Chapter 2 Project Alternatives

2.1 INTRODUCTION

The project alternatives analyzed in detail in the DEIS include the No Action Alternative and one Build Alternative. NEPA requires consideration of the No Action Alternative to allow decision makers to compare the impacts of approving the proposed Project with the impacts of not approving the proposed Project. This chapter describes the two alternatives evaluated in this DEIS – the No Action Alternative and the Build Alternative (with a range of potential power generation outputs from 104MW to 140MW, depending on load and equipment configurations). As discussed below, the Build Alternative (also referred to as the preferred alternative) includes seven contiguous-linked project components ("Project Component A" through "Project Component G"). Where needed (i.e. crossing of the Hackensack River), design options were evaluated, and a preferred alternative was selected for these scenarios. Together, the seven segmented project components comprise the single Build/ Preferred Alternative. The two alternatives are described below in greater detail. This chapter also provides background information summarizing the project development, and the evaluation and screening process explaining how the Build Alternative was developed.

2.2 BUILD ALTERNATIVE

2.2.1 Overview

As stated in Chapter 1, the Build Alternative of the proposed Project would include a natural gas-fired generation plant, referred to as the Main Facility (Preferred Alternative Project Component A), with a net generation[4] of 104MW to 140MW, which would include using steam power generation from waste heat. Several design options have been evaluated for the microgrid. The preferred equipment configuration is a combined-cycle technology resulting in power generation capacity of 104MW to 140MW that combines five natural gas turbines and one steam turbine as per 20% design package, dated September 10, 2018. Approximately four acres of land at the Main Facility site is proposed for a solar panel facility with photovoltaic cells. Other design options of varying combinations of equipment and facility layouts (including all equipment housed inside one large building versus outside in individual enclosures) were considered. Ultimately, one Build Alternative was selected based on siting criteria and consideration of other criteria including capital cost estimates, Buy America requirements, and consistency with Project goals. The primary component of the Build Alternative would be the Main Facility, which would be in the Town of Kearny in Hudson County, New Jersey. It would be electrically connected to the Public Service

[4] Net generation is the amount of electricity generated by the power plant for consumer use. While the microgrid could have capacity to generate up to 140MW, a maximum of 125MW will be contributing to air emissions at any given time. The microgrid is designed with a higher generation capacity to provide consistent electrical loads and avoid fluctuations during islanded conditions.

Electric and Gas Company (PSE&G) system, which currently provides power to NJ TRANSIT and Amtrak facilities in the Project area. Under normal conditions, the microgrid would have the capacity to import from, and export into, the larger commercial grid 24 hours per day, 7 days per week. When the existing commercial electric grid is fully available, the microgrid would operate in parallel with it, providing dedicated power for railroad operations to meet electrical demand in the most reliable and cost-effective manner, offsetting commercial power grid supply demands. In the event any part or all of the microgrid is deactivated, the commercial grid would instantly provide the electric power flow to maintain operations. An interconnection at the Mason Substation would be the location of the "net metering." This constitutes electricity generated minus electricity consumed by NJ TRANSIT and Amtrak loads. Under a scenario involving a regional or local blackout condition, the microgrid would disconnect from the PSE&G commercial grid and become the primary source of power to support the following services:

- Limited commuter rail service on Amtrak's Northeast Corridor between New York Penn Station and County Yard/Jersey Avenue Station in New Brunswick (approximately 32.8 rail miles) via a power connection to a new Kearny Substation;
- Limited NJ TRANSIT commuter rail service between Hoboken Terminal and Millburn Station on the Morris & Essex Line (approximately 16.3 rail miles), via a power connection to the Mason Substation; and
- Service on NJ TRANSIT's Hudson-Bergen Light Rail (HBLR) between Tonnelle Avenue in North Bergen and 8th Street in Bayonne (approximately 16.6 rail miles), via power connections to the individual traction power substations along the HBLR right-of-way.

In addition to providing traction power, the microgrid would also be designed to support some non-traction loads. Providing power for these non-traction loads would not require additional or new infrastructure, beyond what is described and evaluated in this DEIS. The non-traction loads would include:

- NJ TRANSIT Hoboken Terminal and Yard through input to Henderson Street Substation;
- The majority of NJ TRANSIT HBLR station loads (approximately 16.6 rail miles), supported through the connections to the traction power substations mentioned above;
- Northeast Corridor signal power, Hudson River tunnel ventilation, pumping, and lighting loads for the sections of operable track from New York Penn Station to County Yard/ Jersey Avenue Station (approximately 32.8 rail miles);
- NJ TRANSIT Main Line's operating segment signal power from the intersection with the Morris & Essex Line to the Upper Hack Lift Bridge (approximately 2.5 rail miles); and
- The NJ TRANSIT Rail and HBLR Regional Operations Centers.

Figures 1-1 and 1-2 in Chapter 1, "Purpose and Need," highlight the rail service network throughout which power would be distributed during a regional or local blackout condition. The service territory was chosen to support an overall service goal of transporting as many customers as possible between key nodes in

NJ TRANSIT's core public transit system. Newark, New Jersey, and Manhattan, New York, represent areas with very high transit dependency for both work and non-work trips.

During initial studies in 2013 and 2014, the size of the Main Facility was estimated based on historic electrical demand data and by considering the unique aspects of traction power for rail service, since it represents the vast majority of the peak load requirement. Based on these conceptual estimates, a net generation capacity of approximately 104MW would be needed for the core service territory to overcome the frequency fluctuations and negative phase sequence in the electrical system (Sandia 2014). The actual traction power loads are less than 104MW; however, the Main Facility's generation capacity must be great enough to account for intra-hour peaks and down time for equipment maintenance, as well as provide stable voltage and frequency as load changes occur.

NJ TRANSIT has completed the 20% design package, dated September 10, 2018, for the microgrid. While the design details of the Main Facility will continue to be refined during subsequent engineering stages, the environmental analyses in this document evaluate a reasonable worst-case impact scenario of the equipment identified in the 20% design package. To provide for conservative environmental analyses, this DEIS assumes the microgrid would include five natural gas turbines and one steam turbine with an output of 104MW to 140MW of mechanical power operating at maximum capacity. This conservative assumption accounts for the potential for higher estimates of hourly demand and the specification of additional equipment that would allow for uninterrupted service while maintenance is performed on the turbines.

The Build Alternative includes the Main Facility as well as other components required for the power distribution infrastructure needed to support the core service territory—including several substations, various electrical lines, and other elements that extend throughout the project site. For purposes of this DEIS, the Build Alternative is described as "Project Component A" through "Project Component G" (see Figure 2-1), as defined in the list below. Project Components are detailed in Sections 2.2.2 through 2.2.8 of this chapter.

- Project Component A – Main Facility
- Project Component B – Natural Gas Pipeline Connection
- Project Component C – Electrical Lines to Mason Substation
- Project Component D – Electrical Lines and New Kearny Substation
- Project Component E – Electrical Lines and New NJ TRANSITGRID East Hoboken Substation
- Project Component F – Connection to HBLR South
- Project Component G – HBLR Connectivity

At the Main Facility, the primary impervious surface will be at the location of the Main Facility Building (Operations and Control Building) and associated parking. The remainder of the parcel will be covered with gravel or crushed rock, maintaining the current pervious surface. This includes the substation,

Sources:
Design - Project area and points, substations electrical line routes created by BEM Systems, Inc. 2015/2016/2017 based on NJ TRANSIT input and Jacobs Engineering Group, Inc. 20% Design (September 10, 2018)
Aerial - NJGIN High Resolution Orthophotography (2015) and ESRI: Digital Globe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community (Date accessed 2019)

Figure 2-1: Project Area

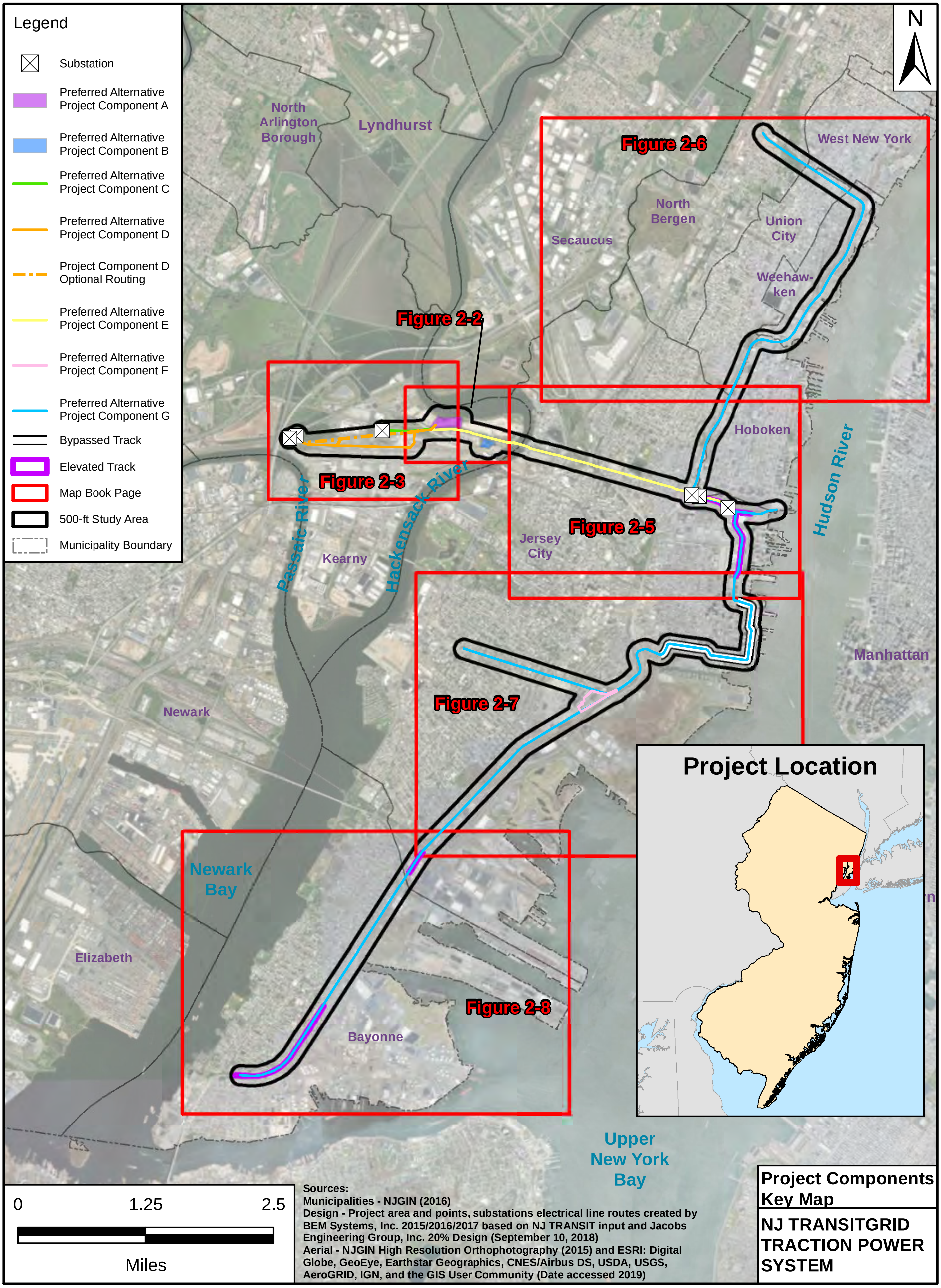
NJ TRANSITGRID TRACTION POWER SYSTEM

Path: \\atlas\GISDATA\Projects\NJ_Transit\Tier3\TransitGrid\2019_DraftEIS\Rev0\Figure2_1_ProjectArea.mxd combustion turbine generator yard, and the detention basin underneath the solar panels. As discussed in this document, the limit of disturbance (LOD) for the New Kearny Substation is a known area of 1.7 acres in Cedar Creek Marsh South. The NJ TRANSITGRID East Hoboken Substation and the nanogrid will be constructed on previously developed land and will therefore not increase impervious surface.

2.2.2 Preferred Alternative Project Component A—Main Facility

The preferred site for the Main Facility is in the Town of Kearny, Hudson County, New Jersey and was selected during a siting analysis completed in 2015 (see Figure 2-1 and Appendix A, "Site Screening Analysis"). The Main Facility site is part of a large tract of land currently owned by the Hudson County Improvement Authority (HCIA) and commonly known as the Koppers Koke Site, which lies within the Koppers Coke Redevelopment Area (the Redevelopment Area) (NJ Meadowlands Commission [NJMC] 2013). The rationale for the selection of the Main Facility site is presented below in Section 2.4, "Background on Alternatives Development, Evaluation and Screening." The Meadowlands Regional Commission (MRC), which resides within the New Jersey Sports and Exposition Authority (NJSEA), is seeking to encourage brownfield redevelopment on this parcel. HCIA has elevated portions of the Koppers Koke Site above the Federal Emergency Management Agency (FEMA) Preliminary Base Flood Elevation (BFE) which was determined from the Preliminary Flood Insurance Rate Map (FIRM) dated July 2, 2018 (panel number 34003C0332J). The BFE for Preferred Alternative Project Component A is +8 feet North American Vertical Datum of 1988 (NAVD88)[5] and the NJ TRANSIT's Design Flood Elevation (DFE) is BFE + 2.5 feet, or +10.5 feet NAVD88 (NJ TRANSIT 2014). An additional 2.5 feet is added to adjust for relative sea level change (SCL) expected over the 50-year Project life at the preferred location. The Sea Level Rise (SLR) calculation was obtained from the NOAA online SLC calculator using the National Oceanic and Atmospheric Administration (NOAA) Intermediate-High scenario, which projects an increase in sea level of 2.5 feet over the next 100 years. To this value a minimum of +1.0 foot, required by the FTA for construction in the coastal zone (Emergency Relief Program, Interim Final Rule), was added, as well as an additional +0.5-foot factor of safety that acknowledges the criticality and cost of the state's railroad infrastructure, for a final DFE of +12 feet NAVD88. The planned elevation of Project Component A is greater than +25 feet NAVD88, so complies with the NJ TRANSIT DFE as well as FTA's Emergency Relief Program 49 U.S.C. 5324 section 4.2.3 Floodplain Management, as discussed in Section 2.3.2 below. The proposed Project would use approximately 26 acres total that NJ TRANSIT is acquiring as part of unrelated litigation within the Redevelopment Area for the proposed Project, consisting of two parcels: a 20-acre parcel located within the Koppers Koke Site that was prepared for development by HCIA, and a six-acre parcel on Fish House Road. The Main Facility would occupy approximately 20 acres within the Koppers Koke Site as shown on Figure 2-2 and would include approximately 32,000 square feet of working and office space (Preferred Alternative Project Component A). As discussed in the next section, the six-acre

[5] North American Vertical Datum of 1988 (NAVD 88) is the vertical control datum of orthometric height established for vertical control surveying in the United States. It consists of a leveling network on the North American Continent, ranging from Alaska, through Canada, across the United States, affixed to a single origin point on the continent.



Project Components Key Map

NJ TRANSITGRID TRACTION POWER SYSTEM

Sources:
Municipalities - NJGIN (2016)
Design - Project area and points, substations electrical line routes created by BEM Systems, Inc. 2015/2016/2017 based on NJ TRANSIT input and Jacobs Engineering Group, Inc. 20% Design (September 10, 2018)
Aerial - NJGIN High Resolution Orthophotography (2015) and ESRI: Digital Globe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community (Date accessed 2019)

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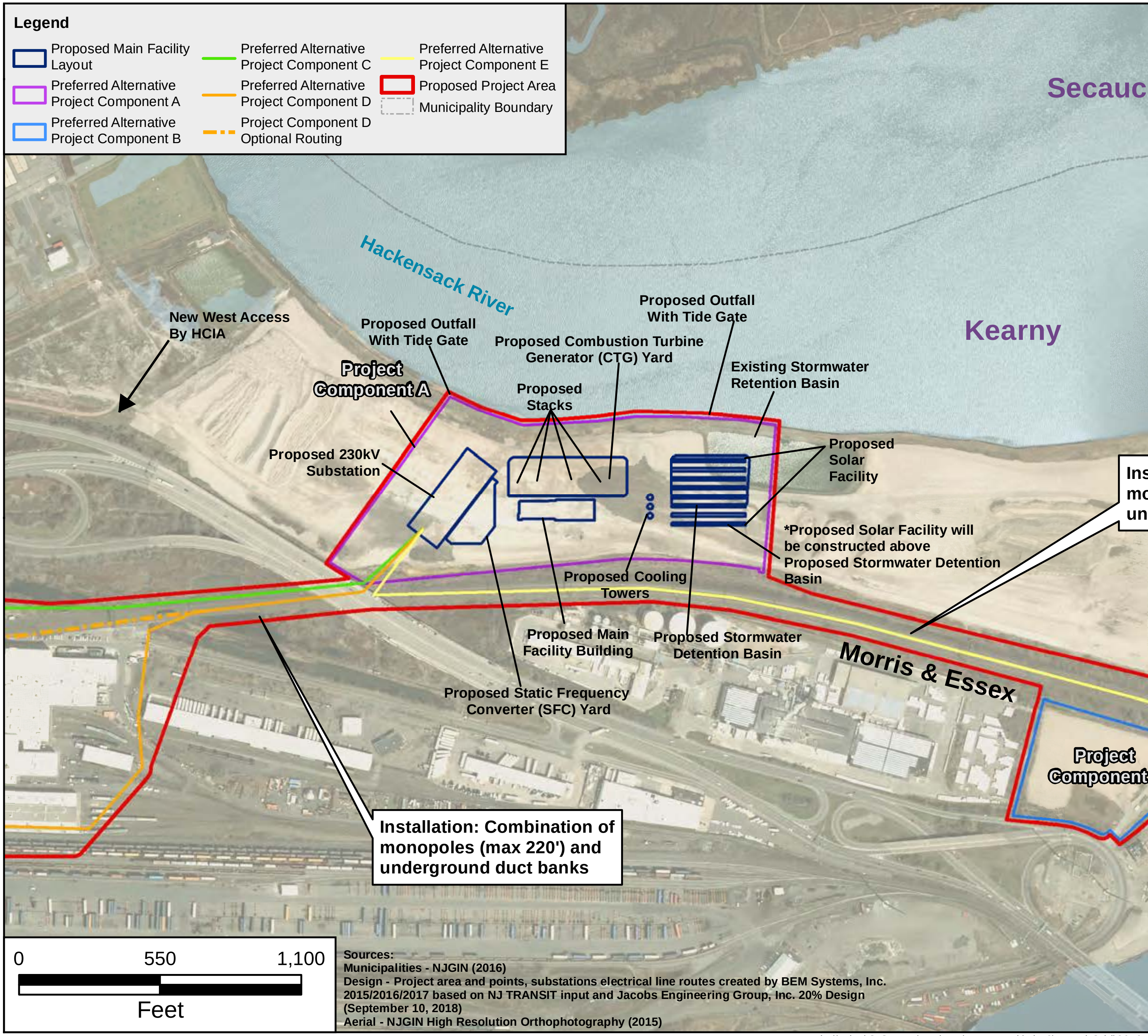

Figure 2-2: Project Components A/B

NJ TRANSITGRID TRACTION POWER SYSTEM

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parcel south of the Morris & Essex Line would be used for natural gas connection and metering (Preferred Alternative Project Component B).

The Main Facility building would include a maintenance shop, locker rooms, control room, process equipment, office facilities, and other general-use spaces. Adjacent to the Main Facility building, a combustion turbine generator (CTG) yard containing five natural gas turbines, two of which will also include heat recovery steam generators (HRSG), would be constructed. Five ventilation stacks, approximately 10 feet in diameter and a maximum of 150 feet high, would be constructed within the CTG yard for the gas turbine exhaust. A substation would be constructed in the proximate vicinity of the CTG yard and the Main Facility building to connect the generated power to the required voltages and frequencies and will include static frequency converters (SFC). The Main Facility layout is shown in Figure 2-2. Construction of the Main Facility building foundation would include pile driving to rock, roughly 100 feet below ground surface, using a double-casing technique to prevent migration of contaminated materials and forming and casting concrete floor slabs and equipment pads. During construction, specific measures will be in place to prevent worker exposure to or spreading of existing contamination. Additional details on the construction methods and effects are discussed in Chapter 17, “Construction Effects.”

NJ TRANSIT has selected the following equipment configuration as the most feasible based on cost, Buy America (49 Code of Federal Regulations [CFR] § 661 [2012]) compliance, revenue potential and consistency with the proposed Project’s goals. During concept verification, several options were evaluated to maximize transit operations within the constraints of the capital budget and air permit limitations (Jacobs 2017a).

The Build Alternative would be a combined-cycle natural gas turbine plant, which would supplement the power output with a steam turbine generator utilizing the waste heat from the gas turbines without additional fuel input. The conceptualized steam turbine capacity would be 14MW to 18MW total (mechanical power) and would have minimal environmental impacts. The Build Alternative would have the following main components:

- Five gas turbines (21MW to 25MW each);
    - Two of these will be connected to HRSGs;
- One steam turbine (14MW to 18MW);
- Two emergency “black start” reciprocating engines (not to exceed 2.5MW each); and
- Solar facility generating approximately 0.6MW occupying approximately four acres on the Main Facility site.

For comparison, a simple-cycle power plant uses only the gas turbines and/or reciprocating engines to generate electricity. In a simple-cycle power plant, the hot exhaust from power generation equipment is released into the atmosphere. In a combined-cycle plant, the excess heat is used to convert water to steam for use in a steam turbine generator. In the Build Alternative, the reciprocating engines would only serve as “black start” generators, which would allow for start-up of the Main Facility without reliance on external electricity. In a combined-cycle plant, cooling towers would be used to condense the steam in the steam turbines and expel the remaining low-grade heat to the atmosphere. Federal and New Jersey regulations impose stringent emissions control technology requirements on power generation facilities. Federal regulations applicable to a new power generating facility include, but are not limited to, the Environmental Protection Agency’s (EPA) Title V and Nonattainment New Source Review (NNSR)/Prevention of Significant Deterioration (PSD) permitting requirements, New Source Performance Standards (NSPS) and Maximum Achievable Control Technology (MACT) standards. The EPA has delegated authority to administer these programs to the New Jersey Department of Environmental Protection (NJDEP). The New Jersey Administrative Code (N.J.A.C.) includes State of the Art (SOTA) criteria and Reasonable Available Control Technology (RACT) requirements. Other regulations found in the N.J.A.C. that may be applicable to the proposed Project include Title 7, Chapter 27, Subchapters 8 (Permits and Certificates for Minor Facilities and Major Facilities without an Operating Permit), 18 (Emission Offset Rules) and 22 (Title V Operating Permits). Selective Catalytic Reduction (SCR) and oxidation catalyst systems would be installed on the plant to reduce the levels of pollutant emissions to SOTA levels.

As shown on Figure 2-2, approximately four acres of the Main Facility site would be utilized for a solar (photovoltaic cells) panel facility. The solar panels would generate approximately 0.6MW (640 kilowatts [kW]) of additional power. Since the power generated from the solar panels is relatively low in comparison to the power generated by the microgrid, it is anticipated that solar power would supplement power needed to run the Main Facility. This solar power would not reach the commercial grid, even though it could technically be connected to the commercial grid via the microgrid. The solar panels would be installed over the proposed detention basin, discussed below. There would be enough clearance over the gravel surface of the detention basin for maintenance access, and the panel tops would be no more than 35 feet above the gravel surface of the detention basin.

<u>Other On-Site Equipment</u>

In addition to the Main Facility, project substations, transformers, frequency converters, cooling towers (approximately 31 feet above grade and approximately 37 feet above grade to top of stack), and other equipment would be built on the Main Facility site to accommodate the different power needs of Amtrak’s Northeast Corridor and NJ TRANSIT’s commuter and light rail services. Other major on-site facility components would include tanks and equipment for ammonia (used for emissions controls), and service and fire water. Security fencing and other security measures would be installed at the site.

<u>Route 7 Access</u>

The Main Facility site would be connected to Route 7 via an easement near the intersection with the Belleville Turnpike. In the project design, NJ TRANSIT has proposed a driveway for access to the Main Facility site. The driveway would be connected to westbound lanes of Route 7 and would provide access along the southwest boundary of the Koppers Koke site to the Main Facility footprint. Separately from the proposed Project, HCIA and its contract purchaser has presented a concept application submission to the New Jersey Department of Transportation (NJDOT) to allow ingress and egress from the Redevelopment

Area to Route 7 for large vehicles (e.g., tractor trailers). In the event that the HCIA's roadway access improvements are delayed, incoming traffic related to the proposed Project could enter the Main Facility site via an existing west access point on the Koppers Koke parcel. Outbound traffic generated by the Main Facility could be routed to westbound Route 7 via the west access point. In this event, NJ TRANSIT would acquire appropriate easements from HCIA for such access and ensure the appropriate access permits are secured from NJDOT.

Water

As discussed in Chapter 15, "Utilities," the Main Facility site contains no sanitary sewers or water service. The Main Facility would include a closed loop system for driving the steam turbine, which would be sourced from the municipal water supplier, Suez Water. There would be two water supply systems piped within the building: a domestic water system for employee day to day use and a process water system. Water usage for the microgrid's natural gas-fired turbines would require water for cooling purposes, which would be further purified with a reverse-osmosis system. Most of the water use for the proposed Project is associated with the steam-driven turbine's cooling water. The cooling tower and the water use would vary with ambient temperature. The cooling tower requires water intake to account for blowdown and evaporation. The heat recovery boilers would require water makeup due to steam system losses and blowdown for maintenance of water chemistry. At peak ambient temperature, the water demand would be approximately 850 to 1,000 gallons per minute (gpm), which corresponds to 1.3 million gallons per day (MGD), for plant operations. This is expected to vary throughout the year. Domestic water would be supplied to toilet rooms, janitor's closets, water laboratory fixtures, break room sinks and fire suppression systems. Domestic water demand is estimated at 102 gpm. Suez Water currently has spare capacity of approximately 3MGD and would therefore accommodate the water needs for the Preferred Alternative. NJ TRANSIT proposes to install a 12-inch water supply line, with a connection to an existing 42-inch main water line which is owned by the Town of Kearny. The new supply line would exit the Preferred Alternative Project Component A footprint near the southwest corner and travel southwest, following a route generally parallel to the Morris & Essex Line. The new connection would be located south of Route 7, but on the north side of the Morris & Essex Line. No surface or ground water will be used for water supply under the Preferred Alternative.

Waste Water/Sewer Supply

All waste water from the facility will be discharged to the municipal sanitary sewer system. There will be two waste water systems – sanitary and industrial. The sanitary waste water will include general plumbing fixtures, filtered backwash from the reverse osmosis (RO) system, the cooling tower blowdown and boiler blowdown. Water temperatures discharged from the cooling towers will be low (under 140^{o}F), so the water can be drained directly to the sanitary sewer. All boiler blowdown drains will go to a flash tank with aftercooler and use municipal water to cool to the temperature specified in the sewer use permit before discharge into the sanitary system. The industrial waste system will collect waste water from the floor drains in the machinery area, hub drains near the Heat Recovery Steam Generators (HRSGs), and elevator shaft sump pumps, which will be used during emergencies. Industrial waste water from within the Main Facility building (machinery area and sump pumps for elevators) will pass through an oil-water separator before being discharged to the sanitary waste system. The waste water from the HRSGs will be oil free and will be cooled to temperature specified in the sewer use permit before discharge into the sanitary system. Sanitary and industrial waste waters will be directed to a treatment plant operated by the Passaic Valley Sewerage Commission (PSVC). NJ TRANSIT proposes to install one sanitary pump station as part of Preferred Alternative Project Component A and a new eight-inch sanitary sewer force main line that would tie into an existing sanitary sewer pump station, operated by Kearny Municipal Utilities Authority (KMUA). The new sanitary sewer line would exit the Preferred Alternative Project Component A footprint near the southwest corner and travel northwest, along the boundary of the Koppers Koke site and parallel to Route 7 before cutting over to the southwest, under Route 7 and under the Newark-Jersey City Turnpike. The proposed tie in is located near the Mason Substation on the Newark-Jersey City Turnpike.

Stormwater Management

The existing stormwater basin was designed as a retention basin for use during remediation activities, including placement of the processed dredge material (PDM). NJ TRANSIT proposes to fill in the portion of the existing retention basin that is within the 20-acre parcel (Preferred Alternative Project Component A) as a feature of the proposed Project, since the location of the existing stormwater outfall is not suitable for use by the proposed Project. Stormwater on the 20-acre parcel is proposed to be collected in a new detention basin under the solar panel facility (discussed above) prior to discharge through two proposed stormwater outfalls. One new outfall is proposed near the northeast corner of the property (immediately north of the detention basin and solar panel facility) and another outfall is proposed near the northwest corner of the 20-acre parcel. The proposed stormwater system would include three stormwater pre-treatment structures; two near the detention basin and solar panel facility and one near the southwest corner of Preferred Alternative Project Component A. The detention basin is designed to comply with the regulations in the NJDEP Stormwater Best Management Practices Manual and NJDEP Stormwater Management Rule (N.J.A.C 7:8) for peak flow reduction so that the post-construction peak runoff rates for the 2-, 10-, and 100-year storm events are 50, 75, and 80 percent respectively, of the pre-construction peak runoff rates. Stormwater managed onsite has been designed to comply with water quality and water quantity requirements in accordance with Rule N.J.A.C 7:8 and will provide 80 percent Total Suspended Solid (TSS) removal prior to being discharged to the Hackensack River.

2.2.3 Preferred Alternative Project Component B—Natural Gas Pipeline Connection

The Main Facility would utilize natural gas as fuel for its combustion turbines and black start engines. The six-acre parcel that would be used for the gas connection to the commercial natural gas supply lines, is located to the south of the Morris & Essex Line within the Redevelopment Area (see Figure 2-2). This parcel is currently owned by HCIA, and would be acquired by NJ TRANSIT, as part of unrelated litigation within the Redevelopment Area, described further below. Three natural gas pipelines currently traverse the parcel: two of the existing natural gas pipelines are owned by PSE&G (16- and 20-inch diameter pipes) and the third (a 12-inch diameter pipe) is owned by The Williams Company (formerly known as TRANSCO). For the proposed Project, natural gas would be delivered via a new interconnection with one of the existing gas pipelines that currently traverse this parcel. Historically, even during extended grid outages, natural gas pipeline supply pressure was maintained. Natural gas pipelines are generally compressed using in line (natural gas burning) compressor station sand not subject to electrical grid disturbances. For the stations that are electrically driven for compression, the PJM Interconnection (regional) grid restoration (black start) plans prioritize the compressor stations over any other loads. The existing natural gas lines under consideration for connection to the Main Facility have natural gas back-up generators. Therefore, the risk of loss of natural gas coincident with loss of grid traction power is deemed to be very low. From the Main Facility site, the new gas line would extend eastward along the southern border of the Koppers Koke Site in a permanent easement, run beneath the Morris & Essex Line in a two-foot diameter steel casing, and southward within the six-acre parcel to connect to the existing pipelines. A new metering station would be installed. The total length of the pipeline extension would be approximately 0.5 miles. NJ TRANSIT would develop an interconnection agreement with The Williams Company and/or PSE&G. A gas metering station enclosed in a small structure, security fencing, and other security measures would be installed on the six-acre parcel.

2.2.4 Preferred Alternative Project Component C—Electrical Lines to Mason Substation

Preferred Alternative Project Component C (see Figure 2-3) would comprise electrical lines (230 kilovolt [kV], double-circuit, 60 hertz [Hz]) along railroad right-of-way between the Main Facility site and Mason Substation to supply power to the Morris & Essex Line. It would extend approximately 0.7 miles in length. The preferred option for installation of these electrical lines is a combination of new monopoles (up to 220 feet tall where required for adequate clearance from other infrastructure) and underground duct banks. For monopoles greater than 200 feet, coordination with Federal Aviation Administration (FAA) guidelines is required to determine if lighting is required for aviation safety. The monopoles would be installed 150 to 1,200 feet apart. For monopoles with a diameter greater than four feet, at each monopole location, four shafts roughly two feet in diameter are proposed to be drilled with an auger to a depth of 95 feet with permanent steel casings. Smaller monopoles would have a single shaft drilled with an auger to a depth of up to 70 feet for the foundation. The duct banks would entail underground concrete-encased cables at a maximum of five feet below ground surface. The duct banks would be located within the railroad right-of-way and designed to protect the electrical cables from water damage and electrical or physical stress. All underground cables would be insulated for wet or dry conditions and suitable for continuous submersion. During construction, specific measures will be in place to prevent worker exposure to or spreading of existing contamination. These measures will be documented in a Materials Management Plan (MMP) and will address contaminated soils and potentially contaminated groundwater. Additional construction details for the new monopoles and duct banks as well as measures to prevent exposure to or spreading of existing contamination are discussed in Chapter 17, “Construction Effects.”

This DEIS evaluated two methods for installation of electrical lines on monopoles up to 220 feet tall or installed via underground cables in duct banks that extend from the Main Facility to the Mason Substation. The three design options evaluated were: 1) all electrical lines installed overhead on monopoles; 2) all electrical lines installed underground in duct banks; and 3) a combination of using overhead (monopoles)

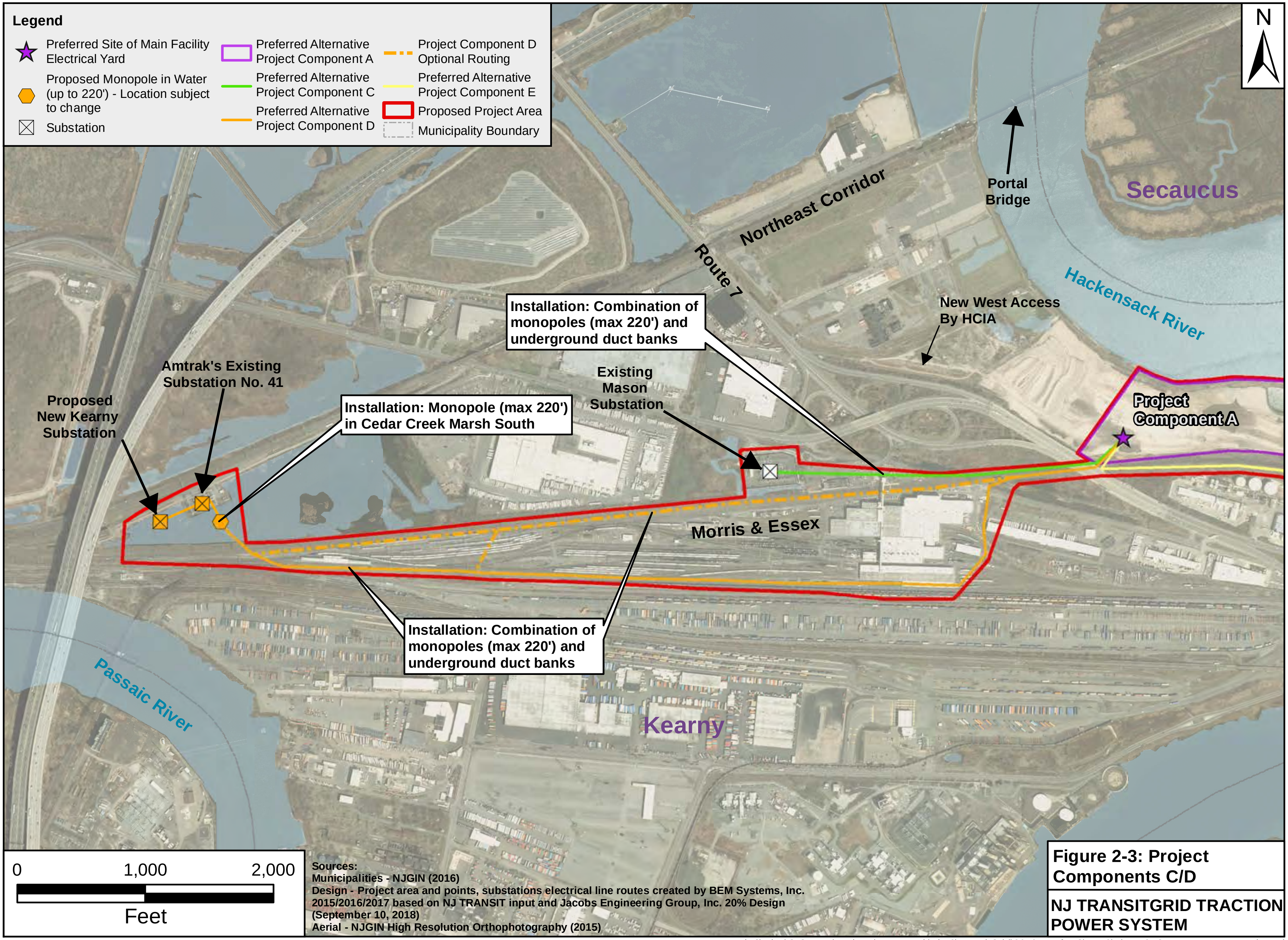

Figure 2-3: Project Components C/D

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and underground (duct banks) options. The third design option was selected as the preferred alternative based on various site-specific factors, such as access, site constraints, localized geology, areas of known contamination and documentation/survey of existing utilities (both overhead and underground) (see Figure 2-3). Construction impacts to existing utilities may result in interruptions to public utilities and/or transportation service delays and therefore, the project has been designed to avoid these interruptions.

2.2.5 Preferred Alternative Project Component D—Electrical Lines and New Kearny Substation

Amtrak's existing Substation No. 41 (see Figure 2-3) provides overhead catenary power to the Northeast Corridor in the area of the Portal Bridge. It is connected electrically between Substation No. 40 (Waverly) and Substation No. 42 (Hackensack), which provides power to the tracks connecting New Jersey and Manhattan. Substation No. 41 is part of the Amtrak power transmission and distribution system that energizes the traction power system along with power for signals, switches, etc. The existing Substation No. 41 is located on a concrete/fill pad adjacent to open water and is subject to flooding and damage from high water during powerful storm events, such as Superstorm Sandy, due to its location adjacent to Cedar Creek Marsh South. A new traction power substation (referred to hereafter as the new Kearny Substation) would be built to replace the existing Substation No. 41 functions and accommodate the new connections to the Main Facility to support Northeast Corridor service. The new Kearny Substation would be located within Amtrak property adjacent to the existing Substation No. 41. The new Kearny Substation would require the construction of an elevated platform on concrete piers to support the new equipment (see Figure 2-4). While the existing lattice structure at Substation No. 41 would remain in place, the equipment at Substation No. 41 would be decommissioned and removed. The existing Substation No. 41 concrete/fill pad would remain in place and continue to be owned by Amtrak and may be used for ancillary railroad activities. The electrical lines from the Main Facility would be built within the existing NJ TRANSIT right-of-way (through the Meadows Maintenance Complex [MMC] as discussed further below) to connect to conductors supported by the existing lattice structure. These conductors (138kV, single phase, 25Hz) would remain connected to the eastbound Northeast Corridor toward Substation No. 42. The existing conductors also would connect to new conductors on the lattice structure at the new Kearny Substation, which would in turn connect to the incoming lines from Substation No. 40. Because the Amtrak owned facility is included in the proposed Project, the Federal Railroad Administration (FRA) is included as a Participating Agency in the Technical Advisory Committee (TAC), as described in Chapter 21, "Agency Coordination and Public Participation."

The electrical line from the Main Facility to the new Kearny Substation (Figure 2-3) would be routed through the existing rail line and through the rail yard in the area of the MMC and the Morris & Essex Line. The Morris & Essex Line in this area is a highly congested utility corridor. To avoid the existing utilities, under the preferred alternative, the electrical line for Project Component D would depart from the Morris & Essex Line east of the Mason Substation and travel south around the MMC buildings and west along the MMC access rail toward Cedar Creek Marsh South (total of 1.47 miles) (see Figure 2-3 for Preferred Alternative Project Component D). As an optional routing, the electrical line could travel along the Morris & Essex right-of-way until it reaches Cedar Creek Marsh South (total of 1.35 miles). Due to a number of

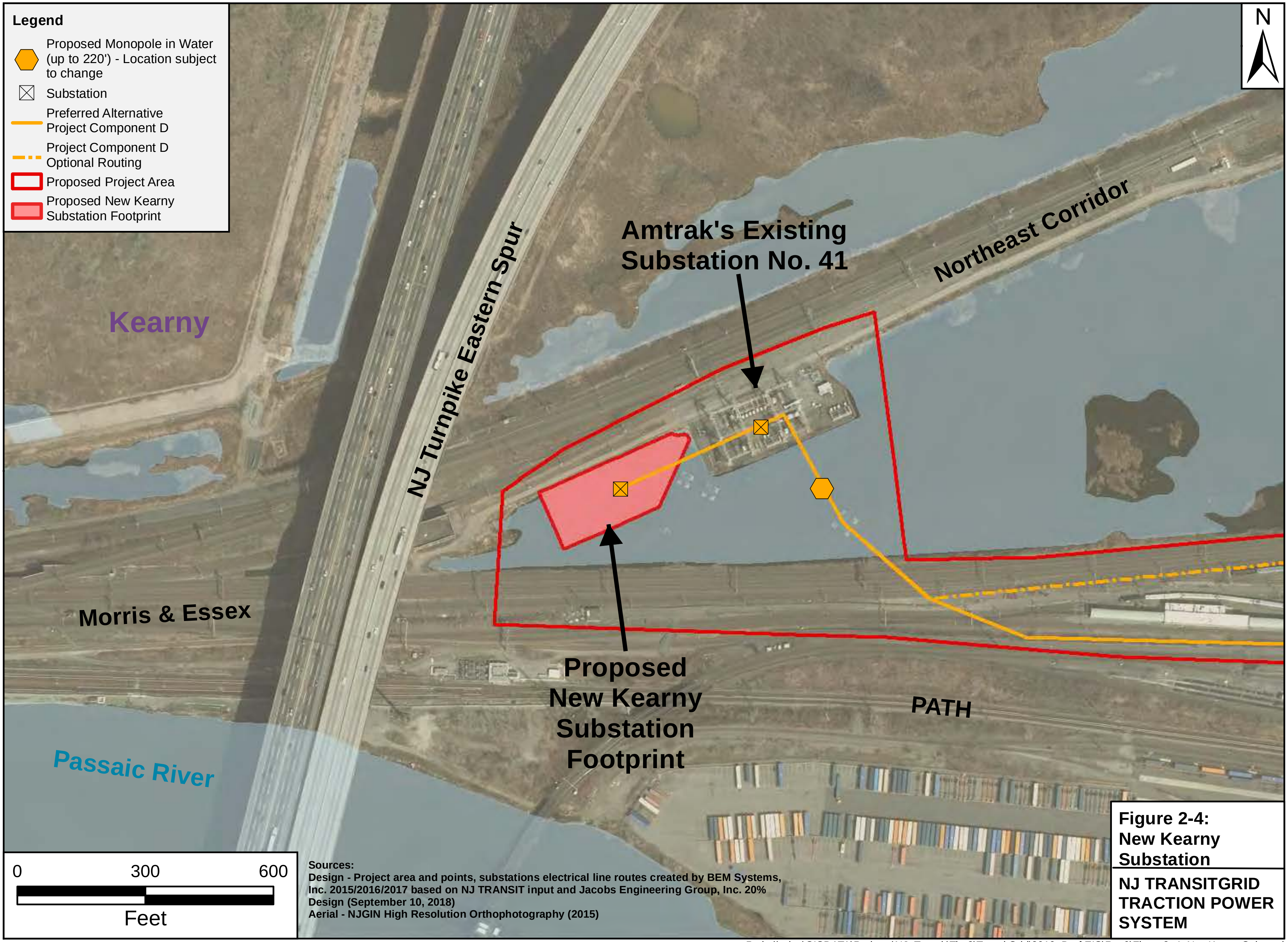

Figure 2-4: New Kearny Substation

NJ TRANSITGRID TRACTION POWER SYSTEM

Sources:
Design - Project area and points, substations electrical line routes created by BEM Systems, Inc. 2015/2016/2017 based on NJ TRANSIT input and Jacobs Engineering Group, Inc. 20% Design (September 10, 2018)
Aerial - NJGIN High Resolution Orthophotography (2015)

Path: \\atlas\GISDATA\Projects\NJ_Transit\Tier3\TransitGrid\2019_DraftEIS\Rev0\Figure2_4_NewKearnySub.mxd factors, including access, existing local utilities and geology, the electrical line could travel south briefly from the Morris & Essex Line before reaching the marsh (total of 1.39 miles) as shown on Figure 2-3. The preferred alternative for Project Component D is the electrical line departing from the Morris & Essex Line before Mason Substation and traveling south around the MMC and west along the MMC access rail to Cedar Creek Marsh South. Once it reaches Cedar Creek Marsh South, the electrical line would continue to the existing Amtrak Substation No. 41 gantry and on to the location of the new Kearny Substation, within NJ TRANSIT and Amtrak rights-of-way.

Similar to Project Component C, the preferred alternative for construction of this electrical line is a combination of new monopoles up to 220 feet tall and in underground duct banks. The monopoles would be installed 150 to 1,200 feet apart. For monopoles with a diameter greater than four feet, at each monopole location, four shafts roughly two feet in diameter are proposed to be drilled with an auger to a depth of 95 feet with permanent steel casings. Smaller monopoles would have a single shaft drilled with an auger to a depth of up to 70 feet for the foundation. The duct banks would entail underground concrete-encased cables at a maximum of five feet below ground surface. The duct banks would be located within the railroad right-of-way and designed to protect the electrical cables from water damage and electrical or physical stress. All underground cables would be insulated for wet or dry conditions and suitable for continuous submersion. During construction, specific measures will be in place to prevent worker exposure to or spreading of existing contamination. These measures will be documented in an MMP and will address contaminated soils and potentially contaminated groundwater. Additional construction details for the new monopoles and duct banks as well as measures to prevent exposure to or spreading of existing contamination are discussed in Chapter 17, “Construction Effects.”

This DEIS evaluated two methods for installation of electrical lines on monopoles up to 220 feet tall or installed via underground cables in duct banks that extend from the Main Facility to the new Kearny Substation. The three design options evaluated were: 1) all electrical lines installed overhead on monopoles; 2) all electrical lines installed underground in duct banks; and 3) a combination of using overhead (monopoles) and underground (duct banks) options. The third design option was selected as the preferred alternative based on various site-specific factors, such as access, site constraints, localized geology, areas of known contamination and documentation/survey of existing utilities (both overhead and underground). Construction impacts to existing utilities may result in interruptions to public utilities and/or transportation service delays and therefore, the project is being designed to avoid these interruptions.

The new Kearny Substation would have a final ground surface level above the anticipated 500-year flood elevation to meet NJ TRANSIT’s DFE of +13.9 feet NAVD88) (NJ TRANSIT 2014). The planned elevation of the new Kearny Substation (Project Component D) is +15.5 feet NAVD88, so exceeds the NJ TRANSIT DFE and meets the required minimum elevation based on FTA’s Emergency Relief Program 49 U.S.C. 5324 section 4.2.3 Floodplain Management. Construction details for these features are discussed in Chapter 17, “Construction Effects.”

2.2.6 Preferred Alternative Project Component E—Electrical Lines and New NJ TRANSITGRID East Hoboken Substation

Preferred Alternative Project Component E includes an electrical line that extends from the Main Facility eastward to Henderson Street Substation (see Figures 2-2 and 2-5). A new NJ TRANSIT substation (referred to as the NJ TRANSITGRID East Hoboken Substation) will be constructed on NJ TRANSIT property between the Morris & Essex Line, HBLR, and Jersey Avenue to serve the Henderson Street Substation and for HBLR resiliency. This approximately 3-mile electrical line will remain within the Morris & Essex Line's right-of-way and will support HBLR service and Hoboken Terminal and Yard. Preferred Alternative Project Component E electrical lines include 27kV 60 Hz medium voltage feeders to the new NJ TRANSITGRID East Hoboken Substation and 13kV voltage feeders for 0.28 miles to the new Henderson Street Substation. The electrical line would cross the Hackensack River, proceed through a 0.8-mile tunnel (the southern tube of the existing Bergen Tunnels, which is part of the Morris & Essex Line), and connect the new NJ TRANSITGRID East Hoboken Substation to the Henderson Street Substation. From the NJ TRANSITGRID East Hoboken Substation, the circuit would be divided with a feeder headed north on the HBLR easement to feed the HBLR north substations, and a feeder headed east connecting to the Henderson Street Substation to feed Hoboken Terminal and Yard. Similar to Project Components C and D, the preferred alternative for construction of this electrical line is a combination of new monopoles, attachment to existing infrastructure, underground duct banks and an interior (aboveground) duct bank within the Bergen Tunnels. New monopoles in the Town of Kearny may be up to 220 feet tall; the monopoles east of the Hackensack River would have a maximum height of 65 feet, with one exception for the Hackensack River crossing. The preferred option is for the electrical line to be run aerially across the Hackensack River, which would require two monopoles (maximum height of 220 feet) on either side of the Hackensack River (i.e., one in Kearny and one in Jersey City), approximately 50 feet north of the Lower Hack Bridge. The eastern monopole of the river crossing would be the only monopole in Jersey City that exceeds 65 feet above top of rail (TOR) along Preferred Alternative Project Component E. Construction details for these features are discussed in Chapter 17, "Construction Effects."

This DEIS evaluated three methods for installation of electrical lines on monopoles (maximum heights described above), installed via underground cables in duct banks or attachment to existing infrastructure (i.e., HBLR elevated tracks and bridges) that extend from the Main Facility to Henderson Street Substation. The three design options evaluated were: 1) all electrical lines installed overhead on monopoles; 2) all electrical lines installed underground in duct banks; and 3) a combination of using overhead (monopoles) and underground (duct banks) options as well as attachment to existing infrastructure. For monopoles up to 220 feet tall (west of the Hackensack River) with a diameter greater than four feet, at each monopole location four shafts roughly two feet in diameter and up to 95 feet deep would be drilled with an auger and installed with permanent steel casings. For monopoles east of the Hackensack River (except for the monopole for aerial crossing of the Hackensack River), the installation process would be the same as described above, but the monopole heights would be no taller than 65 feet, so the footing would be proportionately smaller and shallower (e.g., up to 4-foot diameter, with up to a 70-foot foundation depth). The duct banks would entail underground concrete-encased cables at a maximum of five feet below ground surface. The duct banks would be located within the railroad right-of-way and designed to protect

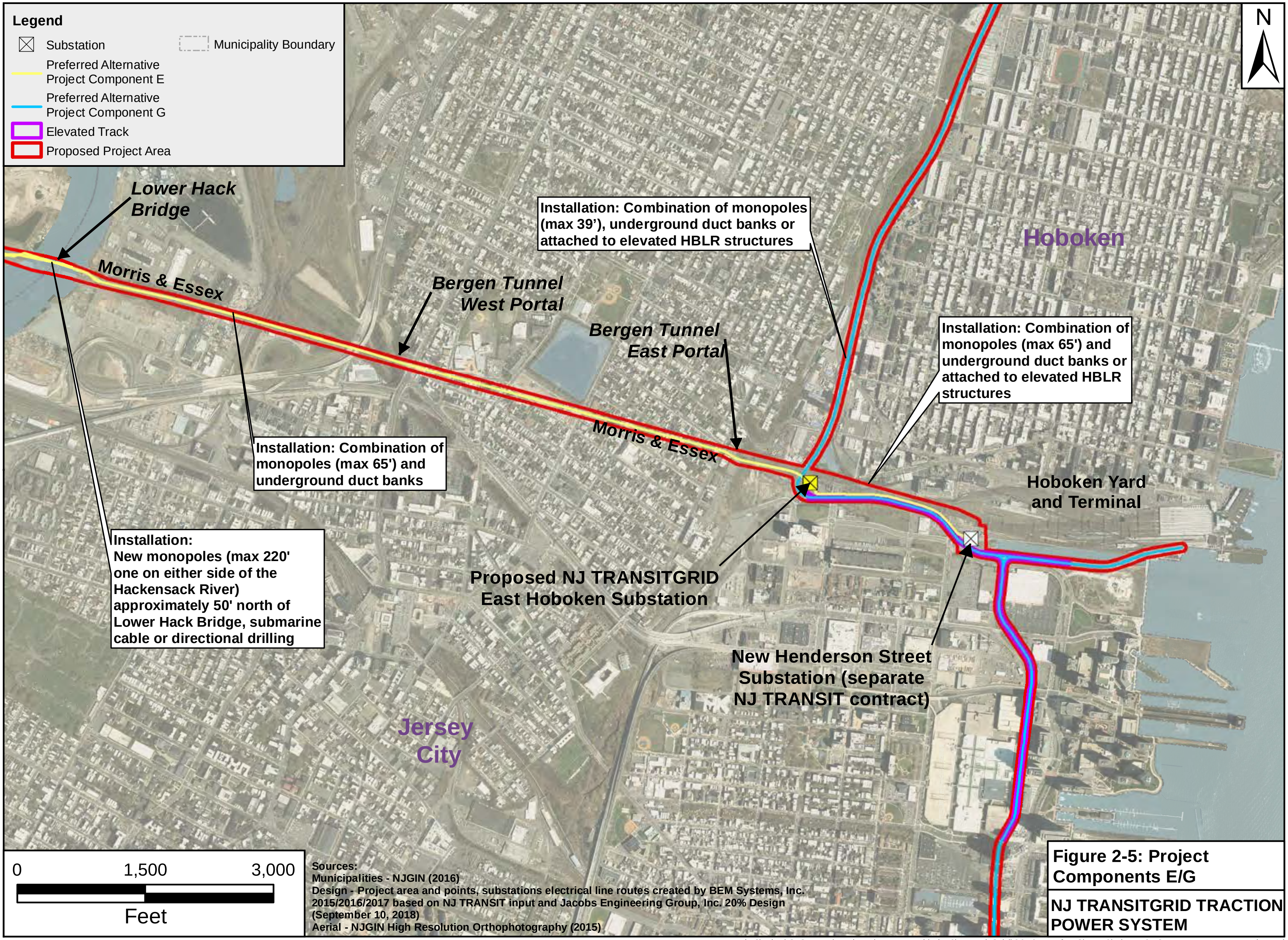

Figure 2-5: Project Components E/G

NJ TRANSITGRID TRACTION POWER SYSTEM

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the electrical cables from water damage and electrical or physical stress. All underground cables would be insulated for wet or dry conditions and suitable for continuous submersion. During construction, specific measures will be in place to prevent worker exposure to or spreading of existing contamination. These measures will be documented in an MMP and will address contaminated soils and potentially contaminated groundwater. Additional construction details for the new monopoles and duct banks as well as measures to prevent exposure to or spreading of existing contamination are discussed in Chapter 17, “Construction Effects.”

The third design option was selected as the preferred alternative based on various site-specific factors, such as access, site constraints, localized geology, areas of known contamination and documentation/survey of existing utilities (both overhead and underground). Construction impacts to existing utilities may result in interruptions to public utilities and/or transportation service delays and therefore, the project is being designed to avoid these interruptions.

In addition, where the electrical line must cross the Hackensack River, three design options were evaluated in this DEIS 1) aerial crossing approximately 50 feet north of the Lower Hack Bridge, 2) through a submarine cable along the river bottom, or 3) directionally drilled underneath the river bed. The preferred alternative for the Hackensack River crossing is the aerial crossing option, 50 feet north of the Lower Hack Bridge. The other two options have been retained in this DEIS and potential impacts analyzed in case the preferred alternative is determined to be infeasible. The final determination for Hackensack River crossing will be made in late design phases by the Design, Build, Commission (DBC) contractor. Construction impacts for the three river crossing alternatives are described in Chapter 17 “Construction Effects.”

2.2.7 Preferred Alternative Project Component F—Connection to HBLR South

Connectivity to the southern portion of HBLR consists of a smaller “nanogrid” that would be installed on NJ TRANSIT-owned property at the HBLR Headquarters on Caven Point Avenue in Jersey City. The nanogrid would consist of two approximately 2MW generators driven by natural gas reciprocating engines. It will supply power to the southern half of the HBLR (approximately 8.66 rail miles) during emergencies. The purpose of siting a nanogrid in the HBLR Headquarters is to avoid placement of electrical lines through historic and cultural resources within a 1.6-mile section of the HBLR in Jersey City. The nanogrid generators are spark gas ignited reciprocating engines, only designed to operate in emergency conditions. As such, they would be able to run for the duration of any emergency condition without the need to shut down for maintenance. During normal conditions, both engines of the nanogrid would only be run for maintenance once a month for one hour. During emergency conditions, the nanogrid in Preferred Alternative Project Component F would be in full-time operation. The emergency generators would be housed within noise attenuating enclosures which would be installed in a parking lot next to an existing emergency generator. As a result, the units will not contribute significantly to noise levels outside the building. The generators would be air cooled and therefore would have no impacts to water resources. Some measure of stored energy is also anticipated in the form of batteries or flywheels to help smooth out the instantaneous load profile of the HBLR traction loads. These emergency generators and storage modules would be installed on an elevated platform estimated at 7 feet above ground surface to comply with NJ TRANSIT's DFE, discussed below. The conceptual platform would be approximately 20,000 square feet and the emergency generators would be 10 to 14 feet tall, bringing the tallest point of the nanogrid to less than 25 feet above nominal ground surface. Natural gas connections are already in place at the HBLR Headquarters facility. A combination of aerial and underground electrical lines on new monopoles less than 40 feet tall or duct banks within the NJ TRANSIT-owned property would connect the emergency generators to HBLR. Construction details for these features are discussed in Chapter 17, "Construction Effects."

2.2.8 Preferred Alternative Project Component G—HBLR Connectivity

To provide service along NJ TRANSIT's HBLR, power would be distributed to the individual traction power substations along the HBLR right-of-way. Preferred Alternative Project Component G is approximately 14.4 miles in length and extends from Tonnelle Avenue in North Bergen to 8th Street in Bayonne, including one spur through the West Bergen section of Jersey City to the West Side Avenue Station (Figures 2-6 through 2-9). From the NJ TRANSITGRID East Hoboken Substation to the HBLR, power would be conveyed through electrical lines. The existing traction power substations along the HBLR line would require switchgear revisions to receive incoming power from the microgrid feeders during emergency operation. Upgrades required for this power distribution would occur within existing transportation rights-of-way. Similar to the electrical lines described above, the preferred option for installation of the electrical lines along HBLR would be on new utility poles (up to 39 feet high), within duct banks and attached to elevated HBLR structures. This DEIS evaluated three methods for installation of electrical lines on monopoles (maximum height described above), installed via underground cables in duct banks or attachment to existing infrastructure (i.e., HBLR elevated tracks and bridges) along the HBLR. The three design options evaluated were: 1) all electrical lines installed overhead on monopoles; 2) all electrical lines installed underground in duct banks; and 3) a combination of using overhead (monopoles) and underground (duct banks) options as well as attachment to existing infrastructure. The third design option was selected as the preferred alternative based on various site-specific factors, such as access, site constraints, localized geology, areas of known contamination and documentation/survey of existing utilities (both overhead and underground). Construction impacts to existing utilities may result in interruptions to public utilities and/or transportation service delays and therefore, the project is being designed to avoid these interruptions. Monopoles would be installed via the same process as that described above, but the monopole heights would be no taller than 39 feet, so the footing would be proportionately smaller and shallower (e.g., 4-foot diameter, with a 20-foot foundation depth). The duct banks would entail underground concrete-encased cables at a maximum of five feet below ground surface. The duct banks would be located within the railroad right-of-way and designed to protect the electrical cables from water damage and electrical or physical stress. All underground cables would be insulated for wet or dry conditions and suitable for continuous submersion. During construction, specific measures will be in place to prevent worker exposure to or spreading of existing contamination. These measures will be documented in a Materials Management Plan (MMP) and will address contaminated soils and potentially contaminated groundwater. Additional construction details for the new monopoles and duct banks as well as measures to prevent exposure to or spreading of existing contamination are discussed in Chapter 17, "Construction Effects."

Sources:
Municipalities - NJGIN (2016)
Design - Project area and points, substations electrical line routes created by BEM Systems, Inc. 2015/2016/2017 based on NJ TRANSIT input and Jacobs Engineering Group, Inc. 20% Design (September 10, 2018)
Aerial - NJGIN High Resolution Orthophotography (2015)

Figure 2-6: Project Component G (North)

NJ TRANSITGRID TRACTION POWER SYSTEM

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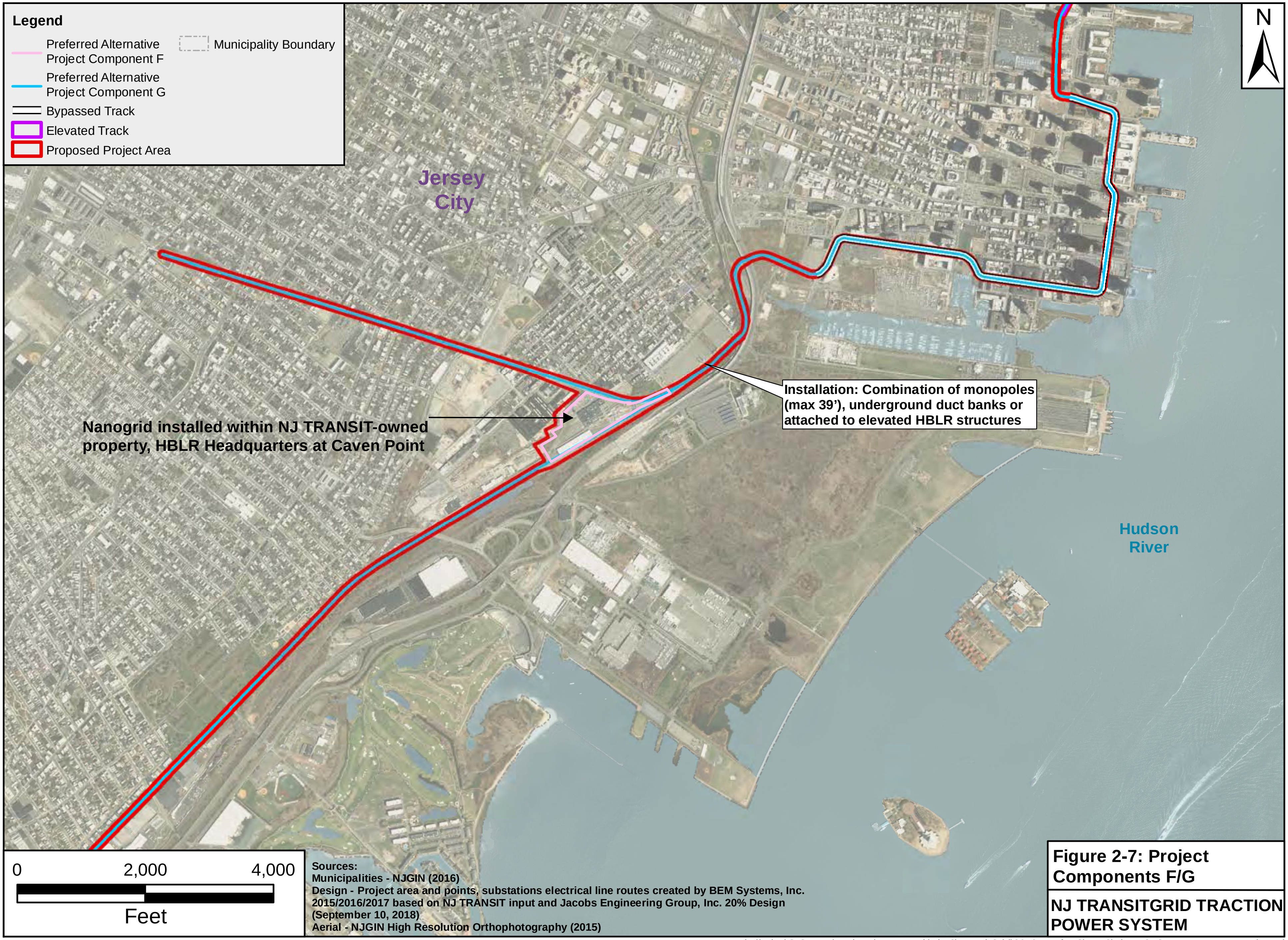

Figure 2-7: Project Components F/G

NJ TRANSITGRID TRACTION POWER SYSTEM

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Sources:
Municipalities - NJGIN (2016)
Design - Project area and points, substations electrical line routes created by BEM Systems, Inc. 2015/2016/2017 based on NJ TRANSIT input and Jacobs Engineering Group, Inc. 20% Design (September 10, 2018)
Aerial - NJGIN High Resolution Orthophotography (2015)

Figure 2-8: Project Component G (South)

NJ TRANSITGRID TRACTION POWER SYSTEM

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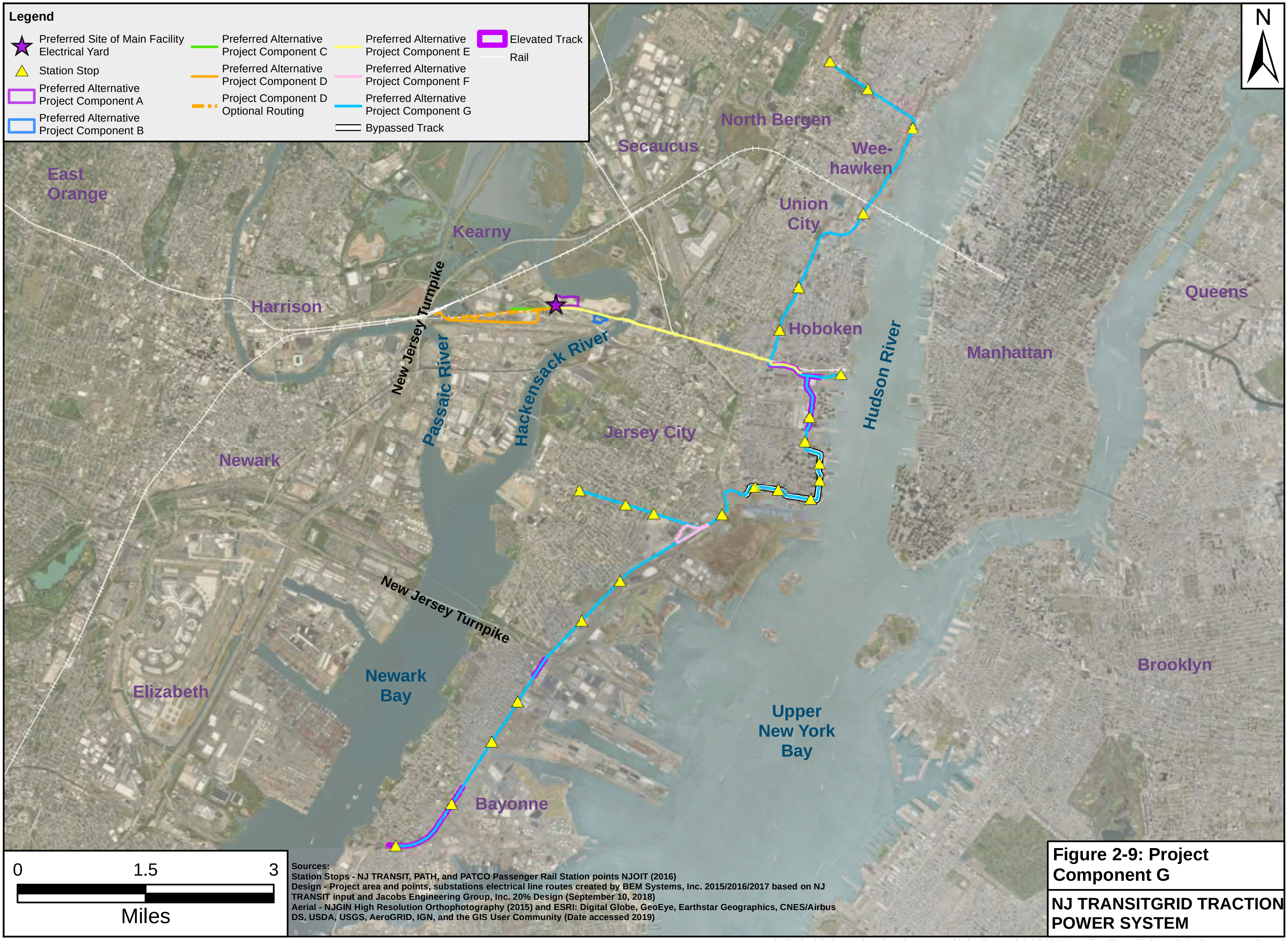

Sources:
Station Stops - NJ TRANSIT, PATH, and PATCO Passenger Rail Station points NJOIT (2016)
Design - Project area and points, substations electrical line routes created by BEM Systems, Inc. 2015/2016/2017 based on NJ TRANSIT input and Jacobs Engineering Group, Inc. 20% Design (September 10, 2018)
Aerial - NJGIN High Resolution Orthophotography (2015) and ESRI: Digital Globe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community (Date accessed 2019)

Figure 2-9: Project Component G

NJ TRANSITGRID TRACTION POWER SYSTEM

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The nanogrid for Project Component F would allow for Project Component G to bypass and avoid the need to install monopoles in a historically significant 1.6-mile segment of the HBLR in Jersey City, while still providing power to the entire HBLR Line. The section that would be bypassed is illustrated on Figures 2-7 and 2-9. The primary reason behind designing the project to bypass this section of HBLR in Jersey City is to avoid construction impacts to the Morris Canal historic resource, discussed further in Chapter 9, “Historic Resources.” Even though the proposed Project is being designed to bypass this segment of the HBLR, the segment was evaluated in this DEIS. Construction details for these features are discussed in Chapter 17, “Construction Effects.”

2.2.9 Estimated Costs of Build Alternative

Construction

The total commitment of funds required for construction of the overall resiliency project is approximately $546,353,085, which includes the DISTRIBUTED GENERATIONS SOLUTIONS project, which is reviewed separately under NEPA as discussed in Chapter 1, “Purpose and Need.” The FTA selected NJ TRANSITGRID as eligible for funding in response to Superstorm Sandy as part of a competitive selection process under the Selection of Public Transportation Resilience Projects in Response to Hurricane Sandy (79 FR 65762), which is funded for $409,764,814 (75% federal match) under the Disaster Relief Appropriations Act of 2013 (Pub. L. 113-2). NJ TRANSIT’s commitment of funds to the project is $136,588,271 (25%). The New Jersey State Transportation Trust Fund (TTF) is the source of funding for NJ TRANSIT’s commitment.

Revenues

Under normal conditions, NJ TRANSITGRID will potentially supply up to 60MW of traction power for the Northeast Corridor (for Amtrak and NJ TRANSIT trains), meet NJ TRANSIT’s Morris & Essex load demand of 10 to 15MW, and transfer excess energy to PJM when those transactions are economically justified.[6] Under emergency conditions (e.g., a PJM system blackout), NJ TRANSITGRID will operate in island mode and meet NJ TRANSIT’s usage of parts of the Northeast Corridor, parts of NJ TRANSIT’s Morris & Essex and HBLR loads, and assist Amtrak by moving its Northeast Corridor trains to nearby stations.

Fixed Operating Expenses

NJ TRANSITGRID’s fixed operating & maintenance (O&M) expenses include plant personnel and insurance. Fixed O&M costs escalate with inflation. Forecasted fuel costs are based on an assumed firm gas supply and delivery arrangements at market rates estimated for 2020. Fuel prices are expected to remain low due to the abundant supply of natural gas.

[6] Economically dispatched (i.e., produced at the lowest cost to customers) energy sales to PJM are forecasted to grow over time as older generation resources retire, potentially constraining the PJM market. NJ TRANSITGRID’s capacity factor for PJM energy sales is forecasted to grow from 8% in 2020 to 19% in 2049. (Levitan & Associates, Inc. 2017).

Variable Operating Expenses

Variable O&M expenses include chemicals and other consumables, accruals for parts replacement, emission controls consumables, and a long-term service agreement (LTSA) with the turbine manufacturer.[7] Such LTSAs are common, especially for plant owners without large portfolios who rely on the manufacturers for major maintenance work (i.e., inspections and overhauls).

Water and waste water disposal will be required for the steam cycle in the HRSG components. Water usage is dependent on plant operations and is significantly affected by cooling tower evaporation that varies with ambient temperature. Water would be purchased from the local water provider that serves this region on an increasing block rate. Waste water will need to be disposed at the commercial / industrial sewer rate set by the local municipal utilities authority.

The TRANSITGRID operations include potential revenues from energy sales to Amtrak, and energy sales to PJM that will provide positive revenues through direct payments and bill offsets that should exceed the operating costs of the proposed Project. Operating costs will vary with fuel/commodity (natural gas) prices, labor costs pertaining to operations and maintenance and inflationary pressures upon capital equipment replacement through the life cycle of the microgrid. Consequently, any projection of revenues generated to offset operating costs will by definition, be variable along with any amount in excess of an operating cost offset. Revenues generated by the NJ TRANSITGRID will be used to support plant operations and NJ TRANSIT's mission of providing public transportation.

Cost estimates were compiled during the project's grant application process (2013) and during initial design phases (2017). The estimated costs of the project are presented in Table 2-1 below.

Table 2-1 Estimated Costs of the NJ TRANSITGRID Project

<table>
<tr><th>Project Activity</th><th>Estimated Cost</th><th>Funding Source</th></tr>
<tr><td>Design and Administration</td><td>$83,586,747</td><td rowspan="2">Total Project Funding $546,353,085 million

$409,764,814 (75% federal match) under the Disaster Relief Appropriations Act of 2013 (Pub. L. 113-2)

$136,588,271 (25%) of the local match to be funded by the New Jersey State TTF as part of
NJ TRANSIT's Capital Program</td></tr>
<tr><td>Construction</td><td>$428,327,406</td></tr>
<tr><td>Annual Operations</td><td>$16.6M - $19.5M[8]</td><td>Project is anticipated to be self-supporting through participation in local energy markets and power purchase agreements.</td></tr>
</table>

[7] Some of these parts and equipment costs may be capitalized for tax and depreciation purposes.
[8] Operation and Maintenance costs estimated during the projects grant application process in 2013.

2.3 NO ACTION ALTERNATIVE

In the No Action Alternative, the microgrid would not be constructed and NJ TRANSIT and Amtrak would continue to be served by the existing commercial grid. Without the microgrid, commuter and intercity rail service in Amtrak's and NJ TRANSIT's core service territory would remain vulnerable to power outages. During future widespread power outages, the benefits of NJ TRANSIT possessing a reliable power source to move commuters between Manhattan and other destinations in northern New Jersey would not be realized. There would be a missed opportunity to increase commuter safety and security in future widespread power outages. Under the No Action Alternative, the risk of not building the project is that extended power outages (e.g., greater than two weeks) could occur with an annual chance of occurrence of 3.3 percent (30-year return frequency). In these situations, the impact to the region could be an economic loss of up to $1.7 billion, which would be avoided with the transportation resiliency provided by the proposed Project (Rutgers University 2014).

The No Action Alternative includes other planned and programmed transportation improvements, which are funded through a combination of state and federal monies and will be in place by 2021, the estimated year of completion for the Build Alternative, as discussed below. It includes projects in NJ TRANSIT's Resilience Program, Amtrak initiatives that will affect operations on the Northeast Corridor, and HCIA and its contract purchaser plans for the Koppers Koke Site.

2.3.1 NJ TRANSIT Resilience Program Projects

The proposed Project is one of five key projects that will enhance service reliability and allow NJ TRANSIT to restore service quickly after a major storm. The other resilience projects, which will be built by 2021, include:

- *NJ TRANSITGRID DISTRIBUTED GENERATION SOLUTIONS* (i.e., fuel cells, photovoltaic panels, and other technologies as appropriate) to provide power to rail and bus stations and other NJ TRANSIT infrastructure in northeastern New Jersey. As indicated in Chapter 1, "Purpose and Need," while these improvements would complement the proposed Project, they would be constructed and function independently from the TRACTION POWER SYSTEM.

- *Signals & Communications Resilience*, which will harden signal and communication systems and other infrastructure on the HBLR system and five commuter rail lines – the Main and Bergen County Lines, Pascack Valley Line, Raritan Valley Line, and Morris & Essex Line. This project is independent from the NJ TRANSITGRID project and will be built regardless of whether the proposed Project advances.

- *Delco Lead Storage and Inspection Facility*, a new electric rail storage yard, service and inspection facility, and track system that will be used to store rail cars and locomotives in a centrally located inland area that is not susceptible to flooding or tree fall, to facilitate the rapid resumption of service after storms have passed. This project is independent from the NJ TRANSITGRID project and will be built regardless of whether the proposed Project advances.

- *Long Slip Fill and Rail Enhancement*, which will build a resilient train station and fill a canal (known as Long Slip) that extends into Hoboken Rail Yard and acts as a conduit for storm surge waters from the Hudson River. The new station will be built on top of the filled area to enable the operation of commuter service even while the yard itself is being shut down in preparation for a significant storm event or returned to service after storm-related or ocean-surge flooding. This project is independent from the NJ TRANSITGRID project and will be built regardless of whether the proposed Project advances.

- *Raritan River Bridge Replacement*, which will address the vulnerability of the existing bridge to major storm events and enhance the reliability of the North Jersey Coast Line service by constructing a new, more resilient bridge. This project is independent from the NJ TRANSITGRID project and will be built regardless of whether the proposed Project advances.

2.3.2 NJ TRANSIT Repair and Resiliency Projects

NJ TRANSIT continues to work towards creating a more resilient transportation system. The NJ TRANSIT DFE criteria requires that the elevations of coastal assets meet or exceed the greater of the FEMA 500-year flood zone elevation or the 100-year flood zone elevation (Base Flood Elevation, or BFE) + 2.5 feet, with inland assets elevated to BFE +1.5 (NJ TRANSIT 2014). To provide increased resiliency, a modified design elevation of BFE + 3.8 feet (rounded up to the nearest foot) was applied to sites within the coastal zone to account for 100-years of sea level rise (SLR), based on the (NOAA) Intermediate-High SLR scenario. The requirements set forth in New Jersey Uniform Construction Code (NJ UCC § 5:23 [2018]) must also be followed. These projects are independent from the NJ TRANSITGRID project and will be built regardless of whether the proposed Project advances. Initiatives affecting transportation services in NJ TRANSIT's service territory include:

- Mason Substation, which will be rebuilt by PSE&G with new switchgear, transformers and the associated relays, circuit breakers, and other electrical system components and ancillary equipment. The project will elevate substation structures and the Kearny Junction Remote Terminal Unit (RTU) house above the NJ TRANSIT DFE as listed above, and components will be designed to better withstand contact with saltwater. The new substation will be built next to the existing substation. Currently, construction is anticipated to begin in spring 2019 and completed by the end of 2021.

- New Henderson Street Substation, which will relocate the facility within Hoboken Terminal Yard and replace storm-damaged equipment at an elevation that meets the NJ TRANSIT DFE of +2.5 feet above the FEMA 100-year flood elevation. The design and required permits were completed in fall 2016 and construction is expected to start in 2018.

- Building 9 Substation, located along the northern perimeter of the MMC by the Morris & Essex Line, will improve substation equipment and associated Rail Operations Center (ROC) switchgear at the MMC. The substation will be elevated above the NJ TRANSIT DFE of +2.5 feet above the FEMA 100-year flood elevation. The substation is being rebuilt by PSE&G.

2.3.3 Amtrak Improvements

In the absence of the proposed Project, Amtrak has plans to completely replace and rebuild Substation No. 41 to make it less susceptible to flooding. Amtrak is planning to replace two of the existing lattice towers in Cedar Creek Marsh South that carry electrical lines to Substation No. 41 with one monopole due to its greater structural integrity. In addition, Amtrak is currently proceeding with reconstruction of certain elements of Substation No. 42, which is located east of the project area at the entrance to the North River Tunnels in Weehawken, NJ, including the installation of a new Control House. Amtrak will install a new Control House at Substation No. 42, which will improve the resiliency of the Northeast Corridor Hudson River Tunnel section.

2.3.4 Koppers Koke Site

As discussed above, HCIA has elevated 126-acres of the Koppers Koke Site (total acreage for Koppers Koke property is approximately 170 acres), including approximately 20 acres upon which the Main Facility would be located. Plans for a frontage road and access to Route 7 are currently under consideration by HCIA and its contract purchaser, The Morris Companies. A concept application has been submitted to the NJDOT.

NJ TRANSIT studied and investigated the acquisition of parcels from a site in the Town of Kearny, Hudson County, known as the Koppers Koke Site, as early as 2008 in order to construct a rail yard. When the rail yard project was cancelled in 2010, along with the Access to the Region's Core (ARC) Project, HCIA, the owner of the Koppers Koke Site, sought compensation from NJ TRANSIT by reason of alleged impacts to future development of the said property. In July 2013, HCIA filed an Inverse Condemnation action against NJ TRANSIT arising out of NJ TRANSIT's inclusion of the Koppers Koke Site in an approved EIS for rail yard and its cancelation of said project. On December 1, 2014, NJ TRANSIT and HCIA agreed to entry by the Superior Court of New Jersey of a consent order that settled this action and attached a term sheet that set forth the mechanism by which NJ TRANSIT could acquire a portion of the Koppers Koke Site as part of the global resolution of the matter.

Therefore, irrespective of the proposed Project, NJ TRANSIT intends to acquire the 20-acre parcel on the Koppers Koke Site as well as the six-acre parcel from HCIA. This acquisition is currently moving forward under the Settlement Term Sheet agreed to by NJ TRANSIT and HCIA.

Under the No Action Alternative, the 20 acres that NJ TRANSIT is acquiring, as discussed above, would likely be used for ancillary railroad purposes. Without the proposed Project, the existing, man-made basin would not be filled.

2.4 BACKGROUND ON ALTERNATIVES DEVELOPMENT, EVALUATION AND SCREENING

2.4.1 Main Facility Siting Analysis

The preferred site in Kearny was identified as a potential location for the Main Facility based on a site screening analysis, completed in 2015, that evaluated properties on the Kearny Peninsula near two existing substations—NJ TRANSIT's Mason Substation and Amtrak's Substation No. 41 (see Appendix A, "Site Screening Analysis"). As indicated above, the Northeast Corridor and Morris & Essex Line would receive the highest loads from the Main Facility. Microgrids are typically located close to the anticipated usage locations for a variety of reasons. First, shorter electrical lines result in higher plant efficiency since less energy is lost in transmission. Second, reliability is increased since shorter electrical lines reduce the probability of service disruptions due to damage to the lines. Lastly, shorter electrical lines reduce capital and operations and maintenance (O&M) costs and reduce the need to site electrical towers in and near residential areas, which could reduce the potential for community opposition.

Based on comments received during the scoping process for this DEIS, alternative sites outside of Kearny were identified and evaluated for their ability to meet the goals and objectives established for the proposed Project. This section summarizes the results of the initial siting analysis as presented in Appendix A, "Site Screening Analysis," and presents the results of the expanded investigation to address the comments received during scoping.

Initial Siting Analysis

The initial siting analysis only considered properties on the Kearny Peninsula because of the following factors:

- Proximity to the substations that would supply power to the service territory of the Northeast Corridor and Morris & Essex Line;
- Proximity to existing natural gas supply lines;
- Relatively large amount of underdeveloped and vacant land located within an area zoned for heavy industrial use; and
- Desire to reduce the need to construct electrical lines in or above open waterways and wetlands.

In the initial siting analysis, 21 sites on the Kearny Peninsula were evaluated based on siting criteria that considered land availability and how well each site would facilitate the ability of the Build Alternative to meet the objectives of the proposed Project. These criteria include:

- Minimize construction risk;
- Minimize schedule risk;
- Maximize efficiencies in the environmental review and permitting processes;
- Minimize property acquisition requirements to the maximum extent feasible;

- Reduce direct and indirect sources of air emissions to the maximum extent feasible[9];
- Minimize the need to construct in wetlands and open waters;
- Avoid impacts on parklands, open spaces, and environmental conservation areas; and
- Minimize construction impacts to the extent feasible.

The first step in the site selection screening process was to identify properties of a minimum size and layout to host such a facility, which was determined to be at least 20 acres. The site must accommodate an access road, a parking lot, water and ammonia tanks, turbines, cooling towers and reciprocating engine equipment, and a main building that would house a single steam turbine, auxiliary bays, maintenance shop, locker room, laboratory, control room, office facilities, and other general-use spaces. Space for substations, transformers, and switchgear and motor controls for the main and auxiliary (black start) power systems is also needed. Based on a preliminary site layout, which follows standard industry requirements for distances between certain equipment, the minimum size of the parcel needed was 20 acres. If an individual site was not greater than or equal to 20 acres, adjacent parcels were combined to total 20 acres and included for consideration as a site alternative. Property boundaries and ownership information were obtained from a variety of sources.[10]

Sites that have been previously developed, but do not contain an active land use, were selected over undeveloped areas and those that would require displacement of a business to meet the proposed Project's goals and objectives. Of the 21 parcels identified via property records, 13 of them were eliminated based on the existence of current land uses on the site or because the property is composed of an open water resource (see Table 1 in Appendix A, "Site Screening Analysis").

The Kearny site located in the central portion of the Redevelopment Area was selected as the preferred site because it is the only site that meets all aspects of the siting criteria, including minimization of property acquisition. In addition, none of the other seven remaining sites would offer any advantage over use of the Kearny site. Use of the Kearny site supports the MRC's goal of Brownfields redevelopment. Since it is being prepared for development by HCIA and has already been raised to an elevation that exceeds NJ TRANSIT's DFE of +2.5 feet above the FEMA 100-year flood elevation, construction and schedule risks are minimized. Its location adjacent to the Morris & Essex Line and at a crossing of a high-pressure natural gas pipeline minimizes property acquisition requirements for the Main Facility (due to the property acquisition which is occurring as part of unrelated litigation), pipeline connection, and

[9] It is important to note that the entire State of New Jersey is currently designated as nonattainment for ozone under the Clean Air Act. Since ozone is a result of emissions of Nitrogen Oxides (NO_x) and Volatile Organic Compounds (VOCs) transported downwind from combustion sources (including out-of-State sources), siting power generation anywhere within New Jersey would have similar impacts with respect to ozone nonattainment. Therefore, use of any site in New Jersey would be expected to result in similar impacts on ozone levels.
[10] New Jersey Geographic Information Network, State of New Jersey Composite of Parcels Data, and tax information from the New Jersey Treasury Department.

installation of electrical lines. Finally, the nearest residences, and other sensitive receptors, are approximately 0.75 miles away, on the opposite side of the Pulaski Skyway.

<u>Expanded Siting Analysis</u>

Areas of investigation for the expanded siting analysis were identified by considering sites of at least 20 acres. Consistent with the initial siting analysis, the new facility must be in an industrial area that hosts both a rail line and a natural gas pipeline to minimize property acquisition requirements, construction risk, and community impacts to the extent feasible.

As shown on Figure 2-10, outside of Kearny, natural gas supply pipelines are located within close proximity to the railroad right-of-way in the industrial areas adjacent to the Hackensack River in Jersey City and the Passaic River in Harrison. There are no other locations in surrounding counties that meet these siting criteria, which relate to the proposed Project’s goals and objectives.

Three areas of investigation (see Figure 2-11) were identified based on the presence of vacant or underutilized parcels that could be combined to provide the 20-acre site that is needed for the Main Facility. Developed sites in active use in the industrial areas were eliminated from consideration. Two areas in Jersey City – the Howell Street area and a portion of PSE&G Hudson Generating Station property – and the waterfront area in Harrison near the new Red Bull stadium were investigated further. Property boundaries and ownership information were obtained for parcels within these areas:

- **Site 1 – Waterfront Industrial Area, Harrison:** While individual parcels of adequate size are available in this area, in particular the PSE&G properties (Block 78 Lot 1 and Block 143 Lot 7.A) and Block 138 Lot 1 owned by Russo at Harrison I, LLC, they are within a Waterfront Redevelopment Area – a 250+ acre area designated by the Harrison Town Council in 1997. The Master Plan for the Town of Harrison and its 2012 update call for waterfront parks, office, retail and residential development in this area. Red Bull Arena, which is part of the revitalization effort, was completed in 2010. Several other projects have received site plan approvals and construction is underway for MetroCentre, a new mixed-use development of Class A office space, retail space, housing and parking. MetroCentre will occupy all properties to the south of the Northeast Corridor between Frank E. Rodgers Boulevard and the Red Bull Arena including Block 138 Lot 1 (Figure 2-12). The U.S. Army Corps of Engineers (USACE) is completing a flood control project, which will include a combination of floodwalls and levees designed to provide protection from tidal floods along the Passaic River. Waterfront boulevards, walkways, and parks are planned as a companion to the USACE flood control project at both PSE&G properties (Blocks 78 and 143) (Heyer Gruel and Associates 2012; Town of Harrison 2015). The triangular area north of the Northeast Corridor (Block 133 Lot 1) will be developed as part of the “Harrison Station” transit oriented mixed-use development project.

- **Site 2 – Howell Street Area, Jersey City:** The area near Howell Street in Jersey City was investigated due to the number of consecutive lots in Block 7402 and 7404 that are vacant or underutilized (Figure 2-13). Combined, these 11 lots total approximately 23 acres. Block 7402 Lots

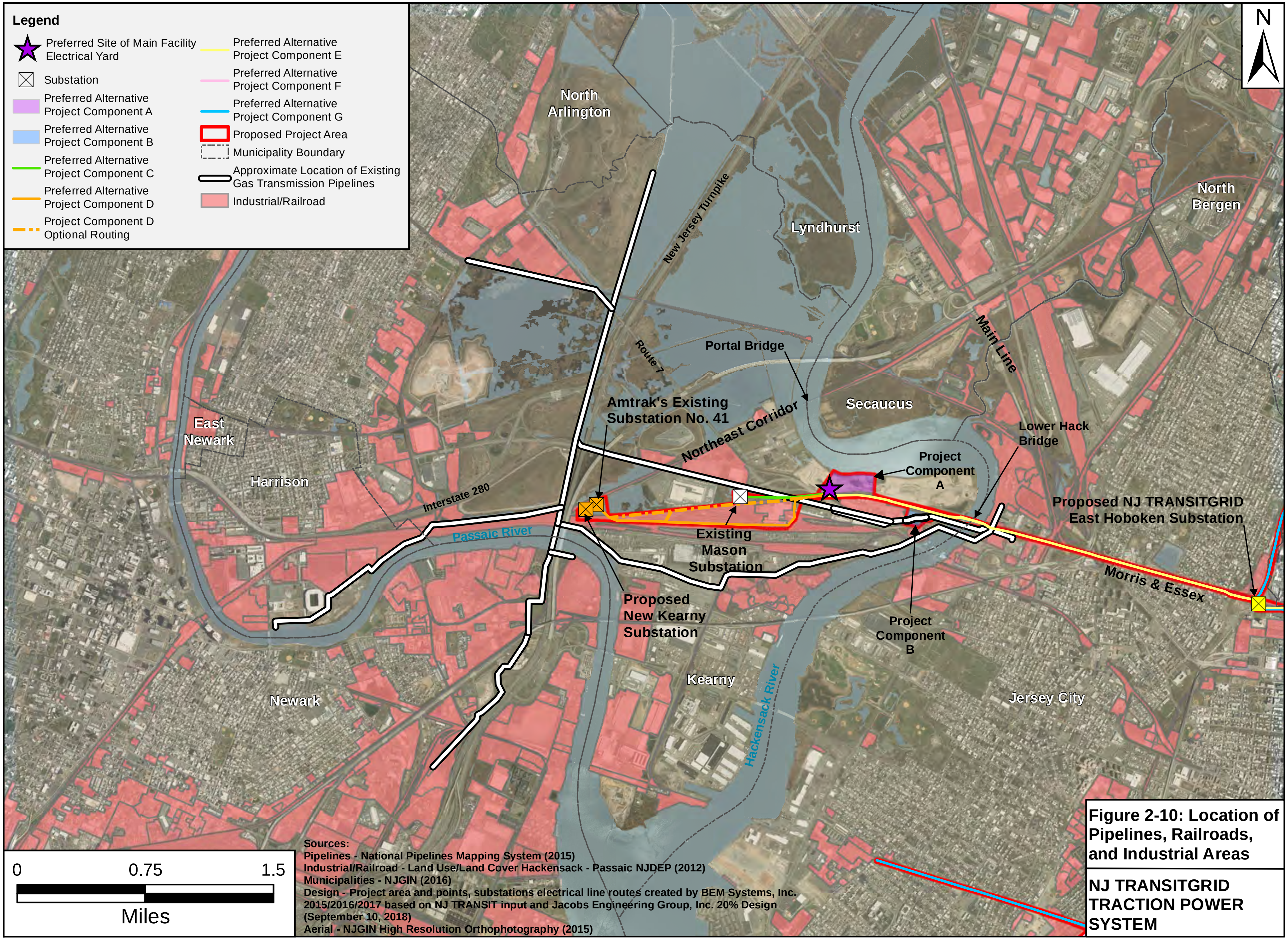

Figure 2-10: Location of Pipelines, Railroads, and Industrial Areas

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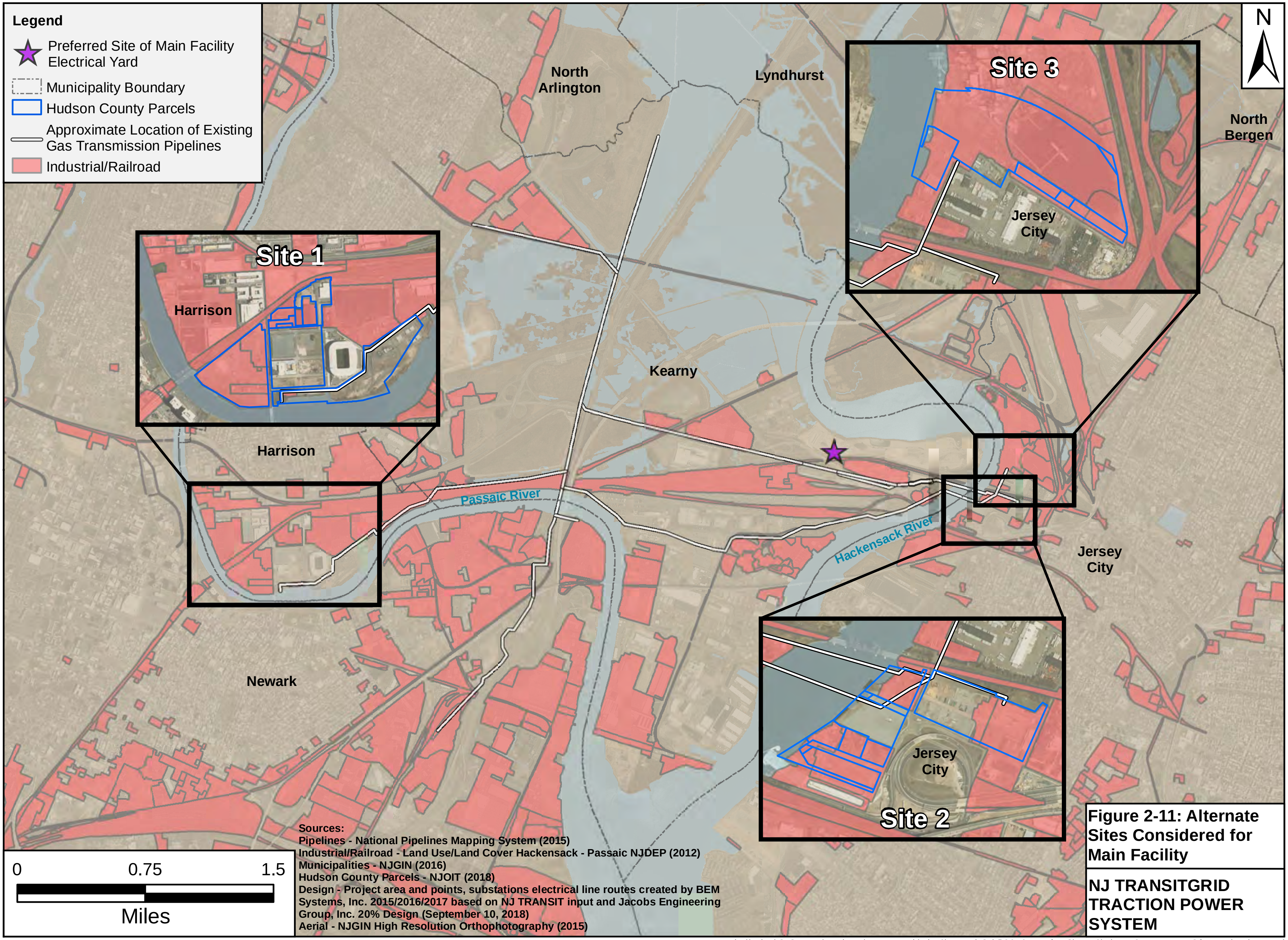

Figure 2-11: Alternate Sites Considered for Main Facility

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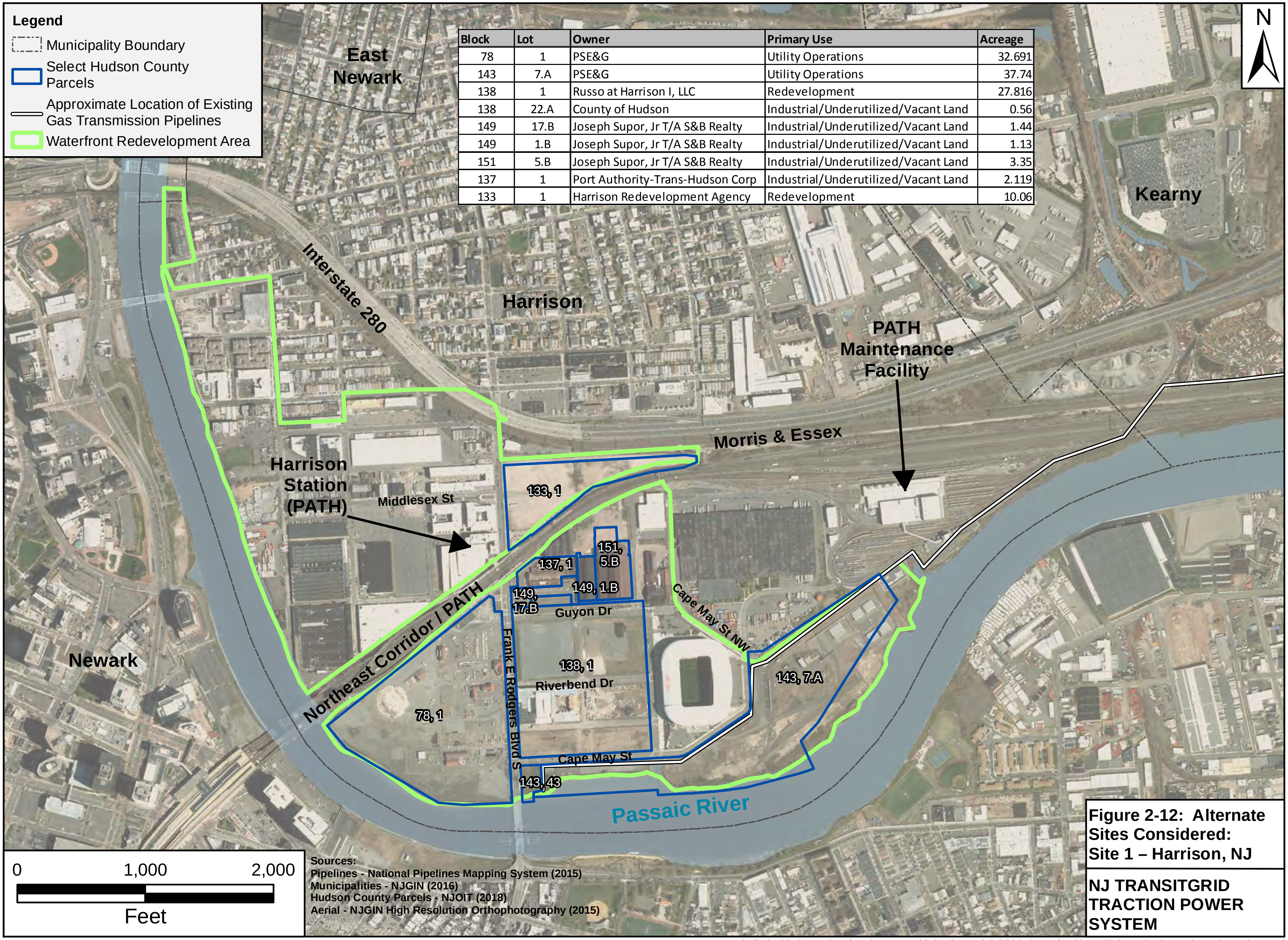

Block	Lot	Owner	Primary Use	Acreage
78	1	PSE&G	Utility Operations	32.691
143	7.A	PSE&G	Utility Operations	37.74
138	1	Russo at Harrison I, LLC	Redevelopment	27.816
138	22.A	County of Hudson	Industrial/Underutilized/Vacant Land	0.56
149	17.B	Joseph Supor, Jr T/A S&B Realty	Industrial/Underutilized/Vacant Land	1.44
149	1.B	Joseph Supor, Jr T/A S&B Realty	Industrial/Underutilized/Vacant Land	1.13
151	5.B	Joseph Supor, Jr T/A S&B Realty	Industrial/Underutilized/Vacant Land	3.35
137	1	Port Authority-Trans-Hudson Corp	Industrial/Underutilized/Vacant Land	2.119
133	1	Harrison Redevelopment Agency	Redevelopment	10.06

Sources:
Pipelines - National Pipelines Mapping System (2015)
Municipalities - NJGIN (2016)
Hudson County Parcels - NJOIT (2018)
Aerial - NJGIN High Resolution Orthophotography (2015)

Figure 2-12: Alternate Sites Considered: Site 1 – Harrison, NJ

NJ TRANSITGRID TRACTION POWER SYSTEM

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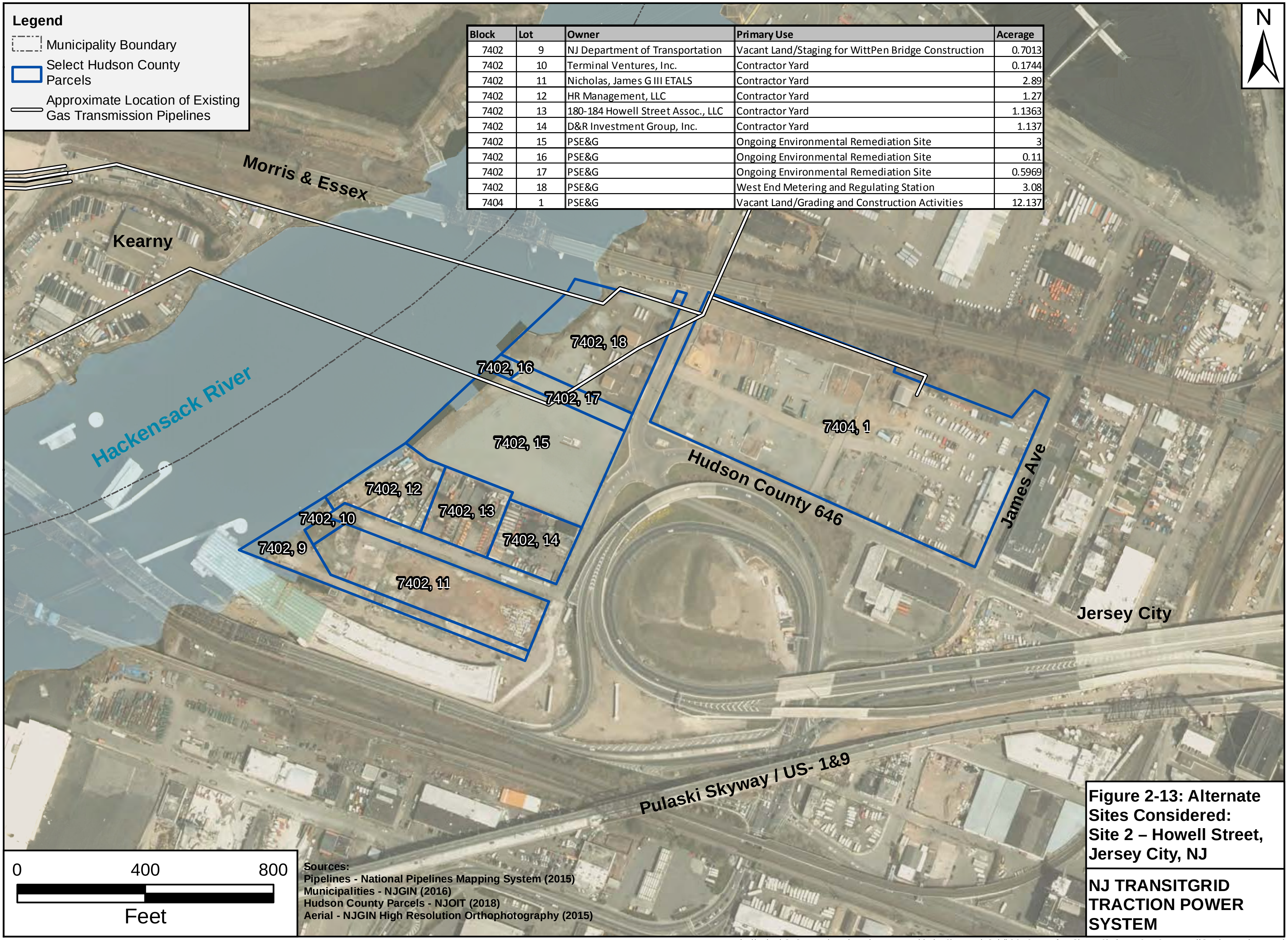

Block	Lot	Owner	Primary Use	Acerage
7402	9	NJ Department of Transportation	Vacant Land/Staging for WittPen Bridge Construction	0.7013
7402	10	Terminal Ventures, Inc.	Contractor Yard	0.1744
7402	11	Nicholas, James G III ETALS	Contractor Yard	2.89
7402	12	HR Management, LLC	Contractor Yard	1.27
7402	13	180-184 Howell Street Assoc., LLC	Contractor Yard	1.1363
7402	14	D&R Investment Group, Inc.	Contractor Yard	1.137
7402	15	PSE&G	Ongoing Environmental Remediation Site	3
7402	16	PSE&G	Ongoing Environmental Remediation Site	0.11
7402	17	PSE&G	Ongoing Environmental Remediation Site	0.5969
7402	18	PSE&G	West End Metering and Regulating Station	3.08
7404	1	PSE&G	Vacant Land/Grading and Construction Activities	12.137

Figure 2-13: Alternate Sites Considered: Site 2 – Howell Street, Jersey City, NJ

NJ TRANSITGRID TRACTION POWER SYSTEM

Sources:
Pipelines - National Pipelines Mapping System (2015)
Municipalities - NJGIN (2016)
Hudson County Parcels - NJOIT (2018)
Aerial - NJGIN High Resolution Orthophotography (2015)

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12, 13 and 14 are occupied by contractor storage units and Block 7402 Lot 15 is the location of the former West End Gas Plant and an active remediation effort is underway. Block 7402 Lot 18 contains PSE&G's West End Metering & Regulating station. Other lots in the area appear to be under construction and some are being used as staging areas for the Wittpenn Bridge construction.

- **Site 3 – Hudson Generating Station, Jersey City**: The portion of PSE&G's Hudson Generating Station property that contains a large coal pile was investigated since PSE&G is currently converting the coal-fired power plant to natural gas. As shown on Figure 2-14, portions or all of Block 7402 Lots 22, 23, 33, 34 and 35 would need to be combined to form a 20-acre site. Lots 33, 34 and 35 are currently used for parking and power plant equipment occupies portions of Lots 22 and 23.

These sites were evaluated in relation to both the proposed Project's goals and objectives, and in comparison, to the Kearny site, as follows:

Minimize Construction Risk

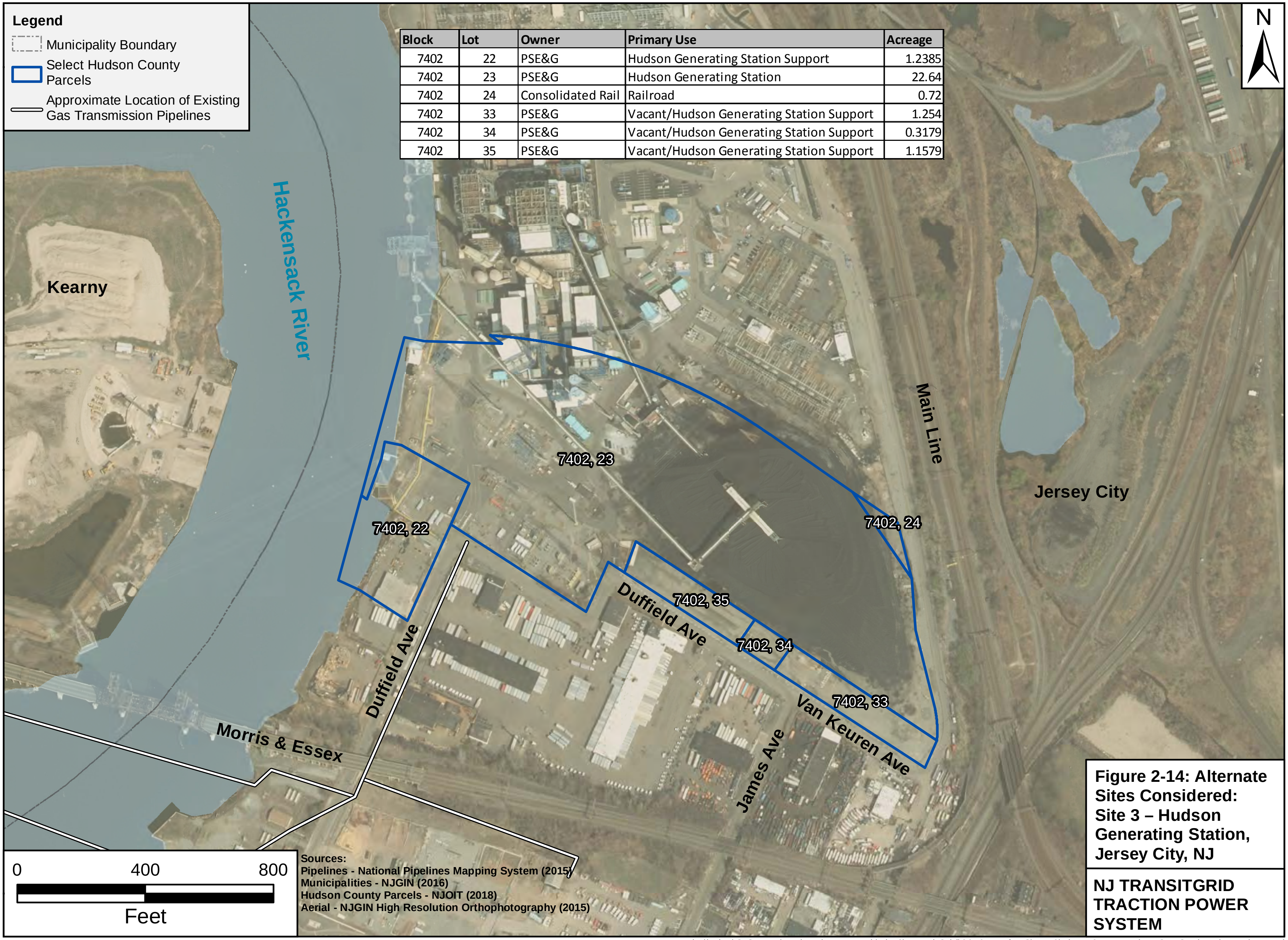
Each of the three areas would present some degree of construction risk due to the former or current industrial use of the property and the potential for soil and groundwater contamination. The Howell Street area remediation project and Hudson Generating Station coal pile present added risks and prior to property acquisition a comprehensive soil and groundwater sampling program would be required. The Kearny site offers low construction risk due to the site investigations and remediation that have already occurred and since the site is under contract for redevelopment by warehouse related uses, which reduces the potential to encounter unexpected conditions during construction compared with the other sites.

Minimize Schedule Risk

The Kearny site presents the least risk to the proposed Project schedule since it is vacant and available for redevelopment and has been raised to exceed NJ TRANSIT DFE criteria. The three areas in Harrison and Jersey City have a higher construction risk, which also translates to a higher risk to the proposed Project schedule. The Howell Street area requires property acquisition from multiple owners and relocation of contractor storage areas, which would add about two years to the schedule due to the federal requirements that must be followed for property acquisition and relocations. All three areas increase the chance that contested condemnation proceedings would be required, which increase risk to the Project schedule. In addition, all three areas would require site clearing (extensive in the case of the PSE&G property in Jersey City) and site preparation including bringing in fill to raise the site to meet flood elevation criteria.

Maximize Efficiencies in the Environmental Review and Permitting Processes

Acquisition of parcels in industrial areas that have not been fully investigated for soil and groundwater contamination or where an active remediation project is ongoing would not meet the objective of streamlining the environmental review and permitting processes. Relative to the three areas of



Block	Lot	Owner	Primary Use	Acreage
7402	22	PSE&G	Hudson Generating Station Support	1.2385
7402	23	PSE&G	Hudson Generating Station	22.64
7402	24	Consolidated Rail	Railroad	0.72
7402	33	PSE&G	Vacant/Hudson Generating Station Support	1.254
7402	34	PSE&G	Vacant/Hudson Generating Station Support	0.3179
7402	35	PSE&G	Vacant/Hudson Generating Station Support	1.1579

Sources:
Pipelines - National Pipelines Mapping System (2015)
Municipalities - NJGIN (2016)
Hudson County Parcels - NJOIT (2018)
Aerial - NJGIN High Resolution Orthophotography (2015)

Figure 2-14: Alternate Sites Considered: Site 3 – Hudson Generating Station, Jersey City, NJ

NJ TRANSITGRID TRACTION POWER SYSTEM

Path: \\atlas\GISDATA\Projects\NJ_Transit\Tier3\TransitGrid\2019_DraftEIS\Rev0\Figure2_14_HudsonGenStationAlternative.mxd investigation, the Kearny Site best meets this objective as it has been fully investigated and site capping is close to completion and it is available for redevelopment. The site is under oversight of NJDEP Licensed Site Remediation Professional (LSRP); however, ground water remediation is ongoing and is not expected to be close to completion.

Minimize Property Acquisition Requirements to the Maximum Extent Feasible

None of the three areas investigated would meet this objective since: the proposed Project is not consistent with the redevelopment plans that have been identified for the Harrison area; the Howell Street area requires acquisition of multiple properties and relocations; and the Hudson Generating Station area requires acquisition of property that is currently being used by PSE&G. The Kearny site meets this objective as it is directly adjacent to the Morris & Essex Line and gas pipeline for routing of the electrical line and gas pipeline connection. As discussed above, NJ TRANSIT will acquire the 26 acres due to the 2014 consent order agreed to between NJ TRANSIT and HCIA.

Reduce Direct and Indirect Sources of Air Emissions to the Maximum Extent Feasible

The Kearny site is the nearest to both Mason Substation and Substation No. 41 and would require the shortest length of electrical lines to these facilities. This decreases transmission losses, which increases efficiency, reducing power demand.

Minimize the Need to Construct in Wetlands and Open Waters

The potential for impacts to wetlands would be minimal for construction in any of the three areas of investigation. For all site options, the New Kearny Substation would be constructed in open water. However, none of the sites investigated for the construction of the Main Facility would require construction in open waters. The three areas and the Kearny site would meet this objective to the same degree.

Avoid Impacts on Parklands, Open Spaces, and Environmental Conservation Areas

The Harrison area would not meet this objective as waterfront parks are proposed along the Passaic River. The other areas and the Kearny site would meet this objective to the same degree.

Minimize Construction Impacts to the Extent Feasible

The Jersey City areas are within industrial zones and the Harrison waterfront area has a considerable amount of construction underway and more planned that would likely be underway during construction of the proposed Project. Each of the areas has good highway access. Construction impacts would be similar at all of the sites. The Kearny site would minimize construction impacts to the maximum extent since it is a large site that is being readied for development by HCIA.

Based on these considerations, the three sites outside of Kearny were eliminated from further consideration. The Kearny site located in the central portion of the Redevelopment Area was selected as the preferred site over these three locations because it is the only one that meets all aspects of the siting criteria. In addition, none of the three sites outside of Kearny would offer any advantage over use of the Kearny site.

2.4.2 Alternatives Development for the Main Facility

The equipment for the Build Alternative was specified by considering a number of factors related to the goals and objectives identified for the proposed Project. Use of black start engines and gas turbines in a combined-cycle plant was evaluated. Options were evaluated with respect to the degree to which they could facilitate an alternative's ability to meet proposed Project objectives. Those that relate to technology and plant types include the objective to:

- Provide a highly reliable power source, utilize modern state-of-the-art resilient equipment, and incorporate advanced resilient safety technology;
- Achieve an economically feasible and cost-effective project, minimize capital and O&M costs, operate 24/7;
- Expedite project delivery, minimize schedule risk and maximize efficiencies in the environmental review/permitting processes;
- Reduce direct and indirect sources of air emissions to the extent feasible.

The Build Alternative would satisfy Project Goal Nos. 1 through 4 described in Chapter 1, "Purpose and Need." During the design engineers' concept validation phase, a total of nine equipment and housing configurations were evaluated for meeting requirements of the proposed Project and project budget compatibility (Jacobs 2017a).

The financial analysis considered a 30-year project life; present values; operating costs including utilities, fuel and maintenance; and potential revenue.

In the end, the equipment configuration that includes five gas turbines, one steam turbine and two black start engines (Build Alternative), all housed on the Koppers Koke Site was recommended for final design. This configuration provides the mission requirements with safe margin, is within the project budget and provides the best long-term cost effectiveness.

As indicated above in Section 2.2, the combined-cycle plant has been identified as the Build Alternative and is included in the detailed analysis in this DEIS. The Build Alternative would be designed to provide a highly reliable power source that utilizes modern state-of-the-art resilient equipment and incorporates advanced resilient safety technology. Gas turbines of the size specified are made in the United States and, as a result, their use would comply with FTA's Buy America regulations (49 CFR § 661 [2012]), allowing for an expedited project delivery schedule.

The use of solar panels, wind energy, and other "green" technologies to fully "island" the NJ TRANSIT and Amtrak electrical systems from the larger commercial power grid are not practical or reasonable alternatives to a natural gas-fired generation plant due to the required load generation capacity, siting requirements for these technologies, the need to meet rapidly fluctuating loads associated with traction power systems under island conditions (especially due to the need for energy storage to guarantee a reliable power source), and cost. As discussed above, a solar panel facility would be installed to supplement the power needed to run the microgrid itself. Therefore, such technologies for generation of all power needs were not retained for analysis in the DEIS.

2.4.3 Installation Options for the Electrical Lines

As described above, the preferred alternative for installation of electrical lines is based on various site-specific factors, such as access, site constraints, localized geology, areas of known contamination and documentation/survey of existing utilities (both overhead and underground). Construction impacts to existing utilities may result in interruptions to public utilities and/or transportation service delays and therefore, the project is being designed to avoid these interruptions. This EIS discloses the potential impacts from all potential installation methods— installation of new monopoles (maximum heights previously described for Preferred Alternatives for Project Components C, D-south alignment, E and G above), the construction of duct banks, Hackensack River crossing options (aerial route [preferred option], submarine cable, or directional drill under the river bottom) and attachment to existing NJ TRANSIT infrastructure (i.e., HBLR elevated tracks and bridges), see Figure 2-1.

2.5 EIS ANALYSIS FRAMEWORK

To provide for a comprehensive and conservative environmental review document, each technical chapter of this DEIS includes an analysis of potential impacts (favorable or adverse) of and any mitigation required for all relevant project components. The preferred alternative for each project component is presented in Table 2-2. The analysis will describe normal operating conditions, and conditions under emergency operating conditions, if these differ from normal operating conditions.

Table 2-2: Build Alternative Project Components Summary

Project Component	**Description**
Preferred Alternative Project Component A: Main Facility	Combined-cycle gas turbine plant - 5 natural gas turbines (21MW to 25MW each)* o With 2 connected to HRSGs - 1 steam turbine (14MW to 18MW)* - 2 emergency black start engines (not to exceed 2.5MW) Four-acre solar panel facility over stormwater detention basin (approximately 0.6MW) Static Frequency Converter yard 230kV substation
Preferred Alternative Project Component B: Natural Gas Pipeline Connection	New metering station and connections to existing natural gas pipelines on six-acre parcel
Preferred Alternative Project Component C: Electrical Lines to Mason Substation	0.7-mile electrical line (combination of new monopoles up to 220 feet tall, and underground duct banks); 230 kV at 60 Hz
Preferred Alternative Project Component D: Electrical Lines and New Kearny Substation	1.47-mile electrical line within NJ TRANSIT's MMC property (combination of new monopoles up to 220 feet tall, and underground duct banks); 138 kV at 25 Hz New Kearny Substation
Preferred Alternative Project Component E: Electrical Lines and New NJ TRANSITGRID East Hoboken Substation	3.0-mile electrical line consisting of: - 0.8 miles within industrial Kearny (combination of new monopoles up to 220 feet tall, and underground duct banks); 27 kV at 60 Hz - 0.2 miles crossing Hackensack River (aerially 50 feet north of Lower Hack Bridge via new monopoles up to 220 feet, one pole on each side of the river bank; 27 kV at 60 Hz) - 0.7 miles within industrial Jersey City (combination of new monopoles up to 65 feet tall [with exception of one pole for river crossing – see above], and underground duct banks); 27 kV at 60 Hz - 0.8-mile segment within the south tube of Bergen Tunnel; 27 kV at 60 Hz - 0.22 miles from Bergen Tunnel to new NJ TRANSITGRID East Hoboken Substation (combination of new monopoles up to 65 feet tall and underground duct banks); 27 kV at 60 Hz - 0.28 miles from new NJ TRANSITGRID East Hoboken Substation to Henderson Street Substation, (combination of new monopoles up to 65 feet tall, underground duct banks and attachment to existing transportation infrastructure [HBLR]); 13.2 kV at 60 Hz - new NJ TRANSITGRID East Hoboken Substation
Preferred Alternative Project Component F: Connection to HBLR South	HBLR Headquarters Nanogrid: two approximately 2MW natural gas-fired emergency generators and stored energy installed on elevated platform in NJ TRANSIT-owned property

Project Component	Description
Preferred Alternative Project Component G: HBLR Connectivity	14.4-mile electrical line on combination of new monopoles (up to 39 feet high), underground duct banks or attachment to existing infrastructure (HBLR elevated tracks); 13.2 kV at 60 Hz - 6.6 miles from Tonnelle Avenue station in North Bergen to the Harismus Cove station in Jersey City - 1.6 miles from HBLR Headquarters to West Side Avenue station in Jersey City - 6.2 miles from Jersey Avenue station to 8th Street station in Bayonne

***Note:** the actual plant output is reduced due to temperature and parasitic loads. Therefore, the total output would be less than the MW output for which each turbine is designed.