Mountain	TT #0001	0102	C-01	10/29/2020	yellowish brown (010YR-5/6) sand mottled with reddish brown (005YR-4/4) silt	2.80'	4.25'	BH, LB	
Hartz Mountain	TT #0001	0103	D-01	10/29/2020	light yellowish brown (010YR-6/4) clay loam	4.25'	4.75'	BH, LB	topped by lenses of organic material that thin to the north and east - thickest in southwest corner of unit
Hartz Mountain	TT #0001	0104	E-01	10/29/2020	reddish brown (005YR-4/4) silty clay	4.75'	4.95'	BH. LB	
Hartz Mountain	TT #0002	0105	A-01	10/29/2020	black (010YR-2/1) loam	0.00'	0.15'	BH, LB	
Hartz Mountain	TT #0002	0106	B-01	10/29/2020	black (010YR-2/1) loam	0.15'	0.90'	BH, LB	below the humus layer
Hartz Mountain	TT #0002	0107	C-01	10/29/2020	light gray (005Y -7/2) loam	0.90'	1.70'	BH, LB	mostly coal ash and cinder
Hartz Mountain	TT #0002	0108	D-01	10/29/2020	yellowish brown (010YR-5/6) sand	1.70'	2.60'	BH. LB	
Hartz Mountain	TT #0002	0109	E-01	10/29/2020	black (010YR-2/1) sand	2.60'	3.30'	BH, LB	with ash and cinder
Hartz Mountain	TT #0002	0110	F-01	10/29/2020	reddish brown (005YR-4/4) silty clay loam	3.30'	4.20'	BH, LB	
Hartz Mountain	TT #0002	0111	G-01	10/29/2020	dark gray (005YR-4/1) clay loam	4.20'	5.25'	BH, LB	disturbed buried surface deposit (?)
Hartz Mountain	TT #0002	0112	H-01	10/29/2020	very dark gray (005YR-3/1) clay loam	5.25'	6.05'	BH, LB	screened with overlying deposit
Hartz Mountain	TT #0002	0113	I-01	10/29/2020	reddish brown (005YR-4/4) silty clay loam	6.05'	6.20'	BH, LB	subsoil
Hartz Mountain	TT #0003	0114	A-01	10/29/2020	black (010YR-2/1) silt loam	0.00'	0.50'	BH, LB	humus
Hartz Mountain	TT #0003	0115	B-01	10/29/2020	black (010YR-2/1) silt loam	0.50'	0.90'	BH, LB	topsoil
Hartz Mountain	TT #0003	0116	C-01	10/29/2020	black (010YR-2/1) loam	0.90'	2.00'	BH, LB	
Hartz Mountain	TT #0003	0117	D-01	10/29/2020	yellowish brown (010YR-5/6) silt	2.00'	2.40'	BH, LB	
Hartz Mountain	TT #0003	0118	E-01	10/29/2020	white (005Y -8/2) -	2.40'	2.90'	BH, LB	coal ash

Appendix C-1 - Provenience Catalog - AirTrain Replacement Program

Site Name	Unit#	Catalog#	Stratum-Level	Date	Soil Description	Opening Depth	Closing Depth	Excavators	Comments
Hartz Mountain	TT #0003	0119	F-01	10/29/2020	black (010YR-2/1) -	2.90'	3.10'	BH, LB	coal ash
Hartz Mountain	TT #0003	0120	G-01	10/29/2020	yellowish brown (010YR-5/6) sand	3.10'	4.20'	BH,LB	coarse sand
Hartz Mountain	TT #0003	0121	H-01	10/29/2020	reddish brown (005YR-4/4) silt loam	4.20'	4.40'	BH, LB	thin, compact deposit
Hartz Mountain	TT #0003	0122	I-01	10/29/2020	dark gray (005YR-4/1) clay loam	4.40'	4.95'	BH, LB	truncated buried topsoil - screened small amount
Hartz Mountain	TT #0003	0123	J-01	10/29/2020	reddish brown (005YR-4/4) silty clay loam	4.95'	5.2'	BH, LB	subsoil
Anheuser Busch	TT #0001	0200	A-01	11/02/2020	dark grayish brown (2.5Y -4/2) sandy loam	0.00'	0.90'	BH, LB	includes the asphalt layer - underlying gravel base
Anheuser Busch	TT #0001	0201	B-01	11/02/2020	dark brown (7.5YR-3/2) sandy clay loam	0.90'	2.50'	BH, LB	brick and hotel china present in fill - discarded in field
Anheuser Busch	TT #0001	0202	C-01	11/02/2020	dark reddish brown (005YR-3/2) silty clay mottled with black (010YR-2/1) sandy clay	2.50'	5.90'	BH, LB	marsh deposit with modern debris (i.e.plastic container lid) and some ceramics, large stones present
Anheuser Busch	TT #0002	0203	A-01	11/02/2020	weak red (2.5YR-4/2) sand	0.00'	1.10'	BH, LB	asphalt layer and underlying road gravel
Anheuser Busch	TT #0002	0204	B-01	11/02/2020	brownish yellow (010YR-6/6) sandy loam mottled with reddish brown (2.5YR-4/4) sandy loam and very dark gray (005YR-3/1) sandy loam	1.10'	1.90'	BH, LB	with large stones
Anheuser Busch	TT #0002	0205	C-01	11/02/2020	reddish brown (005YR-4/3) sand	1.90'	5.50'	BH, LB	tested down to 5.5' by shovel - same deposit - started filling with water
Anheuser Busch	TT #0003	0206	A-01	11/02/2020	dark grayish brown (2.5Y -4/2) sand	0.00'	0.90'	BH, LB	asphalt layer and gravel - more gravel along west end of trench
Anheuser Busch	TT #0003	0207	B-01	11/02/2020	reddish brown (005YR-4/3) loamy sand mottled with dark reddish brown (005YR-3/3) loamy sand	0.90'	2.80'	BH, LB	uncovered large diameter concrete drain pipe on eastern end of trench - halted excavation - top of pipe was at 2.8' below the surface

Appendix C-2 - Artifact Inventory - - AirTrain Replacement Program

Unit#	Catnum	Stratum	Count	Object	Material	Portion	Decoratio	Wtg.	Length	Marks	Comments	Code
Hartz Mountain												
Household Ceramics												
TT #0002	0111.A001	G - 01	1	Food Service-Tableware-Flatware (non-glass)	Whiteware/Ironstone - undecorated (023.00) -	Plate - rim -				-	small sherd	(ACE0101
TT #0002	0111.A002	G - 01	1	Food Service-Tableware (non-glass)	Rockingham ware - undecorated (057.00) -	Unidentified (sherd-level ident.) - body -				-	small sherd	(ACX0000
TT #0002	0111.A003	G - 01	1	Food-related(?)-Unidentifiable	Redware - undecorated-lead glaze-clear (072.10) -	Unidentifiable - body -				-	unglazed exterior - small sherd	(ADA0000
Glass Bottles and Commercial Contai												
TT #0002	0111.G001	G - 01	2	-	- Bottle - - - molded	- body - glass - Colorless	undecorate			-	one is irregular shaped	(GAZ0100
Construction and Waste Material												
TT #0002	0111.C000	G - 01	11	Windows-Windows	glazing (window glass)- - plate-Aqua, Light	fragment - glass (J20060)				-	1 with possible edge	(CEA0101
TT #0002	0111.C000	G - 01	1	Fabric-general	brick- - unidentifiable-Orange	fragment - brick (J20010)		4.0		-	Discarded in lab	(CAA0101
TT #0002	0111.C001	G - 01	1	Hardware-fasteners (general)	nail- - wire cut--	whole - fe (iron) (E15080)			2.5	-		(CGA0201
Faunal and Floral Remains												
TT #0002	0111.F000	G-01	5	Eastern Oyster (Crassostrea virginica)	shell (I19040)	valve fragment		5.0			discarded in lab	

Appendix C-2 - Artifact Inventory - - AirTrain Replacement Program

Unit#	Catnum	Stratum	Count	Object	Material	Portion	Decoratio	Wtg.	Length	Marks	Comments	Code
TT #0002	0111.F000	G-01	1	Eastern Oyster (Crassostrea virginica)	shell (I19040)	upper valve nearly whole		44.0			with hinge - discarded in lab	
TT #0002	0111.F001	G-01	1	Large Mammal - Unidentified	faunal (A11030)	rib fragment		11.0			chopped ends (?)	

From: Marcopul, Kate <Kate.Marcopul@dep.nj.gov>
Sent: Friday, December 11, 2020 12:49 PM
To: Knoesel, Edward (FAA) <edward.knoesel@faa.gov>
Cc: Lamond, Kathryn <klamond@panynj.gov>; david.sanchez@faa.gov; Cronin, Catherine <ccronin@panynj.gov>; D'Apuzzo, Ralph <rdapuzzo@panynj.gov>; Maresca, Vincent <Vincent.Maresca@dep.nj.gov>; Thivierge, Lindsay <Lindsay.Thivierge@dep.nj.gov>
Subject: HPO Project #20-0602 Newark Liberty Int. Airport AirTrain Replacement Project

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HPO Project #20-0602-5

HPO-K2020-053

Ed Knoesel
Environmental Protection Specialist
Federal Aviation Administration
New York Airports District Office
159-30 Rockaway Blvd, Suite 111
Jamaica, New York 11434

Dear Mr. Knoesel:

As Deputy State Historic Preservation Officer for New Jersey, in accordance with 36 CFR Part 800: Protection of Historic Properties, as published in the Federal Register on December 12, 2000 (65 FR 77725-77739) and amended on July 6, 2004 (69 FR 40553-40555), I am providing consultation comments on the following proposed undertaking:

Essex County, Newark City
Newark International Airport
EWR AirTrain Replacement Program
Revised Phase IA Archaeological Survey, Revised Historic Architectural Survey, and Phase IB Archaeological Survey Report

Federal Aviation Administration

800.4 Identification of Historic Properties

Thank you for providing the Historic Preservation Office (HPO) with the opportunity to comment on the potential for the above-referenced undertaking to affect historic properties. The comments below are in response the following cultural resources reports received by the HPO on November 27, 2020:

Zerbe, Nancy L.

August 2020 *Revised*, *Historic Architectural Sites Survey and Effects Assessment for the Newark AirTrain Replacement Project, City of Newark Essex County and City of Elizabeth, Union County, New Jersey.* Prepared for the Port Authority of New York and New Jersey. Prepared by ARCH², Inc., Metuchen, NJ.

Porter, Richard, Leonard G. Bianchi, and Jean Howson

September 2020 *Revised, Phase IA Archaeological Survey, Newark Liberty International Airport (EWR), AirTrain Replacement Program.* Prepared for the Port Authority of New York and New Jersey. Prepared by NV5, Parsippany, NJ.

Porter, Richard, Leonard G. Bianchi, and Jean Howson

November 2020 *Phase IB Archaeological Survey, Newark Liberty International Airport (EWR), AirTrain Replacement Program,* Prepared the Port Authority of New York and New Jersey. Prepared by NV5, Parsippany, NJ.

The above-referenced historic architecture survey and Phase IA archaeological survey were previously submitted for the proposed undertaking. In a letter dated May 12, 2020, the HPO concurred with the historic architecture survey report findings and recommended no additional consideration of architectural historic properties. In addition, the HPO required a Phase IB archaeological survey within the area of potential effects (APE) from Bessemer Street to Haynes Avenue. Since that time, project plans have changed shifting the location of the proposed AirTrain system.

<u>Historic Architecture</u>

-

The above-referenced revised architectural survey report states that there are three previously identified historic properties within the current project's APE: Pennsylvania Railroad New York to Philadelphia Historic District (aka Amtrak's Northeast Corridor) (SHPO Opinion: 1/14/2015); the Haynes Avenue Bridge (SHPO Opinion: 6/3/1991); and the U.S. route 1/9 Historic District (SHPO Opinion: 3/8/1996), and two previously identified properties on airport property but outside the APE: Newark Metropolitan Airport Administration Building and Medical Building (SR: 6/25/1980; NR: 12/12/1980). The current survey evaluated four additional properties: Newark Liberty International Airport's Terminals A, B, and C; Anheuser-Busch, Inc.; Kinglands Rum and Barrel, Inc.; and the New Jersey Galvanizing and Tinning Works, Inc. The report recommended that the previously identified historic properties would not be adversely affected by the project due to the nature of the historic properties, the location of the undertaking, and the distance between the undertaking and the historic properties. Additionally, it is recommended that the four newly surveyed properties do not possess the characteristics necessary to be eligible for listing on the New Jersey and National Registers of Historic Places.

Upon review, the HPO concurs with the findings of the architectural survey report. In consequence, the HPO recommends to FAA that no additional consideration of architectural historic properties is necessary unless project plans substantially change in the future.

Archaeology

The above-referenced revised Phase IA archaeological survey report states that the majority of the project's area of potential effects (APE) was located within a former larger marsh complex and subsequently filled during the late nineteenth and early twentieth centuries. While the potential exists for deeply buried Pre-Contact period archaeological resources exists, the project has a low potential to encounter those resources. The report further assesses the APE from Bessemer Street to Haynes Avenue (Block 5090, Lots 1.05 and 44.01) possesses sensitivity for human burials from the Newark City Cemetery (1869-1954) and late nineteenth century historic period resources from a former glue factory, several dwellings, and hospital. Therefore, this segment of the APE possesses a high archaeological sensitivity for historic period archaeological resources and potential human burials.

The above-referenced Phase IB archaeological survey was conducted in the APE along the alignment of the proposed elevated guideway within Block 5090, Lots 1.05 and 44.01. Testing included the machine excavation of six trenches measuring approximately 4ft by 8ft and extended 4ft to 5ft below ground surface. A buried former topsoil layer was identified in two of the test trenches on Block 50905, Lot 1.05 and produced a small number of late 19th century artifacts. However, no features or concentrations of artifacts were identified. Additionally, approximately 4 feet of fill deposits overly the former topsoil. According to the report, the artifacts recovered from the former topsoil may be related to historic occupation of the property. In order to investigate the topsoil deposit, a large area would need to be stripped of several feet of fill. Although the foundation pier for the proposed elevated guideway will penetrate the fill and extend through the identified former ground surface, construction plans call for pile driving and sheet pile driving for the foundation. These actions will not result in the disturbance of large

areas beneath the fill. Therefore, the report does not recommend any additional archaeological survey. However, if project plans change to include excavation of a larger area to depths below the fill, the report recommends additional archaeological survey to investigate the identified former late 19th century ground surface.

Upon review, the HPO concurs with the findings of the above-referenced Phase IB archaeological survey. Therefore, no additional archaeological survey is required for the undertaking as proposed. However, if project plans change in the future, additional consultation will be needed as intact late 19th century surfaces were identified.

800.5 Assessment of Adverse Effects

Therefore, I concur with your finding that, as proposed, the undertaking will have **no adverse effect** on historic properties. Pursuant to 800.5(c), if no consulting parties object to this finding within the 30-day review period, the project may proceed, as proposed, unless resources are discovered during project implementation, pursuant to 800.13.

Additional Comments:

Thank you again for the opportunity to review and comment on the proposed undertaking. Please reference the HPO project number **20-0602** in any future calls, emails, or written correspondence to help expedite your review and response. If you have any questions, please feel free to contact Lindsay Thivierge of my staff at Lindsay.Thivierge@dep.nj.gov. with questions regarding historic architecture, historic districts, or historic landscapes or Vincent Maresca of my staff at vincent.maresca@dep.nj.gov with questions regarding archaeology.

Sincerely,

Katherine J. Marcopul, Ph.D., CPM
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