

Memorandum

TO: Leslie Fordjour, NYMTC

FROM: Ben Mandel, CALSTART; Chris Lamm, Cambridge Systematics, Inc.

DATE: November 10, 2020

RE: Clean Freight Corridors Planning Study Task 2 Draft Deliverable:
Regional Assessment for Clean Freight Corridors

INTRODUCTION

NYMTC has initiated a Clean Freight Corridors Planning Study to facilitate increased adoption of high-efficiency, low-emission alternative technologies for freight transportation in the New York metropolitan region. As a component of the Regional Freight Plan contained in NYMTC's *Plan 2045* Regional Transportation Plan, this study will support deployment of alternative fuel medium- and heavy-duty (M/HD) vehicles for goods movement by identifying roadway corridors best suited for designation as Clean Freight Corridors to guide future investment in alternative fueling/electric charging infrastructure.

This technical memorandum is an assessment of roadway corridors for this purpose in the New York City multi-state metropolitan region. The study area for this assessment is defined by the boundaries of the Metropolitan Area Planning (MAP) Forum, through which NYMTC collaborates with nearby metropolitan planning organizations (MPOs) and councils of governments (COGs) spanning lower New York (New York City, Long Island, and the Lower Hudson Valley), Northern New Jersey, Northeastern Pennsylvania, and Western Connecticut. The assessment is comprised of an inventory of existing locations of alternative fuel/electric charging infrastructure and the designation status of alternative fuel corridors by the Federal Highway Administration (FHWA). The fuel types and energy sources assessed herein are those supported under Section 1413 of the federal Fixing America's Surface Transportation (FAST) Act: electricity, hydrogen, liquefied petroleum gas (LPG or propane), compressed natural gas (CNG) and liquefied natural gas (LNG).

This assessment leveraged planning tools developed by the U.S. Department of Energy (DOE) and FHWA to identify existing alternative fuel/electric charging infrastructure and current designation status of roadway corridors, respectively. This assessment within the study area will lay the foundation for subsequent tasks intended to identify opportunities to strategically expand alternative fuel/electric charging infrastructure to support the integration of lower-emitting technologies to power on-road goods movement.

FHWA CORRIDOR DESIGNATION AND DEFINITIONS

Under Section 1413 of the FAST Act, FHWA is responsible for designating roadway corridors as either “Signage Ready” or “Signage Pending” for alternative fuels/electric charging based on the availability of publicly accessible fueling/charging infrastructure along those routes. The mileage parameters for corridor designation are as follows: 50 miles or less between stations for electric, 100 miles or less between stations for hydrogen, 150 miles between stations or less for propane and compressed natural gas, and 200 miles or less between stations for liquefied natural gas. For all energy sources, only stations located within five miles of the nominated roadway may be considered for purposes of FHWA’s designation evaluation. Corridors designated as “Signage Ready” are deemed to have met or exceeded these parameters, while corridors designated as “Signage Pending” are deemed not to have sufficiently frequent infrastructure to meet the parameters.

It is important to note that the FHWA’s alternative fuel corridor designation program evaluates fueling/charging stations without regard to which vehicle types they can accommodate, as long as the stations are not for private use (e.g., exclusively for a particular vehicle fleet). Therefore, the designations presented below incorporate fueling/charging stations that may service light-duty, medium-duty, and/or heavy-duty vehicles.

EXISTING ALTERNATIVE FUEL INFRASTRUCTURE IN THE STUDY AREA**OVERVIEW**

The maps below display locations of existing fueling/charging stations and FHWA corridor designations in the study area for each of electric charging, hydrogen, LPG, CNG, and LNG. While FHWA corridor designation information is presented without modification, infrastructure station data were filtered to exclude sites not reasonably accessible by M/HD vehicles. In particular, a majority of electric charging stations in the DOE database were developed for use by light-duty (LD) passenger vehicles, and some that cannot reasonably be used by freight vehicles were screened out of the geospatial analysis (see “Electric Charging Landscape” below for further detail on screening methodology). Conversely, most existing fueling infrastructure for LPG and CNG is already designed for M/HD vehicle usage owing to the greater likelihood of those fuels being used by commercial vehicles (or buses) than passenger vehicles. Accordingly, the station data for those energy sources did not necessitate as much modification to screen out locations inappropriate for freight usage.

The sections below briefly present and discuss the current state-of-play for the infrastructure supporting each of the above-named energy sources for on-road freight vehicles in the greater New York metropolitan region.

ELECTRIC CHARGING LANDSCAPE

The study area contains 197 electric charging sites in total, with numerous corresponding Signage Ready corridor designations throughout the study area. Many of the major highways in the study area have been designated either Signage Ready or Signage Pending for electric vehicle charging; most notably, I-95 is Signage Ready for the entire length of the study area from New Jersey through Connecticut.

Other Signage Ready corridors include:

- I-495 and NY-25 on Long Island;
- Portions of I-84, I-87, I-287, and I-684 in the Lower Hudson Valley;

- Portions of I-80, I-78, and I-287 in New Jersey;
- I-84 and I-91 in Connecticut; and
- I-476 in Pennsylvania.

Notable corridors that are Signage Pending include portions of I-78, I-80, and I-287 in New Jersey and NY-27 on Long Island.

However, while highly useful to LD drivers, Signage Ready corridor segments for EVs may not have charging stations that are able to service M/HD vehicles, so these corridor designations may not bear equal relevance for freight applications. When assessing suitability of these facilities for freight vehicles, the following criteria were weighed to determine the number of such sites that could be appropriate for electric freight vehicles: charging speed, charger type, and charger quantity.

Because M/HD vehicles are heavier than LD vehicles, they require larger battery packs that charge more slowly at a given power level than do passenger cars. Accordingly, many chargers that are appropriate for LD charging along routes will not charge M/HD vehicles quickly enough to be suitable for M/HD charging along routes. Accordingly, sites that do not contain direct-current fast chargers (DCFC or “Level 3”), which are rated at 25 kilowatts or greater, were omitted from the assessment.

Charger type is also a concern, as chargers must be broadly compatible with a wide array of vehicle types in order to be appropriate for use by commercial vehicle fleets. Tesla chargers, which constitute a significant portion of the Level 3 inventory in the study area, are proprietary and thus only compatible with Tesla vehicles. As such, Tesla Superchargers are not suitable for use by any M/HD vehicles that are currently on the market.¹

Furthermore, because of longer charging times required for M/HD vehicles and the

¹ *The Tesla Semi is expected to become commercially available in 2021 and will be used exclusively in freight applications. The Tesla Cybertruck is similarly slated for commercial release in 2021 but will be sold as a consumer-facing product; it is conceivable that the Cybertruck will be deployed in light commercial vehicle fleet applications. To the extent either vehicle can charge at Tesla Superchargers, these stations could become relevant as freight corridor charging sites.*

need for public chargers to be reliably available, charging sites with only one charging dispenser would not be practical facilities for freight vehicle fleets to incorporate into an operational plan. Accordingly, electric charging sites with fewer than two DCFC non-Tesla dispensers were omitted from the assessment.

This screening approach reduced the number of electric charging sites in the study area from 197 to just 45 (see Figure 1). These stations are most densely clustered in New York City and Northern New Jersey.

A final criterion not reflected in this screening process is vehicle accessibility. Because many electric stations were developed for LD vehicles as noted above, some may not be reasonably accessible to larger-format M/HD vehicles. For example, many of these stations are in commercial parking lots with small and dense parking spaces or located in parking structures with low clearance. Because the DOE dataset does not contain information regarding vehicle class accessibility or physical dimensions for electric charging locations, site format and geometry is not accounted for in this assessment. However, this practical consideration will be addressed in future deliverables offering recommended Clean Freight Corridor designations so as to ensure that existing and future charging locations can be made conducive to use by a variety of freight vehicles.

HYDROGEN FUELING LANDSCAPE

Hydrogen station availability is limited compared to other energy sources in the study area. The lone hydrogen station currently available in the study area, located in Wallingford, Connecticut, was built in 2010 and dispenses up to 65 kilograms of hydrogen per day. Although this volume is suitable for LD use,² 65 kg per day is likely insufficient throughput to fuel multiple M/HD vehicles each day. Accordingly, that station has been omitted from the assessment.

While additional stations are planned and under development on Long Island, in the Bronx, and near Hartford, the lack of existing stations means that the study area does not have any Signage Ready corridors. Still, several corridors have been nominated and designated as Signage Pending, including I-84, I-80, I-91, I-95, and

² For example, the Toyota Mirai has a fuel capacity of 5 kg hydrogen to support an estimated driving range of 500 miles.

a portion of I-87 north of Exit 15 (see Figure 2). As pending hydrogen filling stations are completed, Signage Pending segments can be reevaluated as they meet the minimum distance criteria for Signage Ready designation.

LIQUEFIED PROPANE GAS (LPG) FUELING LANDSCAPE

After electric charging, LPG is the most well-represented alternative fuel in the study area with 39 existing fueling stations. Because the vast majority of available propane vehicles in the marketplace are M/HD vehicles, all existing stations are assumed to cater to M/HD vehicles and therefore none were omitted from the assessment.

The LPG stations are well dispersed throughout the study area, which is conducive to corridor-based (e.g., long-haul) fueling. The only Signage Ready designation is a large stretch of I-84 in Connecticut, but segments of I-95 and I-91 in Connecticut, I-80 in New Jersey, and portions of I-84, I-87, and I-95 in New York, are designated Signage Pending (see Figure 3).

Because of the relative density of LPG stations in the study area, additional corridor nominations can be submitted that would likely result in additional designations based on existing infrastructure, particularly on Long Island and in Northern New Jersey.

COMPRESSED NATURAL GAS (CNG) FUELING LANDSCAPE

In the study area, there are 32 existing CNG stations. Although there have been modest attempts to commercialize CNG passenger cars in recent decades, the DOE database showed just one station accessible only to LD vehicles. The rest of the CNG stations are identified as accessible by M/HD vehicles, which constitute the bulk of the on-road CNG market. Accordingly, there are 31 freight-accessible CNG stations in the study area.

The CNG stations are somewhat concentrated in and around New York City, with some stations located by I-95 in Connecticut and I-78 in New Jersey (see Figure 4). New York and Connecticut contain most of the Signage Ready corridors in the study area, including:

- I-87, I-495, and NY-27 in New York;
- I-91 and I-95 in Connecticut; and
- Portions of I-78 and I-476 in Pennsylvania.

Significant stretches of Signage Pending corridors include I-84 in Connecticut and New York, I-80 in New Jersey, and portions of I-278 in New York and I-78 in Pennsylvania.

LIQUEFIED NATURAL GAS (LNG) LANDSCAPE

There is only one LNG station in the study area, located near Allentown, PA (see Figure 5). This site is accessible to M/HD fleets. Because of the sparseness of LNG infrastructure, however, the study area does not contain any Signage Ready corridors. However, there are a few Signage Pending corridors, such as I-84, I-80, and I-95 (New York and Connecticut portions), I-87 in Rockland and Orange counties in New York, and I-80 in New Jersey.

TITLE VII/ENVIRONMENTAL JUSTICE

Freight vehicles have run predominantly on petroleum diesel for decades and have therefore contributed to pockets of high pollution exposure in communities near major freight corridors.³ Environmental Justice (EJ) communities are those that are disproportionately burdened by these emissions, suffering higher rates of pollution exposure without necessarily benefiting economically from the freight activity that generates the emissions burdens. As planners devise strategies to shift a portion of current and future freight activity from on-road trucks to other inherently more efficient modes like rail and barge,⁴ most freight activity is likely to be transported by trucks for the foreseeable future. This fact makes especially imperative the transition of freight vehicles to non-diesel energy sources.

Compared to the rest of the nation, the greater New York City metropolitan region has high concentrations of diesel pollution, which have a strong and negative impact on the health of its citizens largely owing to the fine particulate matter in diesel exhaust. Figure 6 demonstrates the average annual levels of diesel particulate matter in the study area. The most impacted areas appear as pollution “hotspots” corresponding to the most urbanized and/or port areas, namely New York City, Newark, New Haven, Hartford, and Bridgeport.

In compliance with Title VI of the Civil Rights Act of 1964, NYMTC works to ensure that all its plans, programs, procedures, policies, and activities do not have disproportionate adverse effects on minority and low-income populations. To identify these priority EJ areas, NYMTC designates census tracts with at least 57% minority population and 14% of persons below the poverty line as “Communities of Concern.” Figures 7-9 display the spatial relationships between these Communities of Concern and diesel emissions within the NYMTC planning region. New York City contains the greatest density of Communities of Concern in the region, and these census tracts in the five boroughs of New York City tend to be concentrated in and around diesel particulate hotspots (see Figure 7). This likely reflects the proximity of these communities to freight hubs, including Hunts Point in the South

³ See, e.g., Kheirbek et al. (2016) at <https://doi.org/10.1186/s12940-016-0172-6>

⁴ See, e.g., *Freight NYC* from the New York City Economic Development Corporation at <https://edc.nyc/freight-nyc>

Bronx, Maspeth and the area surrounding JFK International Airport in Queens, and Southwestern Brooklyn including Red Hook and Sunset Park, as well as the presence of dense, heavily trafficked and often intersecting major highways and crossings throughout Brooklyn, Queens, the Bronx, and Northern Manhattan. In general, the areas with the heaviest and most concentrated diesel emissions are highly correlated with the presence of Communities of Concern in New York City.

On Long Island, the relationship between communities of concern and diesel particulate matter is less clear (see Figure 8). Not only do Nassau and Suffolk Counties contain fewer Communities of Concern than the New York City boroughs, but the particulate concentrations from diesel emissions are significantly lower as well. As such, there is less interaction between Communities of Concern and diesel particulate matter in these counties. The highest levels of diesel particulate matter are seen near the border of Nassau with Queens, near the JFK Industrial Business Zone and several major New York City highways, but only two Communities of Concern are located near the pollution hotspot (in Elmont and Inwood).

The same largely is true in the Lower Hudson Valley, apart from the southern portion of Westchester County closest to New York City—particularly in Yonkers and Mount Vernon (see Figure 9). Those communities overlap starkly with high concentrations of diesel particulate matter associated with emissions centered in the Bronx and Northern Manhattan. As the distance from New York City increases, there are fewer Communities of Concern and lower levels of diesel particulate matter in most of Westchester as well as in all of Putnam and Rockland counties.

In the NYMTC planning region, denser and more highly urbanized areas tend to have greater concentrations of Communities of Concern as well as significantly higher concentrations of diesel particulate matter. Consequently, as NYMTC freight planning proceeds, measures to reduce diesel emissions in the most highly urbanized and polluted areas of its planning region, such as recommending the placement of alternative fueling infrastructure in industrial zones within New York City, will have the greatest potential to mitigate impacts of freight-sourced air pollution on Communities of Concern.

FIGURE 1. ELECTRIC STATIONS AND CORRIDOR DESIGNATIONS

Figure 1 displays the existing MHD-accessible electric charging station locations (45) and FHWA corridor designations in the study area.

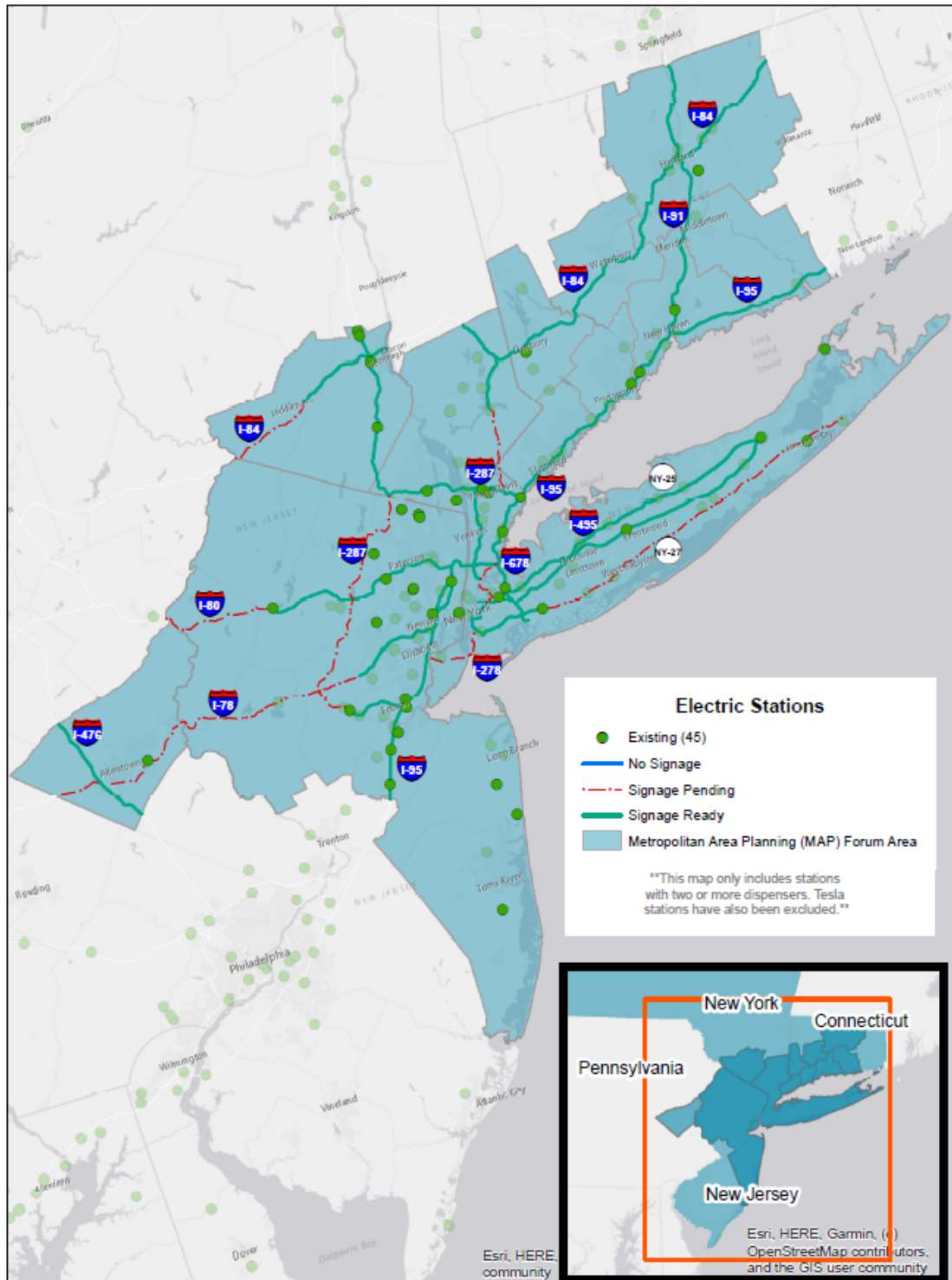


FIGURE 2. HYDROGEN FUELING STATIONS AND CORRIDOR DESIGNATIONS

Figure 2 displays the hydrogen FHWA corridor designations in the study area. There were no existing M/HD-accessible hydrogen fueling stations in the study area.

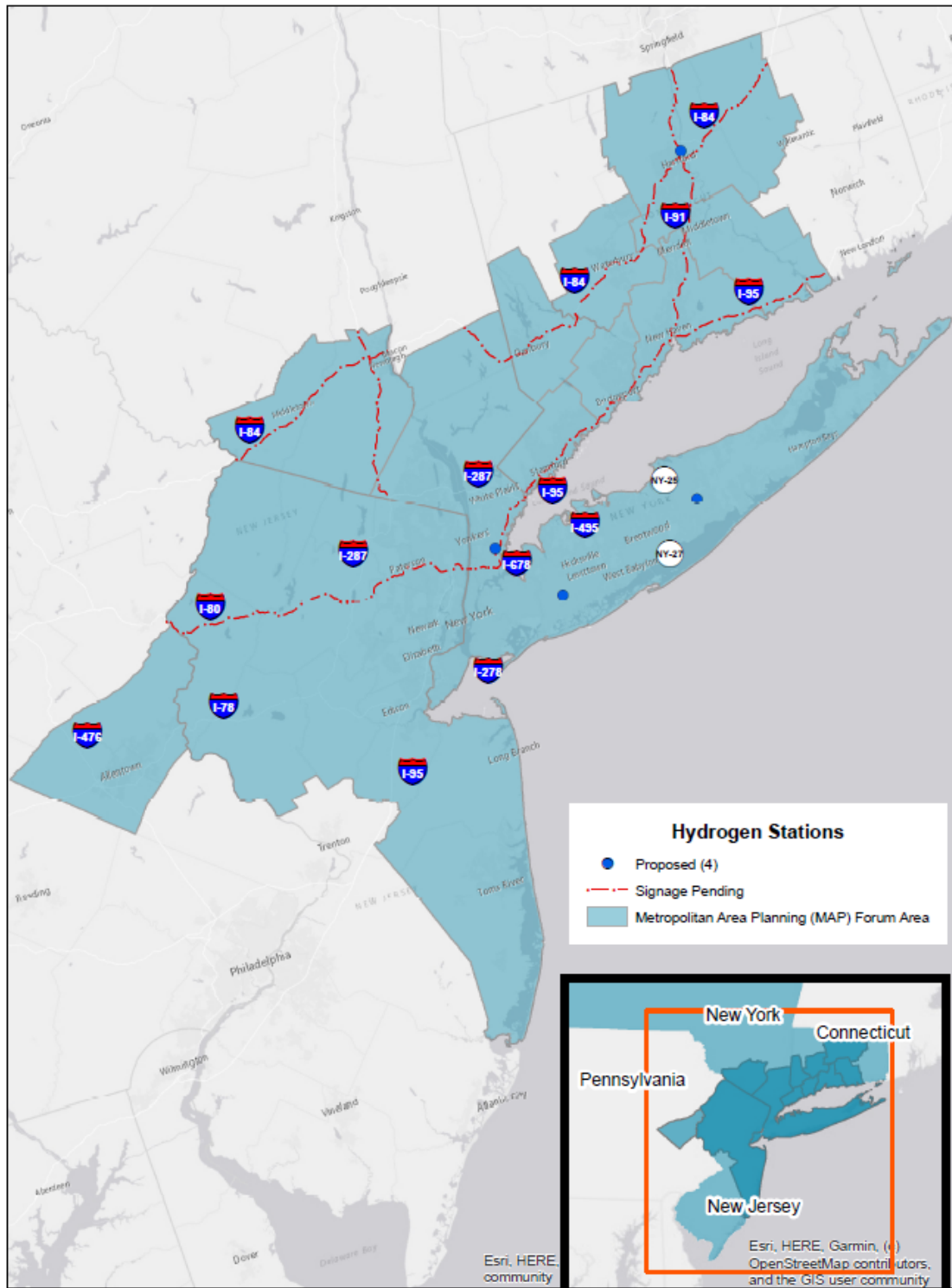


FIGURE 3. PROPANE FUELING STATIONS AND CORRIDOR DESIGNATIONS

Figure 3 displays the existing M/HD-accessible LPG stations (39) and FWAH corridor designations in the study area.

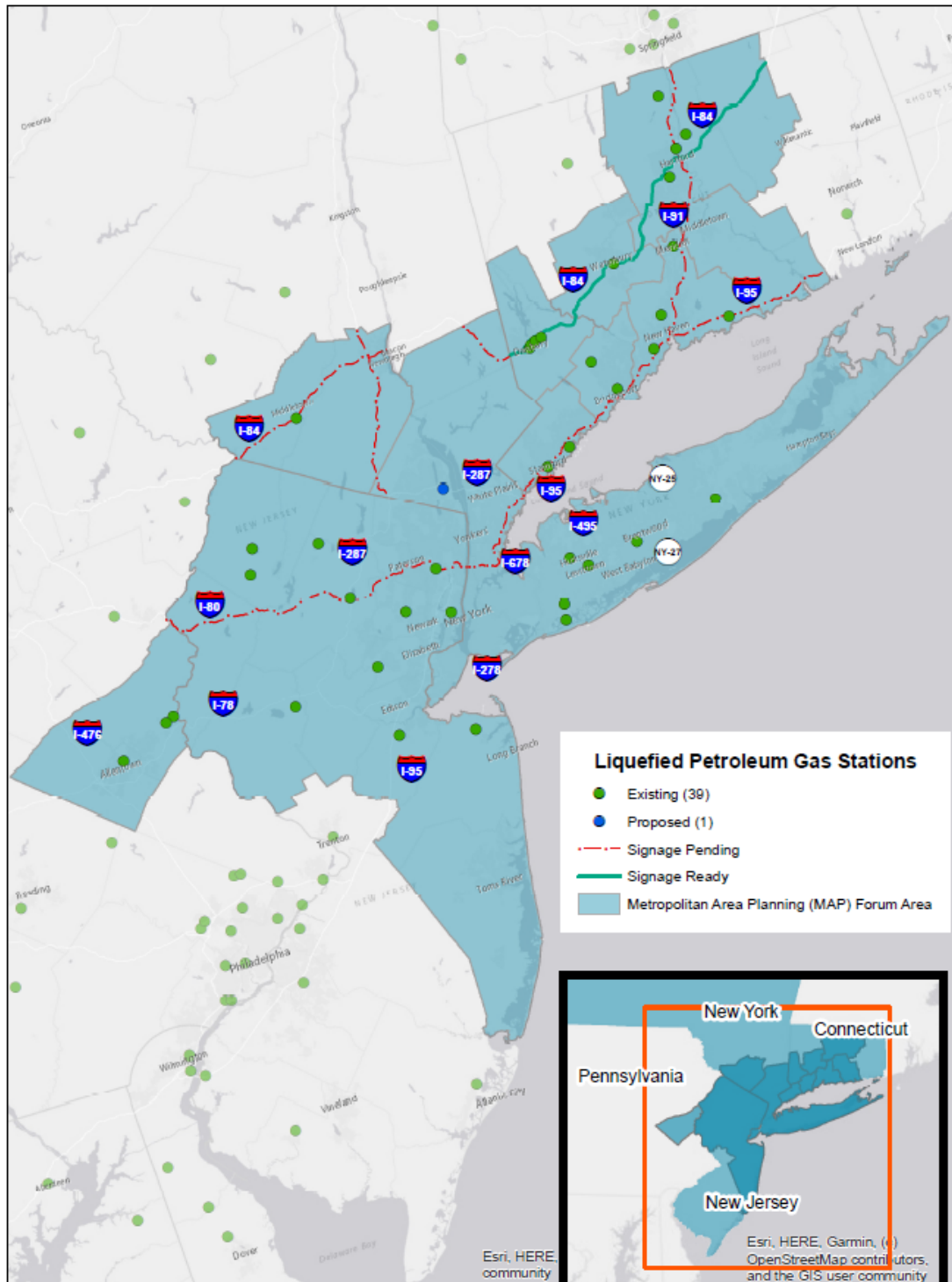


FIGURE 4. CNG FUELING STATIONS AND CORRIDOR DESIGNATIONS

Figure 4 displays the existing M/HD-accessible CNG stations (31) and FHWA corridor designations in the study area.

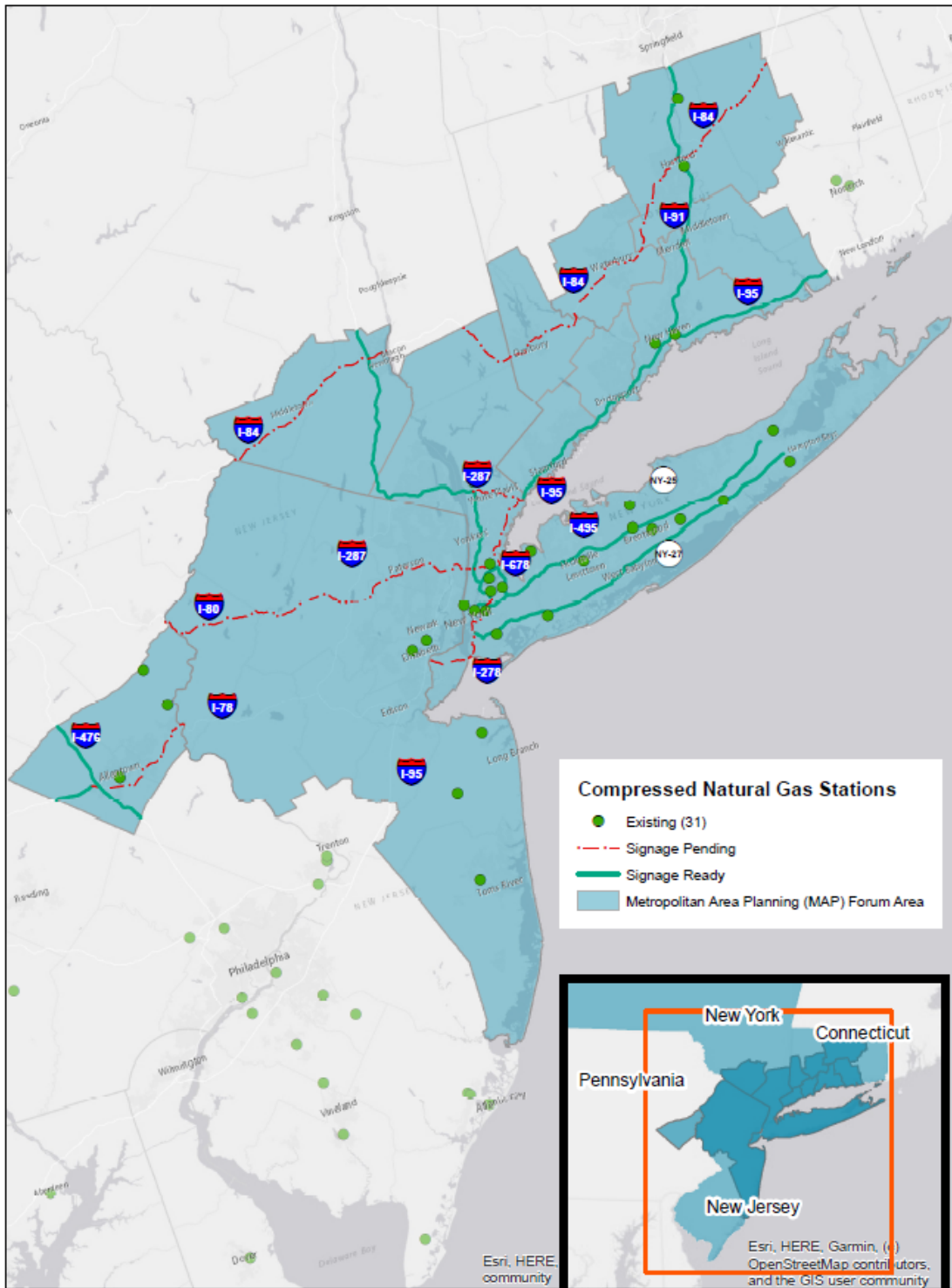


FIGURE 5. LNG FUELING STATIONS AND CORRIDOR DESIGNATIONS

Figure 5 displays the existing M/HD-accessible LNG station (1) and FHWA corridor designations in the study area.

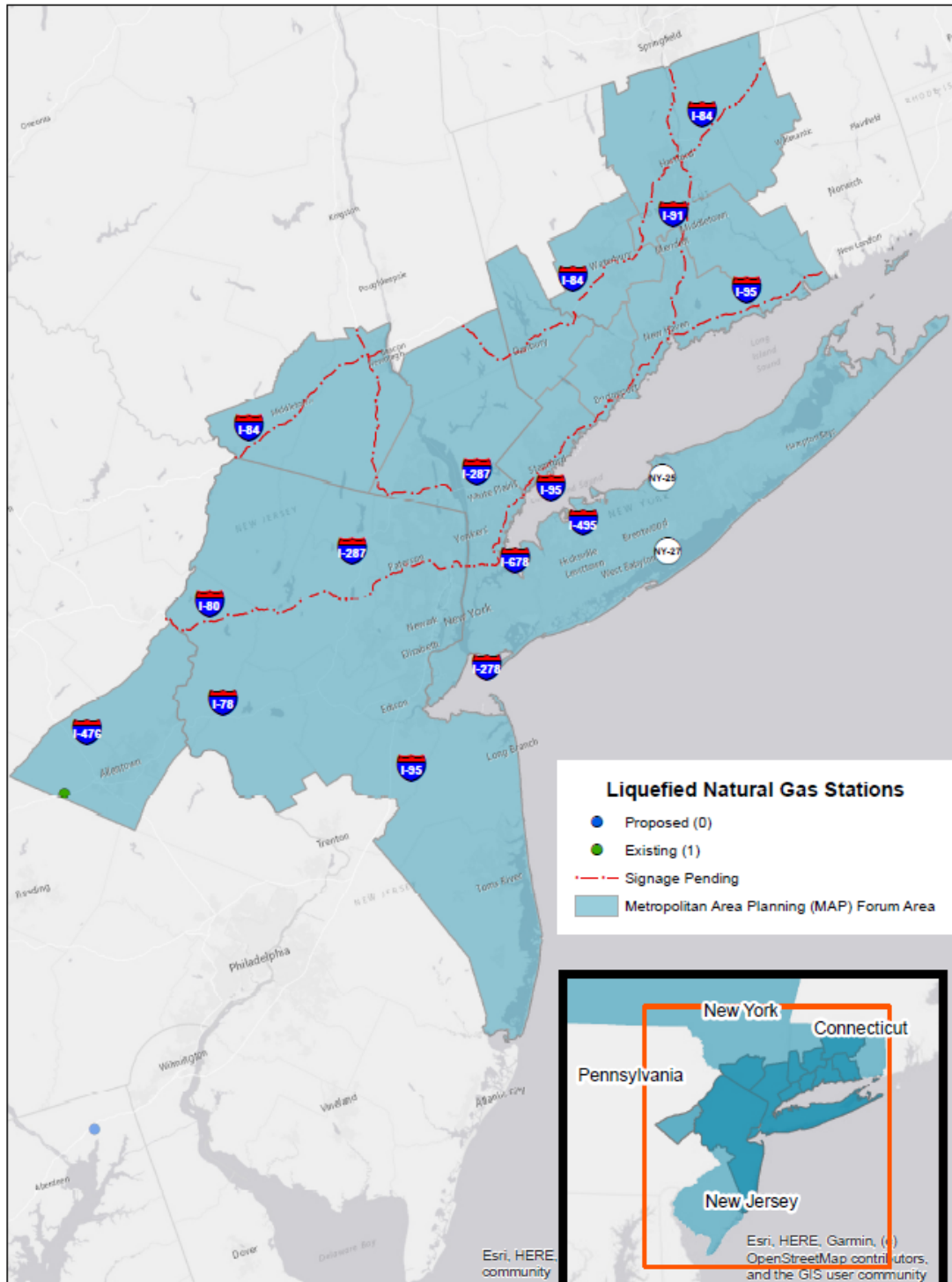


FIGURE 6. DIESEL PARTICULATE CONCENTRATIONS

Figure 6 displays annual average diesel particulate matter concentrations within the study area.

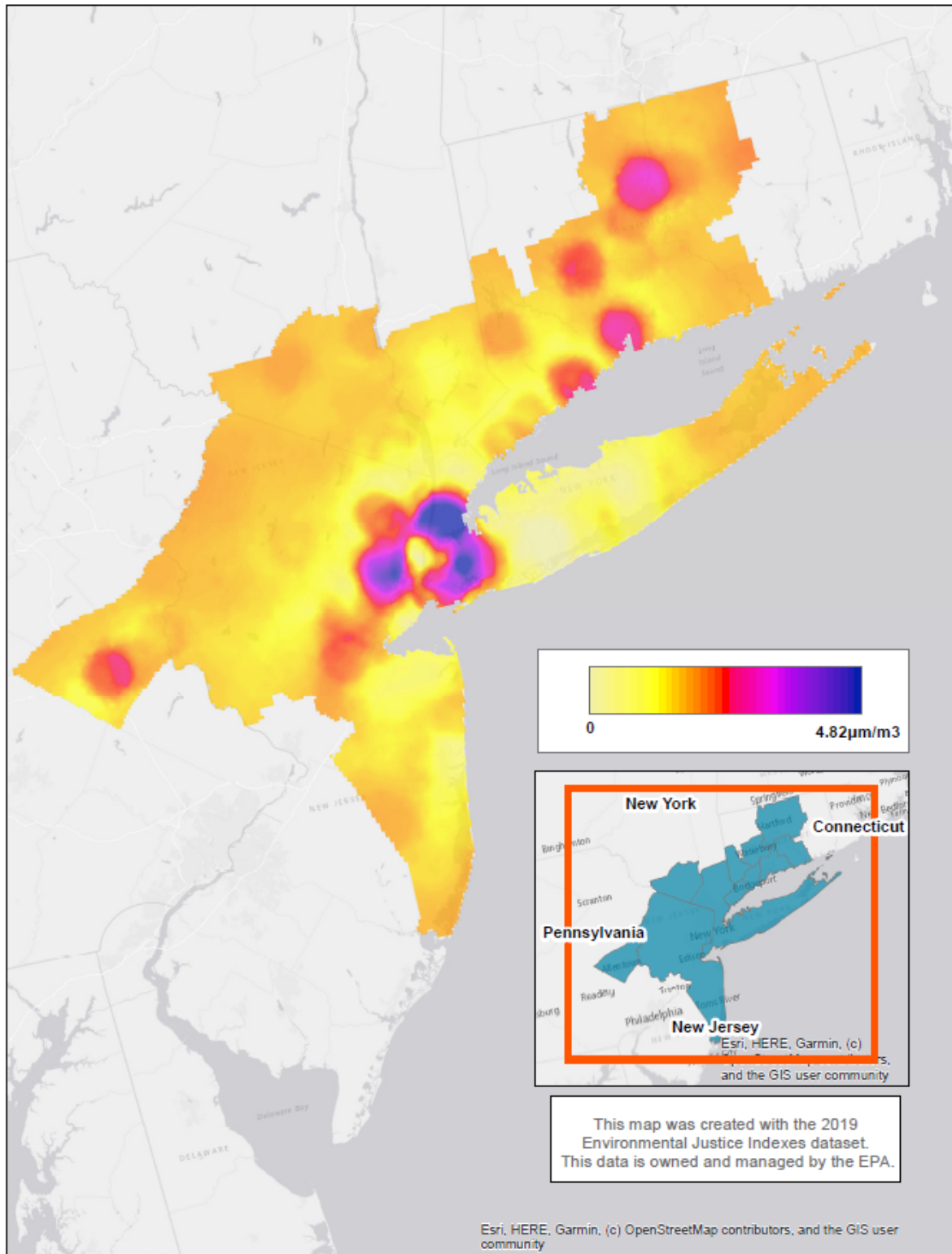


FIGURE 7. COMMUNITIES OF CONCERN & DIESEL PARTICULATE MATTER: NEW YORK CITY

Figure 7 displays levels of Diesel Particulate Matter over designated Communities of Concern in the five boroughs of New York City.

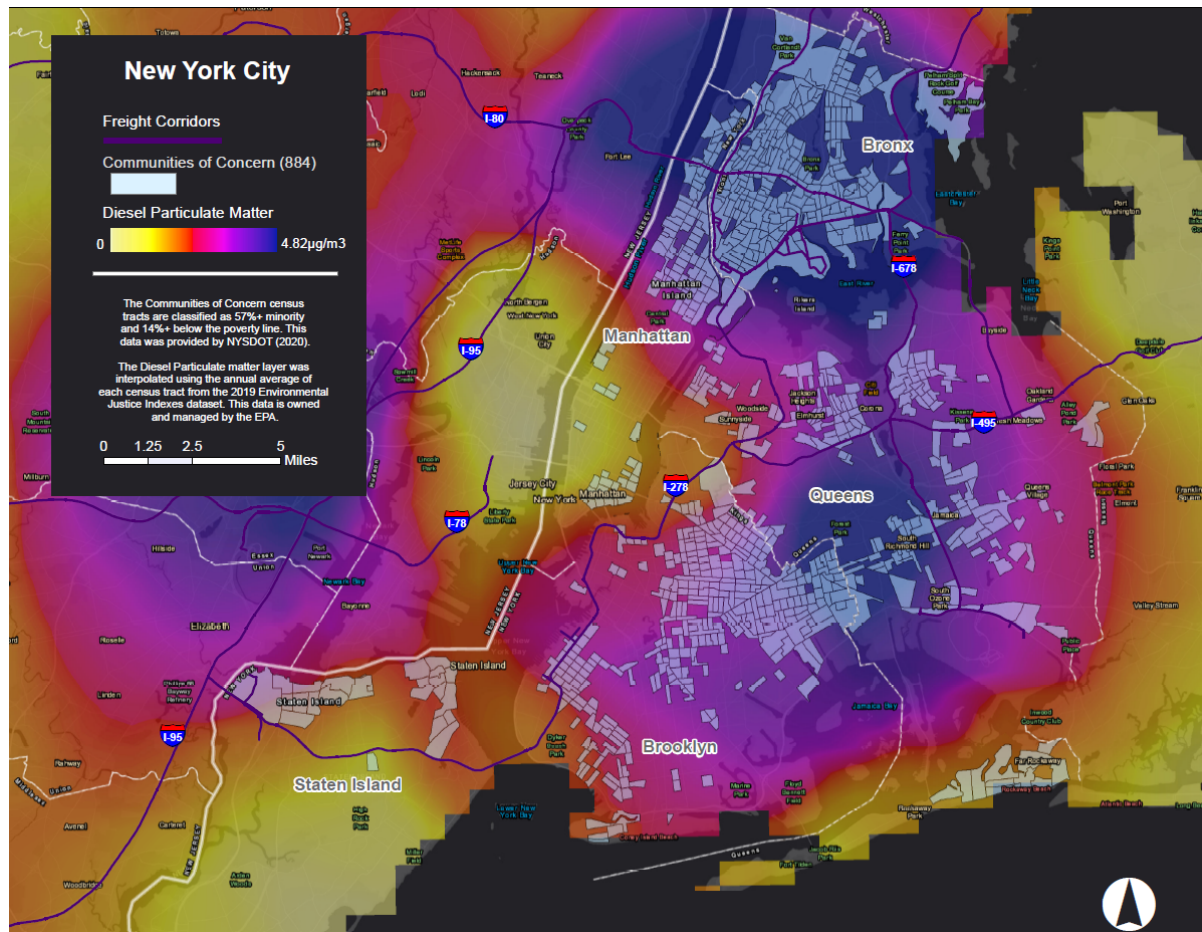


FIGURE 8. COMMUNITIES OF CONCERN & DIESEL PARTICULATE MATTER: LONG ISLAND

Figure 8 displays levels of Diesel Particulate Matter over designated Communities of Concern on Long Island (Nassau and Suffolk Counties).

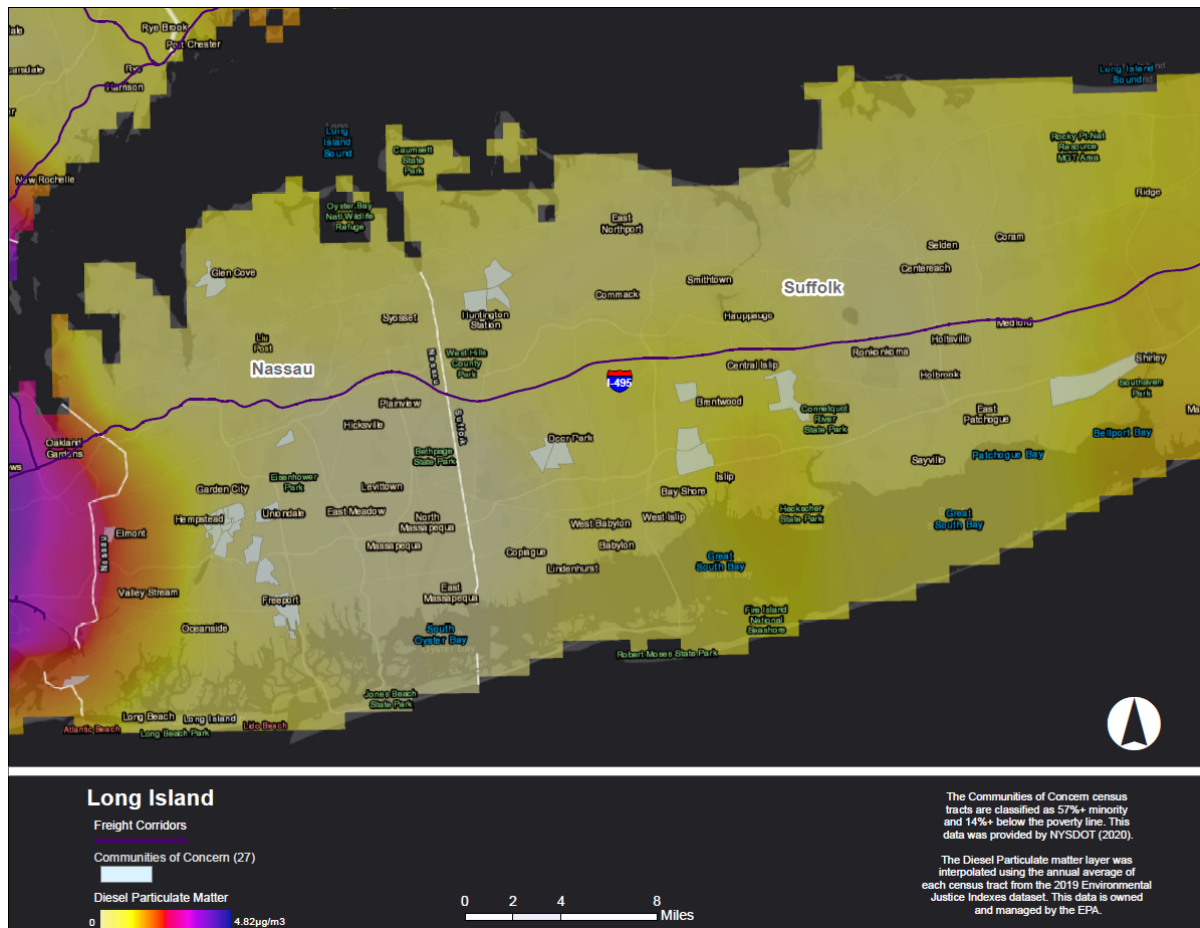


FIGURE 9. COMMUNITIES OF CONCERN & DIESEL PARTICULATE MATTER: LOWER HUDSON VALLEY

Figure 9 displays levels of Diesel Particulate Matter over designated Communities of Concern in Lower Hudson Valley (Westchester and Rockland Counties).

