Date: January 2017

To: David Rosenblatt

From: Ileana Ivanciu

Subject: Rebuild By Design Hudson River Project

This Traffic Study Technical Memorandum was prepared by Dewberry Engineers Inc. (Dewberry), on behalf of the New Jersey Department of Environmental Protection (NJDEP) to summarize the traffic management and construction detouring for the Rebuild by Design project located in Hoboken, Jersey City, and Weehawken in Hudson County, New Jersey. The proposed project is necessary to reduce flood risk and minimize potential impacts from coastal storm surge, high tide and rainfall events in the study area. The objective of this study is to evaluate the impact on vehicle, pedestrian, and cyclist movements in relation to the construction and operation of flooding mitigations within the study area.

The Study area for this project is defined as the entire City of Hoboken, plus the northern portion of Jersey City and southern portion of Weehawken. Three alternatives will be evaluated based upon their long term and short term impacts on the mobility of the community. Within the study area will be two resist structures, one following the coast at the north of Hoboken and a second along the southern border of Hoboken. A third supplementary structure is also proposed for one alternative along the southern region of Sinatra Drive.

The data collected includes traffic volumes of vehicles, pedestrians, bicycles, and public transportation. Crash data was also provided by Hoboken along with traffic signal timings at various intersections. This information was used to evaluate the impacts of temporary detours during construction and any permanent modifications to roadways, pedestrian walkways, and bikeways.

Attachments:

1. **Appendix A –** Volume Diagrams
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Technical Memorandum

Rebuild By Design: Resist, Delay, Store, Discharge Project
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EXECUTIVE SUMMARY

This Traffic Study Technical Memorandum was prepared by Dewberry Engineers Inc. (Dewberry), on behalf of the New Jersey Department of Environmental Protection (NJDEP) to summarize the construction, maintenance and operational traffic and various transportation impacts of the three alternatives proposed for the Rebuild by Design Hudson River project located in Hoboken, Jersey City, and Weehawken in Hudson County, New Jersey. The proposed project is necessary to reduce flood risk and minimize potential impacts from coastal storm surge, high tide and rainfall events in the Study Area. The objective of this study is to evaluate the impact on vehicle, rail, pedestrian, and cyclist movements in relation to the construction and operation of flooding mitigations within the Study Area.

The Study Area for this project is defined as the entire City of Hoboken, plus the northern portion of Jersey City and southern portion of the Township of Weehawken. Three alternatives will be evaluated based upon their long-term and short-term impacts on the mobility of the community. Within the Study Area will be two Resist structures, one following the coast at the north of Hoboken and a second along the southern border of Hoboken. A third supplementary structure is also proposed for one alternative along the southern region of Sinatra Drive.

The data collected includes traffic volumes of vehicles, pedestrians, bicycles, and public transportation. Crash data was also provided by Hoboken along with traffic signal timings at various intersections. This information was used to evaluate the impacts of temporary detours during construction and any permanent modifications to roadways, pedestrian walkways, and bikeways.

1.0 INTRODUCTION

In order to address the need for flood risk reduction within the Superstorm Sandy-affected region, the United States Department of Housing and Urban Development (HUD) launched the Rebuild by Design (RBD) competition in 2013 inviting interdisciplinary design teams to craft pioneering resiliency solutions. During the course of this competition, a comprehensive urban storm water management strategy was developed for the Hoboken, Jersey City and Weehawken area that included hard infrastructure and soft landscape for coastal defense (Resist), policy recommendations, guidelines and urban infrastructure to slow storm water runoff (Delay), green and grey infrastructure improvements to allow for greater storage of excess rainwater (Store), and water pumps and alternative routes to support drainage (Discharge). This proposal was selected as a winner of the RBD competition, and HUD subsequently awarded the State of New Jersey $230 million for the implementation of the first phase of the "Hudson River Project: Resist, Delay, Store, Discharge" (the Project).

This Traffic Study Technical Memorandum was prepared by Dewberry Engineers Inc. (Dewberry), on behalf of the New Jersey Department of Environmental Protection (NJDEP), to evaluate the flood reduction improvements proposed for the RBD project. A summary of this TES will be provided in the Environmental Impact Statement (EIS) for the Project.

1.1 Project Location and Topography

The Project's Study Area encompasses the City of Hoboken and includes the southern portion of the Township of Weehawken and the northern portion of Jersey City. The Study Area has the following approximate boundaries: the portion of the Hudson River which encompasses piers within the Study Area to the east; Baldwin Avenue (in Weehawken) to the north; the Palisades to the west; and 18th Street, Washington Boulevard and 14th Street (in Jersey City) to the south. See Figures 1 and 2, Project Location and Study Area. The Study Area includes the entire comprehensive stormwater management approach which consists of the four components–Resist, Store, Delay and Discharge.

The Study Area is located along the banks of the Hudson River, beneath the Palisades, which rise to the west. Formerly an industrial waterfront community, over the past several decades the Study Area has become increasingly developed with multi-family residential and mid- and high-rise commercial development. Unobstructed views of Manhattan across the Hudson River have led much of this development to be located along the waterfront, but areas in the north and central interior portions of the Study Area have also seen an influx in residential development over the past decade.

The upland area within the Study Area is the land area above mean high tide, and is approximately 1,020 acres. The Study Area encompasses approximately 233 acres of the Hudson River. Figure 3 shows the Preliminary Flood Insurance Rate Map (FIRM) for the Study Area. The Base Flood Elevation (BFE) is the computed elevation to which floodwater is anticipated to rise during a one-percent chance annual flood. This area is also known as the 100-year floodplain. The BFE is the regulatory requirement for the elevation or flood proofing of structures. The relationship between the BFE and a structure's elevation determines the flood insurance premium. Approximately 73 percent, or 16,800 parcels of land, within the Study Area are within the Hudson River's one-percent annual-chance floodplain (Zone AE/VE). The AE and VE zones are both 1% annual-chance floodplains, but the VE zone, which is usually along coastlines and typically does not extend beyond the waterfront (the streets, parks and esplanade directly bordering the Hudson River), is also subject to storm-induced velocity wave actions. About 4% of the land within the Study Area is within the VE zone and has base flood elevations (BFEs) of between 16 and 17 feet North American Vertical Datum (NAVD) 88 (the base flood elevation is the anticipated water level during a flood event). The majority of the Study Area (69%) is within the AE flood zone, with BFEs of between 10 and 12 feet NAVD 88. Within this area, there is a 1 percent probability of flooding in any given year. The area depicted in Figure 3 as having a 0.2 percent annual chance of flooding is also known as the 500-year floodplain. The area depicted in white on Figure 3 has an elevation higher than the estimated 500-year flood level.

Within the Study Area, there are two main entry points of floodwater during coastal storm surge events, such as Superstorm Sandy, the area around Long Slip Canal and Hoboken Terminal, and Weehawken Cove (see Figure 4). Flood waters enter at these points because they are the lowest areas of topography. Following a storm event, low-lying topography prevents water from receding. For reference, Figure 4 also displays the ground surface elevation in 5 foot contour intervals.

The topography of the Study Area is highest along the east-central portion abutting the coastline of the Hudson River at Castle Point. From here, the land slopes gently downward to the north (towards Weehawken Cove), south (towards the Hoboken Terminal and Jersey City) and to the west (towards the foot of the Palisades). This topography reflects the Study Area's history; when originally settled, Castle Point was an island surrounded to the north, south and west by wetlands. These wetlands were gradually filled in as the area grew. Today, these areas - in particular those to the west - are still extremely low-lying, in some places no more than three feet above mean sea level.

1.2 Project Background

The municipalities of Hoboken, Weehawken, and Jersey City were inundated by flood waters during Superstorm Sandy in October 2012. With half of Hoboken flooded for several days, most emergency services were unavailable, many residents were evacuated, and the National Guard was deployed to rescue those who could not evacuate. The magnitude of Superstorm Sandy's devastation, primarily attributed to a record-breaking storm surge during high tide, has overshadowed the fact that little precipitation fell during that storm. Had Superstorm Sandy been accompanied by a more typical heavy rainfall event, the Study Area's past history suggests that flooding levels and property damage could have been even higher.

The Study Area is vulnerable to two interconnected types of flooding: coastal flooding (both from storm surges as well as high tides) and systemic inland flooding (rainfall) which occurs during rainfall events that typically coincide with high tide. These flooding problems are attributed to several factors, including naturally low topography and proximity to waterways; impervious surface coverage and associated runoff; existing, relatively old, sewer infrastructure with interconnected storm and sanitary sewer lines and insufficient discharge capability particularly during high tide.

As seen with Superstorm Sandy, coastal flooding can devastate widespread areas of the Study Area and cause significant economic damage and safety concerns. In addition, systemic inland flooding associated with rainfall tends to be more localized to inland areas of lower elevation, but happens with much greater frequency than coastal surges. The systemic inland flooding typically occurs when high volumes of water are brought into the combined storm-sewer system from rainfall events which coincide with an approaching high tide and/or storm surge. During a high tide or storm surge, the water level of the Hudson River can rise above the level of the combined storm-sewer outfalls; as a result, the river traps the water inside the combined storm-sewer system. Water then backs up within the system, flooding low-lying elevation inland areas with storm water and at times sanitary sewage.

1.2.1 Coastal Flooding

The coastal communities of Hudson County historically have been vulnerable to coastal flood events. This can be in the form of abnormally high tides that occur roughly twice a month (coinciding with full or new moons), or from storm surges brought on by coastal storms. According to FEMA's Preliminary Flood Insurance Study of Hudson County, New Jersey (FEMA, 2013), the most severe flooding for the coastal communities of Hudson County occurs from coastal storm surges during hurricanes. Coastal storm surge water is brought into the area from the Upper New York Bay, New York Bay and the Kill Van Kull, where it is then driven by winds upriver along the Hackensack, Passaic and Hudson Rivers, eventually overflowing onto the shoreline communities. The duration of coastal surges can be increased if the storm also brings about high amounts of rainfall. For example, in 2011, Hurricane Irene brought a five-foot storm surge to the Hudson River, flooding parts of Jersey City and Hoboken, along with 10 inches of rainfall. After the storm passed, flooding conditions remained because the vast amount of rainfall from the storm was draining through tributaries to the Hudson River, which was already swollen by the storm surge.

The coastal surge can be further exacerbated if it coincides with a high tide. For example, a strong storm surge on the Hackensack River on November 25, 1950 resulted in flood waters of 6.5 feet (nine feet above the low-tide level). If this coastal storm surge had occurred during high tide, flood levels would have reached 12 feet. A situation like this occurred during Superstorm Sandy; the storm surge coincided with a full moon, which caused an abnormally high tide. This factor significantly contributed to Superstorm Sandy's devastating flooding of the Study Area.

Superstorm Sandy exposed the vulnerabilities within the Study Area by flooding the coastal areas of Jersey City, Weehawken and Hoboken, as well as over two thirds of the City of Hoboken's low-lying elevation interior areas. Coastal storm surge waters flooded electric utility substations and transformers; power was not restored to many Jersey City and Hoboken residents for nearly two weeks. In addition, the storm surge flooded critical transportation infrastructure, including the Port Authority Trans Hudson (PATH) line at the Hoboken Terminal. Service on this line was not restored for several months, impacting 10,000-15,000 commuters on a daily basis

Studies conducted by the Stevens Institute of Technology Davidson Laboratory (Davidson Laboratory Technical Report TR-2933, October 2014) found that approximately 466 million gallons of water inundated the interior areas of Hoboken. The water entered at the lowest areas of elevation. Within the Study Area, there were two main entry points: the area around Long Slip Canal and Hoboken Terminal in the south of Hoboken, and Weehawken Cove in the north. In the south, the surface elevation ranges between two and five feet above sea level in and around Warrington Plaza and the Hoboken Terminal. Superstorm Sandy brought approximately 11 feet of coastal storm surge water into Warrington Plaza and Hoboken Terminal, resulting in flood waters of between six to nine feet above ground elevation In the area around Weehawken Cove, the elevations range between six and seven feet above sea level. When these elevations are compared to the storm surge levels caused by Superstorm Sandy, the degree of flooding becomes apparent.

The southern and northern low-lying elevation areas of the Study Area, along the Hudson River, acted as an inlet for flood waters into western Hoboken (see Figure 4). During Superstorm Sandy, according to the Stevens Study, approximately 232 million gallons of water entered at the southern breach point, to the south of the Hoboken Terminal. Approximately 78 million gallons of this water remained within the NJ TRANSIT rail yard, the balance of the water (154 million gallons) entered the western portion of the Study Area. Of the portion that entered from the south, 98 million gallons flowed across the rail yard before entering Hoboken along Observer Highway at Park and Willow Avenues, and 56 million gallons moved through Long Slip Canal towards Marin Boulevard. Some water passed from southwest Hoboken into Jersey City via Marin Boulevard, Grove Street and Jersey Avenue, which run beneath the Hudson Bergen Light Rail and NJ TRANSIT rail crossings. In addition, 191 million gallons of coastal storm surge water entered through northern Hoboken, in and around Weehawken Cove. This water flowed to the west into Weehawken, and then south, into the H7, H5, and ultimately H1 sewersheds, respectively (for reference of the combined sewer system, please see Figure 5).

The ground elevation in western Hoboken is low-lying; the H1 sewershed (the southwestern area of Hoboken; see Figure 5) in particular is on average about three feet above sea level. Floodwaters were funneled in from the north and south, inundating this portion of Hoboken, as well as the western areas of the H4, H5 and H7 sewersheds. Because the coastal storm surge prevented outflow from the combined storm-sewer system (the surge water elevation was above the outflow level), the surge waters had nowhere to flow and persistent inland flooding resulted. Ultimately, the outflows were underwater and the combined storm-sewer system was unable to discharge. In addition, because the storm surge prevented sewer outflow, domestic sanitary sewage backed up in residences and businesses, posing a public health risk. Overall, Superstorm Sandy caused approximately $100 million in damages to private property and $10 million in damages to City-owned property in Hoboken. Notably, Hoboken University Medical Center (the only hospital within the Study Area, located in south-central Hoboken) suffered significant flood damage; the hospital was forced to evacuate all patients the day prior to the storm, and was not able to fully reopen until November 14, over two weeks after the storm hit. In the interim, patients were redirected to other nearby hospitals - many of which were also damaged by Superstorm Sandy.

Sea-level rise and high tides also represent distinct coastal flooding concerns. The National Oceanic and Atmospheric Administration (NOAA) estimates sea levels may rise from between 0.5 to 3.5 feet by the year 2075.

Based on these projections of sea level rise, the associated base flood elevations along the Study Area's coastline will likewise increase, further compounding the risk of flooding. High tides will increasingly overtop the existing bulkheads, particularly during storm surges, thereby inundating the low-lying areas of the community with much greater frequency. Studies have shown that in the mid-1800s, there was a 1 percent annual chance of a bulkhead being overtopped by a storm surge within the New York Harbor area; today there is a 20 to 25 percent annual chance of bulkhead overtopping (Blumberg et al, 2015). Rising sea level also means that the North Hudson Sewerage Authority (NHSA) outfalls and other critical infrastructure will be closer to mean sea level, and will be inundated more frequently during high tides. As the vertical distance between the elevation of the water and the elevation of the outfalls decreases, less intense storm surge (which happen with greater frequency than stronger storms) will have the ability to inundate the outfalls, thereby reducing the ability of the system to properly drain storm waters. This means that over time, coastal flood events are expected to occur with greater frequency, which will increase the urgency for flood risk reduction measures.

1.2.2 Systemic Inland Flooding

The NHSA, which provides storm and sanitary sewer utility service to the Study Area, has a combined sewer system that was built in two periods, during the 1850s, and from the 1920s to the 1940s. The combined sewer system handles both sanitary sewerage and storm water runoff. Hoboken is divided into seven main drainage areas (H1-H7, see Figure 5). Sewerage is conveyed through the system by gravity from its source (e.g., a residence or business) through combined sewer mains beneath street beds to the system's main interceptor pipelines. During dry conditions, a system of pump stations located within the NHSA's service area pumps the sewerage to the NHSA's Adam's Street Wastewater Treatment Plant (WWTP). This WWTP serves Hoboken, Weehawken and Union City. During rainstorms, storm water (i.e., rainfall runoff) flows into the combined sewer mains via street and curb inlets, and combines with the sanitary sewerage. If the combined sewer-flow volume exceeds the treatment volume capacity (between 32 and 36 million gallons per day) of the WWTP, a portion of the combined sewer overflow volume is pumped into the Hudson River through the various outfalls located along Hoboken's waterfront.

Inland flooding occurs when the combined sewer system is unable to outflow excess water into the Hudson River. This typically occurs when high volumes of water are brought into the combined sewer system during a high tide and/or storm surge and the outfalls are closed and are unable to discharge. Rainfall events of greater than two inches, combined with a high tide of four feet or greater, occurred 26 times in Hoboken from 2002 to 2012. This is expected to increase in frequency over time based on projections of sea levels rising. As a result, high tides and storm surges are expected to block or obstruct the outfalls for increasingly longer periods of time.

Potential flooding can be further exacerbated if rainfall occurs during high tide and during the daytime hours, when sanitary flows are highest. During a high tide or storm surge, the water level of the Hudson River can rise above the level of the combined sewer outfalls; as a result, the river traps the water inside the combined sewer system. Raw sewage and storm water then backs up through curb inlets and domestic interior plumbing, and floods streets as well as basements of homes and businesses. After flood waters recede, sewage residue (as well as residues from diesel, gasoline and other common roadside chemicals and contaminants) coats roadways, sidewalks, homes and businesses, representing a public health risk, and necessitating cleanup subsequent to the storms.

The most significant inland flooding typically occurs in the H1 sewershed (see Figure 5). A sewershed is a division of a drainage area that is managed by a stormwater utility. The H1 sewershed is located in the southwest area of Hoboken and is bounded generally by Observer Highway to the south, Clinton Street to the east, 7th Street to the north and the NJ TRANSIT Hudson-Bergen Light Rail to the west. This sewershed is extremely low-lying, generally less than three feet above sea level. The most frequent flooding in this sewershed occurs typically around Patterson Avenue and 1st Street (in the vicinity of the 2nd Street Light Rail Station) and Jackson Street and 4th Street. This part of the Study Area is also home to several of the Hoboken Housing Authority's communities, including the Andrew Jackson Gardens and the Monroe Gardens senior housing center, whose residents (i.e., low income and/or elderly) are particularly vulnerable to the impacts from flooding.

The NHSA installed a 50-million gallon-per-day (MGD) wet-weather pump for the H1 sewershed in 2012; however, analysis in 2013 by EmNet indicated that flooding still occurs in severe storms. The pump was activated 36 times between December 2012 and August 2013; of these activations, four storm events led to flooding. In addition to the H1 sewershed, the western areas of sewersheds H4 and H5 (just to the north of H1) also experience significant flooding, notably along 9th Street between Monroe Street and Madison Street.

The Study Area's flooding is greatly exacerbated by its high degree of impervious surface coverage: the Study Area is approximately 94 percent impervious, from building footprints or paved areas such as streets, sidewalks and parking lots. This is a product of the area's population density; with a population per square mile of 39,066, Hoboken is the nation's fourth densest municipality. The area's high impervious cover means that almost all the rainfall that reaches the ground is funneled rapidly into the combined sewer system through building downspouts and street-level storm drains, instead of being discharged onto permeable ground for gradual infiltration, as would be the case in areas with lower impervious coverage. This, coupled with the inability of the system to discharge during a high tide or storm surge, results in inundation of the combined sewer system during a rainfall event and backing up of the sewer system. Ultimately, this leads to the flooding events in low-lying areas, resulting in damage to buildings, residences, cars and infrastructure.

These various factors all contribute to the need to develop a comprehensive flood risk reduction strategy to safeguard against damage to people, property and infrastructure.

1.3 Project Authorization and Regulatory Framework

This Project is funded by HUD Community Development Block Grant - Disaster Relief (CDBG-DR) funds and compliance with a full range of federal, state and local environmental laws is required, as provided in FR notice 79 FR 62182, published October 16, 2014 [Docket No. FR-5696-N-11]. The Project's compliance with all applicable environmental laws and authorities as stated in HUD regulations (24 CFR 58.5 and 58.6), will be demonstrated.

In accordance with 24 CFR 58.1(b)(1), the State of New Jersey, acting through the New Jersey Department of Community Affairs (NJDCA), has assumed environmental compliance responsibilities for the Superstorm Sandy CDBG-DR programs on behalf of HUD. The NJDCA has designated the New Jersey Department of Environmental Protection (NJDEP) to assist with the environmental review. The NJDEP has prepared this DEIS in accordance with HUD's procedures for NEPA found at 24 CFR Part 58, et al. An NOI to prepare the EIS (as defined at 40 CFR 1508.22) was published on September 4, 2015. Simultaneously, the Draft Scoping Document was made available for a 30-day public comment period, and a public meeting was held to discuss scoping on September 24, 2015, followed by drop-in sessions open to the public on September 29 and October 1, 2015. The Final Scoping Document was published on the Project website (http://www.nj.gov/dep/floodhazard/rbd-hudsonriver.htm) in November 2015.

This DEIS is being made available to the general public for comment, as well as circulated to stakeholders, organizations and government agencies that have jurisdiction by law or special expertise with respect to the proposed action. Three agencies/organizations have been identified as being cooperating agencies: U.S. Environmental Protection Agency (EPA), NJ TRANSIT and the Port Authority of New York/New Jersey (PANYNJ). Additionally, three agencies/organizations have been identified as participating agencies: Federal Transit Agency (FTA), National Marine Fisheries Service (NMFS) and Amtrak.
A Notice of Availability of this DEIS has been published in the Federal Register and local media outlets in accordance with HUD and the Council on Environmental Quality (CEQ) regulations. After a 45-day public comment period has elapsed, public comments will be addressed in a Final EIS (FEIS) The FEIS will be circulated in the same manner as the DEIS (including the publication of a Notice of Availability) and will have a comment period of 30 days. If, after the completion of the FEIS comment period, no additional significant comments are received, the NJDEP will complete a Record of Decision (ROD). The ROD designates the selected action, and provides the basis for its selection. It identifies environmental impacts as well as any required mitigation measures that were developed during the EIS process.

1.4 Funding

The Disaster Relief Appropriations Act of 2013 (Public Law 113-2, approved January 29, 2013) was enacted to assist New Jersey's and other disaster-impacted states' recovery efforts for disasters that occurred between 2011 and 2013, including Superstorm Sandy. It appropriates monies targeted for disaster recovery to various federal agencies. Among those monies, the federal government appropriated $16 billion in CDBG-DR funds to be split among states that experienced natural disasters from 2011 to 2013, which the President declared to be Major Disasters. These CDBG-DR funds are administered by HUD and are to be used to address unmet disaster recovery needs, including funding needs not satisfied by other public or private funding sources like Federal Emergency Management Agency (FEMA) Individual Assistance, Small Business Administration Disaster Loans or private insurance. And, as a precondition to receiving CDBG-DR funds, New Jersey was required to submit a comprehensive Action Plan that detailed its unmet needs and described the proposed uses of CDBG-DR funds to address those needs.

The CDBG-DR Action Plan was developed by the NJDCA and approved on April 29, 2013. The Action Plan proposes a range of programs to provide relief following the extensive devastation caused by the storm to the affected residential/business communities and infrastructure. The Action Plan is updated periodically, and Amendment 12 "Substantial Amendment for the Third Allocation of CDBG-DR Funds" was approved on April 20, 2015. Amendment 12 was prepared pursuant to FR-5696-N-11, in order to access the third round of CDBG-DR funds allocated for the New Jersey RBD projects. Amendment 12 provides details on funding, timeline and citizen participation with regard to the Project. Another amendment to the Action Plan will be required to finalize the allocation of funding towards the Preferred Alternative that will be identified through this NEPA process.

In the Federal Register notice announcing award of this funding (79 Federal Register 62182), HUD provided the following direction, "CDBG-DR funds are provided to assist in the implementation of the first phase ("Phase 1") of the proposal titled "Resist, Delay, Store, Discharge." Page 14 of the April 2014 Resist, Delay, Store, Discharge final proposal states that Phase 1 includes: (1) a master plan for the entire strategy, (2) studies and pilot projects on various aspects of the overall strategy and (3) the following catalytic projects: coastal defense at Hoboken Station and surroundings, coastal defense at Weehawken Cove, pump station and greenbelt CSO wetland pilot project. Therefore, the current HUD funding will be provided for the implementation of Phase 1 elements only. This includes the environmental impact analysis of the overall comprehensive master plan of the entire project (including Resist and Delay, Store, Discharge), and the construction of the Resist components. The Delay, Store, Discharge (DSD) elements would be implemented separately by the City of Hoboken or other partners as funding becomes available.

2.0 PURPOSE AND NEED

The purpose and need statement for the Project was developed through a comprehensive process that began with the development of the original Rebuild by Design proposal submitted to HUD for funding, continued through the public scoping process and concept and alternative development for the EIS. Key stakeholders, including elected officials, agencies with regulatory authority, community leaders and the general public were involved at each stage.

2.1 Purpose

The Study Area, comprising the entire City of Hoboken, and adjacent areas of Weehawken and Jersey City (see Section 1.1), is vulnerable to flooding from both coastal storm surge and inland rainfall events. The purpose of the Project is to reduce the flood risk to flooding areas within the Study Area. The Project intends to minimize the impacts from surge and rainfall flood events on the community, including adverse impacts to public health, while providing benefits that will enhance the urban condition, recognizing the unique challenges that exist within a highly developed urban area.

2.2 Need

The historic flooding, and the high likelihood of future flood events from both rainfall and coastal surge flooding, has a tremendous impact on the lives of Study Area residents from a health and safety and economic perspective. When critical infrastructure, including fire stations, hospitals, and a waste water treatment plant (Figure 6) is impacted, it affects the welfare of the entire community. The economic livelihood of the community is diminished by the business disruptions caused by flooding and continual costs to repair and restore homes and businesses, with costs often exceeding the average National Flood Insurance claim award. The future potential for flooding is significant based on Hoboken's topography and the need for a project that minimizes flooding is critical to the health and safety and economic vitality of Hoboken and its affected neighbors in Weehawken and Jersey City.

The Study Area is a very dense urban area of Hudson County that is situated along the Hudson River directly west of Manhattan, New York. The Study Area is vulnerable to two interconnected types of flooding: coastal flooding from storm surge and high tide, as well as systemic inland (rainfall) flooding from medium (generally a 5-year, 24-hour) to high (generally over 10-year, 24 hour) rainfall events.

- Coastal flooding happens with much less frequency than rainfall flooding events, but can devastate widespread areas of the Study Area and cause significant economic damage and safety concerns.
- Rainfall-induced flooding occurs with significantly greater frequency than coastal flooding, but causes less severe economic damage and safety concerns.

The flooding problems for both coastal flooding and rainfall-induced flooding can be attributed to several factors, including naturally low topography and proximity to waterways; significant areas impervious ground coverage which causes surface runoff; existing combined storm sewer infrastructure which cannot handle the volume of water during significant rainfall events and insufficient storm sewer discharge capability, particularly during high tide.

The topography of the Study Area is highest along the east-central portion abutting the coastline of the Hudson River at Castle Point. From here, the land slopes gently downward to the north (towards Weehawken Cove), south (towards the Hoboken Terminal and Jersey City) and to the west (towards the foot of the Palisades). This topography reflects the Study Area’s history; when originally settled, Castle Point was an island surrounded to the north, south and west by wetlands. These wetlands were gradually filled in as the area was developed. Today, these areas – in particular those to the west – are still extremely low-lying, in some places no more than three feet above sea level.

The City of Hoboken's exposure to flood hazard risks is evident by the number of properties included in the FEMA National Flood Insurance Program (NFIP). The NFIP is intended to reduce the financial and recurring impact of flooding on private and public structures by providing affordable insurance to property owners and encouraging adoption of floodplain management regulations. Mortgage lenders for properties within the Special Flood Hazard Area (SFHA) (areas with a 1 percent annual chance of flooding, also referred to as the base floodplain or the 100-year floodplain) require owners to obtain flood insurance from the NFIP. In addition, property owners receiving awards following presidentially-declared disasters (such as Superstorm Sandy) are also often required to obtain NFIP insurance. According to NFIP statistics (https://www.fema.gov/policy-claim-statistics-flood-insurance), as of August 31, 2016, the City of Hoboken had 9,446 NFIP policies in place (the highest in Hudson County), with premiums totaling $7,213,754 (the highest in Hudson County and fifth highest in New Jersey). In addition, the overall liability to the NFIP from property owners in Hoboken was over $2 billion (third highest in New Jersey) with an average claim amount of $26,733.

The need for the Project that minimizes the impacts from coastal and rainfall flooding is necessary and essential to protect public health and safety, and the economic vitality of the community of Hoboken and its neighbors in Weehawken and Jersey City.

2.3 Goals and Objectives

A Project is intended to create a resilient community that is able to resist and rapidly recover from disasters or other shocks with minimal outside assistance. The Project is a comprehensive urban water strategy whose overall purpose is to reduce flood hazard risks, and which seeks to leverage resiliency investment to enhance the urban condition. The ability to meet this purpose will be measured in terms of Goals and Objectives. Goals (in italics below) are overarching principles that guide decision-making. Goals are measured in terms of Objectives, which are measurable steps to meet the Goal. The Goals and Objectives for the Project are:

- Goal: Contribute to Community Resiliency:
- Objective: The Project will seek to integrate flood hazard risk reduction strategies with emergency, civic, and cultural assets. The Project will reduce flood risks within the Study Area, leading to improved resiliency and the protection of accessibility and on-going operations of services (including protecting physical

infrastructure such as hospitals, fire stations and police department buildings as well as roadways and transit resources). This would allow these key assets to support emergency preparedness and community resiliency during and after flood events.

- Goal: Reduce Risks to Public Health:
- Objective: In addition to providing protection to critical healthcare infrastructure (such as local hospitals and emergency preparedness services), the Project will aim to reduce the adverse health impacts that result from combined sewage backups onto streets, and within businesses and residences, through a reduction in storm water infiltration into the existing combined sewer collection system.

- Goal: Contribute to On-going Community Efforts to Reduce FEMA Flood Insurance Rates:
- Objective: The City of Hoboken's exposure to flood risks has resulted in some of the highest insurance premiums in the state. The City has long had a goal of reducing those rates through a number of comprehensive flood risk reduction programs, such as those identified in the City's Green Infrastructure Plan. The NFIP's Community Rating System (CRS) allows municipalities to reduce their flood insurance rates through implementation of comprehensive floodplain management. The Project will propose concepts and alternatives that are consistent with Hoboken's overall effort of reducing FEMA Flood Insurance Rates.

- Goal: Delivery of Co-Benefits:
- Objective: Where possible, the Project will seek to integrate the flood hazard risk reduction strategy with civic, cultural and recreational values. The Project will look to incorporate active and passive recreational uses, multi-use facilities, and other design elements that integrate the Project into the fabric of the community. In this way, the Project will complement local strategies for future growth.

- Goal: Connectivity to the Waterfront:
- Objective: The Study Area's waterfront is currently the location of a vast length of interconnected parks and public walkways which contribute to the vibrancy of the community. The Project will aim to incorporate features that do not restrict access to the waterfront. Where feasible, the Project will build upon, and enhance, existing waterfront access points while providing flood risk reduction.

- Goal: Activation of Public Space:
- Objective: The Project will develop concepts that reduce risks to private and public property from flood impacts while also incorporating design elements that activate public and recreational spaces, thereby enhancing quality of life for the community.

- Goal: Consider Impacts from Climate Change:
- Objective: The Project will take into account the projected impacts from climate change, particularly as it relates to sea-level rise and its impacts on the frequency and degree of flooding.

3.0 BUILD ALTERNATIVES

NEPA documents must evaluate all reasonable alternatives (40 CFR 1502.14). The alternatives to be considered in any NEPA document are driven by the purpose and need for the action. The purpose and need for the Project is to reduce the potential for and magnitude of flooding impacts arising from both coastal storm surge and rainfall events (see Chapter 2.0 Purpose and Need). The success of constructing a reliable and permanent comprehensive flood risk reduction system relies upon designing Project approaches that consider existing infrastructure and environmental constraints, while also designing a flood risk reduction system in accordance with the regulatory standards (such as FEMA flood elevation standards, the NJDEP Flood Hazard Area Control Act, and local floodplain ordinances).

The following three Build Alternatives were developed through a year-long concept development process that considered engineering and environmental constraints while meeting the project's stated purpose and need. The project team met with stakeholders – public and private – as well as the community at-large to develop these project concepts. Concepts were eliminated from further consideration if they were determined to be infeasible, either due to engineering constraints or due to excessive time required to obtain permits. The concepts that were not eliminated were further refined into the following three Build Alternatives. The EIS will evaluate these as well as a No Action Alternative.

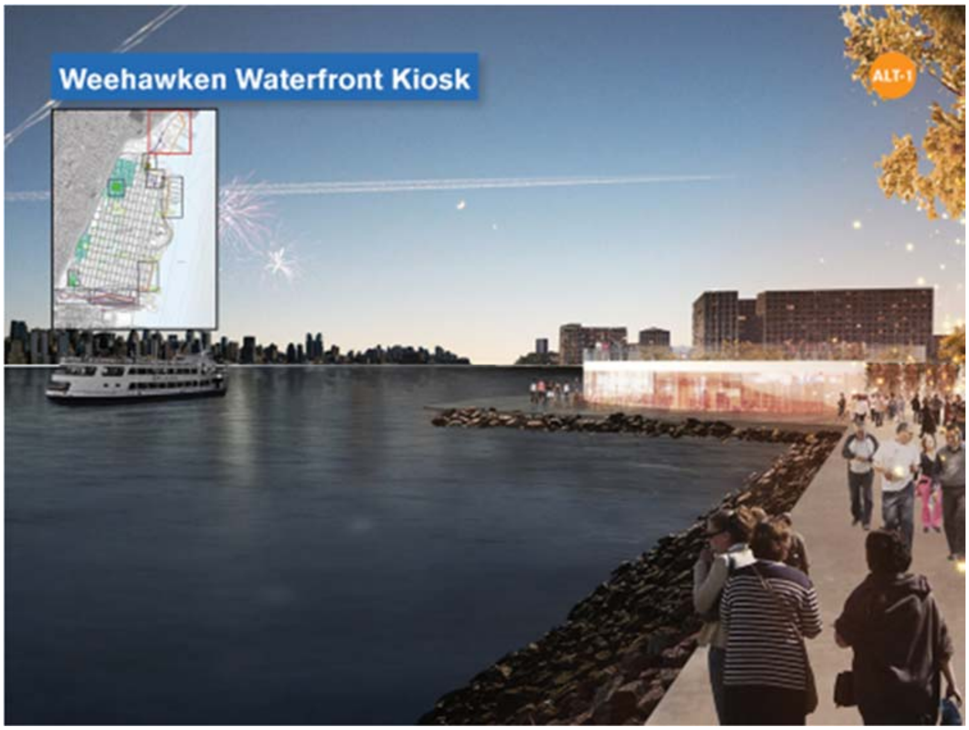
All resist structure heights described in this section are approximate. Structure heights will be finalized as part of the project's final design process.

3.1 Alternative 1

Resist Alignment

Alternative 1 (which was developed from the earlier Concept B and components of the southern alignment of Concept E) provides coastal flood risk reduction to approximately 98 percent of the population within the Study Area 100-year floodplain.

Alternative 1 provides the greatest level of flood risk reduction by locating the resist structures primarily along the waterfront. This alternative's resist structure generally follows the waterfront from the Lincoln Tunnel in Weehawken south to Weehawken Cove where it is envisioned that a boathouse will be incorporated into the structure. The resist structure at Lincoln Harbor ranges from 7.5 to 15.5 feet above ground level (note that all references to resist infrastructure height are in relation to height above ground level) and nine feet along the Cove. Urban placemaking amenities under consideration in this area include a new Lincoln Harbor ferry stop (see Photograph 1) and an improved park space along the north of Weehawken Cove (in the area of the existing park adjacent to Harbor Boulevard). In addition, a bermed and terraced Cove Park will be incorporated into the southwest corner of Weehawken Cove. This would include existing undeveloped land as well as the currently-developed Cove Park (adjacent to Harborside Lofts at 1500 Garden Street). Potential amenities at this park may include playgrounds, lawn areas, game courts, and a viewing deck overlooking Weehawken Cove (see Photograph 2).



Photograph 1: Lincoln Harbor Ferry Stop

Photograph 2: Cove Park

The alignment continues around the waterside of the Tea Building, at a height of between nine and 12.5 feet, and heads south in front of Maxwell Place at about nine feet in height. The resist structure continues south along the waterfront to the intersection of Sinatra Drive North and Frank Sinatra Drive, just south of Maxwell Place Park where the ground elevation begins to rise, and the wall tapers down to meet it at height of one foot. There will be a series of gates along the waterfront to allow access onto piers and across road intersections during non-flood conditions. Possible designs for the resist structure in this area include an elevated promenade north of the Tea Building, raised terraced parks adjacent to Shipyard Park, and bermed/terraced park areas at the location of the existing Maxwell Place Park (see Photograph 3).

Photograph 3: Maxwell Place Park

The resist structure also has a component along Sinatra Drive from 4th Street to 1st Street, in South Hoboken, where the design may consist of an elevated walkway and park space (between 2.5 feet and one foot in height along Sinatra Drive) that ties into a deployable system running east/west on 1st Street (up to 7.5 feet high). In the southern portion of the Study Area, two options will be analyzed: Option 1 features an alignment south of Observer Highway, within the rail yard (south of the proposed Hoboken Yard Redevelopment Area) at approximately five to 11 feet in height. Option 2 includes an alignment along Observer Highway from Washington Street to Marin Boulevard, on an alignment that runs behind NJ TRANSIT offices at a height of about 11 feet. The alignment includes gates for access at various locations including the Marin Boulevard, Grove Street and Newark Avenue underpasses beneath the rail lines, as well as protection where HBLR tracks pass below the NJ TRANSIT overpass in the southwest corner of the Study Area. Urban amenities in these areas include lighting, murals, seating, plantings and wayfinding/signage. Steel sheeting will also be installed along the NJ TRANSIT railroad embankment.

Delay, Store, Discharge

The DSD elements of the Project consist of three large stormwater detention facilities and approximately 61 small tanks (ROW sites) that will include new and/or improved stormwater management techniques designed to complement other efforts by the City of Hoboken as part of the Green Infrastructure Strategic Plan and multiple redevelopment plans (discussed further under Land Use). Details on individual sites and specific plans have been developed as part of the feasibility design. The text below describes the major components that comprise this element of the Project. The location of the proposed facilities are based on studies of the existing flooding "hotspots" in Hoboken. Additionally, two new outfalls are proposed associated with the DSD sites.

BASF Site

The northwest corner of Hoboken south from the NHSA Treatment Plan is a natural topographical low point and catchment area where collection and delay/storage of stormwater can be enhanced by the development of the Northwest Park (BASF Property). The 4.3-acre property was acquired by the City of Hoboken and includes the property at Block 107, Lot 1. The City has recently conducted an Environmental Assessment for the acquisition of this property. The site, which is currently paved and impermeable, is planned for conversion to green park space with an underground stormwater storage/holding tank. A new pump and outfall would be linked to this facility to provide a discharge from the overall catchment area. Amenities under consideration for this park follow three themes: destination, recreational and ecological. A destination park provides for trails and urban landscape features, a recreational park provides for developed recreational uses such as ball fields and skateboard areas and an ecological park provides an opportunity for the public to engage with native vegetation and wildlife.

NJ TRANSIT Site

The area surrounded by the Hoboken Housing Authority (HHA) at Jackson and Harrison Streets from 2nd Street to 6th Street also serves as a natural low-lying catchment area. A high level storm sewer collection system will be added in this 17-acre development to support the discharge component of the Site and direct the stormwater overflow towards the west. On the west side of this neighborhood, a stormwater tank will be incorporated along the light rail line to provide storage of the water drained from the HHA area. A pump station would be incorporated to discharge overflows from the stormwater tank into the existing ditch located at the west side of the NJ TRANSIT Light Rail. NJ TRANSIT ditch currently conveys runoff from the Light Rail property and the Palisades Hill slope to an existing discharge at the Hudson River. Urban amenities under consideration include active and passive recreational options, such as playgrounds, green space and planted areas.

Block 10 Site

The site is located in the southwestern corner of Hoboken adjacent to Academy Bus facility and south of Paterson Avenue. Portions of this currently-paved parcel will be converted to a permeable park space allowing water to infiltrate into the ground. A high level storm sewer collection system will be added to this 8.0 acre watershed, stormwater runoff will be conveyed to a proposed underground detention facility where peak flows will be controlled and delayed before discharging into the existing NHSA combined sewer. Urban amenities under consideration include active and passive recreational options such as playgrounds, green space and game courts. The City of

Hoboken intends to proceed with acquisition of this property after the Record of Decision (ROD) is issued for the Project.

Pump Stations

Three pump stations will be required as part of the discharge component. One pump station is proposed to discharge the overflow from the proposed NJ TRANSIT site detention facility, a force main from the pump station will cross under the HBLR and discharge to the existing ditch located at the west side of the HBLR tracks. A second pump station is required to discharge overflows from the BASF site detention tank. A 2,700 foot long force main will convey the runoff to a new discharge proposed at Weehawken Cove; and a third pump is proposed to the north of Clinton Street (north end of the existing NJ TRANSIT ditch) in the vicinity of the NHSA treatment plant. The purpose of the Clinton Street pump station is to release flows from the ditch to compensate the additional flow discharged from the NJ TRANSIT site, and to prevent surcharge of the existing ditch during backflow conditions. A 720-foot long force main will convey the runoff to a new discharge proposed at Weehawken Cove.

Two new outfall pipes in northern Weehawken Cove are proposed as the discharge component of the Project. One outfall would drain the flow of the existing ditch running along the western side of the HBLR line. This outfall is proposed to be located in the northern part of the Cove near Lincoln Harbor. The second outfall is proposed to be located north of Cove Park to drain the BASF site's catchment area via force main discharge.

Construction and Implementation

Construction for resist infrastructure of this alternative would last approximately 44 months and need to be completed by September 2022. The construction would occur concurrently for the northern and southern resist features. Equipment required for this project includes: dump trucks, back hoes, pile drivers, concrete trucks and other assorted delivery trucks. Some street closures will be required, in particular for gate construction. Pile driving will be required over a 10 month period. A total of 8-9,000 crew days will be required to complete this construction.

Recognizing funding limitations, the DSD portion under Alternative 1 is anticipated to be constructed over the next 15 to 20 years. DSD represent the framework for a future storm water strategy that will need to be implemented by the City of Hoboken and other partners, and can be integrated into the city's existing plans.

Due to the project being in the early stages of planning and design, there are many unknown variables. Modifications to design may arise from obtaining more accurate existing information or other unforeseen deviations from the feasibility study brought about by outside sources (such as more accurate information regarding location of utilities). As a result, the contingency is approximately 25% of the construction and engineering cost.

The construction and final design costs of Resist and DSD are estimated as follows.

Table 3-1 – Alternative 1 Construction Costs

	ESTIMATED COST (MILLIONS)
Estimated Resist Cost	$433.1 to $485.5 million
Estimated Resist Contingency Cost	$98.4 to $111.6 million
Estimated Total Resist Cost	$531.5 to $597.1 million
Estimated DSD Cost	$126.4 and $148 million

Source: Dewberry 2015-2017

These amounts are estimates of the cost to construct Resist and DSD, as well as estimated cost factors for construction and engineering project contingencies.

3.2 Alternative 2

Resist Alignment

Alternative 2 was developed from the earlier Concept E with two modifications. First, the northern Hoboken portion of the alignment along the Tea Building waterfront walkway was moved to 15th Street (south of the Tea Building) to maintain a distinction from Alternative 1. Second, because of the length and height of structure required along Hudson Street or Shipyard Lane, as well as the significant number of gates required for each, the alignment was moved to Washington Street. Washington Street was chosen due to the width of the street to accommodate the necessary structure and potential to blend structural amenities into the commercial nature of the area. This alternative provides coastal flood risk reduction to approximately 86 percent of the population residing within the Study Area 100-year floodplain.

This alternative's resist structure begins near the HBLR Lincoln Harbor station at Waterfront Terrace at an initial height of about 6.5 feet, traveling south towards Harbor Boulevard at a height of between9.5 to 11.5 feet. Opportunities for urban enhancement in the northern portion of the Study Area under Alternative 2 are limited due to siting conditions and include lighting, murals and seating. The resist features then run south along Weehawken Cove at nine feet where it is envisioned that a boathouse will be incorporated into the structure. In addition, a bermed and terraced Cove Park will be incorporated into the southwest corner of the Weehawken Cove. This would include existing undeveloped land as well as the currently-developed Cove Park (adjacent to Harborside Lofts at 1500 Garden Street). Potential amenities at this park may include playgrounds, lawn areas, game courts, and a viewing deck overlooking Weehawken Cove (see Photograph 2).

The structure continues to 15th Street, and travels east along 15th Street from the northern end of Garden to Washington Streets where it will be about seven to eight feet high. Urban amenities in this area may include a bermed park long 15th Street in front of the Tea Building. The resist feature then continues south along Washington Street, tapering to grade level at 13th Street. Street crossings will feature gates to allow for access during non-flood conditions. Consideration will be given to adapting the use of structures in a way to provide urban amenities and landscape enhancements, including elevated walkways and pocket parks, plantings and/or seating areas along Washington Street (see Photograph 4).

Photograph 4: Washington Street from 15th Street, facing south

There will then be two options in the south, along the Hoboken Terminal rail yard: Option 1 will feature an alignment south of Observer Highway, within the rail yard (south of the proposed Hoboken Yard Redevelopment Area) at approximately five to 11 feet in height. Option 2 will include an alignment along Observer Highway from Washington Street directly to Marin Boulevard. The alignment includes gates for access at various locations including the Marin Boulevard, Grove Street and Newark Avenue underpasses beneath the rail lines, as well as protection where HBLR tracks pass below the NJ TRANSIT overpass in the southwest corner of the Study Area. Urban amenities in these areas include lighting, murals, seating, plantings and wayfinding/signage. Steel sheeting will also be installed along the NJ TRANSIT railroad embankment.

During a coastal storm surge event, water from the Hudson River is expected to inundate unprotected areas of the Hoboken waterfront. If the river water overtops the waterfront bulkhead during a storm event, water can enter into the storm sewer system through existing inlets and unsealed manhole covers. While Alternative 1 would prevent a storm surge from entering the city streets, Alternative 2 leaves portions of the city streets and sewer system unprotected. To prevent water intrusion into the existing sewers under Alternative 2, a separation of the sanitary/storm water collection system is proposed by the construction of a “High Level" storm sewer collection system. In addition to the installation of this new storm sewer system, the existing NHSA combined sewer inlets and manholes would be sealed and lined. This proposed drainage would be designed to prevent additional sewer backflow that could cause major flooding issues within the Alternative 2 protected areas during a storm surge event. Storm water collected in this "High Level" storm sewer system would gravity flow into the Hudson River.

Delay, Store, Discharge

See above description under Alternative 1.

Construction and Implementation

Construction for resist infrastructure under this alternative would last approximately 44 months and need to be completed by September 2022. The construction would occur concurrently for the northern and southern resist features. Equipment required for this project includes: dump trucks, back hoes, pile drivers, concrete trucks and other assorted delivery trucks. Some street closures will be required, in particular for gate construction. Pile driving will be required over 12 months. A total of 6-7,000 crew days will be required to complete this construction.

Recognizing funding limitations, the DSD portion under Alternative 2 is anticipated to be constructed over the next 15 to 20 years. DSD represent the framework for a future storm water strategy that will need to be implemented by the City of Hoboken and other partners, and can be integrated into the city's existing plans.

Due to the project being in the early stages of planning and design, there are many unknown variables. Modifications to design may arise from obtaining more accurate existing information or other unforeseen deviations from the feasibility study brought about by outside sources (such as more accurate information regarding location of utilities). As a result, the contingency is approximately 25% of the construction and engineering cost.

The construction and final design costs of Resist and DSD are estimated as follows.

Table 3-2: Alternative 2 Construction Costs

	ESTIMATED COST (MILLIONS)
Estimated Resist Cost	$193.8 to $224.7 million
Estimated Resist Contingency Cost	$44.4 to $52.2 million
Estimated Total Resist Cost	$238.2 and $276.9 million
Estimated DSD Cost	$126.4 and $148 million

Source: Dewberry, 2015-2017

These amounts are estimates of the cost to construct Resist and DSD, as well as estimated cost factors for construction and engineering project contingencies.

3.3 Alternative 3

Resist Alignment

Alternative 3 was developed from the earlier Concept A, which was revised to relocate portions of the resist alignment to areas that would minimize impacts on the community. The alternative utilizes a private alleyway that parallels 14th Street to extend to Washington Street to meet the same flood resist goals. Washington Street was again chosen due to the width of the street to accommodate the necessary structure and potential to blend structural amenities into the commercial nature of the area. This alternative provides coastal flood risk reduction to approximately 85 percent of the population residing within the Study Area 100-year floodplain.

This alternative's resist structure begins at 6.5 feet in height near the HBLR Lincoln Harbor station at Waterfront Terrace, traveling south along HBLR rising to about 11 feet in height, and then continuing south along Weehawken Cove towards Garden Street at nine feet in height. Opportunities for urban enhancement in the northern portion of the Study Area under Alternative 3 are limited due to siting conditions and include lighting, murals and seating. It is envisioned that a boathouse will be incorporated into the structure. In addition, a bermed and terraced Cove Park will be incorporated into the southwest corner of the Weehawken Cove. This would include existing undeveloped land as well as the currently-developed Cove Park (adjacent to Harborside Lofts at 1500 Garden Street). Potential amenities at this park may include playgrounds, lawn areas, game courts, and a viewing deck overlooking Weehawken Cove (see Photograph 2).

A structure would then down the east side of Garden Street adjacent to the west of the Hudson Tea Parking Garage, starting at eight feet in height and tapering down to five feet in height. The structure along Garden Street may consist of an elevated planter with seating. The structure would then continue down the alleyway midway between 15th and 14th Streets from Garden to Washington Streets at four feet in height. Urban amenities within the alleyway could include planters (see Photograph 5). The structure would then travel south along Washington Street at 3.5 feet in height, tapering down to grade level at 13th Street. Street crossings will feature gates to allow for access during non-flood conditions. Consideration will be given to adapting the use of structures in a way to provide urban amenities such as seating and landscape enhancements.

Photograph 5: Resist Feature along the West Alleyway

There will then be two options: Option 1 will include an alignment south of Observer Highway, within the rail yard (south of the proposed Hoboken Yard Redevelopment Area) at approximately five to 11 feet in height. Option 2 will feature an alignment along Observer Highway from Washington Street directly to Marin Boulevard. The alignment includes gates for access at various locations including at the Marin Boulevard, Grove Street and Newark Avenue underpasses beneath the rail lines, as well as protection where HBLR tracks pass below the NJ TRANSIT overpass in the southwest corner of the Study Area. Urban amenities in these areas include lighting, murals, seating, plantings and wayfinding/signage. Steel sheeting will also be installed along the NJ TRANSIT railroad embankment.

During a coastal storm surge event, water from the Hudson River is expected to inundate unprotected areas of the Hoboken waterfront. If the river water overtops the waterfront bulkhead during a storm event, water can enter into the storm sewer system through existing inlets and unsealed manhole covers. While Alternative 1 would prevent a storm surge from entering the city streets, Alternative 3 leaves portions of the city streets and sewer system unprotected. To prevent water intrusion into the existing sewers under Alternative 3, a separation of the sanitary/storm water collection system is proposed by the construction of a “High Level" storm sewer collection system. In addition to the installation of this new storm sewer system, the existing NHSA combined sewer inlets and manholes would be sealed and lined. This proposed drainage would be designed to prevent additional sewer backflow that could cause major flooding issues within the Alternative 3 protected areas during a storm surge event. Storm water collected in this “High Level” storm sewer system would gravity flow into the Hudson River.

Delay, Store, Discharge

See above description under Alternative 1.

Construction and Implementation

Construction for resist infrastructure in Alternative 3 would last approximately 44 months and need to be completed by September 2022. The construction would occur concurrently for the northern and southern resist features. Equipment required for this project includes: dump trucks, back hoes, pile drivers, concrete trucks and other assorted delivery trucks. Some street closures will be required, in particular for gate construction. Pile driving will be required over nine months. A total of 6,000 crew days will be required to complete this construction.

Recognizing funding limitations, the DSD portion under Alternative 3 is anticipated to be constructed over the next 15 to 20 years. DSD represent the framework for a future storm water strategy that will need to be implemented by the City of Hoboken and other partners, and can be integrated into the city's existing plans.

Due to the project being in the early stages of planning and design, there are many unknown variables. Modifications to design may arise from obtaining more accurate existing information or other unforeseen deviations from the feasibility study brought about by outside sources (such as more accurate information regarding location of utilities). As a result, the contingency is approximately 25% of the construction and engineering cost.

The construction and final design costs of Resist and DSD are estimated as follows.

Table 3-3: Alternative 3 Construction Costs

	ESTIMATED COST (MILLIONS)
Estimated Resist Cost	$185.4 to $220.6 million
Estimated Resist Contingency Cost	$39.1 to $47.9 million
Estimated Total Resist Cost	$224.5 and $268.5 million
Estimated DSD Cost	$126.4 and $148 million

Source: Dewberry, 2015-2017

These amounts are estimates of the cost to construct Resist and DSD, as well as estimated cost factors for construction and engineering project contingencies.

3.4 No Action Alternative

The No Action Alternative provides a baseline condition that allows a comparison between proposed actions and the act of doing nothing. Under this alternative, no Resist structure would be constructed. While the City of Hoboken may continue with plans to develop the BASF and Block 10 sites, a comprehensive DSD system would not be built. The No Action Alternative also includes other ongoing or planned projects in the Study Area that are proposed to be completed by 2022. This included the following projects:

1. Long Slip Fill and Rail Enhancement Project (NJ TRANSIT)
2. Property Development between Long Slip Canal and 14th Street, Jersey City (Newport Associates)
3. H1 and H5 Wet Weather Pump Stations (NHSA)
4. Southwest Resiliency Park (City of Hoboken)
5. City Hall Green Infrastructure Improvements (City of Hoboken)
6. Washington Street Rain Gardens (City of Hoboken)

4.0 REGIONAL ACCESS

Due to the natural topography and the presence of significant transportation system infrastructures, the Project Area has concentrated access to its immediate surrounding communities. The speed limit within the Project Area is an overall 25 mph, unless mentioned otherwise. To the west is a large escarpment, the southward continuation of the Hudson Palisades. To the north are the access ramps (NJ Route 495), toll facilities and the portal of the Lincoln Tunnel. To the south are the access tracks and yards of NJ TRANSIT's Hoboken Terminal, the Holland Tunnel portal with toll plaza, NJ Turnpike Holland tunnel extension (I-78), and Route 139 (leading to US 1 & 9). These exclusive means of ingress and egress, though few, provide the Project Area with exceptional regional multi-modal accessibility to and from New Jersey and New York City.

4.1 Northern Ingress And Egress

4.1.1 Weehawken Access

To provide access to and from the north end of Hoboken, two sizable north-south bridge viaducts convey traffic from 16th Street over the Hudson Bergen Light Rail (HBLR) system. The tracks run east-west across Hoboken's north border, limiting access of most north-south ground level roadways including Clinton Street and Grand Street as they dead-end approaching the tracks. Willow Avenue and Park Avenue facilitate access to and from adjoining Weehawken (Figure 2). There is a moderate amount of congestion, particularly in the AM hours. The Willow Avenue structure, a major arterial, contains narrow unprotected sidewalks on both sides that do not experience high pedestrian volumes. The Park Avenue structure contains a single wider (~6 foot) sidewalk protected by half-section (Jersey) barrier.

Below the Park Avenue ramp, a ground level spur of the same name provides a southbound connection outboard of the HBLR tracks with southbound Harbor Boulevard. This connection supports the continuous ground level pedestrian and cycling access to the Hudson waterfront, and southbound vehicular movement from regional connectors such as Port Imperial Boulevard

At 14th Street, an extensive ramp viaduct leads west from Willow Avenue over the HBLR tracks to Union City leading via S. Wing Viaduct to Paterson Plank Road, a road that defines the boundary between Union City and Jersey City. This minor arterial roadway contains a single unprotected sidewalk (~7 feet wide) along its south edge. The sidewalks continue along the eastern edges of both Manhattan Avenue to the north and South Wing Viaduct to the south.

There is a mild amount of congestion in this area, more so in the AM peak hours. NJ TRANSIT buses utilize all three viaducts. The area has moderate to low pedestrian traffic and low bicycle utilization.

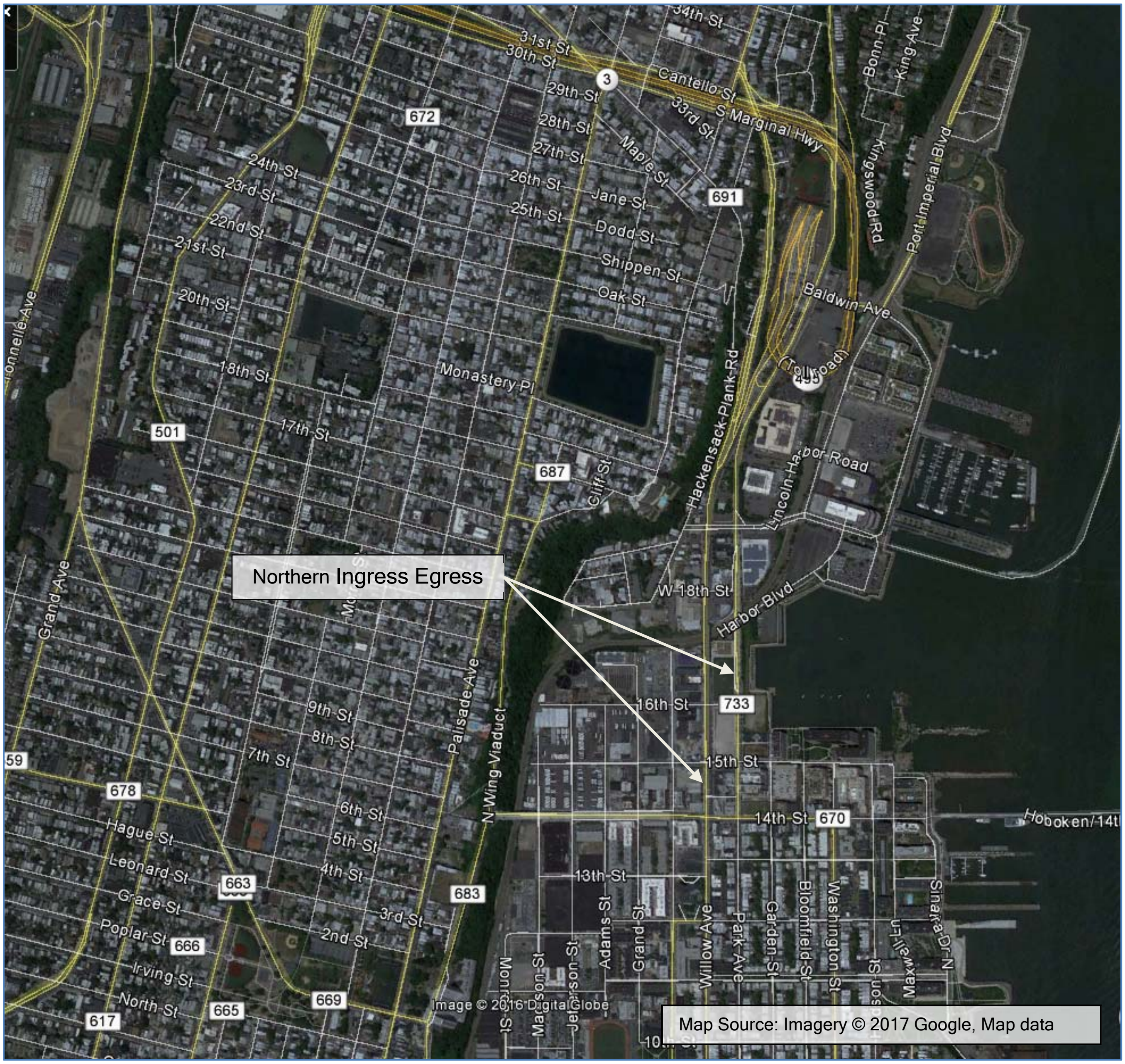


Figure 2: Northern Hoboken Primary Access Routes

4.1.2 Major Vehicular Access Routes

Willow Avenue, Park Avenue and 14th Street facilitate access to the following regional and local systems:

- Willow Ave – a four-lane (two lanes each way) Urban Minor Arterial (14,585 AADT 4/4/12) becomes a 4-lane viaduct crossing over the HBLR tracks from its intersection with 16th Street in Hoboken until just south of 19th Street in Weehawken. Willow Ave changes names to become Park Ave north of 19th St, from which shortly thereafter proceeds a direct 2-lane ramp to the Lincoln Tunnel toll plaza and thence the Lincoln Tunnel, thereby providing access to Manhattan's west side at 40th Street and 9th Avenue.
- Park Avenue (County Route 733) – a two-lane (one lane each way) Urban Local System similarly becomes viaduct of 2-lanes over the HBLR tracks immediately north of 16th Street. North of 19th Street, it becomes J F Kennedy Blvd, a four-lane (two lanes each way) Urban Collector (15,543 AADT 11/20/15). A right turn at Baldwin Street provides access to Port Imperial Blvd, which continuing as River Road (CR 505) provides continuous shoreline access through to Bergen County. A left turn shortly beyond at N. Marginal Hwy leads directly to the westbound on-ramp to NJ Route 495. NJ Route 495 in turn leads to John F Kennedy Blvd, providing local access, NJ Route 3, and terminates into the East Spur of the New Jersey Turnpike providing interstate and statewide access the length of New Jersey.
- 14th Street (County Route 670), a four-lane (two lanes each way) Urban Minor Arterial, which becomes a four-lane (two lanes each way) viaduct immediately west of its intersection with Willow Ave, provides a connection from Hoboken below, to the top of the Palisades that encircle the western border of Hoboken. At the top of the viaduct, S. Wing viaduct (County Route 683) a two-lane Urban Road proceeding south completes the ascent to Patterson Plank Road, the border between Jersey and Union cities, while to the north, N. Wing Viaduct (the continuation of County Route 683) as an Urban Local Road, becomes Manhattan Avenue upon entering Union City.

4.2 Southern Ingress And Egress

A system of Interstate and major regional routes traversing north Jersey City connect with Hoboken by way of four north-south streets: Jersey Avenue, Grove Street, Marin Boulevard and 18th St. Of these four, only Grove Street, Marin Boulevard and Jersey Avenue actually enter Hoboken (Figure 3).

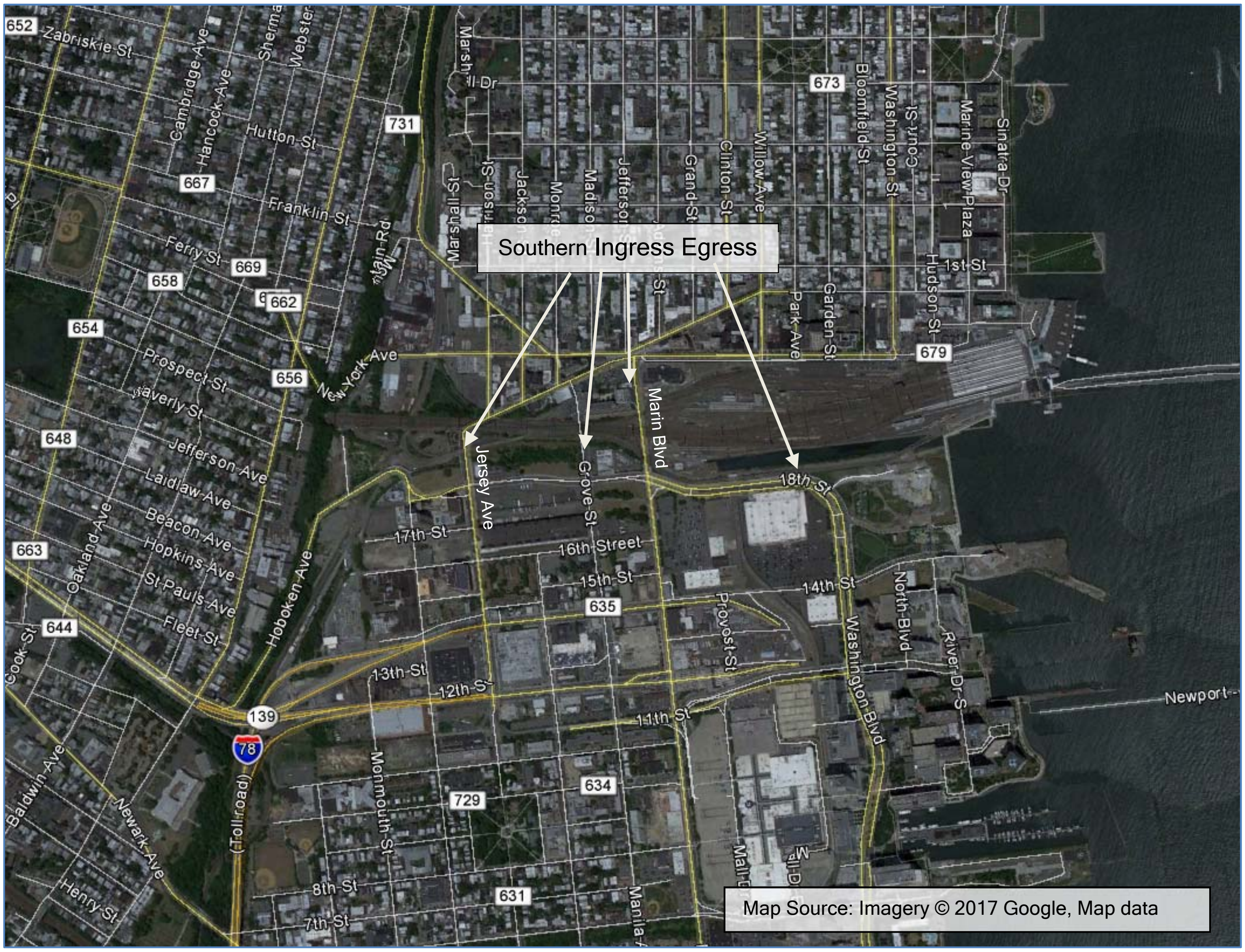


Figure 3: Southern Hoboken-Jersey City Primary Access Routes

Similar to the north, the continuation of the escarpment and east-west railroad tracks limit the number of local connections to adjoining Jersey City. The yard tracks serving NJ TRANSIT's Hoboken Terminal and Long Slip south of these prevent north-south access over the eastern two-thirds of Hoboken's southern border, from Marin Boulevard east to the Hudson. Terminating the north-south avenues and streets of Hoboken through this area is Observer Highway.

The intersection of Newark Street and Observer Highway was previously an extremely skewed intersection. For safety, it was split north and south so the streets no longer cross each other while the road designations remained unchanged. Due to the change, vehicles wishing to access Jersey City must take the south corridor. Heading west, Observer Highway changes to Newark Avenue at the juncture, and heading east, Newark Ave changes to Observer Highway. A diagram can be seen below in Figure 4.

Figure 4: Newark Ave and Observer Highway

Observer Highway to the east, now a 2-lane (one lane each way, with 14-foot striped median and parking along both sides) Urban Minor Arterial (AADT 22,934 12/16/14) contains a wide sidewalk along its northern edge and picks up a sidewalk along its southern edge after "crossing" Newark Street. Adjacent to the south side of Observer Highway, what used to be Vezzetti Way, provides parking as well as a pair of 5-foot bicycle lanes to and from Marin Boulevard and the NJ TRANSIT Hoboken Terminal and Port Authority Trans Hudson (PATH) station. The bicycle lanes see a moderate amount of bicycle traffic during both AM and PM peak hours.

Newark Street, similarly a 2-lane (one lane each way, with center turn lanes and striped wide medians but no parking) Urban Minor Arterial (AADT of 7496 vehicles/day) west of its intersection with Observer Highway has a full sidewalk along its northern edge and a disjointed and poorly maintained sidewalk along its south edge with no designated bicycling infrastructure. This corridor experiences high levels of congestion in the AM hours and moderate to high congestion in the PM hours. In the areas of access to Jersey City, there is a moderate amount of pedestrians during both AM and PM hours.

4.2.1 Jersey City Access

Only three streets provide direct connectivity to and from Hoboken's south border and the regional transportation links. These access streets are: Marin Boulevard, Grove Street, and Jersey Avenue. All three of these streets have sidewalks on both sides. All three streets also convey bus transit. Jersey Avenue has a designated bicycle lane that comes from the western portion of 18th Street, along Jersey Avenue in Jersey City, under the NJ TRANSIT tracks and into Hoboken. This dedicated bicycle lane continues on to the 2nd Street HBLR station. Mentioned previously, 18th Street provides connectivity from the regional links to these three streets.

The regional transportation links referenced above include westbound 14th Street and eastbound 12th Street, a directional pair of 6-lane 25 to 35 mph urban interstate roadways (considered part of Interstate 78 east of Jersey Ave), which provide connectivity between the respective exit and entrance to the Holland Tunnel to the east and NJ 139 to the west. The Holland Tunnel leads to the Canal Street and Vesey Street area of Lower Manhattan.

Interstate route 78 is a 4-lane (two lanes each direction) New Jersey Turnpike Authority toll road. This segment, leading to the NJ Turnpike is known as the Newark Bay Hudson County Extension. Adjoining I-78 at both 12th and 14th street intersections, is NJ route 139. Ascending west from Jersey Avenue, at 14th Street, the expansive viaduct separates into I-78 on the right and NJ 139 on the left. Beyond this, westbound NJ 139 further separates into a two-lane Principal Arterial express section which runs in a cut, and north of this, a two-lane surface Minor Collector which provides local access through a succession of signalized intersections.

Interstate route 78 continues over Newark Bay to the NJ Turnpike, beyond which it is no longer tolled; subsequently leading to Newark Airport and westward through New Jersey to Pennsylvania. NJ Route 139 continues across Jersey City providing connections to US Routes 1 & 9 (which becomes the Pulaski Skyway to the west and Tonnelle Avenue to the north); US Truck Route 1 & 9 with connection to NJ Route 440, and NJ Route 7, which leads to I-280 and Newark.

4.2.1.1 Jersey Avenue

Jersey Avenue, the westernmost of the three, begins immediately south of the NJ TRANSIT approach viaduct as a north-south continuation of northeast- southwest Newark Avenue after it crosses into Jersey City then passes under the railroad tracks. Jersey Avenue, which is entirely within Jersey City, is a 5-lane Urban Minor Arterial (nominally two lanes northbound; but successively two lanes southbound with inside and outside left and right turn lanes, two lanes southbound with left turn lane, then three lanes southbound) providing (via two very large intersections) the principal connection to the three regional arterial systems that serve the southern end of Hoboken and Jersey City. Adjacent to the southbound side exists a two-lane bike path that passes under the HBLR tracks into Hoboken and continues to proceed north alongside the light rail tracks.

Proceeding southward, Jersey Avenue crosses 14th Street, a 6-lane westbound Principal Urban Arterial which provides connection between the traffic exiting the Holland Tunnel and both I-78 and NJ 139.

Further south, Jersey Avenue crosses 12th Street, likewise a 6-lane eastbound Principal Urban Arterial which provides the opposite connection between I-78, together with NJ139, and the Holland Tunnel.

At this intersection with Jersey Avenue, a dedicated left turn lane to Hoboken is provided for the Route 139 eastbound three-lane approach. Adjoining Route 139, but separated by barrier is the similar 3-lane approach of I-78. Facilitated by split green phasing, vehicles coming from I-78 are also able to make a left turn onto northbound Jersey Avenue. South of this intersection, travel on Jersey Avenue is southbound only, leading to either 10th Street or the 11th Street viaduct, in turn leading to Newport Parkway or the entrance ramp to the Newport Mall Parking deck.

4.2.1.2 Grove Street

Grove Street, designated County Route 635 is a 2-lane Minor Arterial Street that experiences an annual average daily traffic of 6166 cars per day, 627 during peak hour. The roadway proceeds from Newark Avenue southward across the entirety of Jersey City to Grand Street. Between 15th Street and Columbus Avenue it is referred to as

Manila Avenue. With the exception of a 100' perpendicular section at its south-side intersection with Newark Avenue, it lies entirely within Jersey City. Between Newark Street and 16th Street it operates as a two-way (one lane each way) roadway. South of Newark Street it passes under the NJ TRANSIT approach viaduct. Beyond this it intersects with the 4-lane 18th Street (which three blocks to the east turns south to become Washington Blvd, where it fronts many of the hi-rise structures of the 'Newport' area of Jersey City), then 16th Street, both in signalized intersections.

South of 16th Street, Grove Street permits parking on both sides and provides two lanes one-way southbound to its signalized intersection with westbound 14th Street. Beyond 14th Street, now referred to as Manila Avenue, it remains one-way southbound but with three through lanes, a wide shoulder "lane" to the west and beyond this, curbside parking. [West of this 14th to 12th street super-block, is a Home Depot with a pick-up & drop-off area, explaining the wide shoulder beyond parking. At 12th Street, the three lanes provide a double left and through and a single through lane.

Beyond 12th Street, it remains one-way south bound, of approximately 3 lanes width but without lane markings and with no parking on either side until reaching 10th Street. South of 10th Street there is parking on both sides and the road has effectively a single travel lane.

4.2.1.3 Marin Boulevard

Marin Boulevard, designated County Route 634, likewise proceeds from the reconfigured intersection of Observer Highway and Newark Street southward across the entirety of Jersey City. Only the northernmost 130 feet of its south-side intersection with Observer Highway is within Hoboken.

Between Observer Highway and 18th Street, Marin Boulevard is a 2-lane Minor Urban Arterial (one lane each way) with an AADT of 15078 cars/ day. The roadway has a modest left turn bay it its signalized intersection with Observer Highway (most movement is north to east). In this segment the NJ TRANSIT viaduct widens to beginning fanning out to the various terminal and yard tracks. South of this the HBLR separates from the NJT body of tracks and angles south east to run along the north side of 18th Street.

South of the signalized intersection with 18th Street through to 14th Street, Marin Boulevard from is nominally 3-lanes wide (one southbound, two, becoming 3 with a turning lane at 18th Street northbound). Between 14th and 12th streets, the roadbed is 4 lanes in width however the southbound outside lane has been stripped out and the corner curb have been extended into the roadway to create and enforce effectively a single southbound lane. This lane is not permitted to make any turns (notably directly into the toll plaza approach). Southbound vehicles on Marin Boulevard wishing to access the Holland Tunnel are directed to turn right onto 14th Street and to access the tunnel at 12th Street via Jersey Ave. South of 12th Street, Marin Blvd remains a three-lane section eventually becoming 4-lanes in width (two lanes each way) south of 8th Street.

As described, these three southward connecting streets provide regional as well as local connectivity with the street network of adjoining Jersey

4.2.2 Local Connecting Roads

Three additional local connecting streets merit mention due to their availability for use when access by Jersey Avenue, Grove Street and Marin Boulevard has been closed off.

The most significant of these is Paterson Plank Road, a two lane, two-way Minor Urban Arterial (AADT of 7230, 494 during peak hours), which continues to the South Wing Viaduct. The roadway then intersects with the 14th Street Viaduct at the north end of Hoboken. This route has a sidewalk behind W-beam guiderail. It does not have a designated bicycle lane.

Paterson Plank Road, as typically employed by the commuter, provides an expedient, scarcely signaled connection between the Holland Tunnel and Lincoln Tunnel approaches, while bypassing downtown Hoboken. The corridor frequently experiences an exceptional level of demand, particularly when one of the two tunnel facilities are backed up.

As noted under the description of north-end access, Paterson Plank Road, however, also provides access into the north end of Jersey City and south end of Union City atop the Palisades, in this case from the south west corner of Hoboken. Paterson Plank Road is reached from Paterson Avenue.

Not frequently used, two additional roads provide access between the southwest corner of Hoboken and the Palisades of Jersey City directly above.

At this same intersection of Paterson Avenue and Paterson Plank Road, Mountain Road (County Route 731) is a small single-lane, 15 mph one-way uphill switch-back road, beginning at a tee just west of the HBLR crossing of Paterson Ave and continuing in a V-shaped pattern up the escarpment to Ogden Avenue, continuing to Central Ave. This road has a sidewalk behind W-beam guiderail and a pedestrian staircase to cut off the longer switchback. It does not have any dedicated bicycling markings.

The second of these is New York Avenue (County Route 671), which is the eastward extension of Observer Highway. This is a two-way, two-lane local road with switchbacks and grades much more accommodating than the aforementioned Mountain Road. It passes under Palisade Avenue and Booraem Avenue, emerging onto two-way Ravine Avenue, from whence one can access Palisades Avenue (a wide two-lane local north-south collector). This road has a sidewalk behind a W-beam barrier. It does not have any dedicated bicycling markings.

Returning to Paterson Avenue, a Minor Arterial Collector that feeds Paterson Plank road and provides access to Mountain Road; it proceeds on a northwest diagonal from Observer Highway at its intersection with Monroe Street. It crosses the HBLR tracks at grade, and continues into Jersey City where it becomes the aforementioned Paterson Plank Road.

Cognizant of their use as “redistributors” of Hudson crossing traffic, Jackson and Harrison streets which connect between Newark and Paterson avenues, have been converted into a one-way couplet, with the former northbound and the later southbound, each providing two directional lanes of travel. Harrison Street contains a southbound bicycle lane from Observer Highway (one block south of Paterson Avenue) to Jersey Avenue, one block away.

Two other roadways bear mentioning, Washington Boulevard in Jersey City, mentioned previously, which begins as 18th Street, a four-lane east-west Minor Urban Arterial, then turns south at the waterfront where it continues as Washington Boulevard. As 18th Street the roadway crosses Jersey Avenue and the two other southern connecting streets at signalized intersections. As Washington Boulevard, the roadway crosses the HBLR at-grade tracks and crosses above the Holland Tunnel Portals, then continues south past Newport, the waterfront and the commercial office towers along Exchange Place into Paulus Hook. Its high-level design provides significant capacity for movement between Hoboken and downtown Jersey City. This boulevard contains sidewalks on both sides behind planted street trees.

The final south end connection between Hoboken and Jersey City is a wide one-way westbound uphill connection between Jersey Avenue and the Route 139 Westbound service road, referred to as Hoboken Avenue. Little known, and little used, access requires turning westward on 18th Street (accessible from any of the three Hoboken southward primary access roads), then continuing to Coles Street, a wide one-way Principal Arterial road. This road does have a sidewalk though portions on the lower end appear to be disjointed or in disrepair. It does not have any dedicated bicycling markings.

Perimeter bicycling access is available via all the named vehicular routes; however, with the exception of three blocks of Harrison and Jackson Streets, does not have a formal designated right-of-way.

4.2.3 Major Vehicular Access Routes

A catalogue of the south end regional vehicular access systems includes:

- Holland Tunnel – Access to Manhattan's west side at Canal, Varick and Hudson Street, with a cross-town connection to Brooklyn via the Manhattan Bridge.
- Route 139 – Access to Jersey City and connection to Newark via US 1 & 9/Pulaski Skyway, and New Jersey Turnpike (I-95) via NJ 7 (Newark-Jersey City Turnpike) providing connections to I-280.
- I-78 (New Jersey Turnpike Newark Bay Extension) – Access to Bayonne, the south end of Jersey City, the New Jersey Turnpike, Newark Airport and points west.

Movements on the above conjoined systems are separated into one-way pairs with westbound flow on 14th Street and eastbound flow on 12th Street. Vehicles from the Holland Tunnel proceed west on 14th Street through a series of one-way signalized intersections to Jersey Avenue where they transition to a highway form. The roadways rise as they approach the escarpment and separate into Route 139 on the west and I-78 on the east. New Jersey Turnpike I-78 turns south outside the escarpment and passes under Route 139.

An opposite system of ramps brings together (but does not co-mingle) vehicles coming from I-78 with those coming from Route 139 and its service road. The divided 3+3 lane approaches to the Jersey Avenue/12th Street intersection alternate along with the Jersey Ave crossing. Vehicles then proceed through a series of east-bound one-way signalized intersections to the Holland Tunnel Toll Plaza.

Perimeter pedestrian egress between Hoboken and the surrounding communities of Jersey City, Union City, and Weehawken to the north is afforded on all of the previously named vehicular routes.

4.3 Roadway Operations

4.3.1 Data Collection

Within the study area mentioned above a large amount of traffic data was gathered and analyzed. Existing conditions for motor vehicles was established based upon signal timings, traffic volumes including turning movements, lane configurations, and observations of queue length. Data is typically gathered during peak hours. Level of service (LOS) is a common way of evaluating the functionality of a roadway or corridor based upon its capacity and vehicle flow. LOS A and B are considered very high functioning roadway LOS C is considered average, LOS D denotes an acceptable amount of congestion. LOS E signifies an unacceptable amount of congestion, and LOS F is considered "failing." Intersections noted with "U" are unsignalized and have at least one approach as a free-flowing movement. No delay is calculated for these intersections. Typically Level of Service strongly correlates to vehicle delay and queue length, which in some cases affects adjacent roadways.

4.3.2 Study Area Operations

Figure 5: Hoboken Northern Ingress/Egress LOS (PM Peak)

In general, the northern streets of Hoboken experience better flowing traffic according to recorded levels of service data (Figure 5). However, levels of service decline progressing towards the waterfront. Of the areas studied by Dewberry, the southern ingress/egress routes experience the worst level of service. Marin Boulevard and Grove Street displayed high levels of congestion more so during AM peak hours (Figure 8), while intersections closer to Hoboken Terminal displayed high levels of congestion in PM peak hours (

Figure 6). It should be noted that in addition to the roadways being over capacity, extremely high levels of pedestrians add to congestion and delays at and adjacent to Hoboken Terminal.

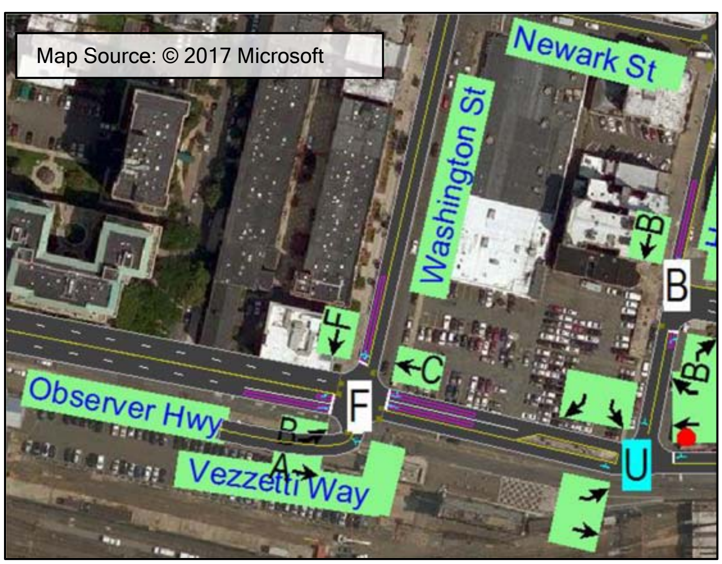


Figure 6: Observer Highway at Washington Street LOS (PM peak)

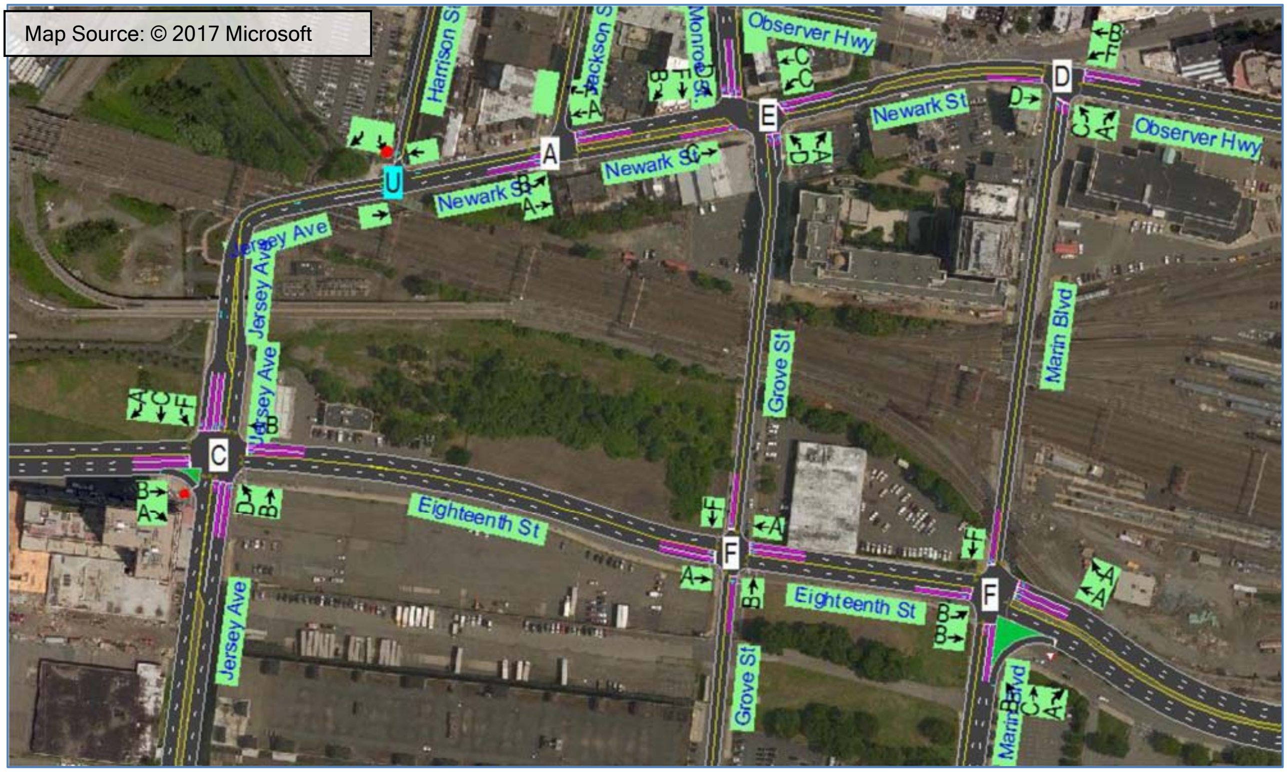


Figure 7: Hoboken South Ingress/Egress LOS (AM Peak)

4.4 Pedestrian Network

Since about half of the Study Area population uses public transit according to 2015 American Community Survey (ACS) statistics, the Study Area is very pedestrian focused. Nearly all streets are lined with sidewalks and corresponding crosswalks that provided flexibility in pedestrian movements.

4.5 Hoboken Area Bike Network Routes

The following map indicates the Hoboken and Jersey City Streets that contain bike trails, dedicated bike lanes, and bicycle-friendly roads. As seen below in Figure 8, contains several north-south running roadways with dedicated bicycle lanes to the west of Hoboken, both dedicated bicycle lanes and bicycle-friendly roadways near Hoboken Terminal, and a bicycle trail along the waterfront. In general the study area is a bicycle-friendly network, and cyclists are to be taken into consideration during any planning process and execution.

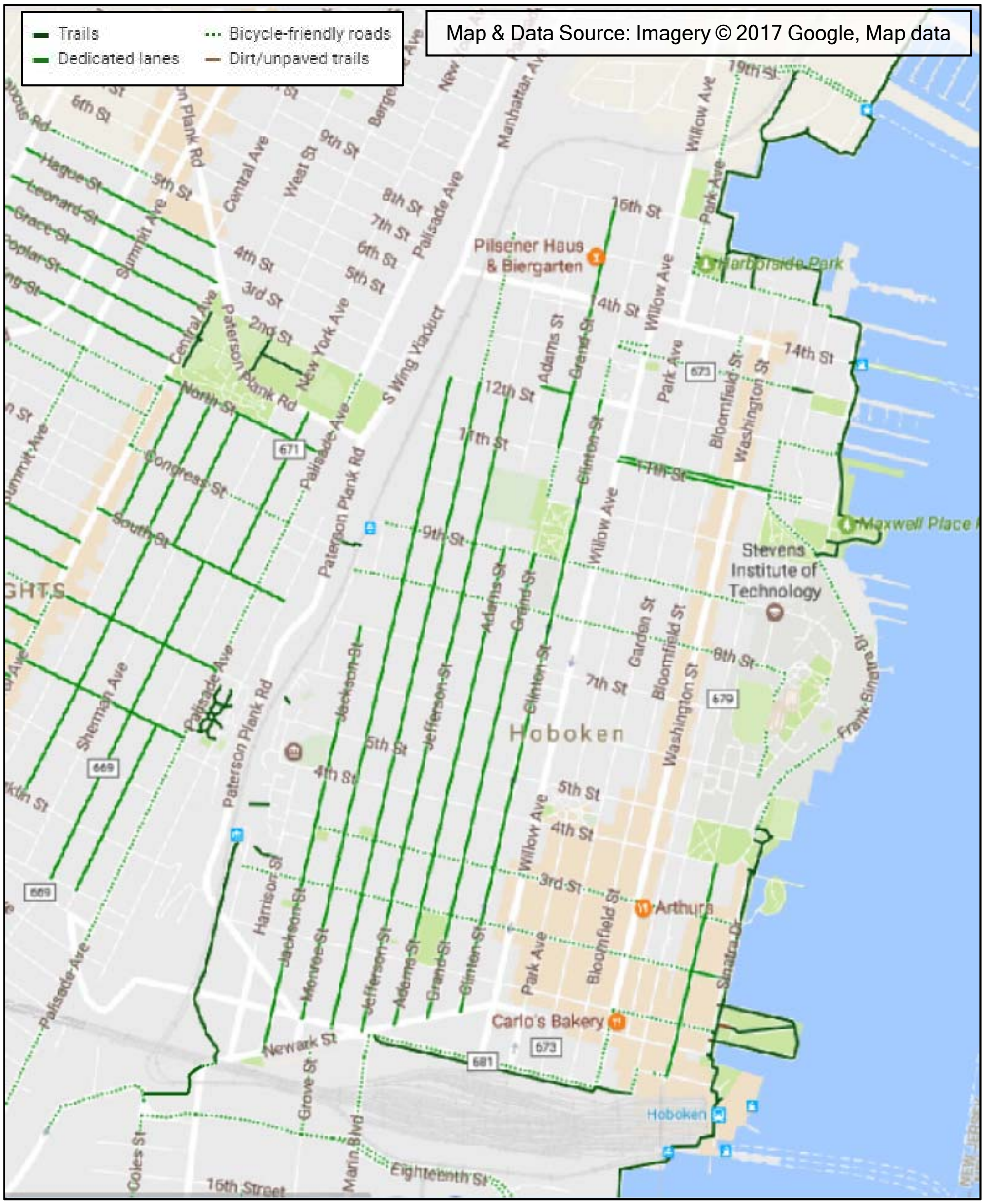


Figure 8: Hoboken Area Bike Network

4.5.1 Bikeshare Stations

The municipalities within the Study Area participate in bikesharing programs. These programs allow individuals to rent bikes and use them as needed for their commute and check them back in to rental stations or kiosks when not in use. Hudson Bike Share launched with 17 stations and has since expanded, currently operating over 25 rental stations throughout Hoboken and in the Lincoln Harbor neighborhood of Weehawken. Bikeshare stations are placed throughout Hoboken, in general no more than a 3 to 5 minute walk from any given location. Bikes may be rented on a single use, monthly membership, or yearly membership basis, with free and reduced-priced membership to Hoboken residents of Hoboken Housing Authority and in Section 8 housing. Citi Bike operates a similar bikeshare program in Jersey City, although no Citi Bike rental stations or kiosks are located within the Study Area. The following map shows bikeshare stations within the Study Area.

Figure 9: Bikeshare Stations

4.6 Bus Transit

4.6.1 NJ TRANSIT Study Area Bus Routes

NJ TRANSIT bus routes provide circulation to, from and within the Study Area and make use of the majority of the previously described perimeter access routes in and out of the Study Area, including:

- Park Avenue (Local Routes 23/63/64H/68)
- Willow Avenue (Local Routes 64H/89; PABT Routes 119/126)
- 14th Street (Local Routes 22/64H; PABT Routes 119)
- Paterson Avenue (Local Routes 22X/85/87/64H)
- Jersey Avenue (Local Route 64H)
- Grove Street (PABT Route 126)
- Marin Boulevard (Local Routes 63/64/68)

Figure 10 identifies the Hoboken, Jersey City and Weehawken streets that contain NJ TRANSIT bus routes and bus stops within and beyond the Study Area.

Figure 10: Bus Routes with Bus Stops

Figure 11 shows the Hoboken "Hop" shuttle service network. The Hop runs three lines within Hoboken that connect various parts of the city to the Hoboken Terminal. The Hop shuttle service runs between 7 am to 8 pm every half hour.

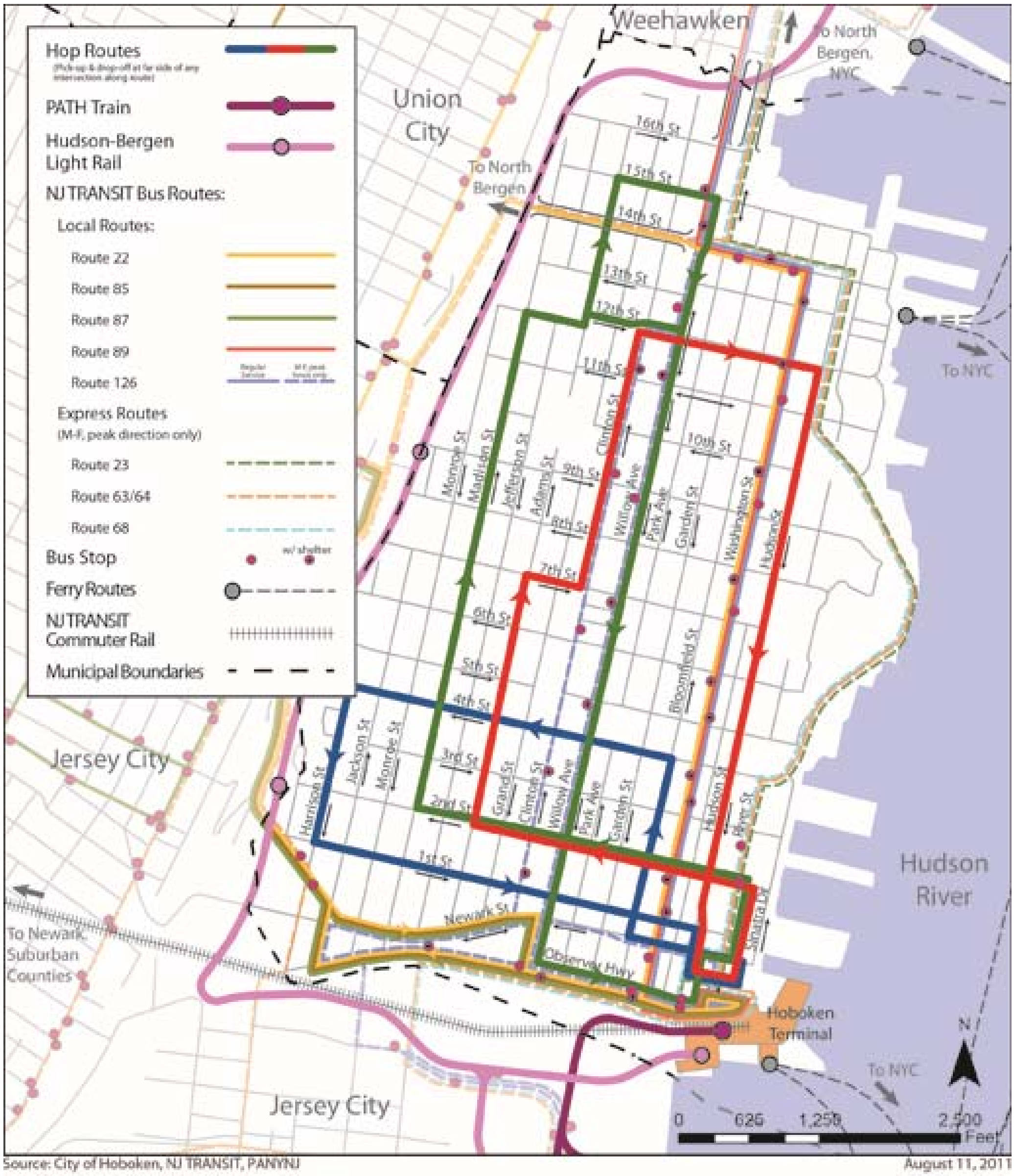


Figure 11: Hoboken "Hop" Shuttle Service Network

The map below shows the Hoboken Senior Shuttle service network with information confirmed within the city limits. The Senior Shuttle is only within the city limits of Hoboken and runs every hour.

NEW ROUTE (Effective Monday, June 9, 2016)

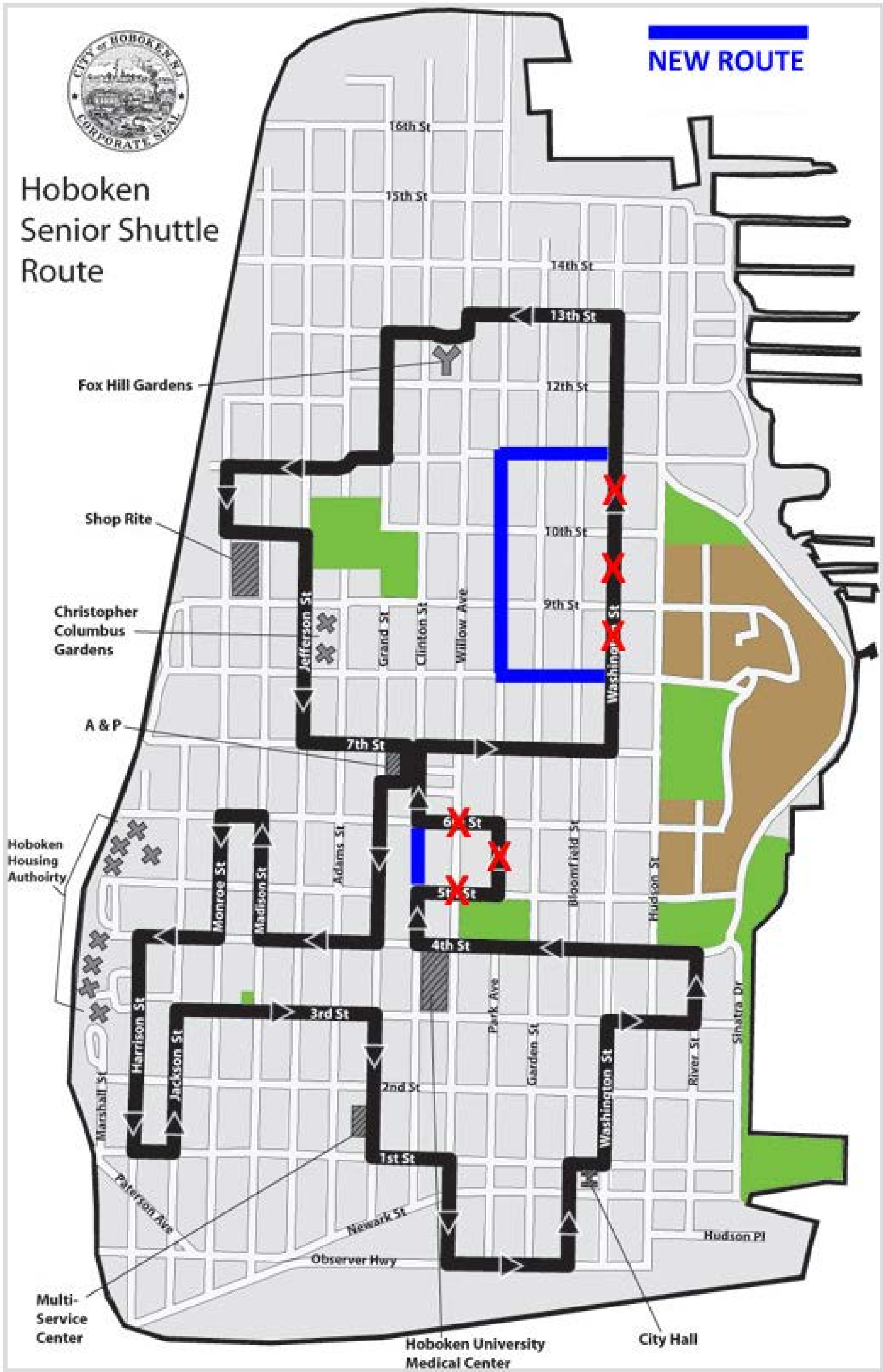


Figure 12: Hoboken Senior Shuttle Network

4.7 Project Area Light Rail Network

Within the Study Area, tThe Hudson Bergen Light Rail (HBLR) also operates within the Study Area. system borders nearly all of Hoboken's land bound borders and occupies area towards the Weehawken waterfront. North of Hoboken, the tracks lineHBLR runs along Port Imperial Boulevard and Waterfront terrace. Once entering Hoboken, theythe HBLR follows just inside the city's northern border and continue along Hoboken's west edge where they make two stops at 9th Street-Congress Street and 2nd Street. The HBLR then travels alongtracks contour the southern border of Hoboken in order towhere it connects towith Hoboken Terminal. The HBLR also connects residential Bayonne and western Jersey City with Jersey City's Exchange Place and , Newport Center, and Hoboken Terminal.

Figure 13: HBLR System

4.8 Ferry Service

Ferry service to New York City is available in the Study Area at three locations. The Lincoln Harbor ferry stop (located at the end of 19th Street and Harbor Boulevard in Weehawken) provides a connection to Midtown New York/West 39th Street. The Hoboken 14th Street ferry stop provides connections to Midtown/West 39th Street as well as the World Financial Center. The third ferry stop is located at the Hoboken Terminal, and it provides connections to Paulus Hook in Jersey City and Pier 11/Wall Street and the World Financial Center in Lower Manhattan. Hoboken at two locations. One at the north end of Hoboken to Midtown/ 39th Street is on Sinatra Drive North at 14th Street. The second is at Hoboken NJ TRANSIT Terminal at the south of Hoboken. Map locations can be seen below in Figure 9 from Traffic memo.

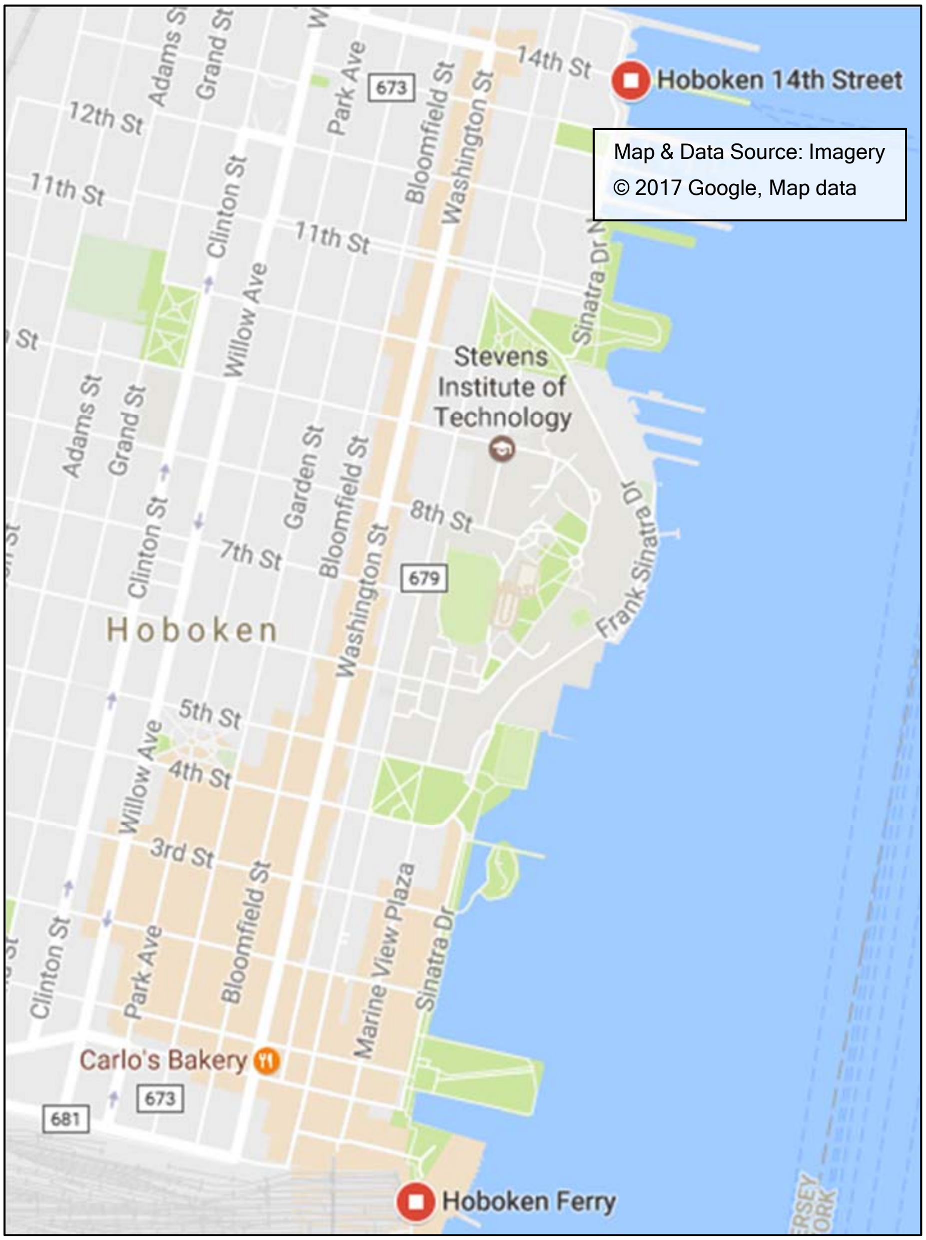


Figure 9: Hoboken Ferry

4.9 Trucking Network

According to Chapter 190, Article XX of Hoboken's municipal code, vehicles over four tons are only permitted to travel on the following roadways, with the exception of local pickup and deliveries.

Name of Street	Location
Fifteenth Street	From Madison Street to Willow Avenue
Fourteenth Street	From Willow Avenue to Hudson Street
Hudson Place	From Hudson Street to River Street
Hudson Street	From Fourteenth Street to Eleventh Street
Hudson Street	From Hudson Place to Observer Highway
Hudson Street	From Newark Street to Observer Highway
Monroe Street	From Observer Highway to Newark Street
Newark Street	From River Street to Hudson Street
Observer Highway	From east to west boundary lines
Paterson Avenue	From Marshall Street to Monroe Street
River Street	From Fourth Street to Newark Street
Sinatra Drive	From Eleventh Street to Fourth Street
Willow Avenue	From Sixteenth Street to Fourteenth Street

4.10 On Street Parking

According to Hoboken Department of Transportation and Parking, most streets are designated on one side (the north or west side) as "Resident Permit Parking Only", and the other side (south or east side) as "Permit Parking Only". The outstanding streets are typically in commercial areas and designated as metered parking.

5.0 RESIST STRUCTURE ELEMENTS

Resist structures are located in the southern end of Hoboken and adjoining Jersey City, and at the northern end of Hoboken and adjoining Weehawken. Structures are only warranted for these areas due to the limitations of the project area and the natural topography of Hoboken, Jersey City, and Weehawken. The north has higher ground towards the eastern central portion of the city. Lower lying areas are found in the south, west and north portions of the city and adjoining portions of Jersey City and Weehawken.

The Resist structures comprise three types of elements:

- Fixed vertical barrier, either in the form of vertical structure, or as observed in the vicinity of NJ TRANSIT's facilities, existing embankments.
- Gates: deployable, which are erected from a flush position with the pavement; transverse rolling structures that mate with the fixed vertical barrier (most common); and fixed elements incorporated into the existing embankments, with the exception of a single swinging flood gate.
- Log barriers, which are narrow (less than eight- feet-wide) openings in the vertical structures that typically facilitate transverse pedestrian movement, but can be closed by inserting successive pieces of aluminum planking within recesses to close the opening.

Three different alternative alignments of the Resist structures have been proposed. Within these three alternatives, different options are proposed for the Resist structures along the south side of Hoboken.

5.1 North Resist Structures

In the northern portion of the city and continuing into Weehawken, the three Alternatives contain versions of Resist structures.

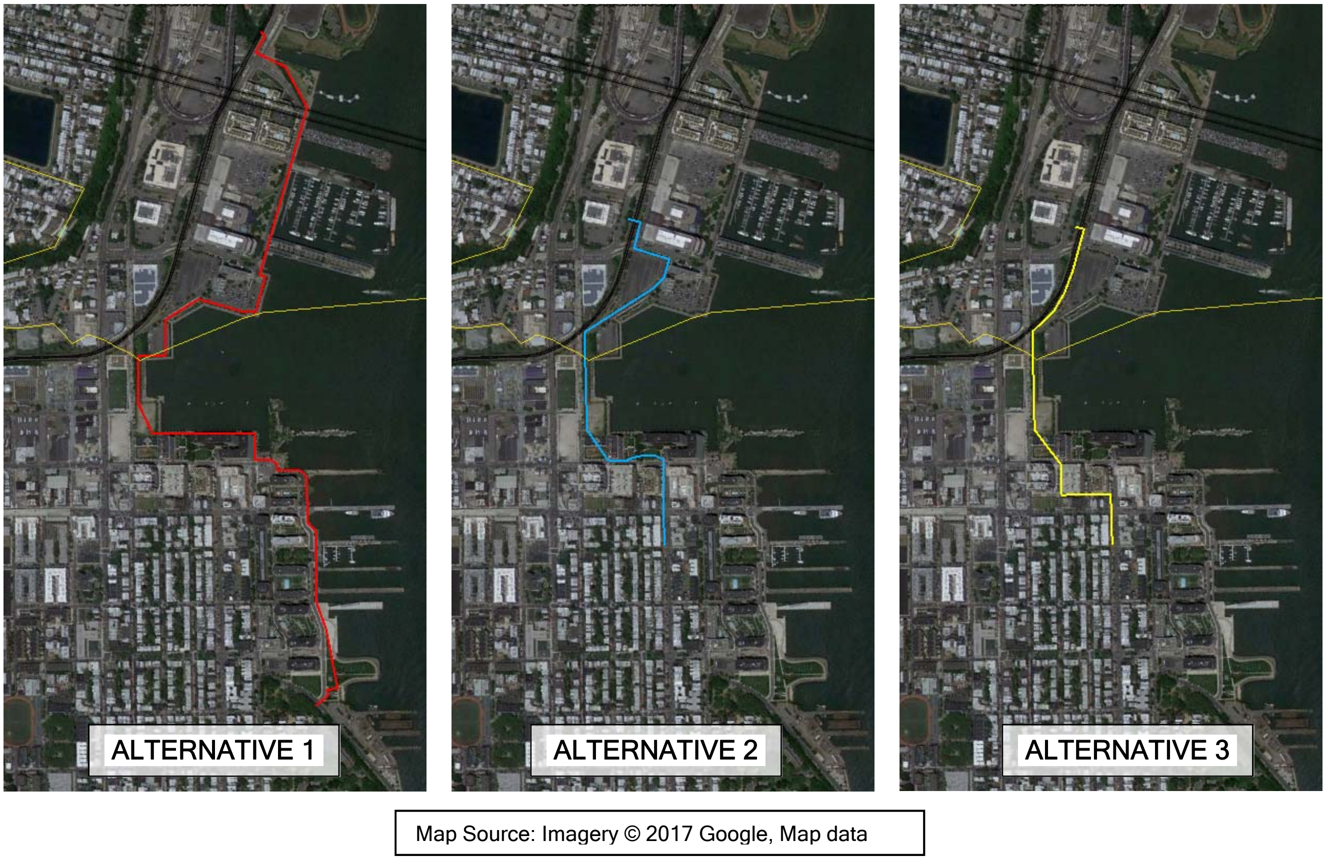


Figure 10: North Alternative Resist Structure Alignments

5.1.1 Alternative 1

The North Resist structure of Alternative 1 (Figure 14) is the most expansive and begins under the escarpment at Frank Sinatra Drive and Sinatra Drive North (**A**). A rolling flood gate crossing Frank Sinatra Drive immediately south of the intersection ties into the escarpment south of Frank Sinatra Drive. The gate would be stored north of Frank Sinatra Drive outside of the sidewalk alongside the east side of Sinatra Drive North. The flood barrier would lead north, where it would immediately host a smaller "driveway" scale rolling flood gate providing access to the Hoboken Cove Boathouse (**B**). The structure would contour down the sidewalk just north of the Boathouse toward the cove and then outboard of the sidewalk and proceed north back to Sinatra Drive North. Sloped pathways, an ADA compatible ramp, and a set of access stairs would provide pedestrian connectivity over the flood barrier to the waterfront side of Maxwell Place Park (**C**).

The flood barrier would continue alongside Sinatra Drive North atop the wharf structure outboard of the roadway, with driveway-sized rolling flood gates provided to enable access to four of the five existing piers extending into the Hudson River (**D**). Following Sinatra Drive North, the flood barrier would continue outboard of the roadway, continuing briefly alongside Shipyard Lane to 15th Street.

At this corner, a swing flood gate would be located (**E**). Just east of 15th Street's crossing of Hudson Street, the flood barrier would proceed north through the middle of the promenade located outboard of the two apartment towers at 1500 Washington Street. After passing the open space and Harborside Lofts of 1500 Garden Street, the structure would proceed diagonally across a vacant lot alongside Park Ave opposite 16th Street (**F**).

Figure 14: Alternative 1, North Resist Structure

Proceeding north alongside Park Avenue, the resist structure enters Weehawken. It turns east along the perimeter of Weehawken Cove, outboard of a parking lot, then inboard of a waterfront park, with a log gate providing access at the park's west end promenade (G).

The flood barrier encloses the parking lot immediately to the north, and continues to proceed just inboard of the promenade past a residential pier (Riva Pointe), a commercial pier (1600 Harbor Boulevard), and a parking pier. At the north end of this development cluster, the flood barrier curves to the west through a park outboard of Harbor Boulevard (H).

North of the intersection of Harbor Boulevard and Port Imperial Boulevard, the resist structure provides for a very large rolling flood gate to cross and seal off Port Imperial Boulevard. At the western edge of Port Imperial Boulevard, the flood barrier turns northeast running between Port Imperial Boulevard and the elevated HBLR tracks. As the HBLR structure descends, the flood barrier turns west under the tracks and ties into the rock of the southern end of the Palisades escarpment (I).

Alternative 1 Southeast Resist Structure

Because the ground rises significantly east of Stephens Institute of Technology, the Hudson facing resist structure of Alternative 1 is broken up into two segments.

5.1.2 Alternative 2

The Alternative 2 (Figure 15) structure begins at the northwest corner of the intersection of Washington Street and 13th Street (**A**). It proceeds north along the middle of the western sidewalk of Washington Street, an Urban Minor Collector carrying on average 10952 cars per day. This alternative is a much shorter span than Alternative 1. In order to maintain adequate space for pedestrians, the sidewalk with be expanded resulting in a narrowing of Washington Street along these two blocks. As it approaches the intersection of 14th Street, provision is made on the outboard (street) side for storage of a rolling flood gate to close off 14th Street (**B**). The length of the flood gate is such as to provide for clear movement from the sidewalks along 14th Street into the crosswalks, and thus is on the order of 75+ feet in length.

The flood barrier continues north, where at 15th Street provision is made for another rolling flood gate stored on the south side of the intersection and outboard of the flood barrier (**C**). North of the intersection, the flood barrier turns west and enters the front lawn area of the apartment towers of 1500 Washington Street. The barrier proceeds west crossing the existing walkway continuation of Bloomfield Street without provision of passage.

The flood barrier passes to the south of the Harborside Lofts in the middle of a sidewalk that has been extended well into 15th Street, physically narrowing a travel way that has already been narrowed by application of a painted shoulder treatment and shifting the centerline southward (**D**). Upon passing the Harborside Lofts, the flood barrier proceeds diagonally through Harborside Park (**E**), then continues outboard of Park Avenue until reaching Harbor Boulevard just south of the HBLR tracks, where a rolling flood gate is provided (**F**).

Figure 15: Alternative 2, North Resist Structure

The flood barrier continues along the north/west side of Harbor Boulevard, providing a small rolling flood gate to enable access to the bike trail that runs alongside the HBLR (G). Continuing farther, it provides two sizable rolling flood gates to a structured parking facility west of Harbor Boulevard and south of 19th Street (H). Then it turns west along the south side of 19th Street until reaching Waterfront Terrace.

Between Waterfront Terrace and the HBLR tracks an extensive gate structure is provided to close off 19th Street (I). At the rear (north end) of that gate storage structure, an east-west flood gate structure is provided to close off the HBLR tracks, with the gate stored west of the tracks. At this location, Lincoln Harbor Road rises in elevation upon a retained fill abutment in order to cross over Waterfront Terrace and enter a large parking deck on its third floor. The gate storage structure ties into the side of that retained-fill wall.

5.1.3 Alternative 3

The north structure of Alternative 3 (Figure 16) is similar in route to Alternative 2 but with some differences. Alternative 3 begins at the same location as Alternative 2, on the northwest corner of Washington Street and 13th Street (**A**). It has the same rolling flood gate across 14th Street and expanded sidewalk (**B**).

Continuing north on an expanded sidewalk, the flood barrier however turns west proceeding along the south side of an existing alley. In turning west, its crossing of the north-south sidewalk is accommodated by the presence of a short rolling flood gate (**C**). Continuing west, the flood barrier replaces an existing retaining wall. As it reaches the adjacent Bloomfield Street, accommodation to store a rolling flood gate to close off Bloomfield Street is made on the western side (**D**).

The flood barrier continues through the alley until reaching Garden Street, which has been purposefully terminated short of 14th Street to serve only as the entrance and exit for a parking deck to its east, reduce cutting through traffic, and facilitating pedestrian movement in this area.

Upon reaching Garden Street, the flood barrier turns immediately north running close alongside the west face of the parking. The adjoining sidewalk is widened in this area (**E**). At Garden Street and 15th Street, the alignment of the flood barrier turns diagonally northwest, crossing the intersection at 45 degrees. To accommodate this crossing, an exceptionally long rolling flood gate is provided, stored on the northwest side of the intersection (**F**).

Figure 16: Alternative 3, North Resist Structure

From here the flood barrier proceeds diagonally through Harborside Park, as does Alternative 2, continuing north alongside and under the Park Avenue Viaduct until reaching the HBLR tracks.

As with Alternative 2, a rolling flood gate is provided for the crossing of Harbor Boulevard (**G**). From this point, the flood barrier follows the HBLR tracks along their eastern side. At 19th Street, an arrangement similar to that of Alternative 2 is provided, with a rolling flood gate stored on the northwest side of the intersection and a perpendicular flood gate crossing the HBLR stored on the west side of the tracks and tying into the abutment of the Lincoln Harbor access ramp (**H**).

5.2 South Resist Structures

In the southern portion of the city and continuing into Jersey City, the three Alternatives contain different variations of the Resist structures. Some spans are similar to other alternatives, especially Alternative 3 which is a combination of Alternative 1 and Alternative 2.

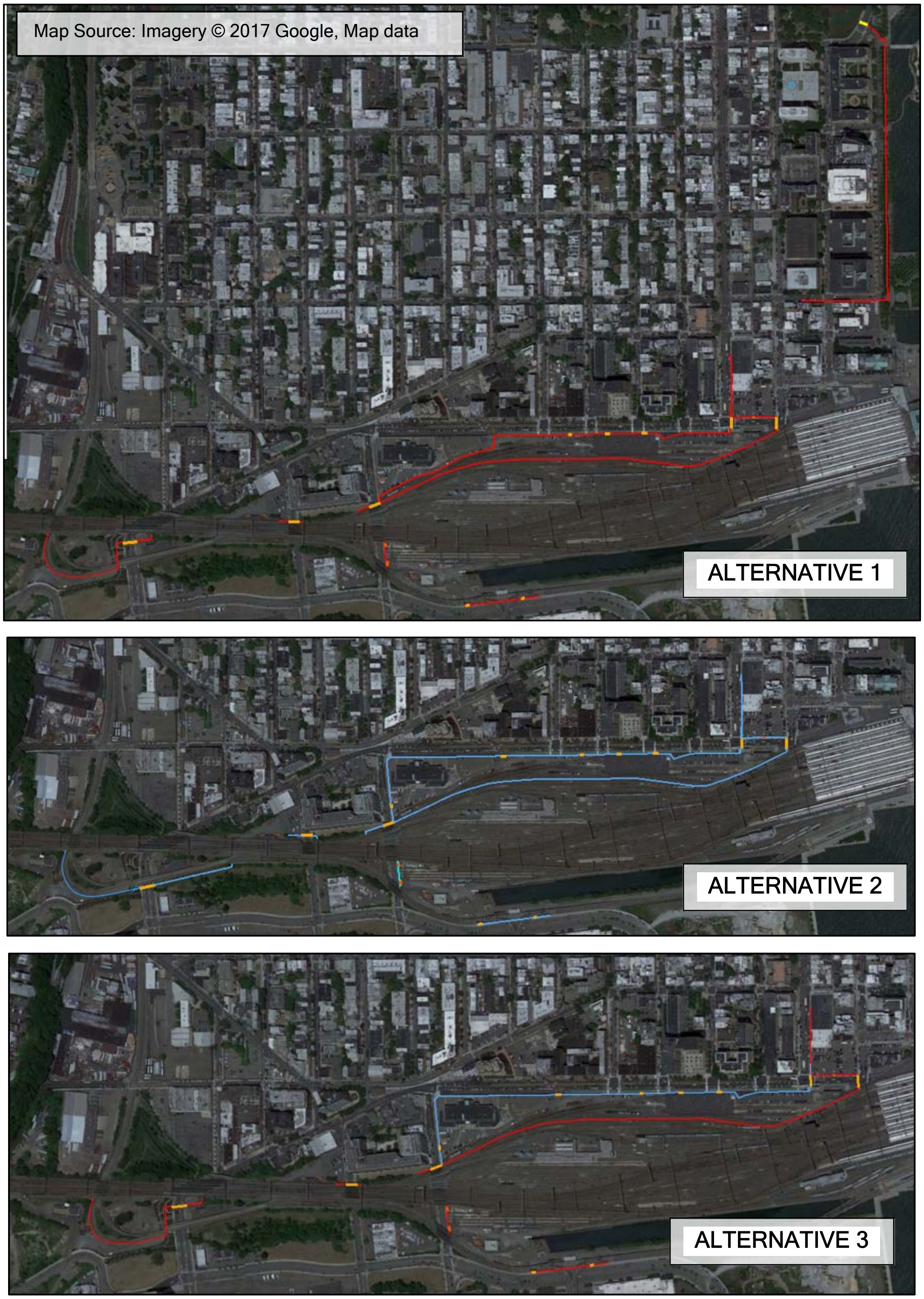


Figure 17: South Alternative Resist Structure Alignments

5.2.1 Alternative 1

Figure 18: Alternative 1 Southeast Resist Structure

Beginning at its southeast end, the resist structure consists of a deployable flood log system located on the south sidewalk of 1st Street () beginning approximately 120 feet west of River Street (**A**). During deployment, the intersections of 1st Street with River St & Sinatra Drive would be closed off.

The permanent resist structure, which has a height above adjoining surfaces of approximately 1' at the south end becoming 2.5' at the north end of the waterfront park, would be located along the landside edge of an alley of planted trees and shrubs just outboard of the wide sidewalk and curb street trees (**B**). Access across the low barrier would be afforded by frequent stairs and ramps to accommodate all users.

At the north end of the waterfront park, the resist structure would follow Sinatra Drive curving toward its intersection with Frank Sinatra Drive (**C**). A swing gate, designed to close off Frank Sinatra Drive, and normally open and secured on the east side of Frank Sinatra Drive north of the intersection would be deployed during an event. This structure is only applicable to Alternative 1.

The southernmost barrier structure is located just adjacent to Hoboken's southern border with option to construct on NJ TRANSIT property (**Figure 19**).

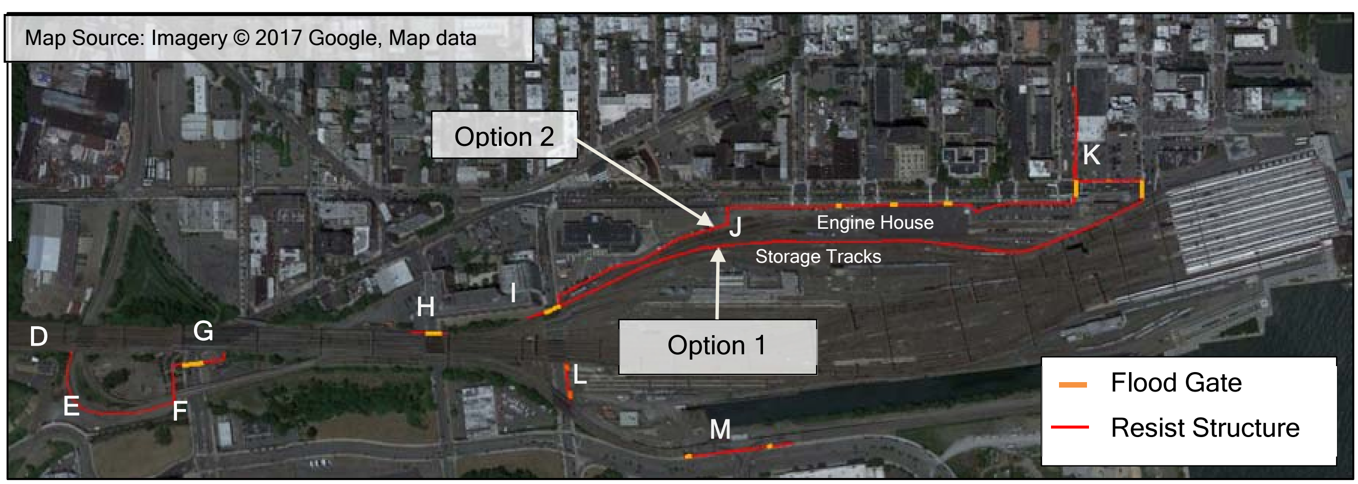


Figure 19: Alternative 1, South Resist Structure

From the west, a resist flood barrier structure ties into the NJ TRANSIT Commuter Rail east-west approach embankment west of the HBLR portal under the NJ TRANSIT approach tracks (**D**). The resist structure extends south to meet Hoboken Avenue where a small "driveway" scale rolling floodgate (**E**) provides maintenance access to the HBLR track. The flood barrier then continues directly east towards Jersey Avenue. The existing sidewalk/bike path continues from Hoboken Avenue to Jersey Avenue just south (outboard) of the resist structure.

For Alternatives 1 & 3, the resist structure extends north under the HBLR overpass and continues to the NJ TRANSIT viaduct (**F**). Prior to reaching the embankment and prior to Jersey Avenue making the turn into Newark Avenue, the structure turns east and transitions to a sliding gate closure of Jersey Avenue on the south side of the NJ TRANSIT overpass (**G**). The gate is stored on the east side of Jersey Avenue, and the storage enclosure ties into the NJ TRANSIT embankment beyond the stored position of the gate.

Because the HBLR rises up to pass over Jersey Avenue, the resist structure and adjoining bike lane are able to pass under the HBLR structure and continue northward then east to provide the west frame for a transverse rolling flood gate crossing of Jersey Avenue. The receiving frame/bulwark on the east side of Jersey Avenue continues east and ties into the NJ TRANSIT embankment. This location east of Jersey Avenue provides for the storage of the transverse gate when not in use.

The next portal in the NJ TRANSIT approach embankment is at Grove Street (**H**). At this location, for all three alternatives, the Resist structural element is located north of the NJ TRANSIT embankment and consists of a simple transverse gate, adjoining frame on both sides of the passage, storage structure for the gate when not in use and tie-ins from the frame and storage structure into the existing approach embankment.

The next location is at the under-crossing of Luis Munoz Marin Boulevard (**I**). As before, and for all three alternatives, the Resist gate is located north of the HBLR tracks, and comprises much of the same elements of the transverse gate, supporting frame, storage structure and on the west end, a tie-in into the NJ TRANSIT embankment. From this point, two optional alignments of the continuing flood barrier are proposed.

Further south down Luis Munoz Marin Boulevard, is proposed a structure to span the length between the two overhead track viaducts, just north of Eighteenth Street (**L**). Rolling gates will allow the same access for employees that exists today.

Location **M**, also present in all Alternatives, provides a resist structure on the north side of 18th Street to ameliorate the opening created by the transition of the HBLR from solid abutments to open bridge-type structure at this wye. The resist structure would tie into the two west and east abutments and would provide two driveway scale rolling flood gates

5.2.1.1 Option 1

Present in all three alternatives, the structure proceeds eastward and south of an existing retaining wall. It cuts across a number of tracks along the northern edge of the NJ TRANSIT yard and continues east approximately 30 feet south of the NJ TRANSIT Shop (off Observer Highway). The structure then dips somewhat south until just north of the NJ TRANSIT catenary structures and tracks feeding in and out of the terminal until reaching Observer Highway at its intersection with the west side of Hudson Street. There, it turns directly north and terminates in a north/south gate crossing of Observer Highway just west of Hudson Street. The gate is stored along the west side of the sidewalk along Hudson Street, north of Observer Highway.

At their east end, both Options 1 and 2 share a flood barrier located along the north side of Observer Highway between Hudson Street and Washington Street, inside (north) of the existing sidewalk and along the southern property line of the existing parking lot. Upon reaching Washington Street, this flood barrier continues northward, outside (east) of the eastern sidewalk. However, as the flood barrier proceeds north a distance of approximately 280 feet (K), it shifts away from the current edge of the sidewalk to essentially provide a passage east of the barrier between the barrier and the western edge of the existing buildings (a commercial space at the south end and the southern 35 or so feet of the CVS at its northern end). To accommodate the gate and its storage alongside Washington Street, the roadbed of Washington Street will be narrowed and the adjoining east sidewalk widened. The current configuration of parking alongside both west and east sides of Washington Street will be maintained, and its current de facto single-lane operation will be maintained, but with slightly narrowed lanes. The three southernmost parking spaces on the southbound side will be removed to provide for needed separate right turn and left turn bays.

5.2.1.2 Option 2

Under Option 2 the structure continues slightly farther north than Option 1 (~30’) then proceeds east along the current southern edge of the parking lot of the NJ TRANSIT Maintenance of Way facility (Observer Highway). It follows the property line of the parking lot turning northward at its eastern exit until it reaches the south edge of Observer Highway, whereupon it turns east and follows the highway. Before reaching the aforementioned NJ TRANSIT Shop, a “driveway” scale rolling flood gate is provided to enable access to the parking lot west of the shop. Upon reaching the transit shop the flood barrier jogs outward to accommodate the shop (J), and across its front, two driveway size rolling flood gates allow access to existing doorways in and out of the shop onto Observer Highway. East of the shop, the flood barrier follows the existing fence line then turns northeast to form a terminus at the southeast edge of Observer Highway at its intersection with Washington Street. Crossing Observer Highway is the location for a transverse flood gate which is stored north of Observer Highway and east of the sidewalk along the east side of Washington Street.

Option 2, presented also in Alternative 3 continues north from the flood gate crossing Luis Munoz Marin Boulevard along the fence line until reaching Observer Highway. It proceeds east along the southern existing fence line past the NJ operations facility (excluding it from the zone of protection). A rolling flood gate is provided across the driveway east of the operations facility. It then proceeds east past the NJ TRANSIT shop until terminating at Observer Highway and Washington Street, where a flood gate stored north of Observer Highway provides a closure of Washington Street.

At the east end, as mentioned in Option 1, the flood barrier continues along the north side of Observer Highway between Hudson Street and Washington Street (K). See Option 1 for further details.

5.2.2 Alternative 2

With the exception of Location F, Location G and Option 2, Alternative 2 is nearly identical to the southernmost barrier structures in Alternative 1 (Locations D,E, H, I, K, L, M, Option 1:J). Crossing Jersey Avenue, the Resist structure will provide a gate (stored on the east side of Jersey Avenue) south of the structure carrying the HBLR (F). It continues east with a flood barrier along the south side of the structure conveying the HBLR (G) until that structure transitions to the embankment also carrying the commuter rail tracks; whereupon the flood barrier turns north and ties into the embankment. See Figure 20 below.

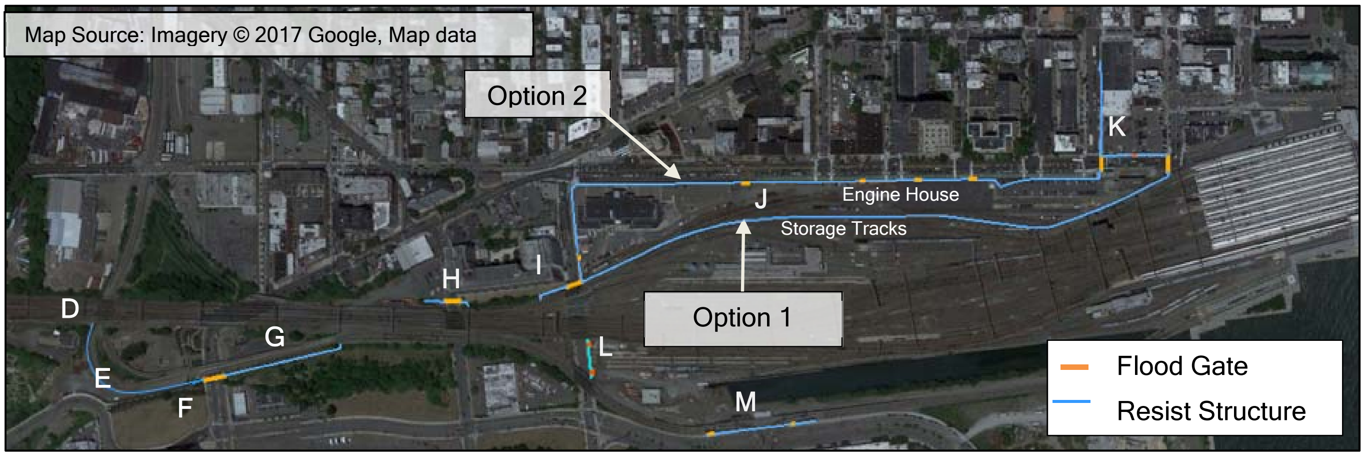


Figure 20: Alternative 2, South Resist Structure

5.2.2.1 Option 1

See Alternative 1, Option 1.

5.2.2.2 Option 2

Option 2, presented in Alternatives 2 and 3 continues north from the flood gate crossing Luis Munoz Marin Boulevard along the fence line until reaching Observer Highway. It proceeds east along the southern existing fence line (J) past the NJ TRANSIT operations facility (excluding it from the zone of protection). A rolling flood gate is provided across the driveway east of the operations facility. It then proceeds east past the NJ TRANSIT shop, with the same rolling flood gates until terminating at Observer Highway and Washington Street, where a flood gate stored north of Observer Highway provides a closure of Washington Street.

5.2.3 Alternative 3

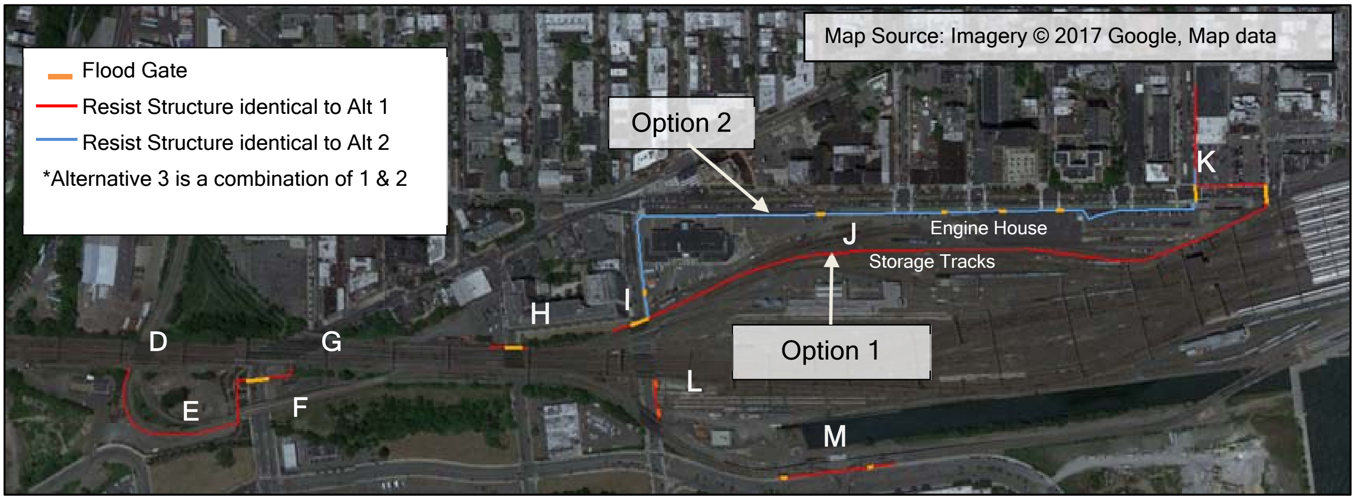


Figure 21: Alternative 3, South Resist Structure

The south Resist structures for Alternative 3 are the same as those for southernmost structures in Alternative 1 at (Locations D-I, K-M) with the exception of Option 2 which is the same as Alternative 2, Option 2.

5.2.3.1 Option 1

See Alternative 1, Option 1.

5.2.3.2 Option 2

See Alternative 2, Option 2.

6.0 CIRCULATION CONSIDERATIONS

In general, the northern streets of Hoboken experience better flowing traffic according to recorded levels of service data. Of the areas studied, the southern ingress/egress routes experience the worst levels of service. The most extreme concentration of pedestrians is within the vicinity of Hoboken Terminal at the very southeast area of the city. Intersections in this location can experience over 3,000 pedestrians per hour. Hoboken, in general, has high levels of pedestrians, however the levels disperse throughout the city. Waterfront areas and adjacent intersections can see up to 500 pedestrians per hour. Levels typically drop below 100 pedestrians per hour towards the vehicular ingress and egress routes of the city. In general, cyclists traveling pedestrian routes can mostly be found closer to the vehicular ingress and egress routes, with volumes of at most 20 cyclist crossings per hour.

As mentioned in the regional access portion of this report, Hoboken has a limited number of means of ingress and egress. As construction closures and restrictions occur in these areas, movements, especially during peak hours, will require ample signage and guidance to move as safely and efficiently as possible throughout the transportation system. Special consideration should be taken for these movements during the construction process.

7.0 CONSTRUCTION IMPACTS OF THE RESIST STRUCTURES

The location of the resist flood barriers and gates are for the most part relatively adjacent to buildings and streets. These areas principally are sidewalks and the edges of streets. This construction can produce considerable inconvenience for residents and owners with regard to pedestrian and vehicular access. It is noted that the intervening streets, which are the cause and need for gates, break up the construction work into segments which may serve to contain the effort and localize the effects of closures.

It would be a reasonable expectation that to construct a resist structure within a sidewalk area, that for the duration of construction, all adjacent parking, sidewalks, and bicycle lanes will have to be closed off, with one or more lanes occupied by construction equipment, trucks, etc. All efforts will be made to limit the interruption of vehicle traffic, including use of alleyways and working with property owners such as NJ TRANSIT. Any work adjacent to NJ TRANSIT tracks will be coordinated and carefully staged and may necessitate off-hours and night work to avoid disruption to the facility.

Figure 22 depicts, within the pink perimeter, the limits of the primary study area of anticipated impacts due to detours during construction. To the south, it is bounded by 18th Street below and Observer Highway (West) and Newark Street (East), then First Street above.

On the east it extends to the pedestrian, and bicycling areas of the waterfront, excluding the piers, while the interior limit is generally the west side of Hudson Street. At the north end of Hoboken, this area expands to include Washington Street then Willow Ave north of 12th Street.

Continuing into Weehawken, it follows Willow Ave up to its feet into the Holland Tunnel, then shifts east to JFK Blvd E, then includes Baldwin Avenue and Port Imperial Boulevard in the vicinity of the construction.

Once construction is complete, flood gates will remain in the open position until a flood event occurs. Motorist and bicycle traffic as well as public transit will continue to flow as it did before construction. Modifications to waterfront pedestrian and recreational space will be altered, however all amenities will remain accessible.

The following sections provide an assessment of the various detour options to accommodate the in-street construction of the different alternative roadway crossings.

Figure 22: Study Area for Assessment of Construction Impacts of the Resist Alternatives

7.1 Alternative 1
Alternative 1- North Waterfront Structure

7.1.1 Frank Sinatra Drive (North Side heading north)

This Frank Sinatra Drive crossing (Location A in Figure 14) will be a southward sliding gate stored on the north corner at the north end of the road where it T-intersects with Sinatra Drive North (see Figure 23). This installation is only proposed under Alternative 1. Frank Sinatra Drive is a two-lane Major Collector road with sidewalks on both sides and adjacent parking on both sides. It intersects with Sinatra Drive North which is a one-way southbound road with a right turn only restriction. Frank Sinatra Drive carries approximately 650 vehicles during peak hour, and it is one of the main roads used to access waterfront attractions.

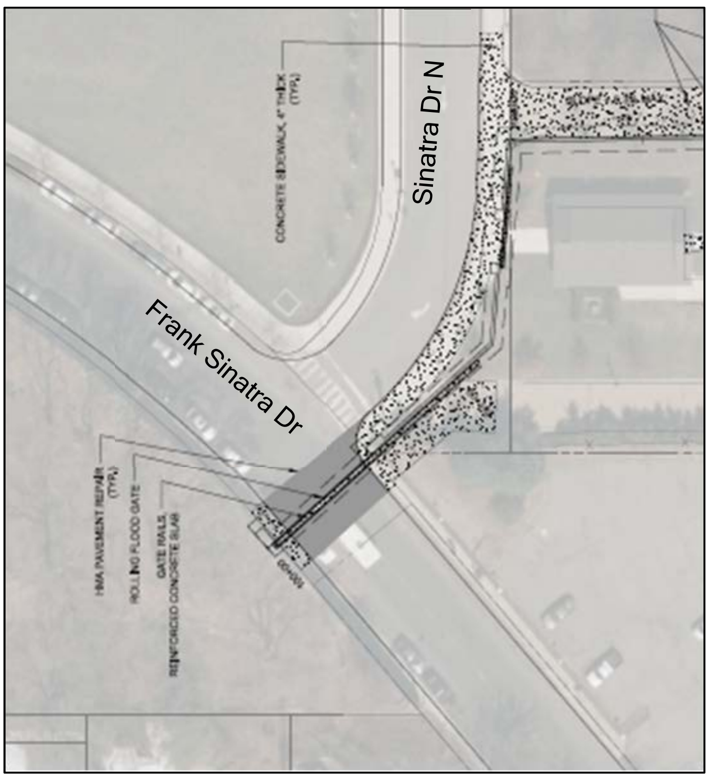


Figure 23: Frank Sinatra Drive (North) Flood Gate

7.1.1.1 Motorists Impacts

During construction, most of Frank Sinatra Drive can only be accessed from either 4th Street or 5th Street. Traffic attempting to reach attractions such as Castle Point or Maxwell Place Park will have to enter on the south side and travel north on Frank Sinatra Drive. Traffic exiting the waterfront facilities that would typically exit north would be diverted southbound towards their original entrance point. See Figure 24 for visual aid. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

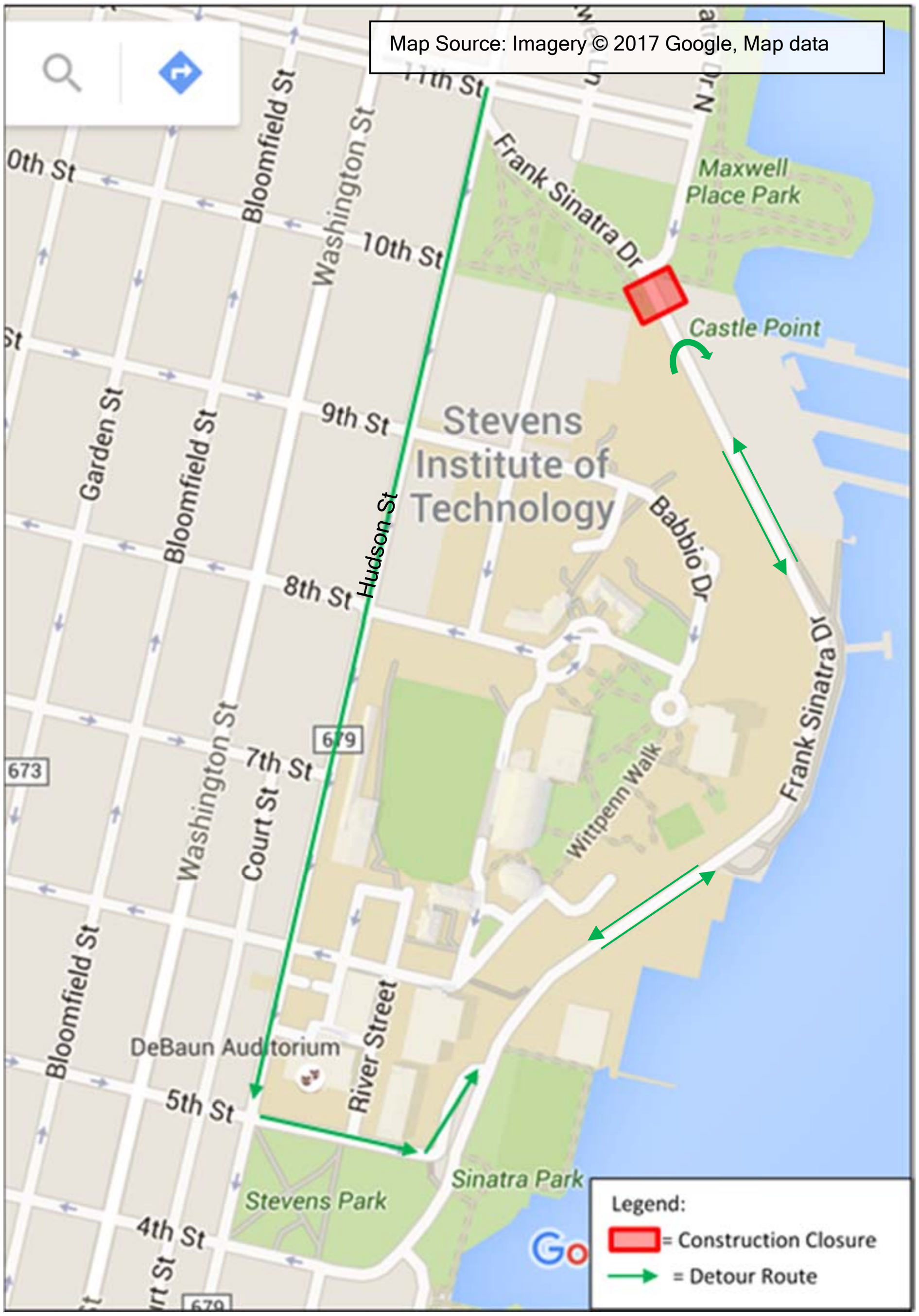


Figure 24: Frank Sinatra Drive (South) Construction Detour Map

7.1.1.2 Pedestrian Impacts

The west side of the area of impact is lined by a 12' retaining wall, and the east side is lined by fenced private property. In the event of a full intersection closure, pedestrians wishing to travel through the construction closure will be instructed to take the same detour as vehicles.

7.1.1.3 Cyclist Impacts

Bicyclists should follow the same detour route as motorists and pedestrians.

7.1.1.4 Bus Transit Impacts

The closure interferes with bus transit route, however does not interfere with any bus stops. There are no bus stops on Frank Sinatra Drive north of 4th Street. Bus route can easily be routed to Hudson Street, similar to the vehicle and pedestrian detours.

7.1.1.5 Rail Impacts

There will be no impacts to the NJ TRANSIT Rail system during construction.

7.1.1.6 Ferry Impacts

There will be no impacts to Hoboken ferry at this closure.

7.1.2 Maxwell Place Park

After crossing Sinatra Drive North(Location C in Figure 14), the structure will enter Maxwell Place Park along the walkway just north of Hoboken Cove Boathouse, then turn north following the path of the existing walkway inside the park (Location B in Figure 14). The structure will then continue north along the path of existing raised concrete barriers currently in place to discourage vehicles from entering the paved recreational area. See Figure 25 below.

Figure 25: Maxwell Place Park Flood Barrier

7.1.2.1 Motorist Impacts

There will be no impact to motorists during construction

7.1.2.2 Pedestrian Impacts

During construction pedestrian access to Hoboken Cove Boathouse, Maxwell Place Park, adjacent paved pedestrian recreational area and pier at 12th Street will be prohibited. Pedestrians traveling the waterfront will need to use the western sidewalk of Sinatra Drive North.

7.1.2.3 Cyclist Impacts

Bicyclists would be advised to use increased caution as shoulder widths may be narrowed or eliminated.

7.1.2.4 Bus Transit Impacts

There will no impact to bus transit during construction.

7.1.2.5 Rail Impacts

There will be no impacts to the NJ TRANSIT Rail system during construction.

7.1.2.6 Ferry Impacts

There will be no impacts to Hoboken ferry at this closure.

7.1.3 Pier Access

Between 12th Street and 14th Street (Location D in Figure 14) four driveway-sized rolling flood gates accessing existing piers will be constructed along the waterfront structure.

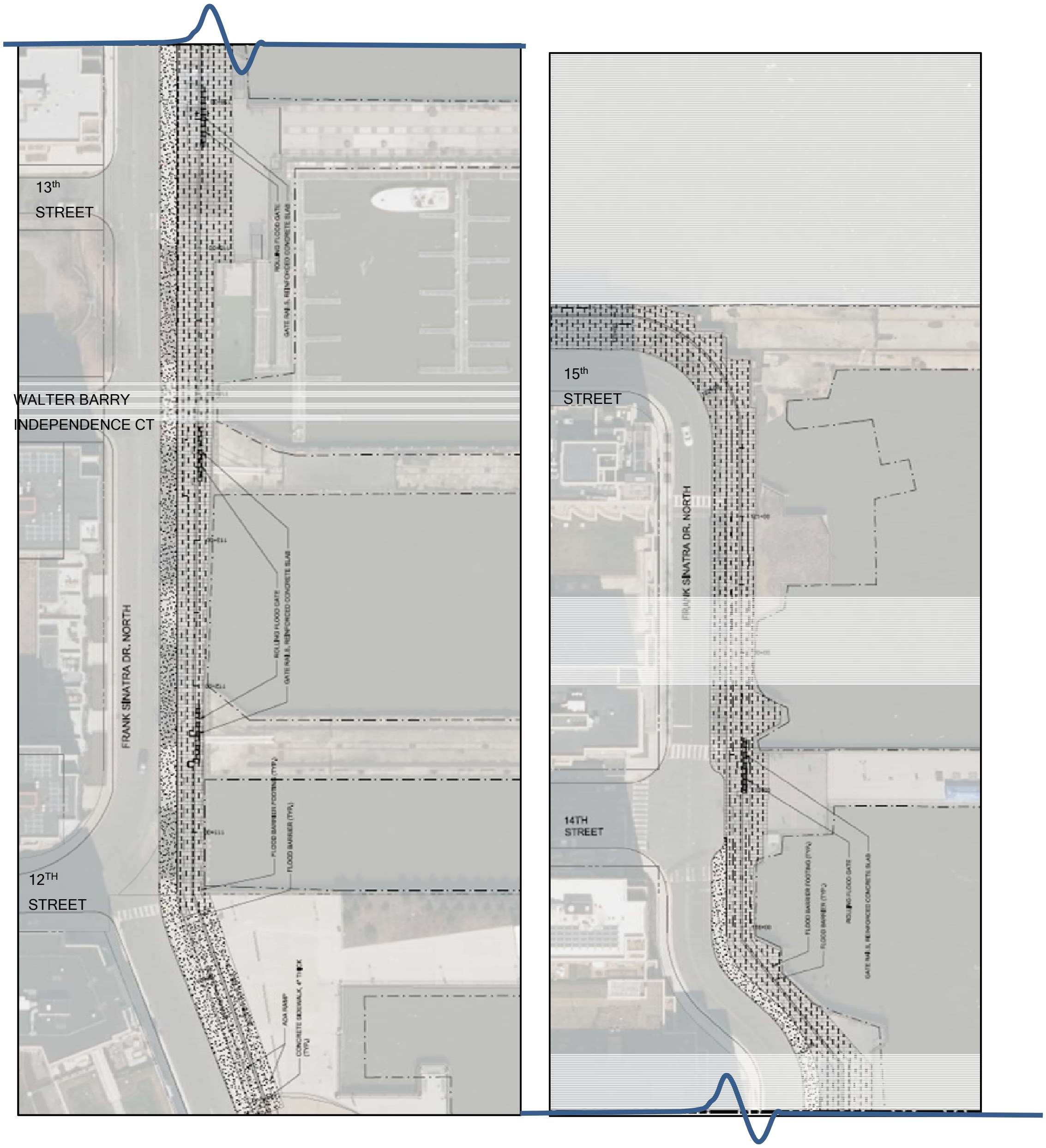


Figure 26: Pier Access Flood Gates

7.1.3.1 Motorist Impacts

Lane closures along Sinatra drive will be very unlikely as there is an approximate width of 30' of closed off recreational space for construction vehicles to occupy.

7.1.3.2 Pedestrian Impacts

During construction, pedestrians wishing to travel the waterfront will need to travel along the western side of Sinatra Drive North, as use of the recreational space and adjacent sidewalk will be prohibited. Pedestrians will be routed to the inboard sidewalk by either a flagger or signage at the approaching crosswalks.

7.1.3.3 Cyclist Impacts

Bicyclists would be advised to use increased caution as shoulder widths may be narrowed or eliminated.

7.1.3.4 Bus Transit Impacts

There will no impact to bus transit during construction.

7.1.3.5 Rail Impacts

There will be no impacts to the NJ TRANSIT Rail system during construction.

7.1.3.6 Ferry Impacts

During construction access to 14th Street Ferry will remain operational with localized detours. Pedestrian access will be part of the construction plan and may vary according to the stage of construction.

7.1.4 15th Street at Shipyard Lane

A diagonal swinging floodgate will be constructed just northwest of the intersection at 15th Street and Shipyard Lane (Location E in Figure 14). The gate will be constructed across an unoccupied lot adjacent to the intersection. See Figure 27 below.

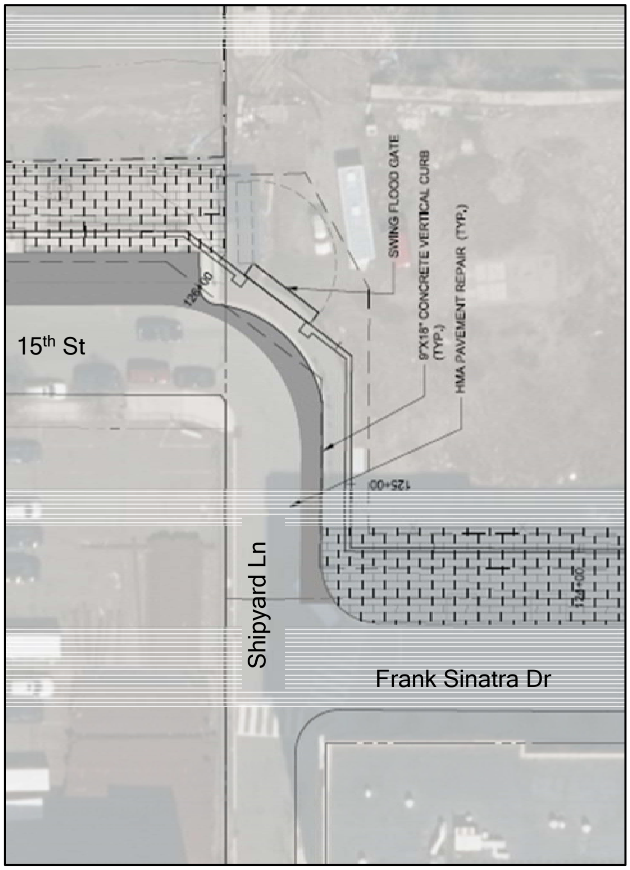


Figure 27: North End Waterfront Closure Flood Gate

7.1.4.1 Motorist Impacts

During construction of the floodgate, lane closure should not be necessary as construction vehicles and activates will have ample space to occupy within the lot.

7.1.4.2 Pedestrian Impacts

Pedestrian access to waterfront recreational areas and adjacent sidewalks will be prohibited. Sidewalks will remain open inboard of the roadway. Pedestrians will be routed to the inboard sidewalk by either a flagger or signage at the approaching crosswalks.

7.1.4.3 Cyclist Impacts

Bicyclists would be advised to use increased caution as shoulder widths may be narrowed or eliminated.

7.1.4.4 Bus Transit Impacts

Bus service will not be affected.

7.1.4.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.1.4.6 Ferry Impacts

Ferry service will not be affected.

7.1.5 North End Waterfront Cove Closure

At the northeast end of Hoboken, the flood gate will follow the waterfront pedestrian recreational walkway, cutting diagonally across a vacant lot just north of Harborside Park (Location F in Figure 14). See Figure 28 below for detail.

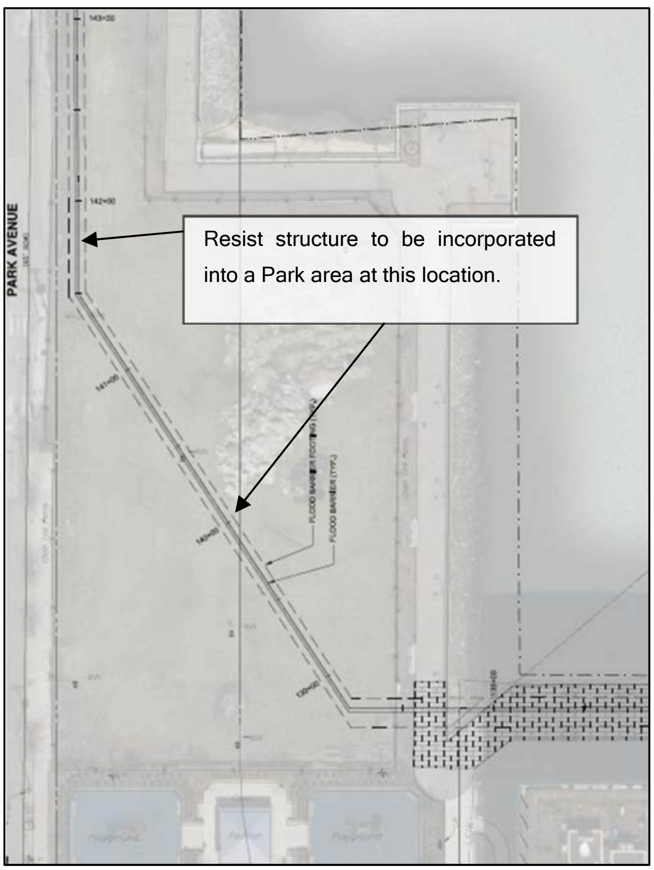


Figure 28: North End Waterfront Closure

7.1.5.1 Motorist Impacts

There will no impact on motorist activity during construction.

7.1.5.2 Pedestrian Impacts

The construction process will only affect pedestrian activity along the waterfront walkway. Contractors will be required to make every effort to incorporate pedestrian access though the area into their construction plan. A detour completely avoiding this waterfront area would cause an extensively long alternative route for pedestrians.

7.1.5.3 Cyclist Impacts

Bicyclists traveling the waterfront route should follow the pedestrian detour. Bicyclists traveling the roadway will not be impacted.

7.1.5.4 Bus Transit Impacts

There will be in impact on bus transit.

7.1.5.5 Rail Impacts

There will be no impact on NJ TRANSIT Rail system.

7.1.5.6 Ferry Impacts

Ferry service will not be affected.

7.1.6 Harbor Boulevard Waterfront Access

Along the Weehawken segment of the structure, gates will provide access at the promenade pedestrian entrance (Location G in Figure 14) and at each pier.

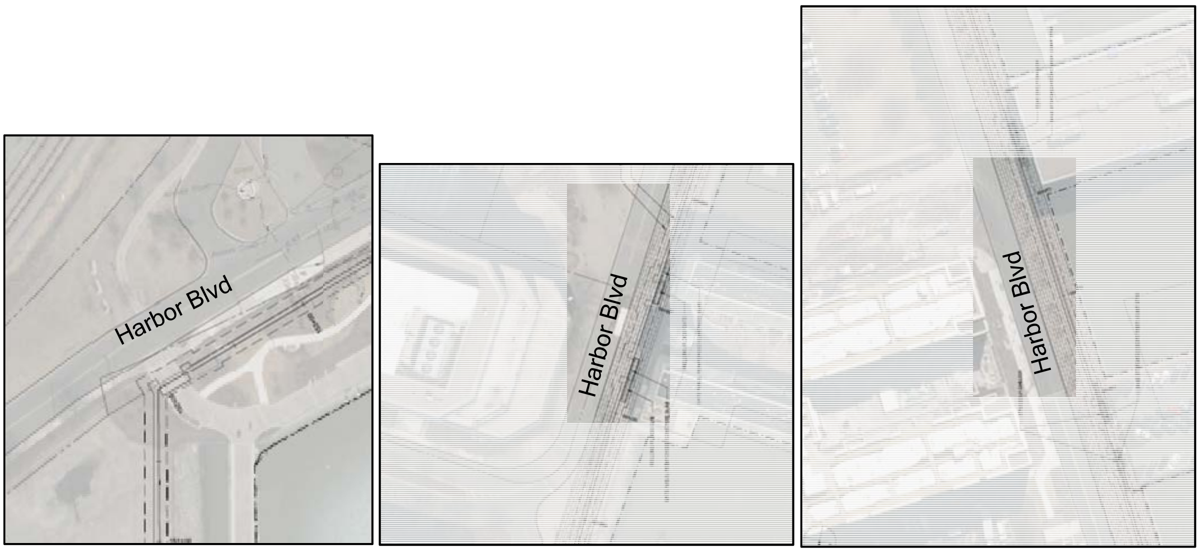


Figure 29: Harbor Boulevard Waterfront Access Flood Gates

7.1.6.1 Motorist Impacts

Access to parking garages at waterfront properties may be temporarily suspended. Contractor will be required to make all efforts to provide access to at least one parking garage at all times.

7.1.6.2 Pedestrian Impacts

During construction of the pedestrian gate providing access to Harbor Path, pedestrian crossings will be routed further east on Harbor Boulevard.

During construction at the waterfront, construction activity will be contained within the waterfront recreational areas and adjacent walkway. Pedestrian access to these waterfront areas will be prohibited, with the exception of residential access. Sidewalks will remain open inboard of the roadway. Pedestrians will be routed to the inboard sidewalk by either a flagger or signage at the approaching crosswalks. Safe pedestrian access to waterfront residences will be provided by contractor at all times.

7.1.6.3 Cyclist Impacts

Bicyclists traveling the waterfront route should follow the pedestrian detour. Bicyclists traveling the roadway will not be impacted.

7.1.6.4 Bus Transit Impacts

There is a bus stop on Harbor Blvd that will need to be temporarily relocated to the intersection just north of the closure or suspended. If relocated, the bus route may follow the same detour as motorists.

7.1.6.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.1.6.6 Ferry Impacts

Ferry service will not be affected.

7.1.7 Port Imperial Boulevard at Harbor Boulevard/Baldwin Avenue

This crossing (Location I on Figure 14) consists of a sliding barrier (northbound side) as well as a swinging barrier (southbound side). The barrier runs along the north side of the intersection before turning to run in the east-west direction (see **Error! Reference source not found.** below). Port Imperial Boulevard at this location is a four-lane road (two lanes each direction) with a large 25-foot median. At this intersection the road widens to a three-lane approach (shared through and right, through only, and left only). It has sidewalks on both sides and runs parallel to the overhead NJ HBLR train tracks. Port Imperial Boulevard gives access to waterfront condominiums, parks and the Lincoln Harbor Light Rail Station and is fairly landlocked due to the train tracks that run parallel on the west side. It carries approximately 1,800 vehicles during peak hour.

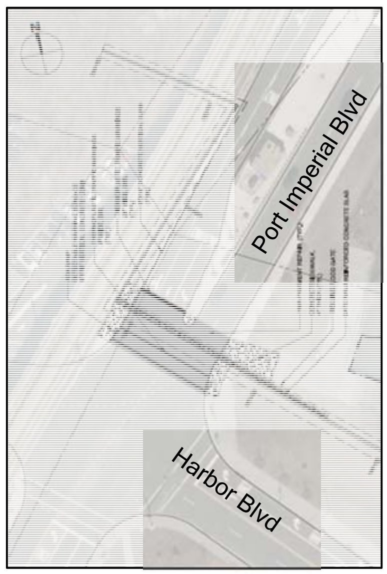


Figure 30: Port Imperial Boulevard Flood Gate

7.1.7.1 Motorist Impacts

On both sides of the roadway, including under the HBLR tracks, there is ample room for construction vehicles and activities. In the event of a full closure, the southern access to Port Imperial Boulevard will be closed, thus detouring traffic to JF Kennedy Boulevard via either Baldwin Avenue or Pershing Road. Due to the limited access to Port Imperial Boulevard, detours will be extensive. Night construction would be recommended. Detour roads that will be utilized during construction can be found in Figure 31. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

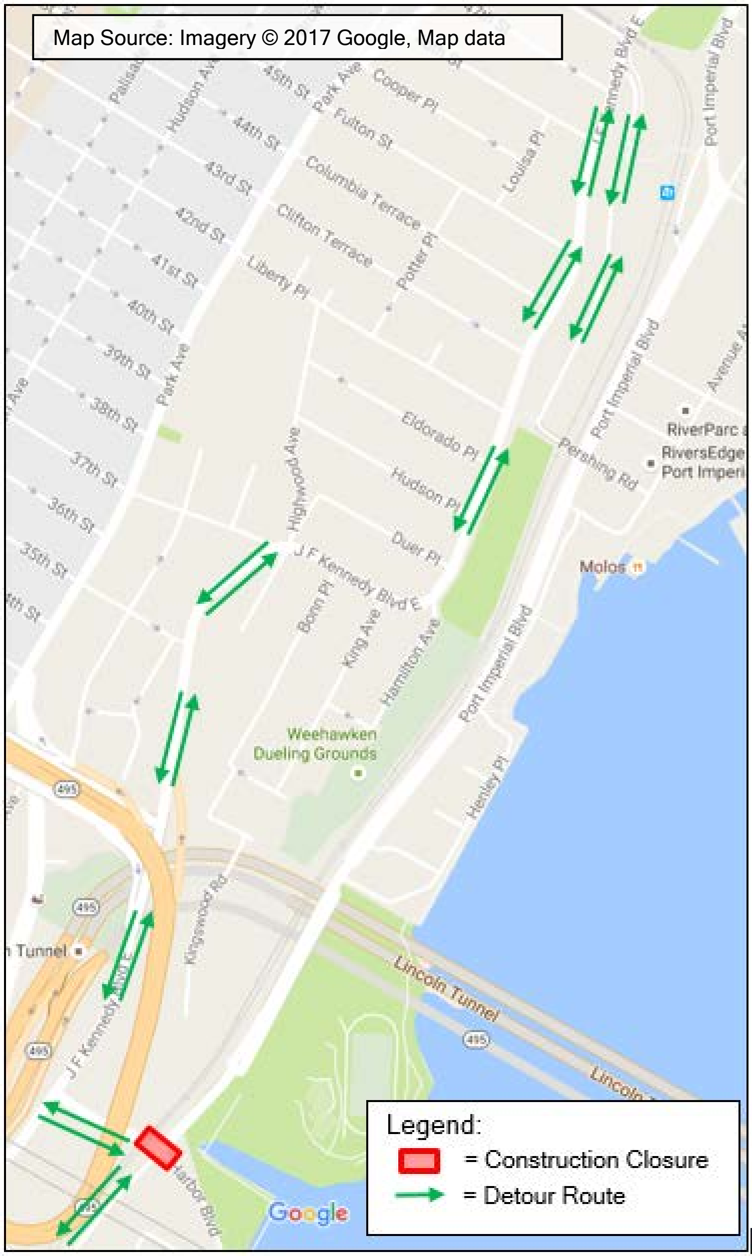


Figure 31: Port Imperial Boulevard Construction Detour Map

7.1.7.2 Pedestrian Impacts

In the event of a full closure, pedestrians should follow the same detour as motorists.

7.1.7.3 Cyclist Impacts

In the event of a full closure, bicyclists should follow the same detour as motorists.

7.1.7.4 Bus Transit Impacts

The intersection closure effects an NJ TRANSIT bus route, but does not interfere with any bus stops. The bus can be re-routed the same detour as motorists.

7.1.7.5 Rail Impacts

Closure will not affect NJ TRANSIT Rail activities.

7.1.7.6 Ferry Impacts

Closure will not affect ferry activates.

ALTERNATIVE 1- SOUTH RESIST STRUCTURE

7.1.8 Frank Sinatra Drive (4th Street)

The proposed Alternative 1 barrier crosses Frank Sinatra Drive near where it intersects with the one-way Sinatra Drive as shown in Figure 32 below. In this area (Location C in **Error! Reference source not found.**), Frank Sinatra Drive is a main road fronting waterfront attractions (parks, piers, and walkways). Frank Sinatra Drive is a two-lane Major Urban Collector with sidewalks on both sides and a bike lane on the southbound side. It carries approximately 650 vehicles during peak hour.

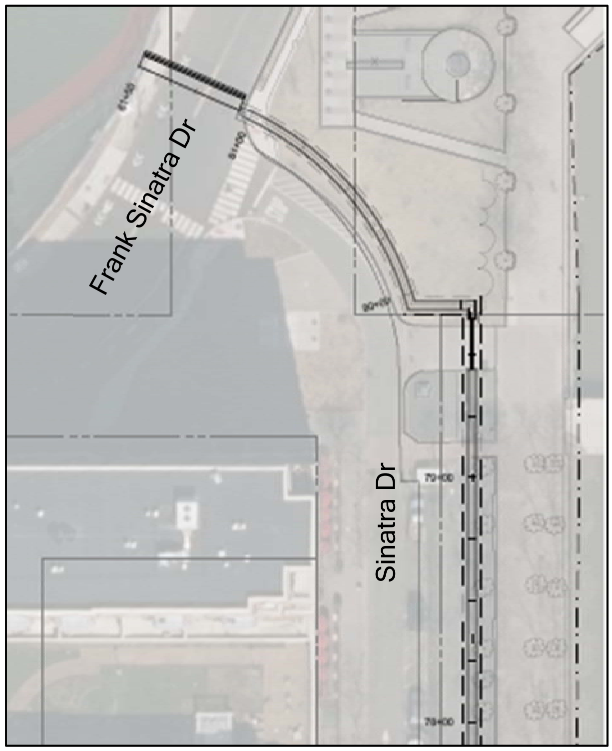


Figure 32: Frank Sinatra Drive (South) Flood Gate

7.1.8.1 Motorist Impacts

During construction, Frank Sinatra Drive will become mainly a northbound route due to limited access to the road. The only southbound traffic will be the vehicles that are destined to one of the waterfront attractions before the barrier crossing, and upon exiting will be forced to return north in order to reach the rest of Hoboken. Southbound through traffic will be detoured to Hudson Street (one-way southbound) via 11th Street. Northbound traffic will be detoured north to 5th Street (one-way eastbound) via Washington Street in order to access Frank Sinatra Drive. Detour roads that will be utilized during construction can be found in Figure 33. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

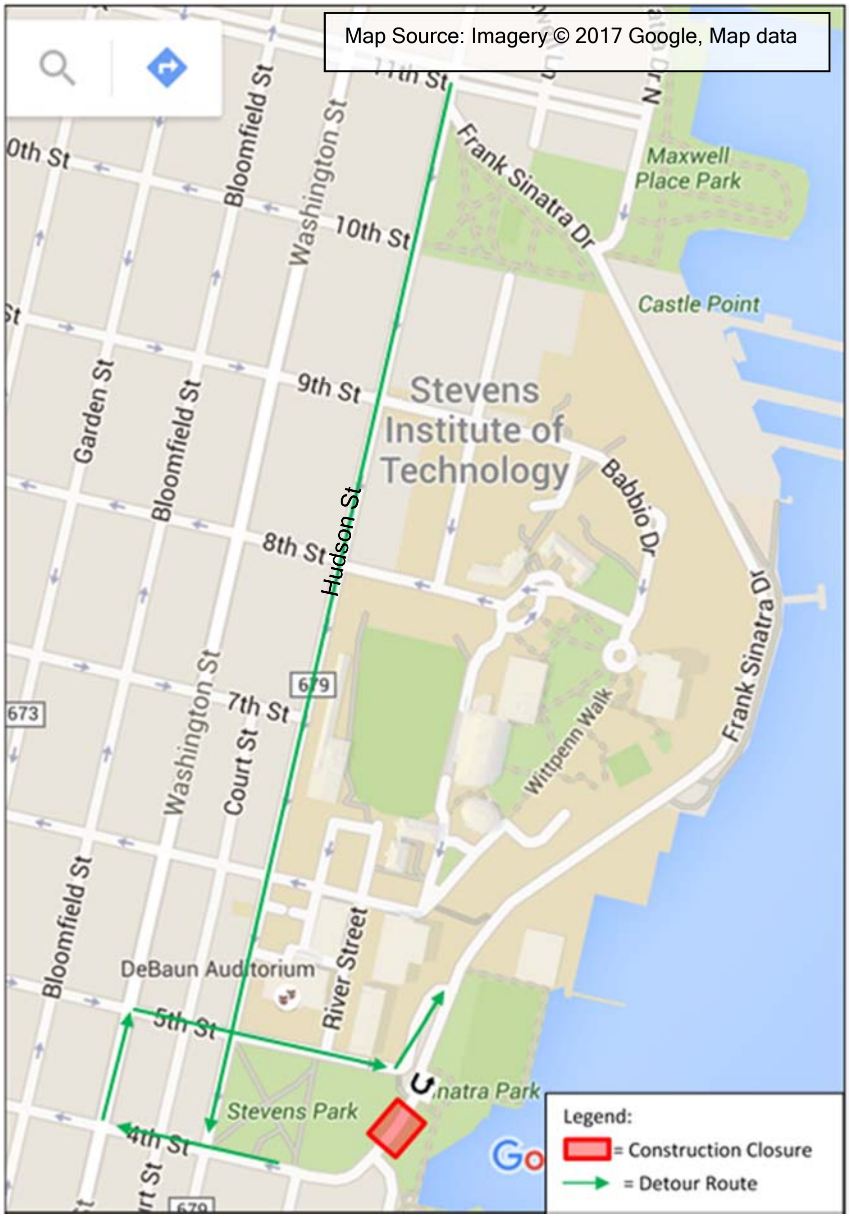


Figure 33: Frank Sinatra Drive (South) Construction Detour Map

7.1.8.2 Pedestrian Impacts

Pedestrians may utilize public waterfront park space east of the closure as a safe detour route.

7.1.8.3 Cyclist Impacts

Bicyclists may utilize public waterfront park space east of the closure as a safe detour route.

7.1.8.4 Bus Transit Impacts

NJ TRANSIT bus route will be affected but bus stops will not. The bus route may follow the same detour route as motorists without affecting bus stops.

7.1.8.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.1.8.6 Ferry Impacts

Ferry service will not be affected.

7.1.9 1st Street (Sidewalk), River Street Crossing and Frank Sinatra Drive Crossing

1st Street has a proposed Alternative 1 deployable flood barrier that runs parallel to the south side of the road along the sidewalk area (Location A in **Error! Reference source not found.**). The barrier begins approximately 140 feet west of River Street and travels east, crossing River Street and Frank Sinatra Drive and continuing north along the waterfront as shown in **Error! Reference source not found.** below. This barrier location is only proposed in Alternative 1. 1st Street is a one-way eastbound Major Urban Collector with both sidewalks and parking on each side. 1st Street carries an Average Annual Daily Traffic (AADT) of 4,400 vehicles per day.

River Street is a two-lane Major Collector road with both sidewalks and parking on either side. It carries approximately 800 vehicles during peak hour.

In this location (Figure 34 below), Frank Sinatra Drive (between Newark Street and 2nd Street) is a very minor one-way northbound road with sidewalks on both sides and parking on the east side. The majority of the vehicular use is for parking for the waterfront park and bicycle path that runs parallel to Frank Sinatra Drive. It carries approximately 80 vehicles during peak hour; congestion in this area is mainly due to pedestrians and bicyclists.

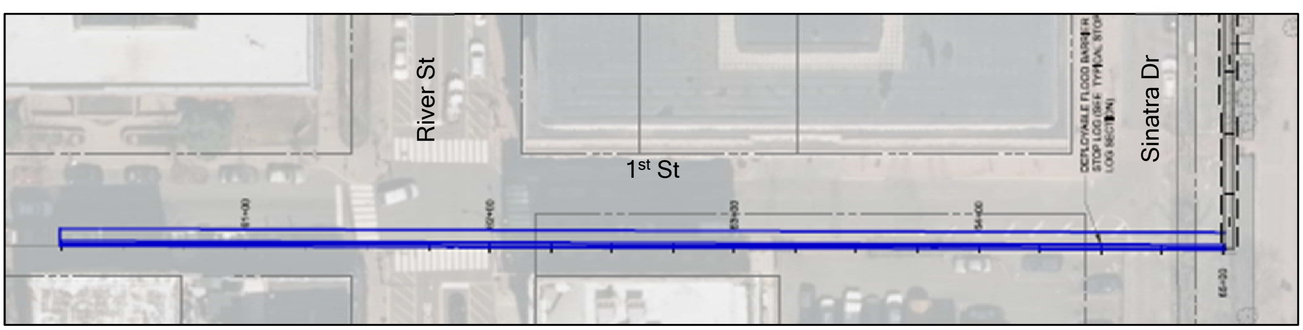


Figure 34: 1st Street Flood Gates

7.1.9.1 Motorist Impacts

Since 1st Street is a one-way street with parking, full closure should not be expected. However, due to the narrow width of Frank Sinatra Drive, full closure will be likely. If full closure of 1st Street is necessary between Hudson Street and Frank Sinatra Drive, traffic will need to be detoured around the barrier location by utilizing Newark Street, Hudson Street, Washington Street, 2nd Street and 3rd Street. Because Newark Street is one-way westbound, Hudson Street is one-way southbound, and 2nd Street is one-way westbound, traffic will need to utilize more distant roads such as 3rd Street and Washington Street in order to reach their destination. Figure 35 shows the detour roads that will be utilized during construction. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

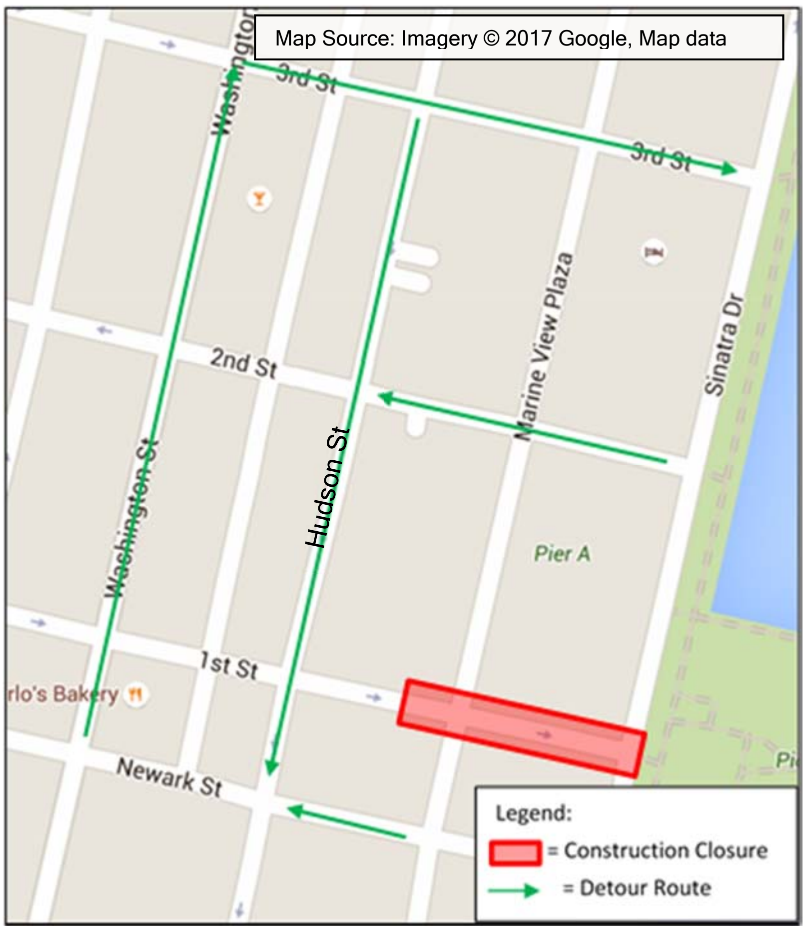


Figure 35: 1st Street Construction Detour Map

7.1.9.2 Pedestrian Impacts

Pedestrians will be directed to use the same detour route as motorists.

7.1.9.3 Cyclist Impacts

Bicyclists will be directed to use the same detour route as motorists and pedestrians.

7.1.9.4 Bus Transit Impacts

NJ TRANSIT and Hoboken Hop green, green, and red line bus routes will need to be detoured in order to avoid the closure, however, the closure does not affect any bus stops.

7.1.9.5 Rail Impacts

Closure will not affect NJ TRANSIT Rail activities.

7.1.9.6 Ferry Impacts

Closure will not affect ferry activities.

7.1.10 Jersey Avenue

The Jersey Avenue crossing (Location G in **Figure 19**) is proposed under all three alternatives. The proposed barrier runs in close proximity to the overhead NJ TRANSIT railroad. At this location, Jersey Avenue contains sidewalks on both sides of the road and intersects with Eighteenth Street on the south side of the railroad tracks approximately 300 feet from the proposed barrier location in Alternatives 1 and 3 and approximately 180 feet from the proposed barrier location in Alternative 2. At this intersection, Jersey Avenue transitions to a four-lane approach, a left exclusive, two through lanes, and a right exclusive. Adjacent to the southbound lane exists a bike lane that will be permanently slightly shifted in order to allow bicycle access through the gate opening when it is in its open position.

Jersey Avenue carries approximately 1,800 vehicles during peak hour at this location and is one of the main access points to and from Hoboken on the south side. To the north of the crossing, Newark Street/Jersey Avenue and Harrison Street is a stop-controlled intersection operating at a Level of Service (LOS) F. To the south of the crossing, Jersey Avenue and 18th Street is a signal-controlled intersection operating at a LOS C for both AM and PM peak hours.

A fair amount of the construction footprint on the Jersey Avenue portal is concentrated off of the road. The crossing has sidewalks on either side. Construction should be scheduled for off-peak and overnight hours, as Eighteenth Street at both Grove Street and Marin Boulevard experience very high levels of congestion during peak hours, as seen in Figure 7.

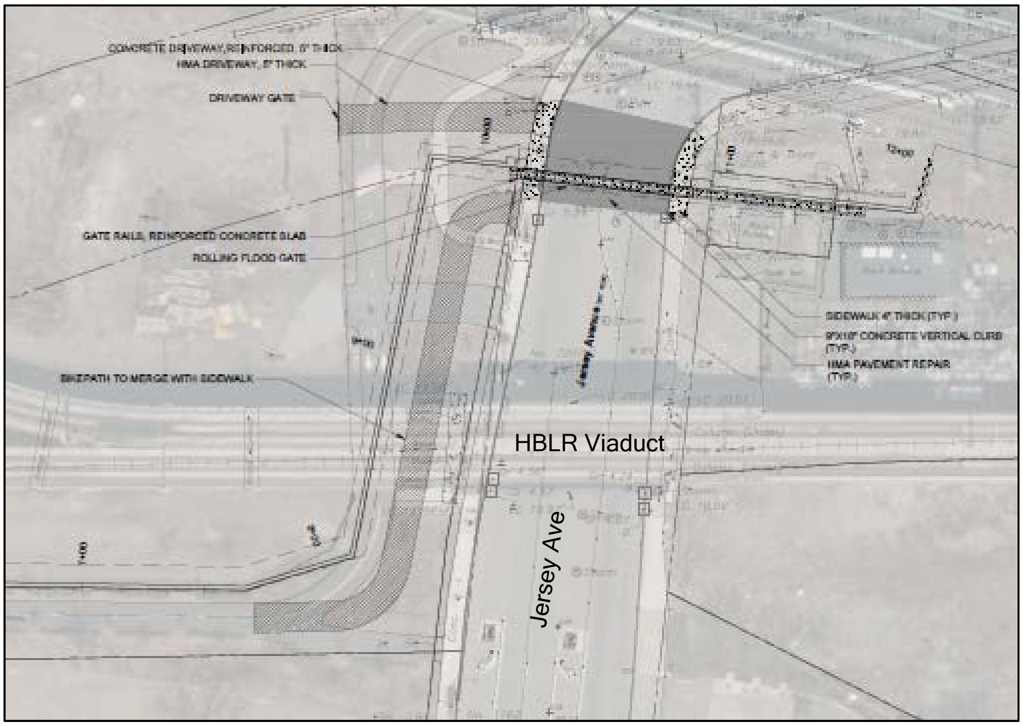


Figure 36: Jersey Avenue Flood Gate

7.1.10.1 Motorist Impacts

As the roadway is four lanes across, full closure should not be necessary. However in the event of a full closure, traffic would be detoured to the remaining two access points which are Marin Boulevard and Grove Street, both which intersect with Newark Street once inside Hoboken. Detour roads that will be utilized during construction can be seen in Figure 37 below. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

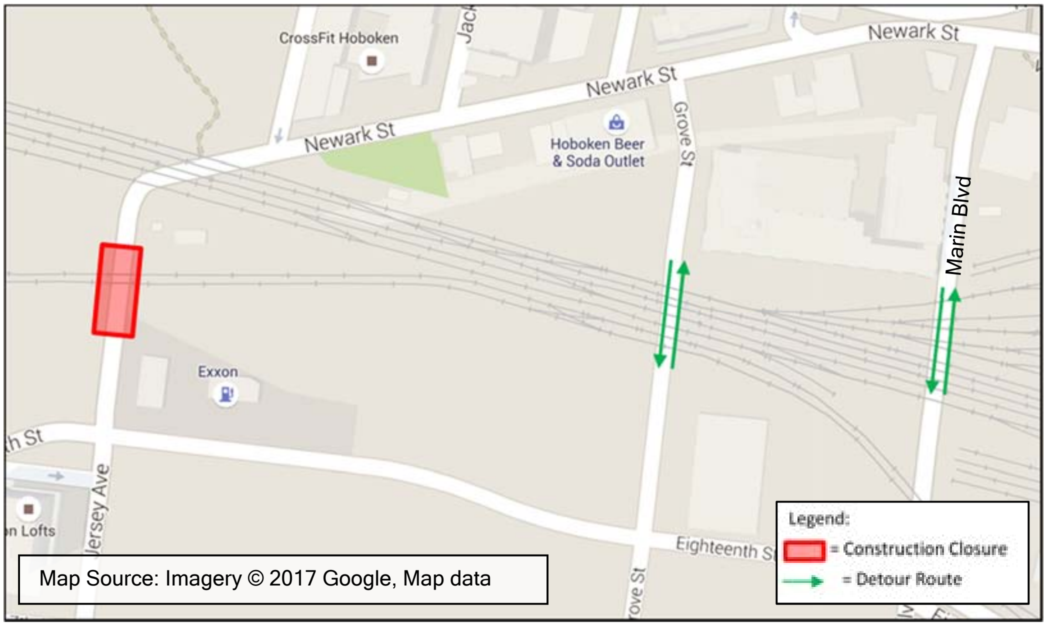


Figure 37: Jersey Avenue Construction Detour Map

7.1.10.2 Pedestrian Impacts

The moderate amount of pedestrian activity that travels this crossing will be routed at the adjacent crosswalk to the appropriate side of the roadway.

7.1.10.3 Cyclist Impacts

During construction, the bike path leading to the closure will be temporarily closed and permanently altered. Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

7.1.10.4 Bus Transit Impacts

NJ TRANSIT bus route will be affected but bus stops will not. The bus route may follow the same detour route as motorists without affecting bus stops.

7.1.10.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.1.10.6 Ferry Impacts

Ferry service will not be affected.

7.1.11 Grove Street

The Grove Street crossing (Location H in Figure 19) is proposed under all three alternatives in the same location (see Figure 38). This crossing is similar to the Jersey Avenue crossing. The proposed barrier also runs in close proximity to the overhead NJ TRANSIT railroad tracks. Grove Street contains sidewalks on both sides as well as adjacent parking on the north side of the tracks. Grove Street is a two-lane road with a single-lane approach as it intersects Eighteenth Street to the south and transitions to a two-lane approach (exclusive left lane and exclusive right lane) as it intersects Newark Street to the north. Grove Street carries approximately 1,000 vehicles during peak hour and is also one of the main access points to and from Hoboken from the south side. Grove Street experiences high to severe congestion during the AM hours, as seen in Figure 7, and high levels of congestion in the PM hours. This crossing experiences a moderate amount of pedestrians during peak hours and very low bicycle activity. For these reasons, construction should be scheduled during off-peak and nighttime hours at this closure.

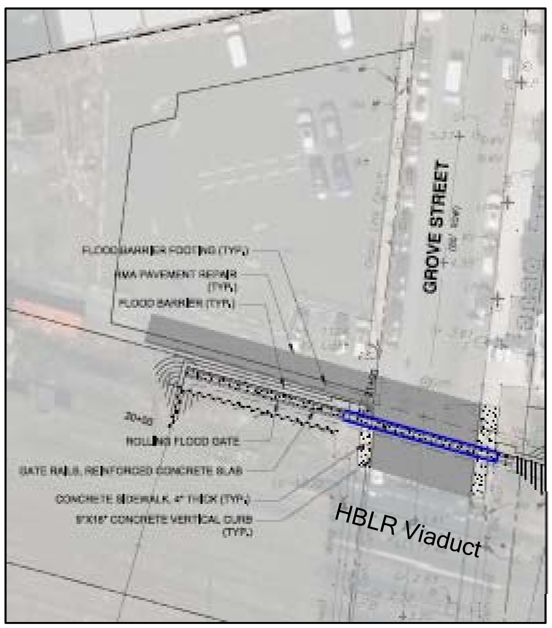


Figure 38: Grove Street Flood Gate

7.1.11.1 Motorist Impacts

Impacts to traffic during construction may be minimal. A moderately-sized parking lot and adjacent lot to the west could potentially be rented for the purposes of accessing and staging the work. This would reduce the likelihood of or at least minimize the duration of a full closure. In this event, traffic would have to be detoured to the remaining two access points which are Jersey Avenue and Marin Boulevard. Both streets intersect Newark Street once inside Hoboken. See Figure 39 below. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

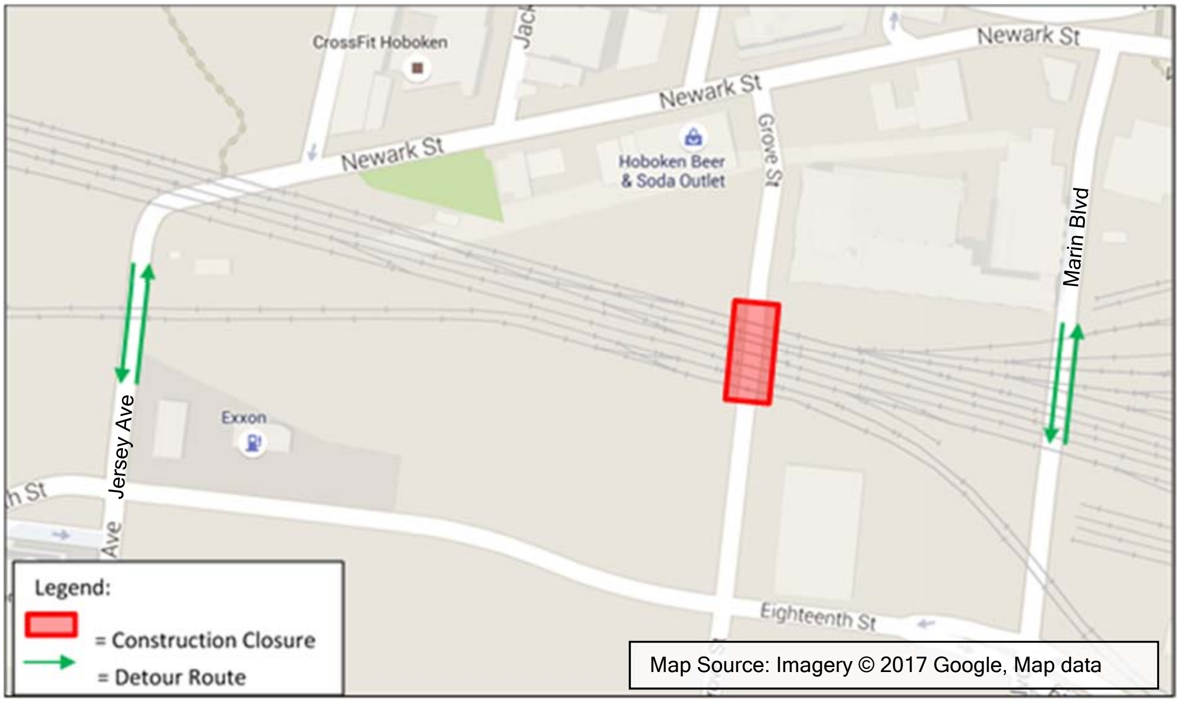


Figure 39: Grove Street Construction Detour Map

7.1.11.2 Pedestrian Impacts

Pedestrians should follow the same detour route as motorists.

7.1.11.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

7.1.11.4 Bus Transit Impacts

NJ TRANSIT bus route will be affected but bus stops will not. The bus route may follow the same detour route as motorists without affecting bus stops.

7.1.11.5 Rail Impacts

Due to the vicinity to NJ TRANSIT tracks, nightly closure may be necessary in order to avoid conflict with service and ensure safety of construction personnel.

7.1.11.6 Ferry Impacts

Ferry service will not be affected.

7.1.12 Marin Boulevard

The Marin Boulevard crossing (Location I in Figure 19), as shown below in Figure 40, is the third means of access to and from the south side of Hoboken along with the previous two crossings. The proposed barrier, included in all three alternatives in the same location, is in close proximity to the overhead NJ TRANSIT railroad tracks. Marin Boulevard contains sidewalks on both sides of the road as well as adjacent parking on the north side of the tracks. Marin Boulevard is a two-lane road with a single-lane approach as it intersects Eighteenth Street to the south. The roadway then transitions to a two-lane approach (exclusive left and exclusive right) as it intersects Newark Street to the north. It carries approximately 1,200 vehicles during peak hour. The roadway experiences moderate to severe congestion during the AM peak hours (as seen in Figure 7) and moderate to high congestion in the PM peak hours (LOS E at Eighteenth Street and LOS C at Newark Street). This roadway experiences moderate levels of pedestrians in the AM peak hours and moderate to high levels in the PM peak hours. To the north of the crossing, there are low levels of bicycle activity. Levels increase to moderate heading south.

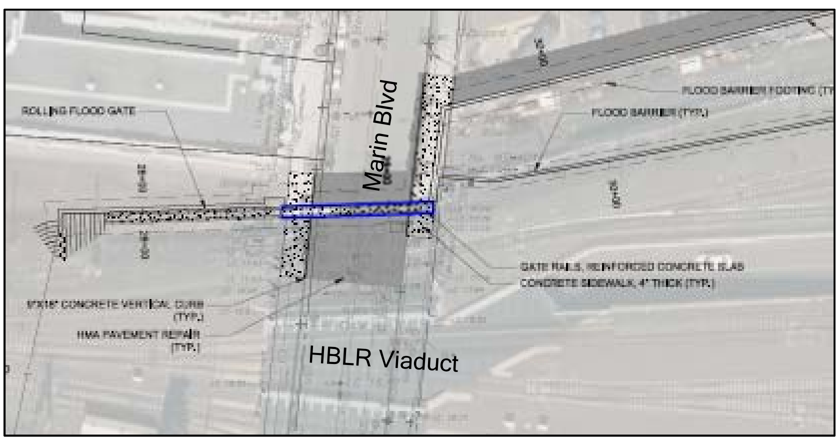


Figure 40: Marin Boulevard Flood Gate

7.1.12.1 Motorist Impacts

During construction, the crossing has a setback from the trackway in which to work, with multiple options to avoid full roadway closure. One option would either be by utilizing an existing unpaved roadway alongside the track, from the parking stalls along the property line of NJ TRANSIT's facilities. The other would take the east curb lane of Luis Munoz Marin Boulevard, and the south parking stalls. In the event of a full closure, traffic would have to be detoured to the remaining two access points which are Jersey Avenue and Grove Street, both which intersect with Newark Street once inside Hoboken (see Figure 41 below). All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

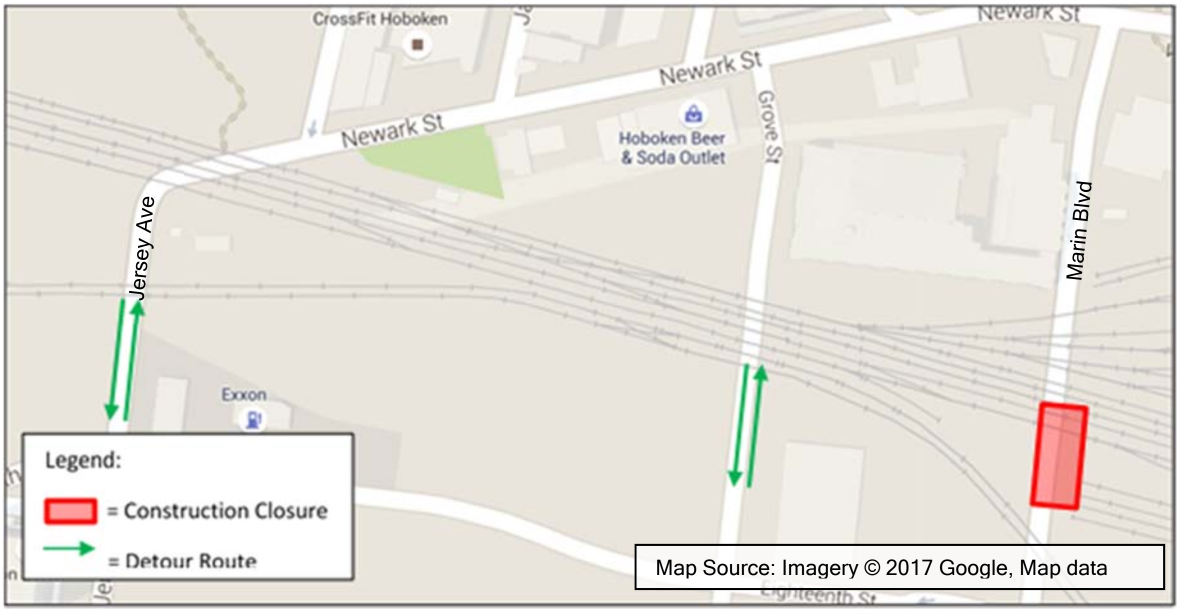


Figure 41: Marin Boulevard Construction Detour Map

7.1.12.2 Pedestrian Impacts

Pedestrians should follow the same detour route as motorists.

7.1.12.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

7.1.12.4 Bus Transit Impacts

NJ TRANSIT bus route will be affected but bus stops will not. The bus route may follow the same detour route as motorists without affecting bus stops.

7.1.12.5 Rail Impacts

Due to the vicinity to NJ TRANSIT tracks, nightly closure may be necessary in order to avoid conflict with service and ensure safety of construction personnel.

7.1.12.6 Ferry Impacts

Ferry service will not be affected.

7.1.13 NJT Maintenance of Way Facility, NJT Parking Lot, Engine House, and Rail Sidings

For Option 1 under all three Alternatives the resist structure will follow northern most profile of Hoboken Terminal rail yard (Location J in Figure 19, Option 1). Construction in this area will not affect any pedestrian, vehicle or bicycle traffic.

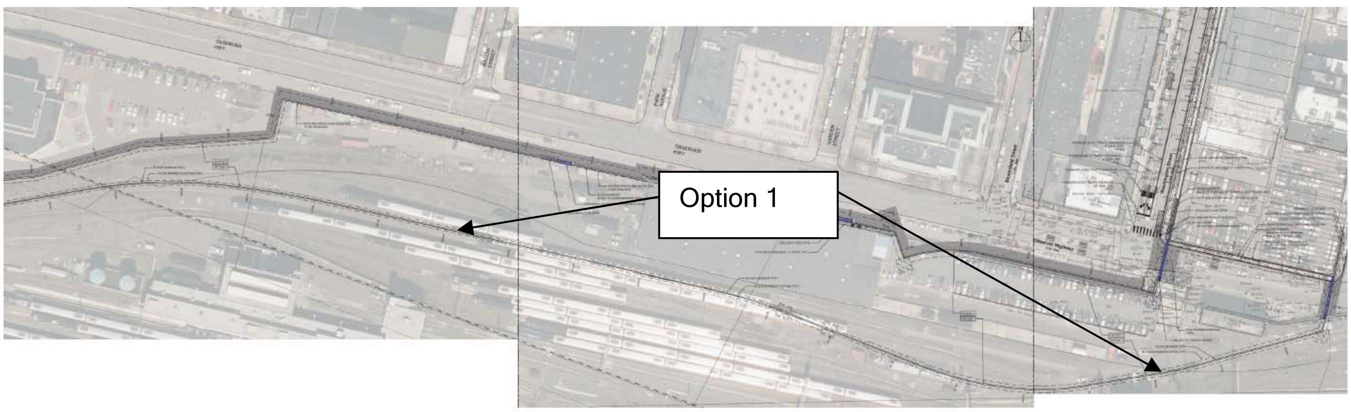


Figure 42: NJ TRANSIT Facilities Flood Barrier

7.1.13.1 Motorist Impacts

Motorist activity in will not be affected.

7.1.13.2 Pedestrian Impacts

Pedestrian activity in will not be affected.

7.1.13.3 Cyclist Impacts

Bicyclists would be advised to use increased caution as shoulder widths may be narrowed or eliminated.

7.1.13.4 Bus Transit Impacts

Bus service will not be affected.

7.1.13.5 Rail Impacts

Efforts will be coordinated with NJ TRANSIT Rail and light rail in order to minimize interruption of service.

7.1.13.6 Ferry Impacts

Ferry service will not be affected.

7.1.14 Observer Highway Length

Under Alternative 1, Option 2, the resist structure follows behind the NJ TRANSIT Maintenance Facility (369 Observer Highway) and before turning north towards Observer Highway. The structure then spans length of Observer Highway from NJ TRANSIT Maintenance Facility driveway entrance to Hudson Street is identical for option 2 under all three alternatives.

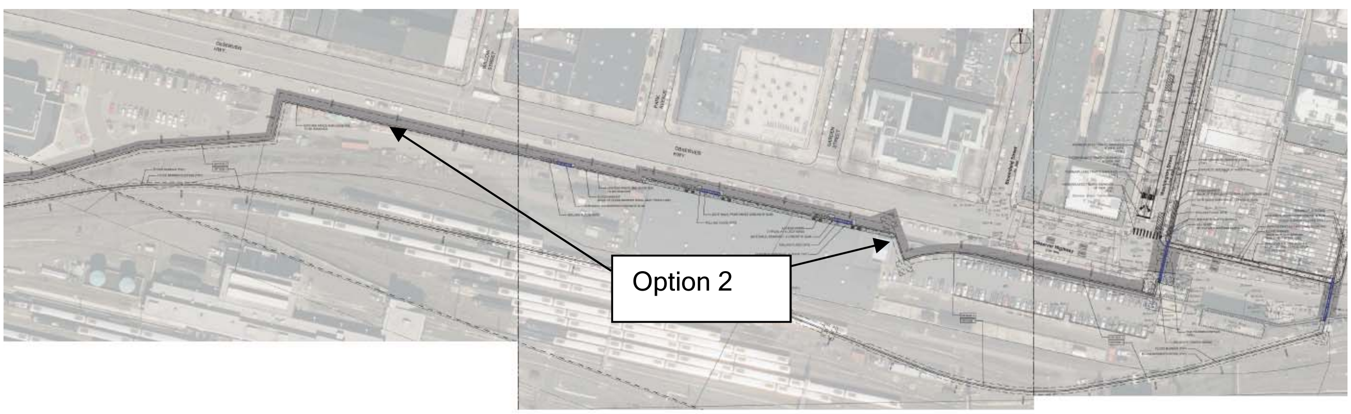


Figure 43: Observer Highway Flood Barrier

7.1.14.1 Motorist Impacts

During construction, full lane closures along this route should not be expected, however there will be impacts to parking and vehicular movements.

7.1.14.2 Pedestrian Impacts

Pedestrians will be routed to the sidewalk on the north side of the roadway by either a flagger or signage at the crosswalks approaching the construction site.

7.1.14.3 Cyclist Impacts

The bicycle lane along the south side of Observer Highway will likely be temporarily closed. A temporary bicycle lane will likely not be set in place. Bicyclists may dismount and travel as pedestrians or travel as a motorist.

7.1.14.4 Bus Transit Impacts

Closure of any kind will effect NJ TRANSIT, Hoboken Hop green line, and Hoboken Senior Shuttle service. There are several bus stops along the length of Observer Highway. Depending on the length of the construction zone, stops may be moved to another location along the roadway and bus routes will need to be detoured.

7.1.14.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.1.14.6 Ferry Impacts

Ferry service will not be affected.

7.1.15 Observer Highway Crossing

Observer Highway has two crossings, one near Washington Street and one near Hudson Street (Location K in Figure 19). Both are depicted in Figure 44 below. The two barriers are located approximately 250 feet apart from each other. The eastern barrier is proposed in all three alternatives for Option, and the eastern barrier is proposed in Option 2. This area of Observer Highway is a two-lane road with a small painted median and a sidewalk on the north side of the road. The road remains a single-lane Major Collector approach as it intersects Hudson Street and transitions to a two-lane approach (exclusive through lane, shared through and right lane) as it intersects with Washington Street. Observer Highway carries approximately 900 vehicles during the peak hour, which is over two times Hudson's 4124 average annual vehicles per day. To the west of the crossings, the signalized intersection of Observer Highway and Washington Street experiences moderate to severe congestion (LOS D in the AM peak and LOS F in the PM peak). This area experiences high levels of pedestrian activity (with low bicycle activity) due to its proximity to Hoboken's bus and train terminal. It is the main route for drivers entering Hoboken on the south end and heading toward any waterfront attractions (parks, piers, and walkway) as well as the Hoboken transit terminal at the southeast end.

Both sides of Observer Highway have areas for construction vehicles and work zone phasing. To the south is a paved "no parking" area that can easily be occupied for construction; to the north is a parking lot that could potentially be occupied for construction activity.

Figure 44: Observer Highway Flood Gates

7.1.15.1 Motorist Impacts

Every effort will be made to stage construction to minimize the impacts of roadway closures. However, in the event of a full closure, drivers would have to be detoured north on either Bloomfield Street or Washington Street in order to continue east on Newark Street to reach waterfront attractions. These detour options are shown in Figure 45 below. Construction should be scheduled for off-peak and nighttime hours, as Washington Street experiences high levels of congestion as seen in

Figure 6. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

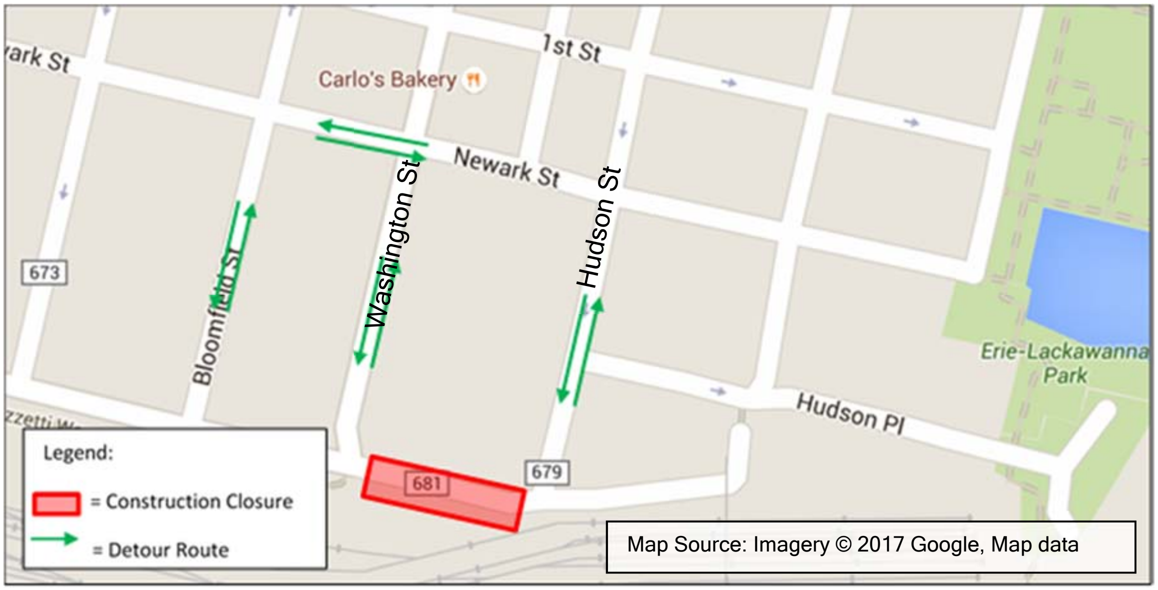


Figure 45: Observer Highway Construction Detour Map

7.1.15.2 Pedestrian Impacts

Efforts will be made to minimize impacts to pedestrians via temporary accommodations in the area of construction however, during certain periods of the construction pedestrians will be directed to use the same detour route as motorists.

7.1.15.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

7.1.15.4 Bus Transit Impacts

The closure will affect NJ TRANSIT bus service. Any bus routes experience interruption of regular route may follow the motorist suggested route without affecting on any stops.

7.1.15.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.1.15.6 Ferry Impacts

Ferry service will not be affected.

7.1.16 Closure at Marin Boulevard and Track Yard

For Option 1 under all three Alternatives a resist structure will be erected just east of Marin Boulevard at of Hoboken Terminal rail yard (Location L in Figure 19). See Figure 46 below for detail.

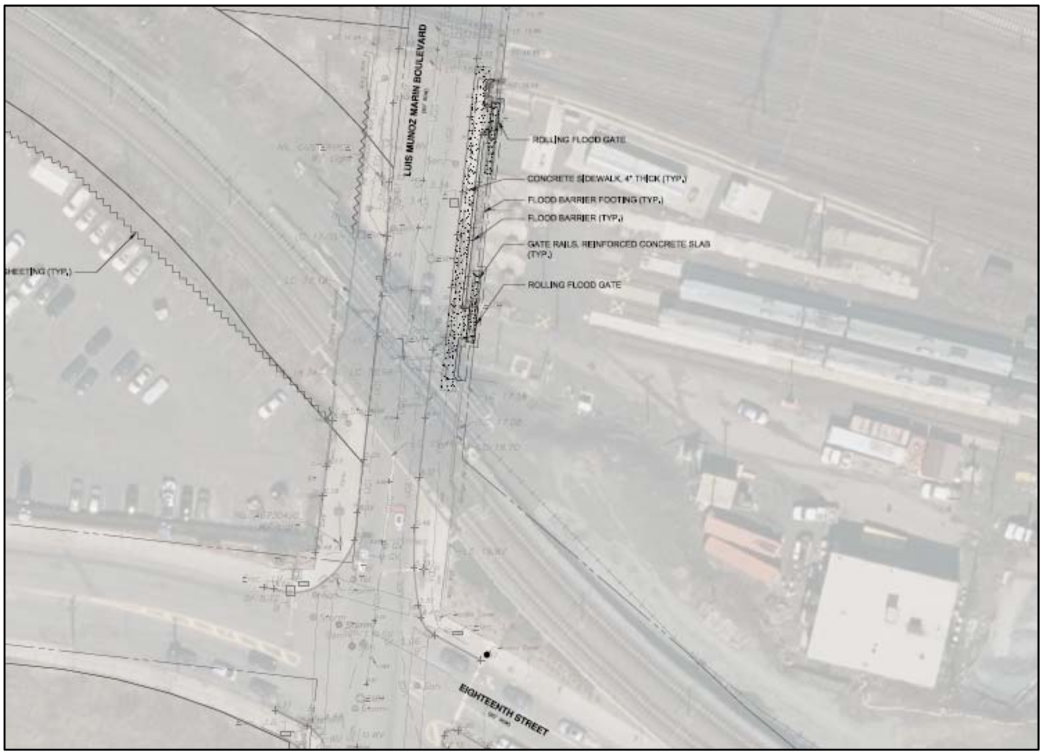


Figure 46: Marin Boulevard at Track Yard Flood Gate

7.1.16.1 Motorist Impacts

Motorist activity will not be affected.

7.1.16.2 Pedestrian Impacts

There may be temporary closure of the sidewalk on the east side of the road during construction and pedestrians will need to detour to the west side of the road, but generally speaking, pedestrian activity will not be materially affected.

7.1.16.3 Cyclist Impacts

Bicyclists would be advised to use increased caution as shoulder widths may be narrowed or eliminated.

7.1.16.4 Bus Transit Impacts

Bus service will not be affected.

7.1.16.5 Rail Impacts

NJ TRANSIT Rail service will not be affected, however ingress and egress to the yard through this location will require coordination with NJ TRANSIT.

7.1.16.6 Ferry Impacts

Ferry service will not be affected.

7.1.17 18th Street at NJ TRANSIT Tracks

For Option 1 under all three Alternatives a resist structure will be erected on the north side of 18th Street at of Hoboken Terminal rail crossing (Location M in Figure 19). See Figure 47 below for detail.

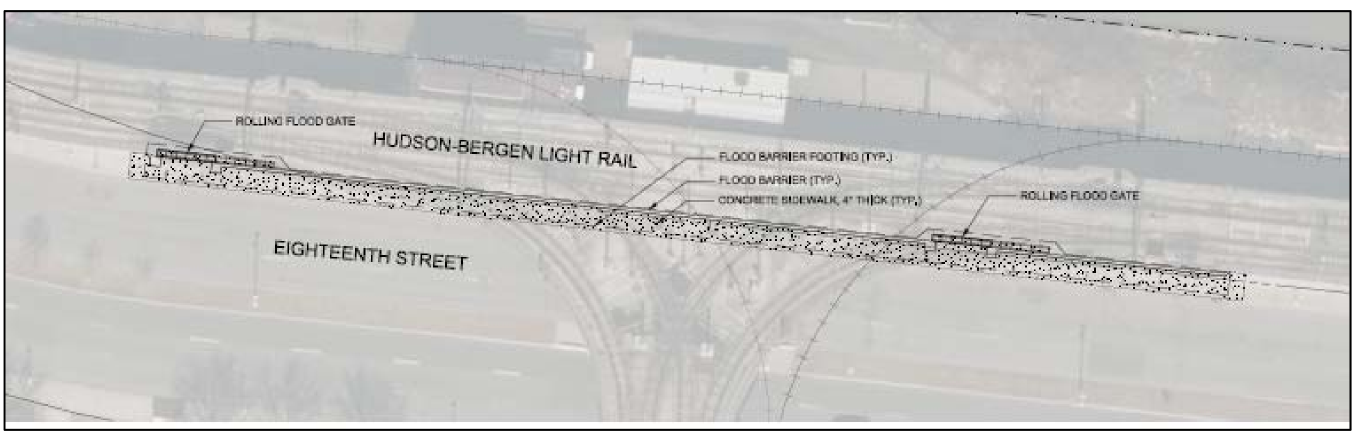


Figure 47: 18th Street at NJ TRANSIT Tracks Flood Gate

7.1.17.1 Motorist Impacts

Motorist activity will not be affected.

7.1.17.2 Pedestrian Impacts

Pedestrian activity will not be affected.

7.1.17.3 Cyclist Impacts

Bicyclists would be advised to use increased caution as shoulder widths may be narrowed or eliminated.

7.1.17.4 Bus Transit Impacts

Bus service will not be affected.

7.1.17.5 Rail Impacts

NJ TRANSIT Rail service will not be affected, however ingress and egress to the yard through this location will require coordination with NJ TRANSIT.

7.1.17.6 Ferry Impacts

Ferry service will not be affected.

7.2 Alternative 2

Alternative 2- North Resist Structure

7.2.1 Washington Street Heading North

The proposed barrier runs the west side of Washington Street with a crossing at 14th Street in Alternatives 2 & 3. (See Figure 48 and Location B of Figure 15.) 14th Street is striped as two lanes in the eastbound direction and one lane in the westbound direction with both sidewalks and parking on either side. The intersection has bulb outs for parking and brick crosswalks on all sides. 14th Street carries approximately 650 vehicles during peak hour.

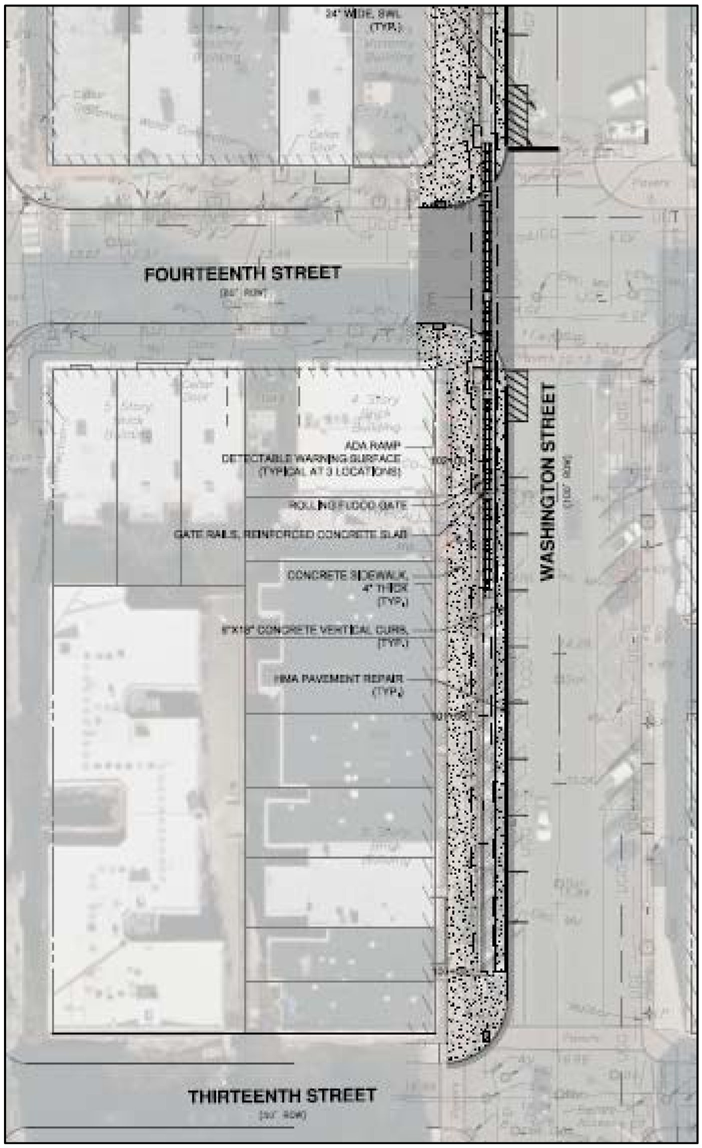


Figure 48: 14th Street flood gate

7.2.1.1 Motorist Impacts

Along Washington Street, construction activity will likely remain contained within sidewalk and parking areas. Crossing 14th Street, all efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan. In the event of a full closure of 14th Street, traffic will have to be detoured north to 15th street using either Bloomfield Avenue or River Street, to continue in the east/west direction. Figure 50 below shows the detour roads that will be utilized during construction.

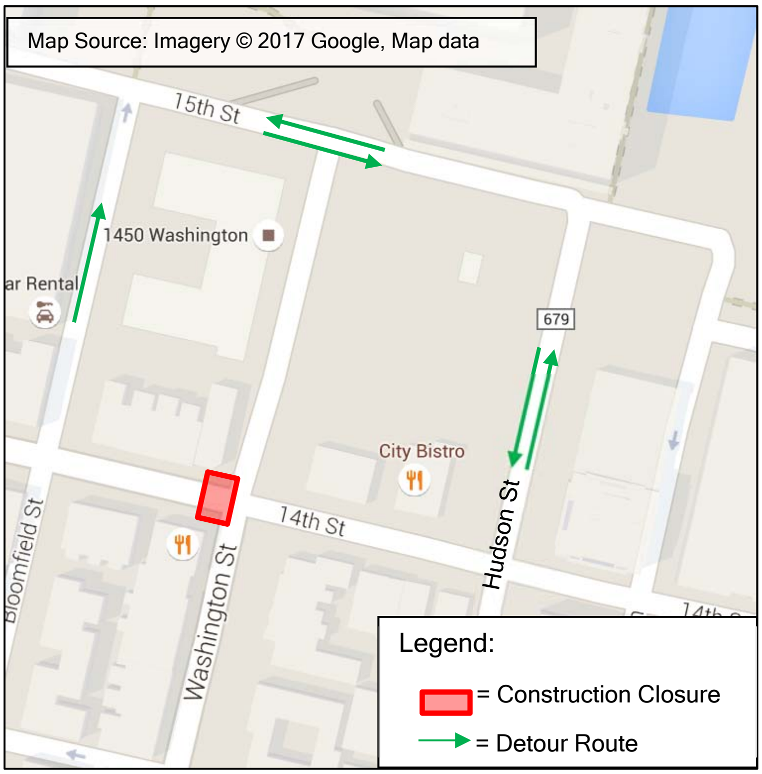


Figure 49: 14th Street construction detour map

7.2.1.2 Pedestrian Impacts

Pedestrians will be advised to follow available alternative routes and efforts will be made to maintain access through the area during construction.

7.2.1.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

7.2.1.4 Pedestrian Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

7.2.1.5 Bus Transit Impacts

The detour will affect two NJ TRANSIT bus stops. The bus stops may be moved to 15th Street in order to follow the detour, or may be suspended or combined with

7.2.1.6 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.2.1.7 Ferry Impacts

Ferry service will not be affected.

7.2.2 15th Street Crossing At Washington Street

The proposed flood gate crosses 15th Street at the west side of its intersection with Washington Street (see Figure 50) and is proposed under Alternative 2 only (Location C of Figure 15). 15th Street is a two-lane road with sidewalks on both sides and diagonal parking along the eastbound side. The proposed barrier will run through existing bulb outs at the southeast corner of the intersection which support the diagonal parking on both 15th Street and Washington Street. 15th Street carries approximately 600 vehicles during peak hour and operates with little congestion (LOS B).

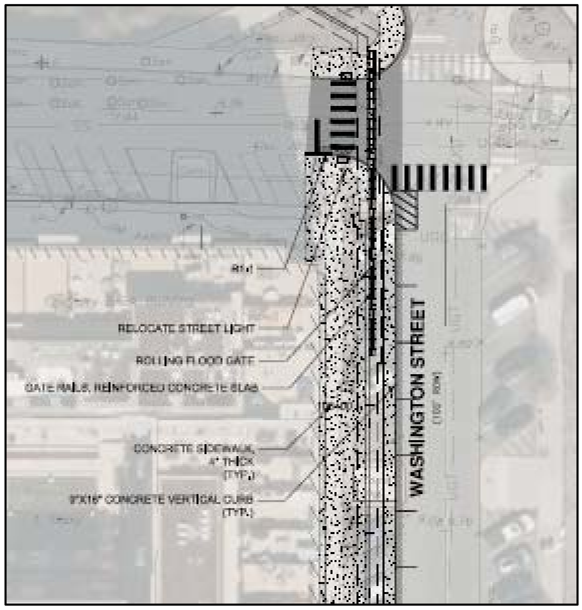


Figure 50: 15th Street and Washington Street Flood Gate

7.2.2.1 Motorist Impacts

Due to the roadway width of both intersecting streets and the existence of parking, full intersection closures will not be likely. However, in the event of a full closure, traffic would need to be detoured south to 14th Street via either Hudson Street or Park Avenue in order to continue in the east/west direction. Detour roads that will be utilized during construction can be found in Figure 51 below. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

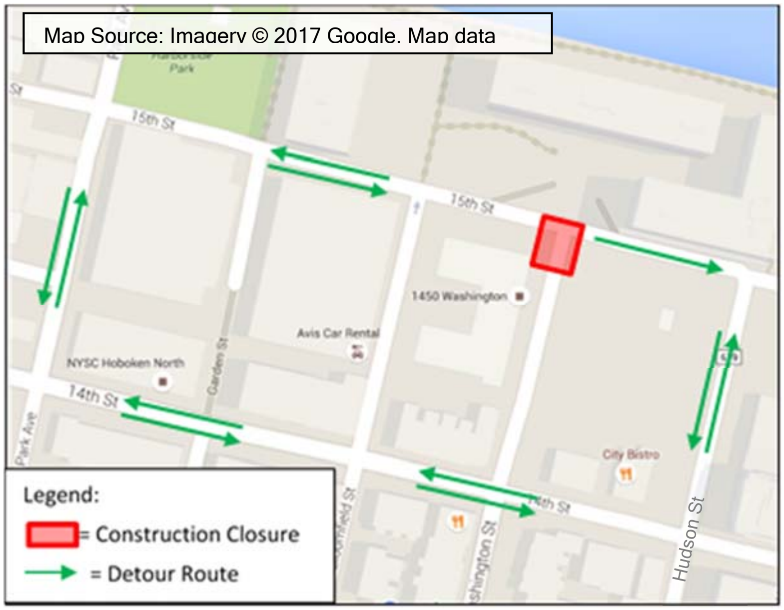


Figure 51: 15th Street and Washington Street Construction Detour Map

7.2.2.2 Pedestrian Impacts

During construction, in the event of partial closure, the large volume of pedestrians will need to be rerouted from the western sidewalk to the eastern sidewalk. In the event of a full intersection closure, pedestrians will be guided to use the same detour route as motorists.

7.2.2.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

7.2.2.4 Bus Transit Impacts

Bus service will not be affected.

7.2.2.5 Rail Impacts

NJ TRANSIT service will not be affected.

7.2.2.6 Ferry Impacts

Ferry service will not be affected.

7.2.3 5th Street Length

The proposed flood barrier (Figure 15 at locations D and E) follows the northern length of 15th Street providing driveway access to existing parking lots and sidewalk access which can be seen below in Figure 52.

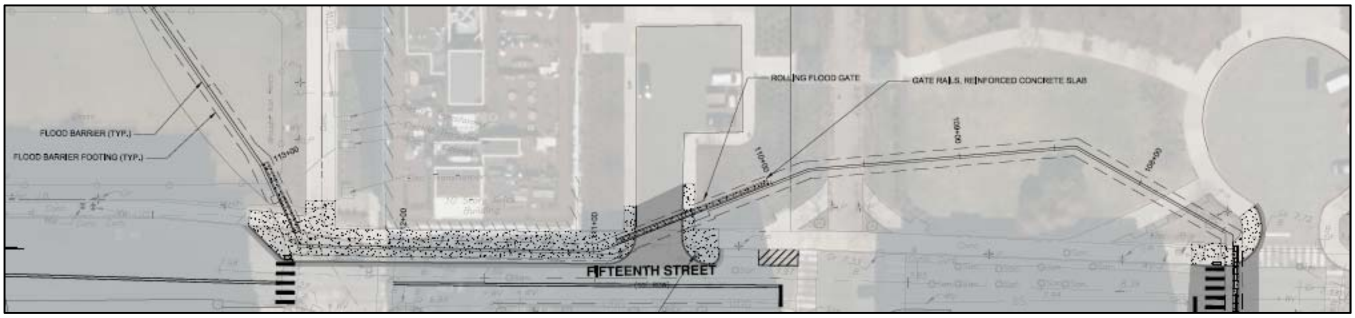


Figure 52: 15th Street Floor Barrier

7.2.3.1 Motorist Impacts

During construction, partial or full closure of 15th Street may be necessary. During this time, Garden St is a dead end road primarily used for parking and deliveries. Access to this roadway will be temporarily unavailable. Traffic will be detoured to 14th Street via Washington Street and Park Avenue. See Figure 55 below for visual aid. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

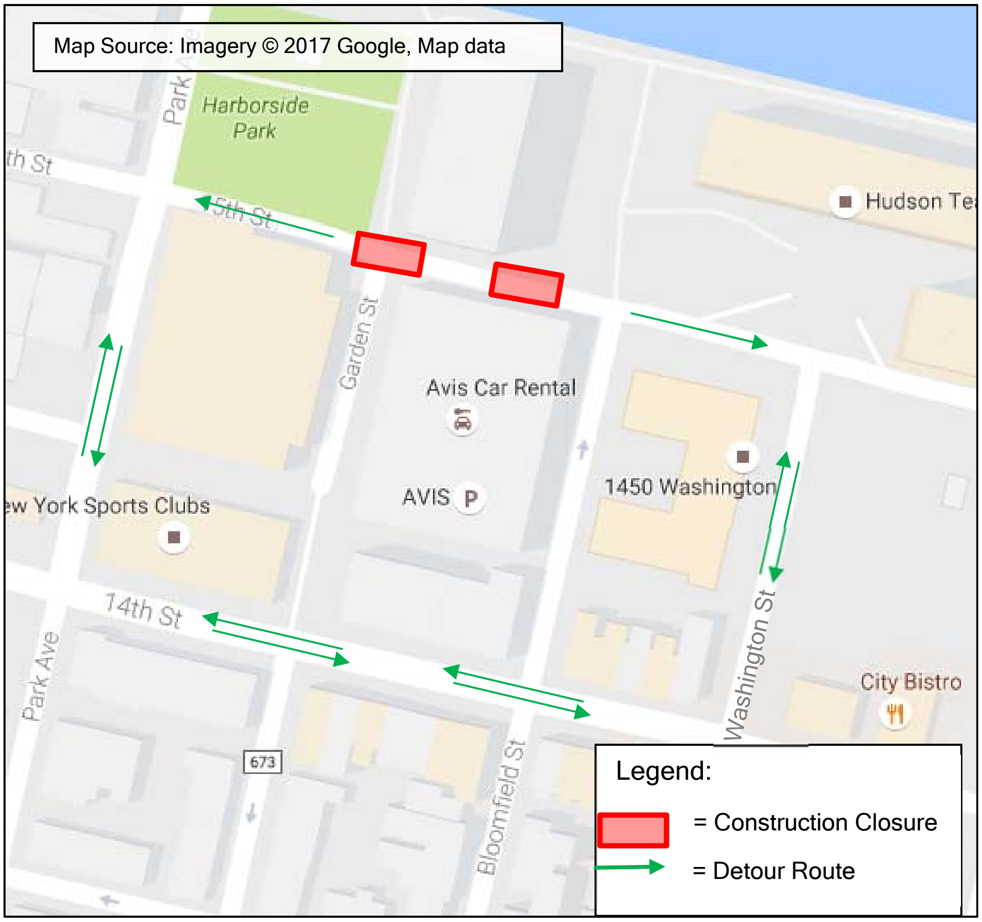


Figure 53: 15th Street detour Map

7.2.3.2 Pedestrian Impacts

Pedestrians will be guided to use the same detour route as motorists.

7.2.3.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

7.2.3.4 Bus Transit Impacts

Bus service will not be affected.

7.2.3.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.2.3.6 Ferry Impacts

Ferry service will not be affected.

7.2.4 North End Waterfront Cove Area

See section 7.1.5

7.2.5 Harbor Boulevard at Park Ave

The Harbor Boulevard crossing is on the south end of Harbor Boulevard under the Park Avenue Bridge. It runs parallel to the NJ TRANSIT HBLR train tracks and is proposed in Alternatives 2 and 3 (see Figure 54 and Location F in Figure 15). The barrier crosses just after Harbor Boulevard and transitions from a two-lane road to a one-lane, one-way road. Harbor Boulevard merges with Park Avenue southbound approximately 500 feet from the barrier location. The road is a minor road with no sidewalks or parking. It is fairly narrow once it converts to a one-way road due to its proximity to the bridge supports on the south side as well as the train tracks on the north side. This road can be used to access Hoboken via Park Avenue from the nearby restaurants and hotels. However, due to the poor condition of the road, most drivers use 19th Street to access Park Avenue. GPS routing may utilize 19th Street instead of Harbor Boulevard.

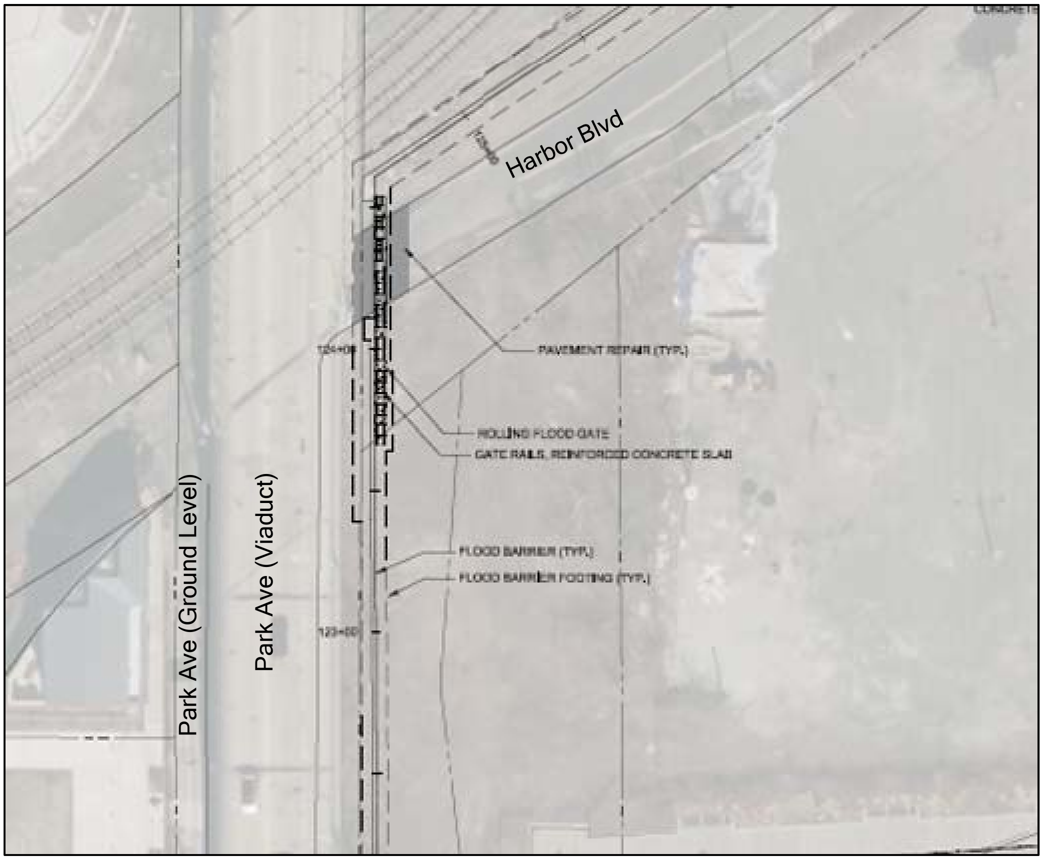


Figure 54: Harbor Boulevard flood gate

7.2.5.1 Motorist Impacts

The earthen area on the north side and the lot on the south side of Harbor Boulevard at the crossing provide ample space for construction vehicles and activity. Full closure should not be required, but in the event that it was necessary, the minor traffic volumes would be detoured to 19th Street in order to reach Hoboken via Park Avenue. Detour roads that will be utilized during construction can be seen in Figure 55. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

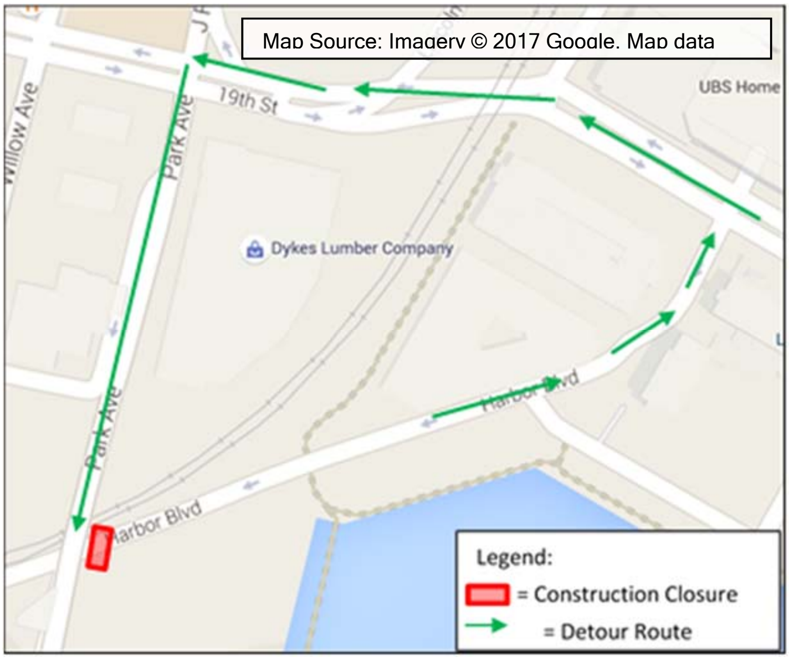


Figure 55: Harbor Boulevard Construction Detour Map

7.2.5.2 Pedestrian Impacts

Efforts will be made to accommodate pedestrians in this area through the construction zone.

7.2.5.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

7.2.5.4 Bus Transit Impacts

The closure will affect NJ TRANSIT bus route. The bus route may follow the motorist suggested route without affecting on any stops.

7.2.5.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.2.5.6 Ferry Impacts

Ferry service will not be affected.

7.2.6 Harbor Boulevard Length

A flood barrier is proposed running the length of Harbor Boulevard from Park Ave to 19th Street along the north side of the roadway. This crossing is just east of Harbor Boulevard at Park Avenue. This section of the barrier contains rolling flood gates granting access where major driveways currently exist, as well as well as pedestrian access to Harbor Path, a pedestrian and bicycle trail. This crossing will adopt the same detour route as Harbor Boulevard at Park Avenue. See Section 7.1.6 for details on this area along with Figure 29.

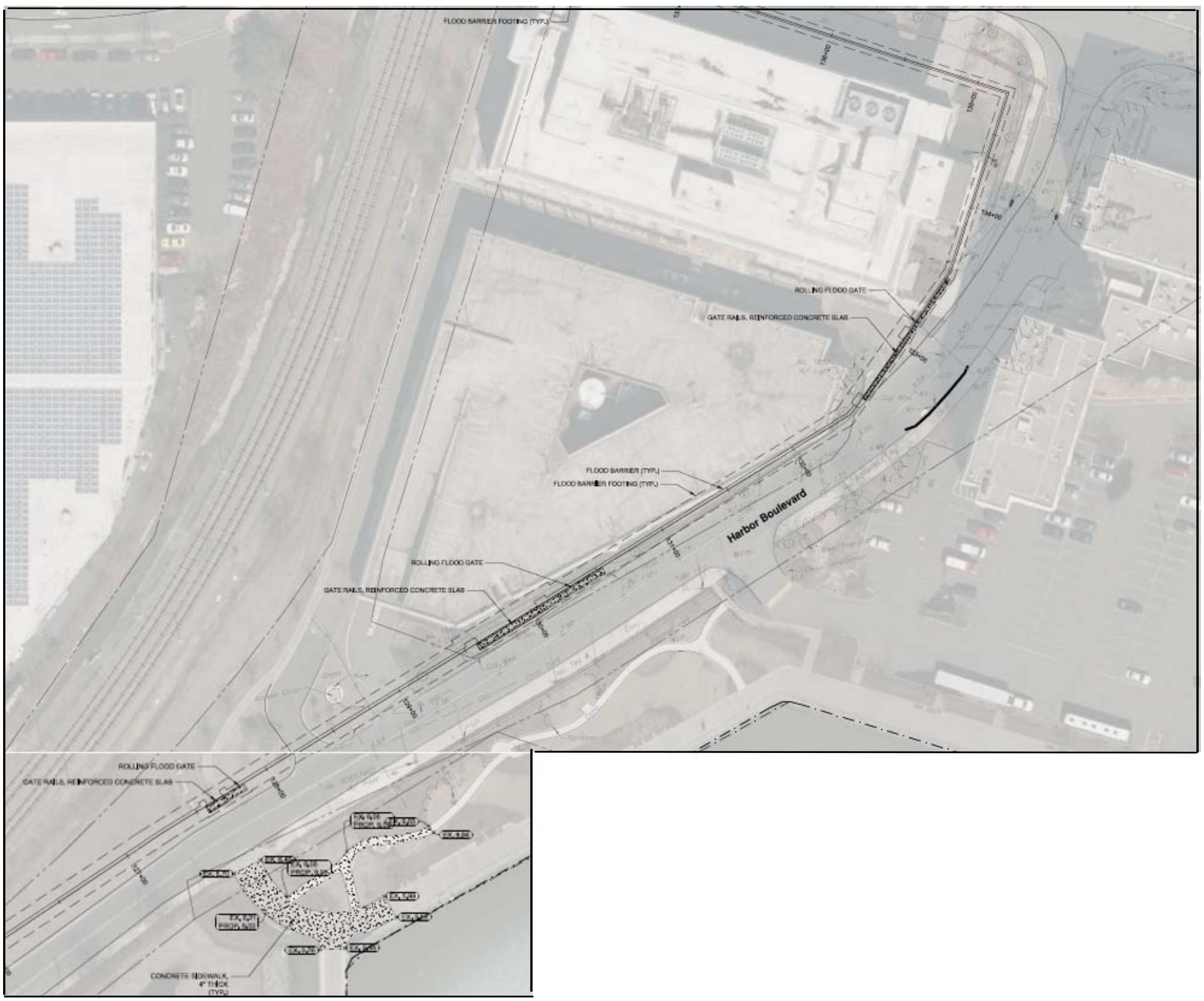


Figure 56: Harbor Boulevard flood barrier

7.2.6.1 Motorist Impacts

All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan. In the event of a full closure, motorists will be directed to utilize the same detour route described in Section 7.2.5.1 and shown in Figure 55.

7.2.6.2 Pedestrian Impacts

During construction of the gate crossing at Harbor Path and barrier portion adjacent, pedestrian access to Harbor Path will be prohibited. Pedestrian will be directed to use the sidewalks provided on Harbor Boulevard and 19th Street.

7.2.6.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.
Cyclists wishing to utilize Harbor Path will follow the same detour as pedestrians.

7.2.6.4 Bus Transit Impacts

Bus service will not be affected.

7.2.6.5 Rail Impacts

Rail service will not be affected.

7.2.6.6 Ferry Impacts

Ferry service will not be affected.

7.2.7 19th Street at Waterfront Terrace Intersection

This barrier is on the west side of the intersection next to a set of at-grade train tracks (see Figure 57 and Locations H and I in Figure 15). 19th Street is a four-lane (two lanes in each direction) road with sidewalks on both sides and a small painted median. It forms a three-legged signalized intersection with Waterfront Terrace. 19th Street carries approximately 1,400 vehicles during peak hour. There is a gate west of Waterfront Terrace that will cross the HBLR tracks.

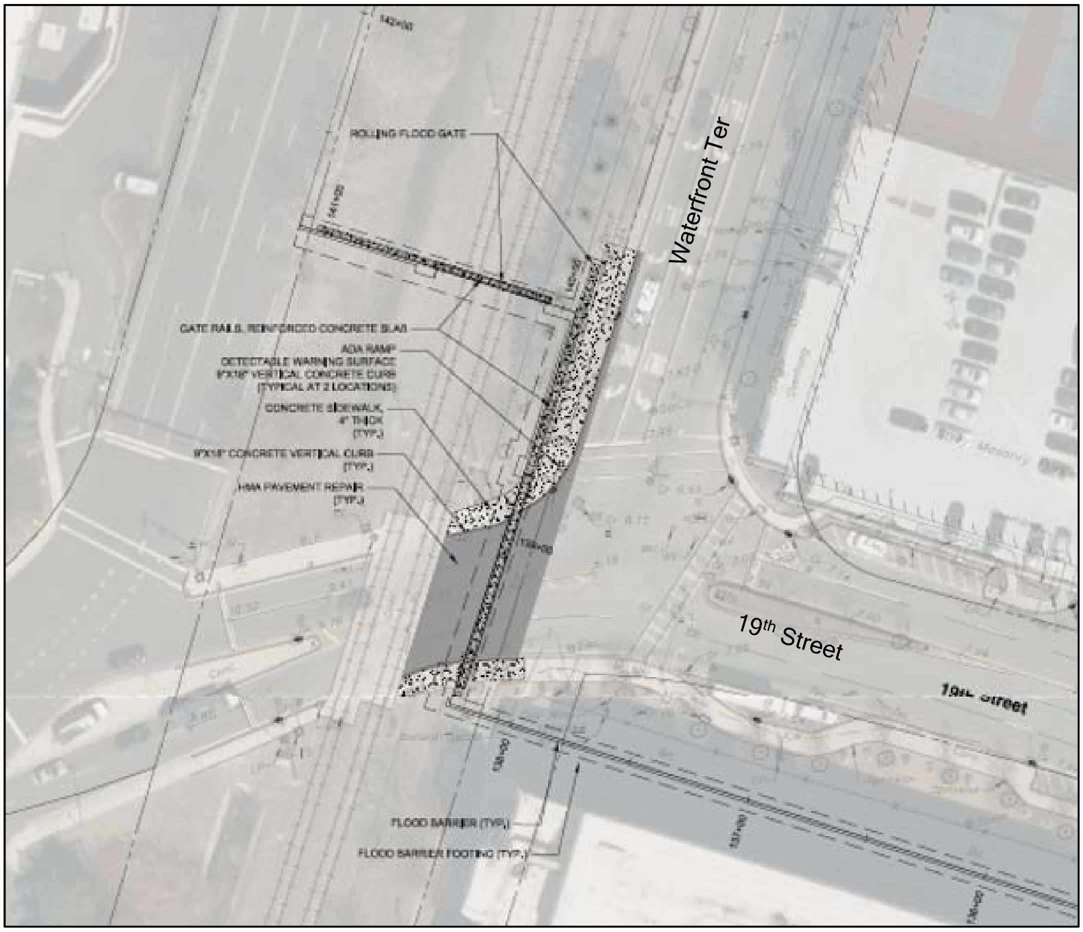


Figure 57: 19th Street Flood Gate

7.2.7.1 Motorist Impacts

The widths of the crossing roadways should allow for staged construction. In the event of a full closure, vehicles would have to be detoured around the barrier using Harbor Boulevard as well as Baldwin Avenue and JFK Kennedy Boulevard. Detour roads that will be utilized during construction can be seen in Figure 58**Error! Reference source not found.**. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

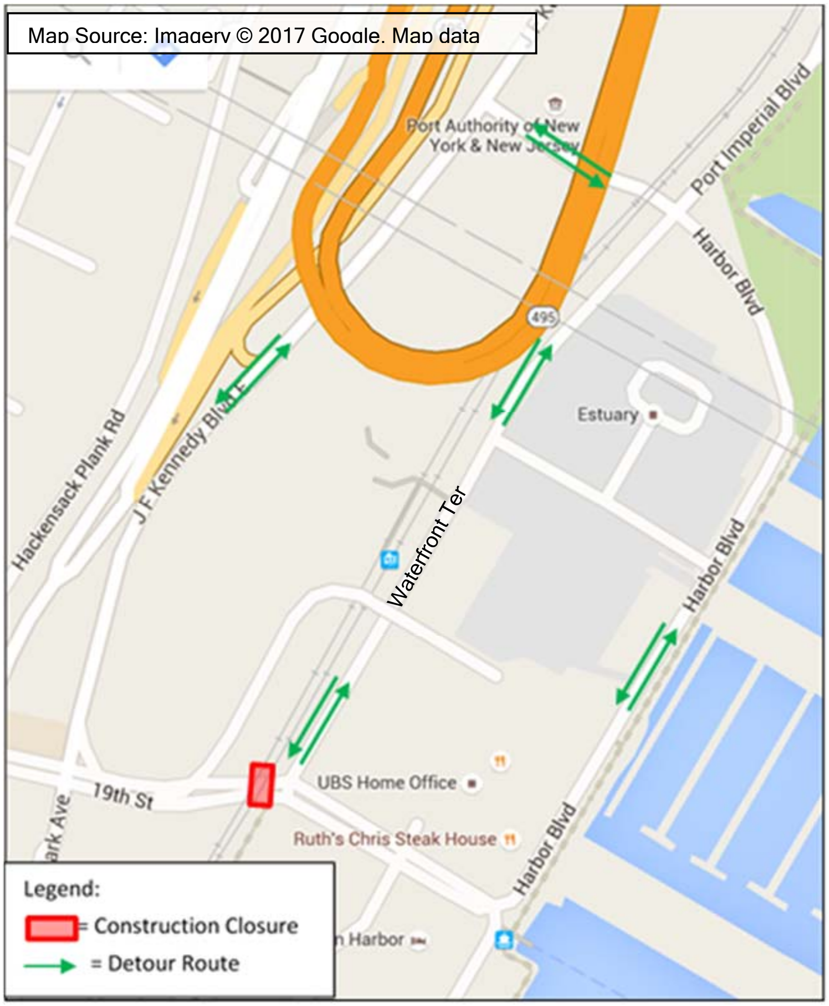


Figure 58: 19th Street Construction Detour Map

7.2.7.2 Pedestrian Impacts

In the event of a full closure, pedestrians should follow the same detour as motorists.

7.2.7.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

7.2.7.4 Bus Transit Impacts

The intersection closure effects an NJ TRANSIT bus route. The bus can be re-routed the same detour as motorists.

7.2.7.5 Rail Impacts

Construction of the gate across the HBLR tracks and other work in the area will need to be coordinated closely with NJ TRANSIT. Given the HBLR is a 7-day - 24 hour operation there will be some outages associated with construction of the gate across the tracks, however, impacts to service will be limited to weekends and off-hours whenever possible.

7.2.7.6 Ferry Impacts

Ferry service will not be affected.

ALTERNATIVE 2- SOUTHERN RESIST SECTION

7.2.8 Jersey Avenue

The proposed barrier (Location F in Figure 20) runs in close proximity to the overhead NJ TRANSIT railroad. At this location Jersey Avenue contains sidewalks on both sides of the road and intersects with Eighteenth Street on the south side of the railroad tracks approximately 180 feet from the proposed barrier, as shown in Figure **59**. Much like Section7.1.10, the bike lane that will be slightly shifted in order to allow permanent access through the gate opening.

See Section 7.1.10, for roadway information and Figure 37 for construction closure information.

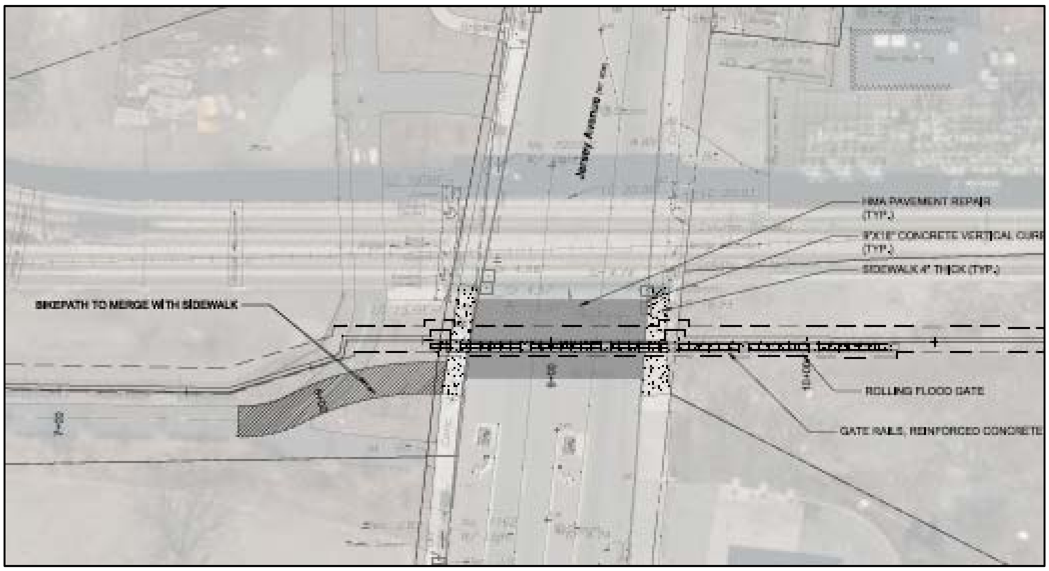


Figure 59: **Jersey Avenue Flood Gate**

7.2.9 Grove Street

This alternative is proposed in all three alternatives. See Section 7.1.11 for information along with Figure 38 and Figure 39 for closure maps.

7.2.10 Marin Boulevard

This alternative is proposed in all three alternatives. See Section 7.1.12 for information along with Figure 40 and Figure 41 for closure maps.

7.2.11 NJT Maintenance of Way Facility, NJT Parking Lot, Engine House, and Rail Sidings

This alternative is proposed in all three alternatives for Option 1. See Section 7.1.13 for information and Figure 42 for barrier location.

7.2.12 Observer Highway Length

The resist structure is proposed to run the length of Marin Boulevard from the NJ TRANSIT rail crossing (Location J, Figure 20) and turn east at Observer Highway until meeting with the barrier proposed in Alternative 1, Option 2. (See 7.1.14, Figure 44, Figure 45 and Figure 6 for further information about this closure location.)

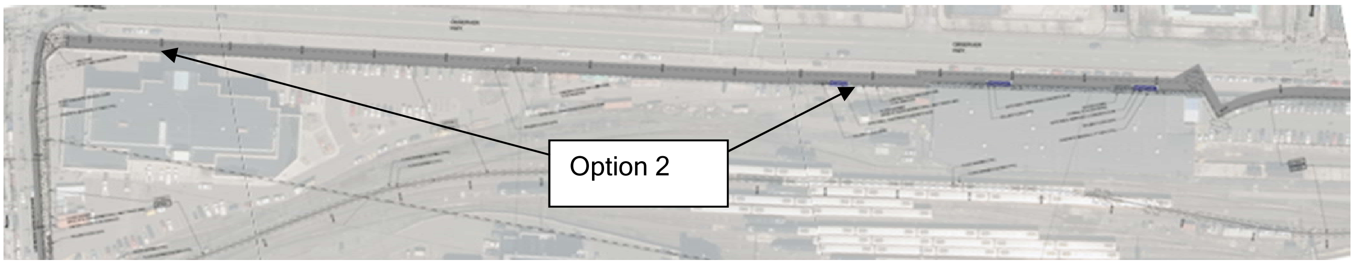


Figure 60: Observer Highway Resist Barrier

7.2.12.1 Motorist Impacts

As the construction along Marin Boulevard is expected to remain inside of the NJ TRANSIT facility property roadway closures should not be expected.

7.2.12.2 Pedestrian Impacts

Pedestrian traffic should be expected to be rerouted to the western sidewalk of Marin Boulevard via either a flagger or advanced signing at the approaching crosswalks.

7.2.12.3 Cyclist Impacts

The bicycle lane along the south side of Observer Highway will likely be temporarily closed. A temporary bicycle lane will likely not be set in place. Bicyclists may dismount and travel as pedestrians or travel as a motorist.

7.2.12.4 Bus Transit Impacts

Bus service will not be affected.

7.2.12.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.2.12.6 Ferry Impacts

Ferry service will not be affected.

7.2.13 Observer Highway Crossing

Flood gates are proposed to cross Observer Highway in all three alternatives. See Section 7.1.15 for more information at these crossings.

7.2.14 Closure at Marin Boulevard and Track Yard

This crossing is proposed in all three alternatives. For information on this crossing see Section 7.1.16.

7.2.15 18th Street at NJ TRANSIT Tracks

This crossing is proposed in all three alternatives. For information on this crossing see Section 7.1.17.

7.3 Alternative 3

North Resist Structure Heading North

7.3.1 Washington Street and 14th Street

This crossing is proposed for both Alternative 2 and Alternative 3. For information on this crossing see Section 7.2.1 along with Figure 48 and Figure 49.

7.3.2 Washington Street to Bloomfield Street Alleyway

Just north of 14th Street, the resist structure turns down a pedestrian alleyway. This section of the resist structure can be seen at Location C of Figure 16. The Structure will cross Washington's west sidewalk and run the length of a small courtyard between Washington Street and Bloomfield St.

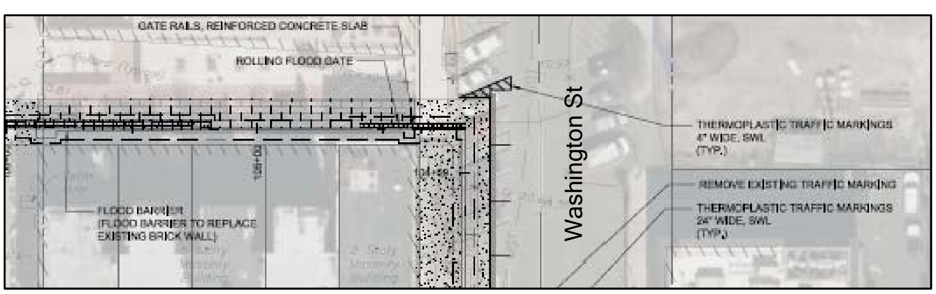


Figure 61: Washington Street to Bloomfield Street Alleyway Flood Barrier

7.3.2.1 Motorist Impacts

There will be no impacts to motorists during construction.

7.3.2.2 Pedestrian Impacts

Pedestrian access to the alleyway will be prohibited during construction. To travel from Washington Street to and from Bloomfield Street, pedestrians will need to utilize the sidewalks on either 14th Street or 15th Street.

7.3.2.3 Cyclist Impacts

Bicyclists traveling the alleyway will be advised to use the same detour route as pedestrians.

7.3.2.4 Bus Transit Impacts

NJ TRANSIT bus service will not be affected.

7.3.2.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.3.2.6 Ferry Impacts

Ferry service will not be affected.

7.3.3 Bloomfield Street and Alleyway to Garden Street

Between 14th Street and 15th Street, the flood barrier crosses Bloomfield Street (See Location D in Figure 16.) and continues to a second pedestrian alleyway that spans from Bloomfield Street to Garden Street. Bloomfield Street is a one-way Major Urban Collector road northbound with both sidewalks and parking on either side. The proposed barrier and gate location can be seen in Figure 62 below.

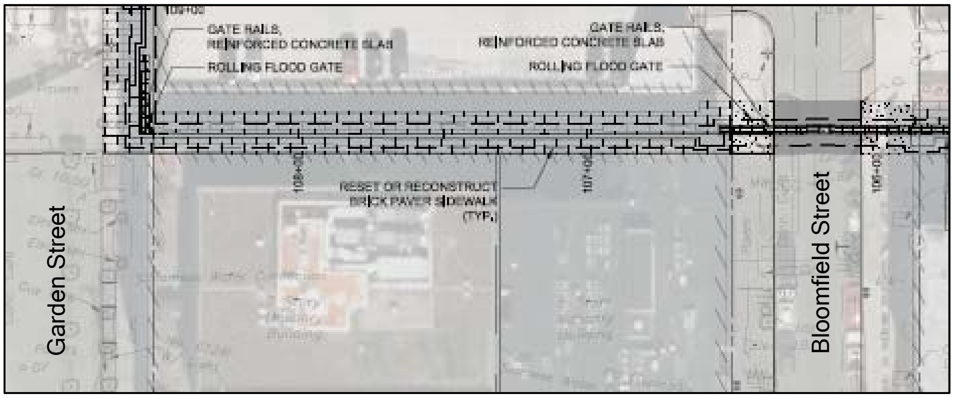


Figure 62: Bloomfield Street Flood Gate

7.3.3.1 Motorist Impacts

During construction, closure of Bloomfield Street will detour traffic east to Washington Street via 14th Street or 15th Street. The detour roads that will be utilized during construction can be seen in **Error! Reference source not found.**. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

Figure 63: Bloomfield Street Construction Detour Map

7.3.3.2 Pedestrian Impacts

Pedestrian access to the alleyway will be prohibited during construction. To travel from Bloomfield Street to and from Garden Street, pedestrians will need to utilize the sidewalks on either 14th Street or 15th Street.

7.3.3.3 Cyclist Impacts

Traveling Bloomfield Street, efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists. Just as pedestrians access to alleyway is prohibited, as will cyclist access.

7.3.3.4 Bus Transit Impacts

NJ TRANSIT bus service will not be affected.

7.3.3.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.3.3.6 Ferry Impacts

Ferry service will not be affected.

7.3.4 Garden Street

This section of the proposed barrier runs the eastern length of Garden Street (Location E of Figure 16) with gates to provide access for sidewalk access and building access, as seen in Figure 64 below. Garden Street is a dead end roadway. Garden Street is a dead-end local road that ends between 25th Street and 14th Street with a loading zone on the west side of the street and no street parking. It carries vary minor traffic, mainly used for truck deliveries.

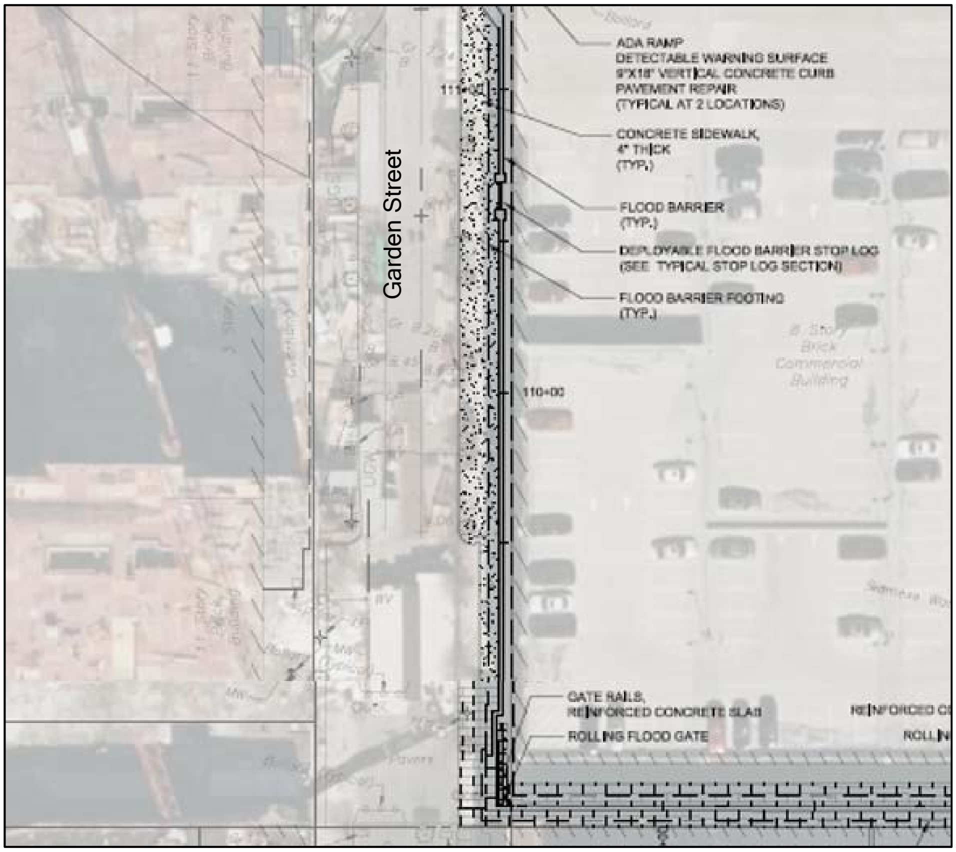


Figure 64: Garden Street Flood Barrier

7.3.4.1 Motorist Impacts

Deliveries on Garden Street will either need to be suspended or loaded from a different side of the building they are planned for.

7.3.4.2 Pedestrian Impacts

Pedestrian traffic may will need to be directed to the eastern sidewalk of Garden Street by either a flagger or advanced signage at approaching crosswalks.

7.3.4.3 Cyclist Impacts

Bicyclists would be advised to use increased caution as shoulder widths may be narrowed or eliminated.

7.3.4.4 Bus Transit Impacts

NJ TRANSIT bus service will not be affected.

7.3.4.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.3.4.6 Ferry Impacts

Ferry service will not be affected.

7.3.5 15th Street and Garden Street

The proposed barrier gate crosses 15th Street at a 45 degree angle between the northwest corner of the intersection and the southeast corner of the intersection as shown in Figure 65 below and Location F of Figure 16. (See Section 7.3.4 for information on Garden Street.) 15th Street is a two-lane Major Urban Collector with sidewalks on both sides. It widens moving westward through the intersection transitioning to a two-lane approach as it intersects Park Avenue. 15th Street carries approximately 650 vehicles during peak hour.

Figure 65: 15th Street and Garden Street Flood Gate

7.3.5.1 Motorist Impacts

Due to the width of the roadways, construction staging may be possible. In the event of a full closure during construction, traffic would be detoured south to 14th Street via Washington Street to continue in the east/west directions. Detour roads that will be utilized during construction can be found in **Error! Reference source not found.** below. All efforts will be made to avoid a full roadway closure. When and where possible, traffic staging including working in part of or half of the roadway at a time or allowing only one way traffic may be included into the construction plan.

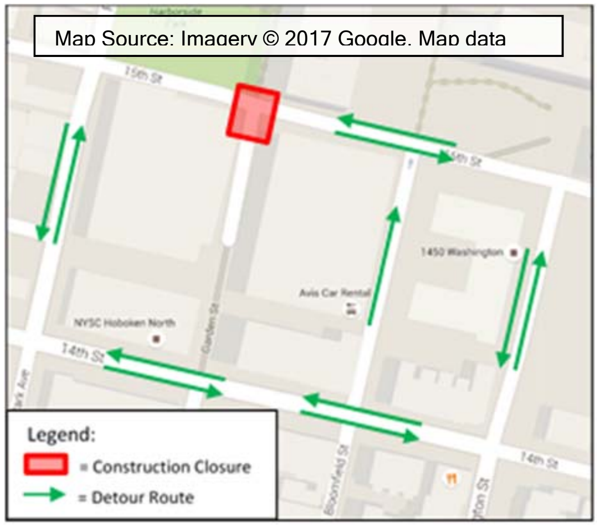


Figure 66: 15th Street Garden Street construction detour map

7.3.5.2 Pedestrian Impacts

Pedestrians will be guided to use the same detour as motorists.

7.3.5.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

7.3.5.4 Bus Transit Impacts

NJ TRANSIT bus service will not be affected.

7.3.5.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

7.3.5.6 Ferry Impacts

Ferry service will not be affected.

7.3.6 Harbor Boulevard at Park Avenue

This flood gate is proposed in Alternatives 2 and 3. See Section 7.2.4 for information on this gate location. The resist barrier runs along the Harbor Path and HBLR tracks to 19th Street.

7.3.7 Harbor Path Adjacent

The proposed flood barrier runs the length between HBLR tracks and Harbor Path from Harbor Boulevard at Park Ave to 19th Street as seen below in Figure 67.

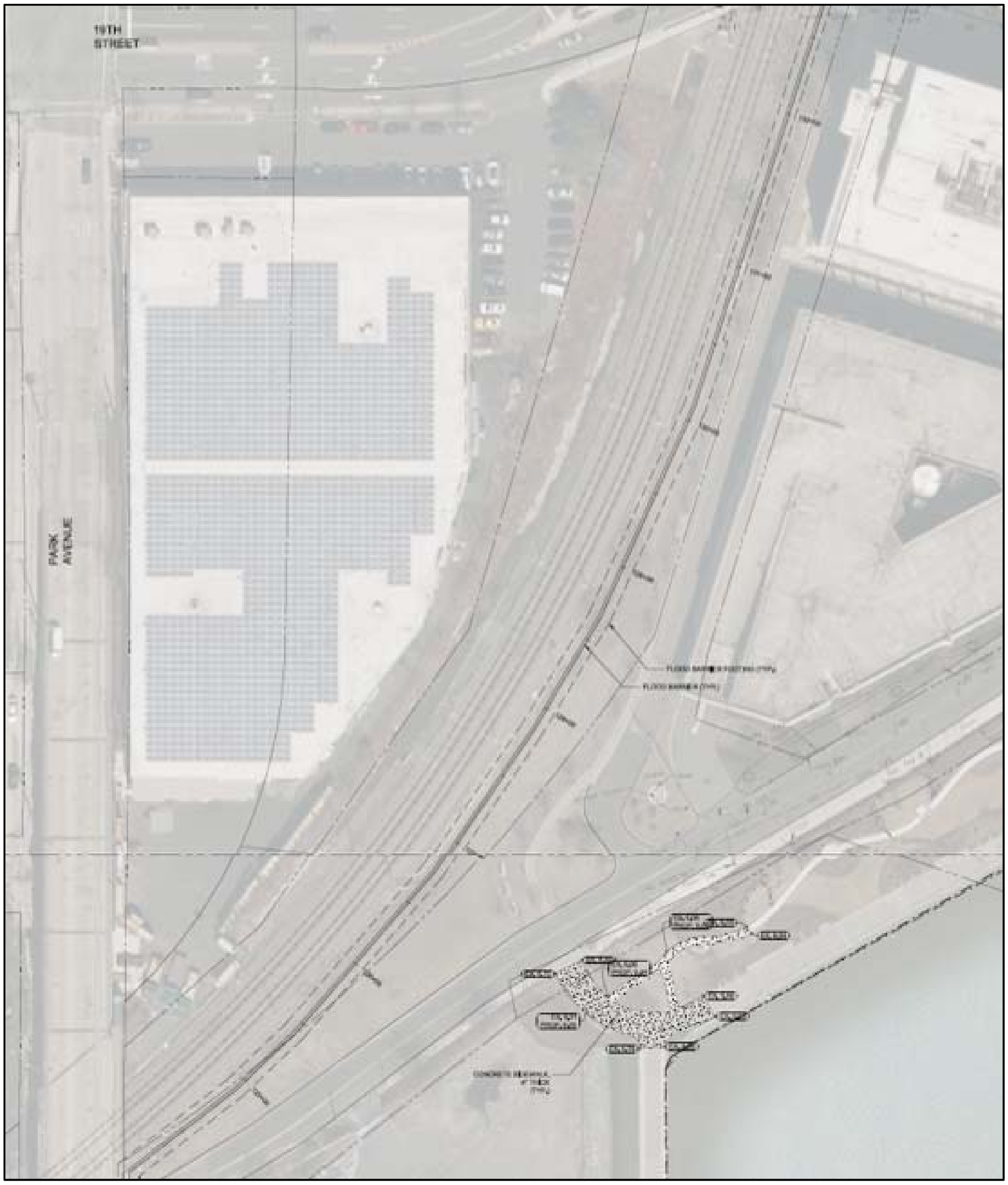


Figure 67: Harbor Path adjacent flood barrier

7.3.7.1 Motorist Impacts

There will be no impacts to motorist.

7.3.7.2 Pedestrian Impacts

During construction, access to sections of Harbor Path will be impacted. Pedestrian will be directed to follow temporary detour routes including the use of sidewalks on Harbor Boulevard and 19th Street.

7.3.7.3 Cyclist Impacts

Cyclists wishing to utilize Harbor Path will follow the same detour as pedestrians.

7.3.7.4 Bus Transit Impacts

NJ TRANSIT bus service will not be affected.

7.3.7.5 Rail Impacts

Due to proximity to railroad tracks, construction activity will be closely monitored and coordinated with NJ TRANSIT in order to limit interruption of service. Given the HBLR is a 7-day - 24 hour operation there may be some outages associated with construction of the gate across the tracks, however, impacts to service will be limited to weekends and off-hours whenever possible.

7.3.7.6 Ferry Impacts

Ferry service will not be affected.

7.3.8 19th Street at Waterfront Terrace

This flood gate is proposed in Alternatives 2 and 3. See Section 7.2.7 for information on this gate location.

ALTERNATIVE 3- SOUTHERN RESIST STRUCTURE

7.3.9 Jersey Ave

This flood gate location is prosed in Alternatives 1 and 3. See Section 7.1.10 for information on this gate location.

7.3.10 Grove St

This flood gate is proposed in all three alternatives. See Section 7.1.11 for information on this gate location.

7.3.11 Marin Blvd

This flood gate is proposed in all three alternatives. See Section 7.1.12 for information on this gate location.

7.3.12 NJT Maintenance of Way Facility, NJT Parking Lot, Engine House, and Rail Sidings

This alternative is proposed in all three alternatives for Option 1. See Section 7.1.13 for information.

7.3.13 Observer Highway Length

This flood barrier is proposed in Alternatives 2 and 3. See Section 7.2.12 for information on this flood barrier.

7.3.14 Observer Highway Crossing

Flood gates are proposed to cross Observer Highway in all three alternatives. See Section 7.1.15 for more information at these crossings.

7.3.15 Closure at Marin Boulevard and Track Yard

This crossing is proposed in all three alternatives. For information on this crossing see Section 7.1.16.

7.3.16 18th Street at NJ TRANSIT Tracks

This crossing is proposed in all three alternatives. For information on this crossing see Section 7.1.17.

8.0 STORMWATER DETENTION FACILITIES

8.1 13th Street And Adams Street

This underground detention system covers from Madison Street and 12th Street at the southwest corner to 13th Street and Adams Street at the northeast corner, about two blocks wide by two blocks long. The storage tank would sit under an empty lot and hold 5.8 million gallons. The 62.25 acre drainage area covers from 11th Street and Paterson Plank Road on the southwest corner to Clinton Street and 16th Street on the northeast corner. The drainage area perimeter runs along Paterson Plank Road and crosses under the 14th Street overpass. Figure 68 above shows the location of the storage tank as well as the drainage area lined with drainage pipes.

The roads surrounding the storage tank site are one-way roads with sidewalks on both sides as well as adjacent parking on both sides with the exception of Madison Street on the west side. Madison Street is a two-lane road with sidewalks on both sides, a shared bike lane and adjacent parking on the northbound side.

The drainage area encompasses approximately ¼ mile of the 14th Street access out of Hoboken to Paterson Plank Road. This road is the only access point to the west side of Hoboken.

Figure 68: 13th Street Flood Storage

8.1.1.1 Motorist Impacts

During construction, road closure should not be necessary. The work can be expected to remain within the property limits. In the event that roadways need to be temporary closed, traffic would utilize Grand Street for the southbound direction and 10th Street for the eastbound direction. The adjacent apartment building located on the east side of the storage tank can be accessed via Grand Street, 12th Street, or 13th Street.

Construction of drainage pipes may result in partial or full roadway closures. As none of these streets are major thoroughfares, traffic should be easily detoured with little congestion.

8.1.1.2 Pedestrian Impacts

Sidewalks and parking surrounding the construction site will likely be temporarily unavailable. Pedestrians will be guided to follow the same detour as motorists.

8.1.1.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

8.1.1.4 Bus Transit Impacts

Service to Hoboken Hop green line and Hoboken Senior Shuttle service may be affected. Depending on closure location, bus routes may need to be detoured and bus stops may need to be moved to the adjacent street.

8.1.1.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

8.1.1.6 Ferry Impacts

Ferry service will not be affected.

8.2 Southwest End - Observer Highway And Harrison Street

The underground storage tank is proposed under an existing parking lot for the Academy Bus Depot. The storage tank is approximately 150 feet wide by 200 feet long and holds 616,000 gallons. The drainage area covers 8.62 acres. The tank spans from the at-grade HBLR train track crossing of Paterson Street on the northwest corner to Harrison Street and Newark Street at the southeast corner. The perimeter of the drainage area follows the curvature of existing parking lots as well as the train tracks on the west side. The surrounding roads include Harrison Street which is a one-way southbound road with sidewalks and adjacent parking on both sides, and Observer Highway which is a two-way street in the east/west direction with sidewalks on both sides.

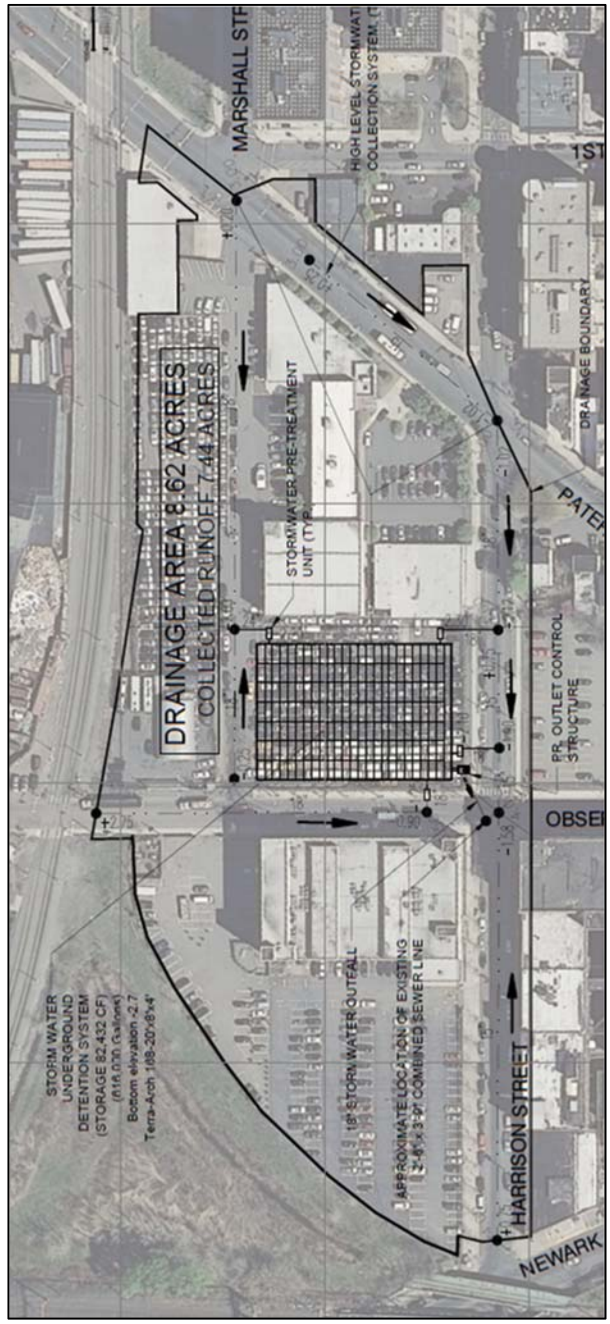


Figure 69: Observer Highway Flood Storage

The drainage elements (shown as arrows in Figure 69) will be reconstructed to segregate current combined sewer overflow system into a separate storm water collection system. The work will occur on a block by block basis that will relocate local vehicular, transit or bicycle traffic to the nearest adjacent street. Because these streets are not major thoroughfares, the impact of the diversion is minimal.

8.2.1.1 Motorist Impacts

During tank construction, road closure should not be necessary. The work can be expected to remain within the parking lot limits. In the event that roadways need to be temporary closed, traffic will be detoured to Paterson Avenue which runs diagonal in the northwest/southeast direction. Also, the existing Academy Bus Depot parking lot will have to be temporarily relocated. Bus access will have to be solely from Paterson Avenue as the Observer Highway access will likely be closed during construction.

The drainage area covers both Observer Highway and Paterson Street; both roads are used as access points into Hoboken. If these roads have to be closed at some point during construction, it would be wise to only close these roads in stages, so that there is always one access point to Hoboken open.

8.2.1.2 Pedestrian Impacts

Sidewalks and parking surrounding the construction site will likely be temporarily unavailable. Pedestrians will be guided to follow the same detour as motorists.

8.2.1.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

8.2.1.4 Bus Transit Impacts

There are two bus stops within the drainage area. The stops may either be suspended or temporarily moved to a safe waiting area for riders along a detour route to be designed by NJ TRANSIT.

8.2.1.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

8.2.1.6 Ferry Impacts

Ferry service will not be affected.

8.3 NJ TRANSIT Site – 2nd Street To 6th Street

The storage tank runs along the HBLR railroad tracks on the west side of Hoboken between 3rd Street and 5th Street. The storage tank varies in width due to its location between the train tracks and the Hoboken Housing Authority buildings. The storage tank holds 1,368,480 gallons. The 17.24-acre drainage area covers from 2nd Street to 6th Street and covers as far east as Jackson Street. The storage tank does not interfere with any roads or the railroad tracks.

The drainage area covers access to many residential estates in the area as well as access to a baseball field. It does not however cover any major roads. Figure 70 shows the location of the storage tank as well as the drainage area.

Figure 70: 2nd Street Flood Storage

8.3.1.1 Motorist Impacts

During construction, the parking lots for the residential housing would be the only traffic component affected. These parking lots will need to be temporarily relocated. If a closure is necessary during construction, access to residential estates will have to be temporarily relocated.

8.3.1.2 Pedestrian Impacts

During partial closures, pedestrians will be guided to the opposite sidewalk by signage or a flagger at the approaching cross walks. In the event of a full closure, pedestrians will be guided to use the same detour route as motorists.

8.3.1.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

8.3.1.4 Bus Transit Impacts

There is one NJ TRANSIT bus stop within the drainage area that may need to be temporarily relocated. In the event of a closure, NJ TRANSIT Hoboken Hop blue line, and Hoboken Senior Shuttle will follow the same detour as motorists, and the bus stop will be moved to safe waiting location for riders.

8.3.1.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

8.3.1.6 Ferry Impacts

Ferry service will not be affected

9.0 ROW STORAGE TANKS

As part of the delay storage discharge system, Dewberry has proposed small 25 foot by 6 foot (typically) right-of-way storage tanks to be located under or adjacent to sidewalks throughout Hoboken.

There are approximately 65 proposed tanks throughout Hoboken (see Figure 71). Clustered tanks, classified as at least two or more tanks located near or next to each other, will most likely cause a heavier closure during construction. Isolated tanks are fairly separated from any other tank. They are usually located in between intersections. In areas that experience high levels of congestion, such as Washington Street, construction should be scheduled for off peak and/or overnight hours.

Figure 71: ROW Storage

The ROW tanks will not have any long term effects on daily commuter activity. The only permanent changes to access will be on 5th Street near Monroe Street and on Monroe near 7th Street. Curb bump out tanks will be constructed at these location within the roadway along the curb line where now exists a no parking zone. The only effect of these tanks is a slightly narrowed roadway for short length of the tank.

9.1.1.1 Motorist Impacts

Due to the size and location of the tanks, full roadway or intersection closures will not be likely. Motorists should expect narrowed lanes and a lower speed limit. Construction vehicles would occupy the sidewalk and parking spaces adjacent to the work zone.

9.1.1.2 Pedestrian Impacts

During partial closures, pedestrians will be guided to the opposite sidewalk by signage or a flagger at the approaching cross walks. In the event of a full closure, pedestrians will be guided to use the same detour route as motorists.

9.1.1.3 Cyclist Impacts

Bicyclists would be advised to use increased caution as shoulder widths may be narrowed or eliminated.

9.1.1.4 Bus Transit Impacts

Due to the size of the tanks, any sites that coincide with bus stops should be moved within sight distance of the existing bus stop.

9.1.1.5 Rail Impacts

NJ TRANSIT Rail service will not be affected.

9.1.1.6 Ferry Impacts

Ferry service will not be affected.

10.0 EMERGENCY DEPLOYMENT IMPACTS

Under all alternatives, some areas will be impassible whether by vehicle, by bicycle or on foot while gates are deployed (Figure 72). However, not all alternatives are equal in this respect. Alternative 1, with an alignment along the waterfront does restrict access onto properties located on the piers in Weehawken and Hoboken east of the resist structure upon deployment of the gates. In contrast, gate deployment for Alternatives 2 and 3 will require alternate routes, but properties are accessible. The gate closures are similar to detours in place during construction. In Alternatives 2 & 3 there is one gate that crosses the HBLR tracks in Weehawken. Closure of this gate will be closely coordinated by NJ TRANSIT. In all Alternatives, access to the NJ TRANSIT rail yard and certain maintenance areas is impacted but not entirely isolated and other than the HBLR track to the north, NJ TRANSIT tracks are not impacted. Flood gate placement was designed only to limit access in areas that have a greater risk of flooding during a storm surge condition, when typically restrictions would be placed on mobility due to an emergency condition. Flood gates will remain in the deployed position for the entirety of the flood event and will open once water recedes to a safe level.

Figure 72: Deployed Flood Gate Graphic

Flood gate deployment is being addressed as part of the continuing Operations & Maintenance discussions for the project. This will require a multi-organization agreement encompassing the cities of Hoboken, Jersey City and Weehawken; Agencies such as NJ TRANSIT, Port Authority of New York & New Jersey, Hudson County, Jersey City Municipal Utilities Authority and North Hudson Sewerage Authority. Obviously the Emergency Management organizations of all of these entities will be heavily involved in this effort. Procedures and responsibilities will be established for routine maintenance, communication and activation of the systems in the event of an impending storm condition.

10.1.1.1 Motorist Impacts

Once flood gates are in the closed position, with all Alternatives there will be no access to and from the south of Hoboken. Jersey Avenue, Grove Street, and Marin Boulevard gates will all be secured. Access will be from the west via New York/Observer Highway (see Figure 73) and Paterson Plank Road. Access to Hoboken Terminal will be limited to Hudson Street and points east.

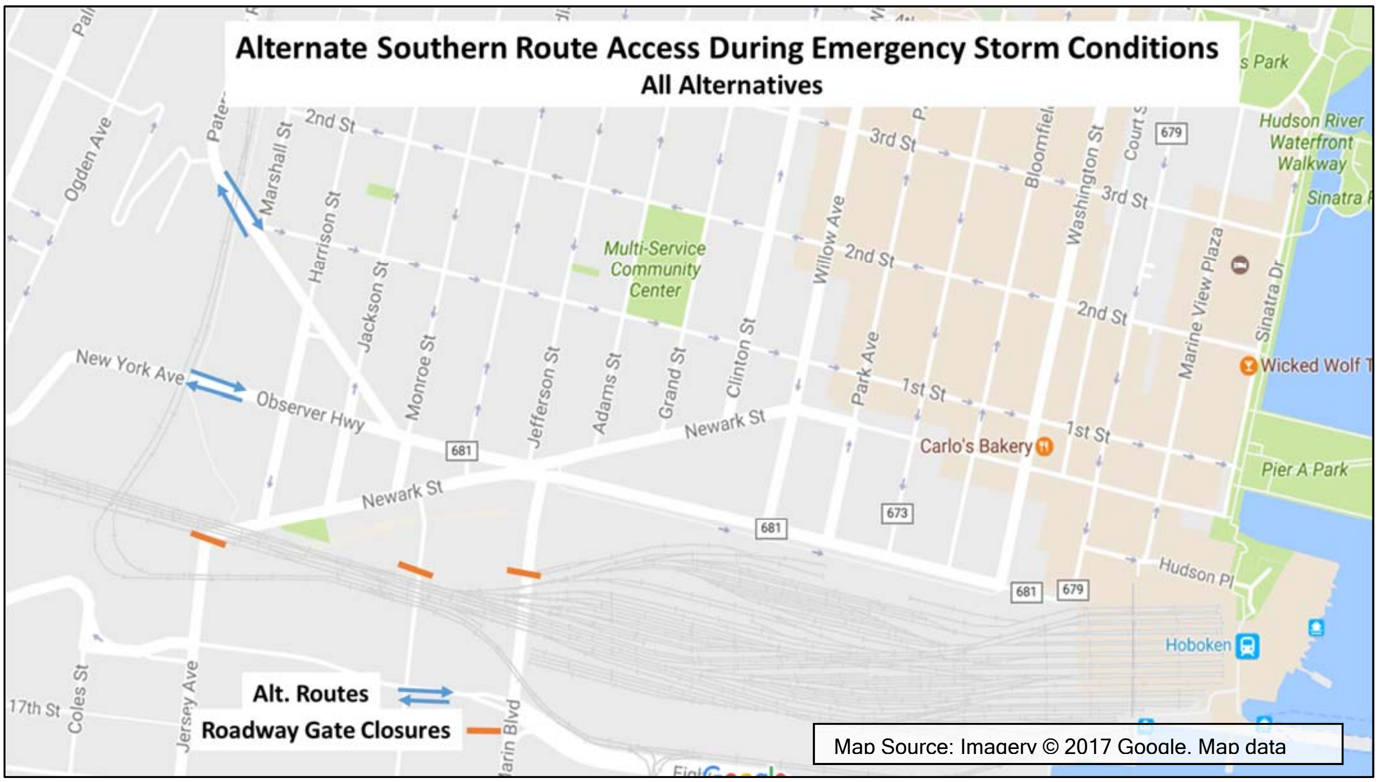


Figure 73: Southern Emergency Access

To and from the north of Hoboken, access via Willow Avenue and Park Avenue bridges will remain operational. Under Alternatives 2 and 3 deployment, Harbor Boulevard will be closed off just north of Hoboken, limiting access to Weehawken solely to Willow Ave and Park Ave. Additionally, under Alternative 1, Weehawken ferry and piers will be inaccessible including some waterfront properties. Further north in Weehawken, under both Alternatives 2 and 3 Port Imperial Boulevard/Waterfront Terrace will be closed at Harbor Boulevard. This closure should not have any effect on resident evacuations. (See Figure 78.) Alternatives 2 and 3 would require track gate crossings at the HBLR line south of the Lincoln Harbor Light Rail station, whereas Alternative 1 would pass underneath the HBLR overpass just north of Baldwin Avenue. Therefore, Alternative 1 would not require gate crossings across the HBLR tracks. Although the Alternative 2 and 3 gate crossings do not interfere with resident evacuations, closure timing and procedure will need to be coordinated with NJ TRANSIT in order to provide evacuation by rail.

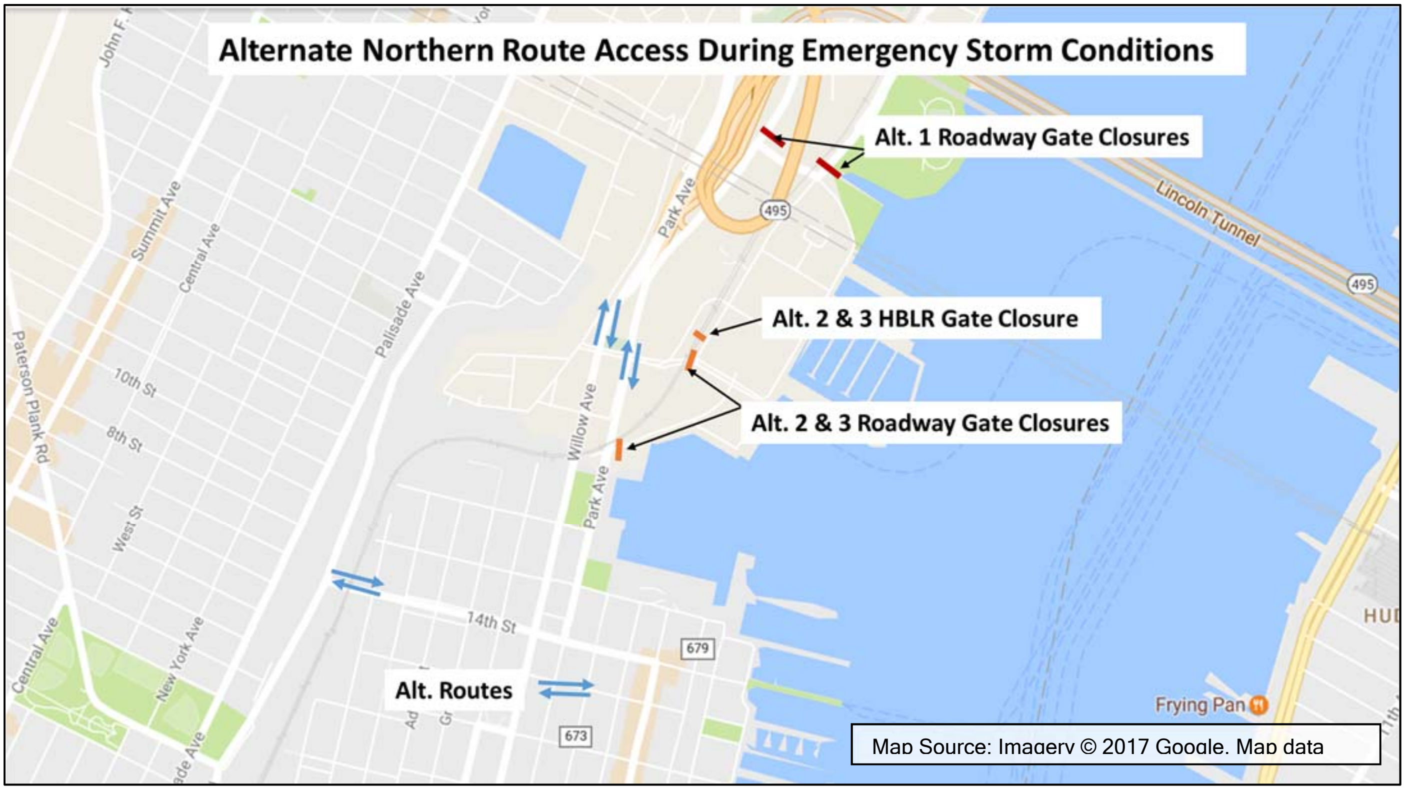


Figure 74: Northern Emergency Access

10.1.1.2 Pedestrian Impacts

Pedestrians will experience the same limitations as motorists.

10.1.1.3 Cyclist Impacts

Efforts will be made to accommodate cyclists during construction, however there may be times when cyclists should utilize the same detour as motorists.

10.1.1.4 Bus Transit Impacts

NJ TRANSIT Bus Route Impacts

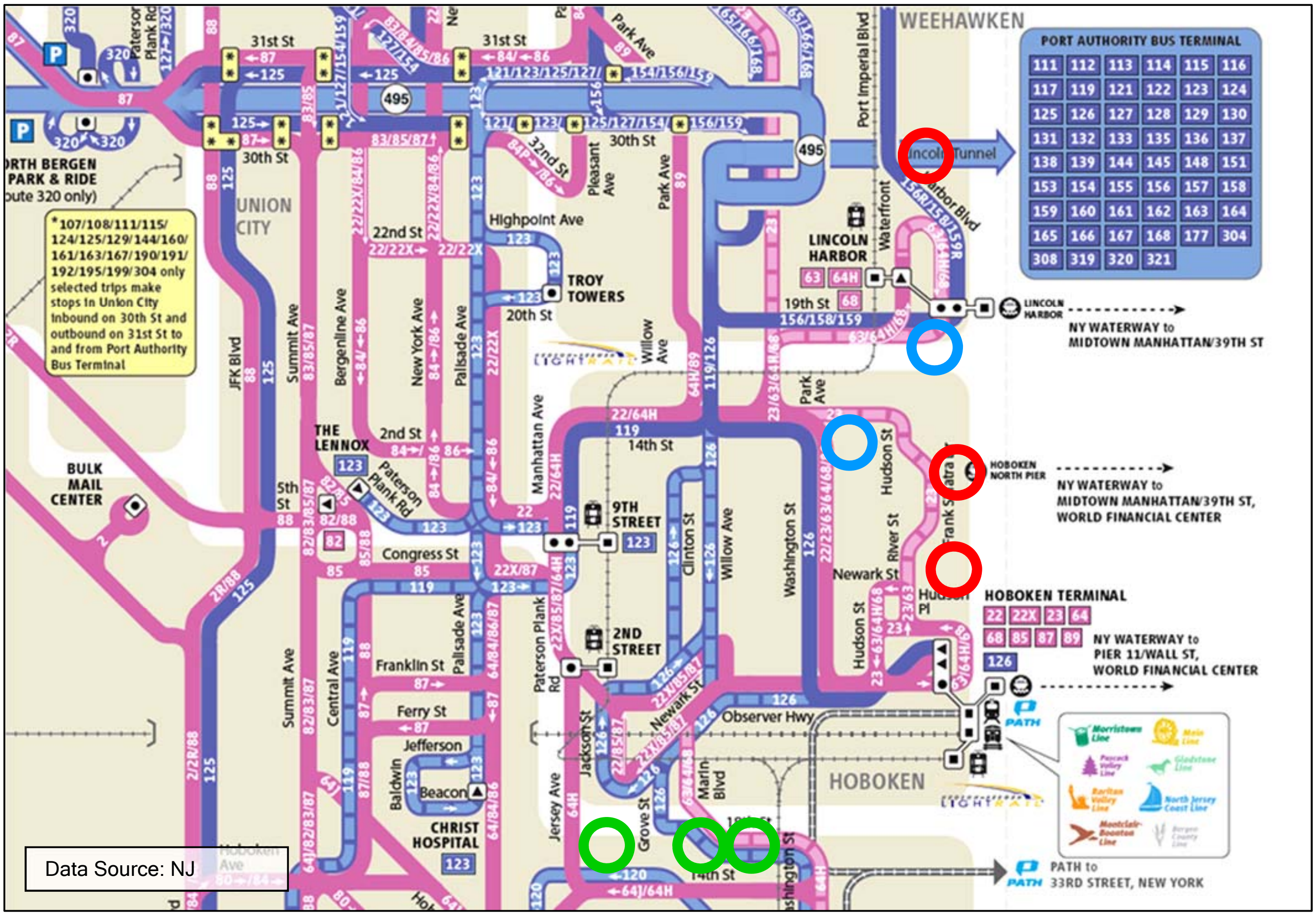


Figure 75: NJ TRANSIT Hoboken Bus Routes

Locations closed by deployed Alternative 1 Resist Elements

Locations closed by deployed Alternatives 2 & 3 Resist Elements

Locations closed by deployed Alternatives 1, 2 & 3 Resist Elements

Deployment of the resist elements (rolling gates) for all Alternatives would interrupt routes using Jersey Avenue, Grove Street & Marin Boulevard. The locations of these resist elements are adjacent to the NJT rail viaduct, and are depicted by green circles on the transit map above.

Deployment of the Resist elements for Alternative 1 would, in addition to the above, interrupt NJT Bus Route 23 which makes use of Frank Sinatra Drive, where there would be gate structures located just south of its intersection with Sinatra Drive North, and just north of its intersection with Sinatra Drive. It would also interrupt NJT Bus Routes 156R, 158, and 159R at their southern entry onto Port Imperial Boulevard, where there would be a gate structure just north of its intersection with Baldwin Avenue/Harbor Boulevard. These three locations are depicted with red circles.

Deployment of the Resist elements for both Alternatives 2 & 3 would, in addition to the three locations previously described on the south end of Hoboken, interrupt with a gate across 19th Street just east of the HBLR tracks, NJT Bus Routes 63, 64H and 66; which utilize 19th Street to make a loop at Lincoln Harbor using Waterfront Terrace and Harbor Boulevard, returning via 19th Street. It would also, via a gate across 14th Street immediately west of Washington Street, interrupt NJ routes 22, 23, 63, 64, 68, 89 & 126.

Because of the interruption of service that would occur, deployment will occur after public transit is suspended.

Hoboken HOP and Senior Shuttle Impacts

Hoboken HOP and Senior Shuttle services are limited to Hoboken. Closures in the North at 14th and 15th Street and in the South on Observer Highway will impact bus routes, however, during emergency conditions it is likely that these services will be suspended.

10.1.1.5 Rail Impacts

Deployment will occur after public transit is suspended. The details of the timing of Light Rail closure and gate closure will be worked out as part of the maintenance and operating program.

10.1.1.6 Ferry Impacts

Gate deployment would result in loss of access to piers and waterfront amenities, however deployment will occur after public transit is suspended.

11.0 LONG-TERM IMPACTS

During non-emergency conditions, circulation throughout the study area will continue similar to pre-construction conditions. Flood gate storage has been designed as not to inhibit daily movements and activates. However, periodically the gates will need to be maintained and operationally tested (including deployment), which may result in short term roadway closures. All closures are to be planned with the least inconvenience to residents as possible and closely coordinated with public transportation, specifically NJ TRANSIT with special attention to railroad crossings.

11.1.1.1 Motorist Impacts

For motorists, the long term effects will be the most negligible. No roads will be closed. With the exception of a few locations where roads are slightly narrower, the resist structures should not cause issues for vehicle travelers and commuters. Additionally, required set-backs at intersections will be observed in the final design.
Motorists will be affected by periodic maintenance and testing, but will be able to resume regular activity at all other times.

11.1.1.2 Pedestrian Impacts

Pedestrians will be affected in terms of travel routes. No public areas or routes will be closed off, however public space will be modified to incorporate the flood barriers into recreational space in a useful manor such as murals, observation decks, public green space, etc. Sidewalks will be widened to accommodate flood barriers and gates that take up valuable pedestrian space resulting in narrower roadways. See Figure 76 below.

Figure 76: Side Street Barrier Graphic

For Alternative 1, there will be a significantly different experience for pedestrians traveling along the waterfront than what is experienced today. The southern flood barrier of Alternative 1 adjoins a tree-lined bikeway and pedestrian walkway. Due to the height of the barrier, pedestrians will either be on the land side of the barrier or the river side of the barrier with access points periodically provided down the length of the barrier. The barrier height varies but as mentioned in 3.1, the height can reach up to 16 feet height and will require introduction of ramps and steps to access the waterfront. All ramps will need to meet ADA standards and be spaced so that handicapped persons may enter and exit the promenade during emergency situations. The northern section of Alternative 1 the concept crosses a series of parks between which a fairly high resist barriers will be necessary. A graphic example can be seen below in Figure 77.

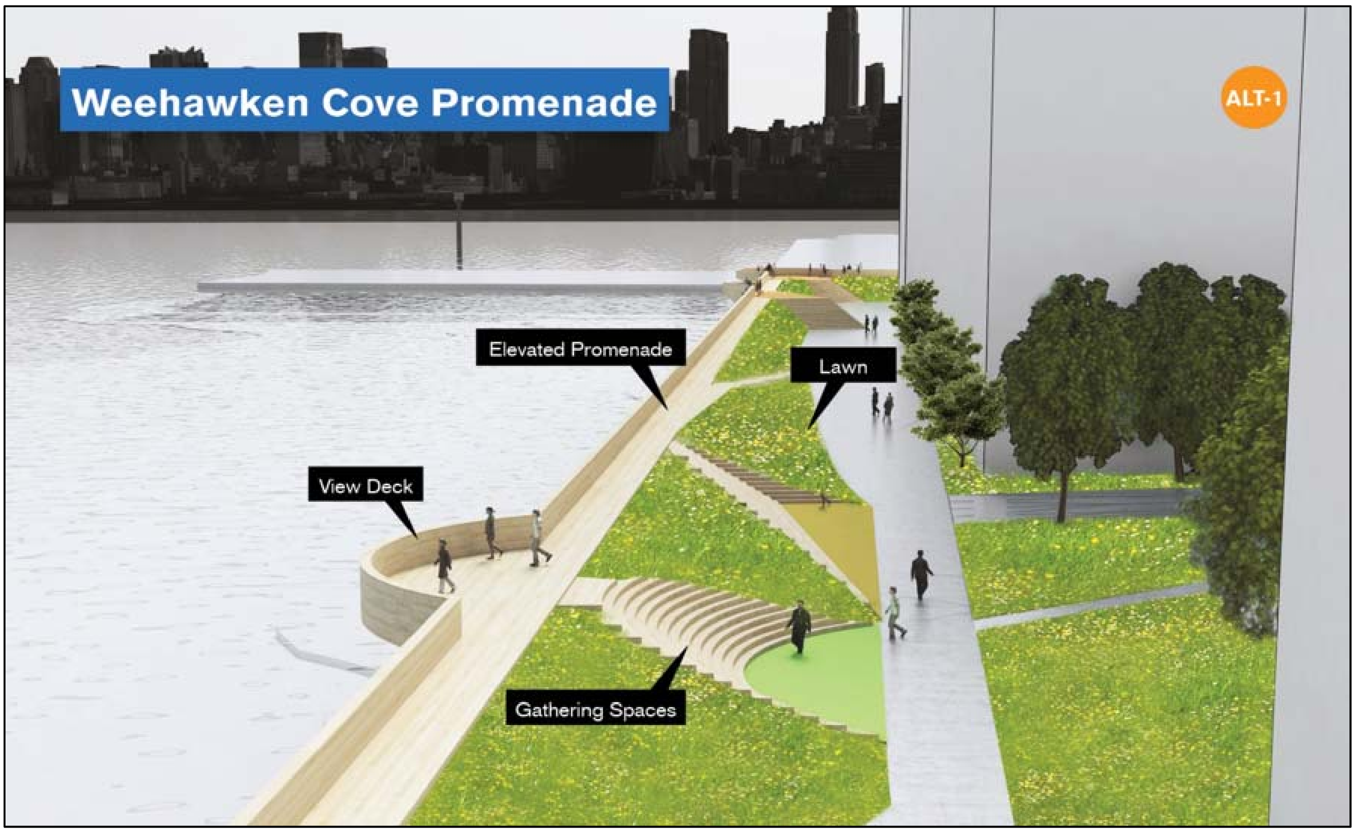


Figure 77: Waterfront Barrier Graphic

11.1.1.3 Cyclist Impacts

Cyclists will experience a similar affect as pedestrians. Any dedicated bicycle lanes that are affected by construction will be replaced, however for Alternative 1, cyclists will have limitations along the waterfront.

In all alternatives, the Jersey Ave flood gate location will cause bicyclists traveling to and from Jersey City to slightly reroute by about 30’. The current alignment of the designated bike path will be realigned in order to pass through the flood gate opening. All efforts will be made to preserve the dedicated bicycle path, as it plays a key role in the lives of Jersey City residents who travel via bicycle.

Figure 78: Northern Resist Structure with Dedicated Bicycle Lanes

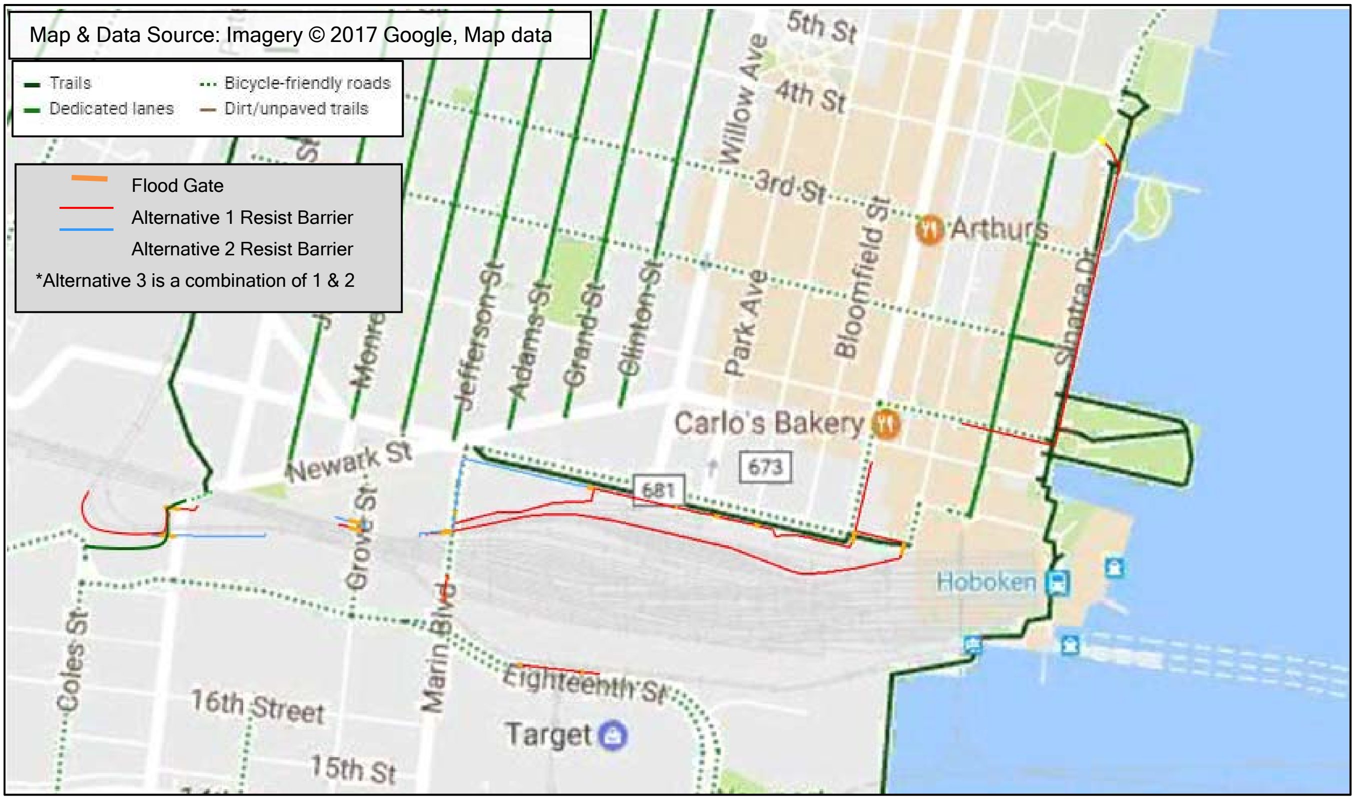


Figure 79: Southern Resist Structure with Dedicated Bicycle Lanes

11.1.1.4 Bus Transit Impacts

NJ TRANSIT Bus Routes

Any bus stops that are affected by the resist structure will be modified in order to accommodate safe rider access. Graphic images below show the resist structure and NJ TRANSIT bus stops.

Figure 80: North Resist Structure Bus Stop Interference

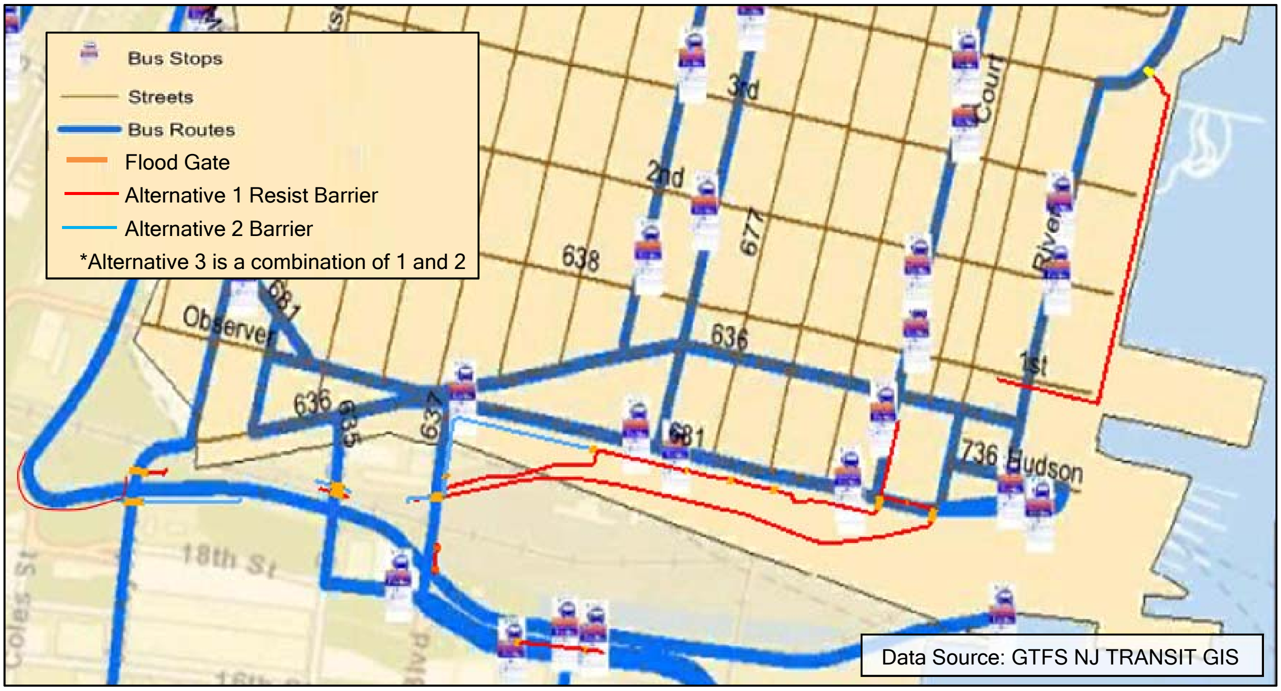


Figure 81: South Resist Structure Bus Stop Interference

Hoboken HOP and Senior Shuttle Impacts

Hoboken HOP and Senior Shuttle services are limited to Hoboken. Maintenance closures in the North at 14th and 15th Street and in the South on Observer Highway will temporarily impact routes.

11.1.1.5 Rail Impacts

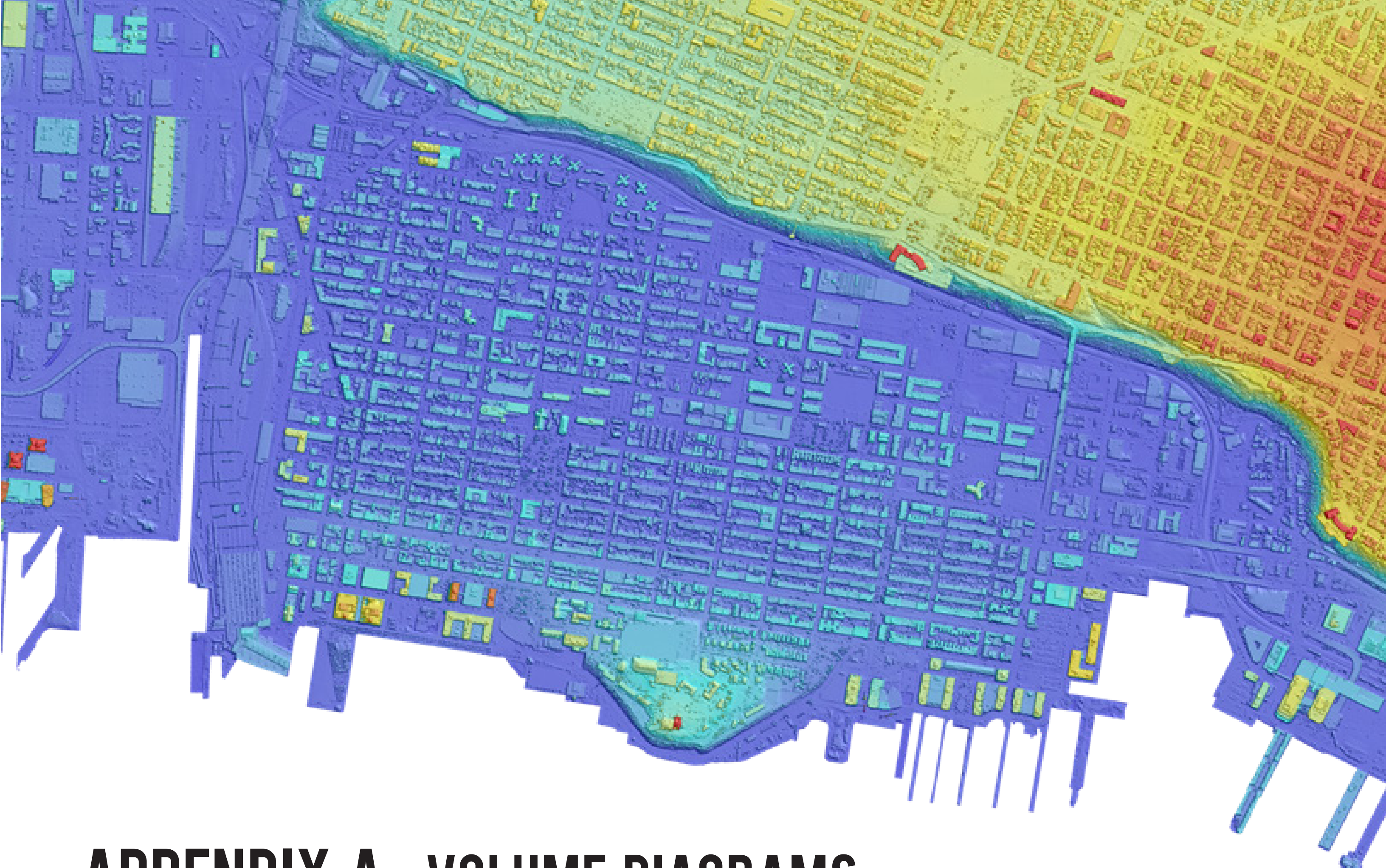
NJ TRANSIT Rail access will not be affected long-term.

11.1.1.6 Ferry Impacts

Ferry access will not be affected long-term.

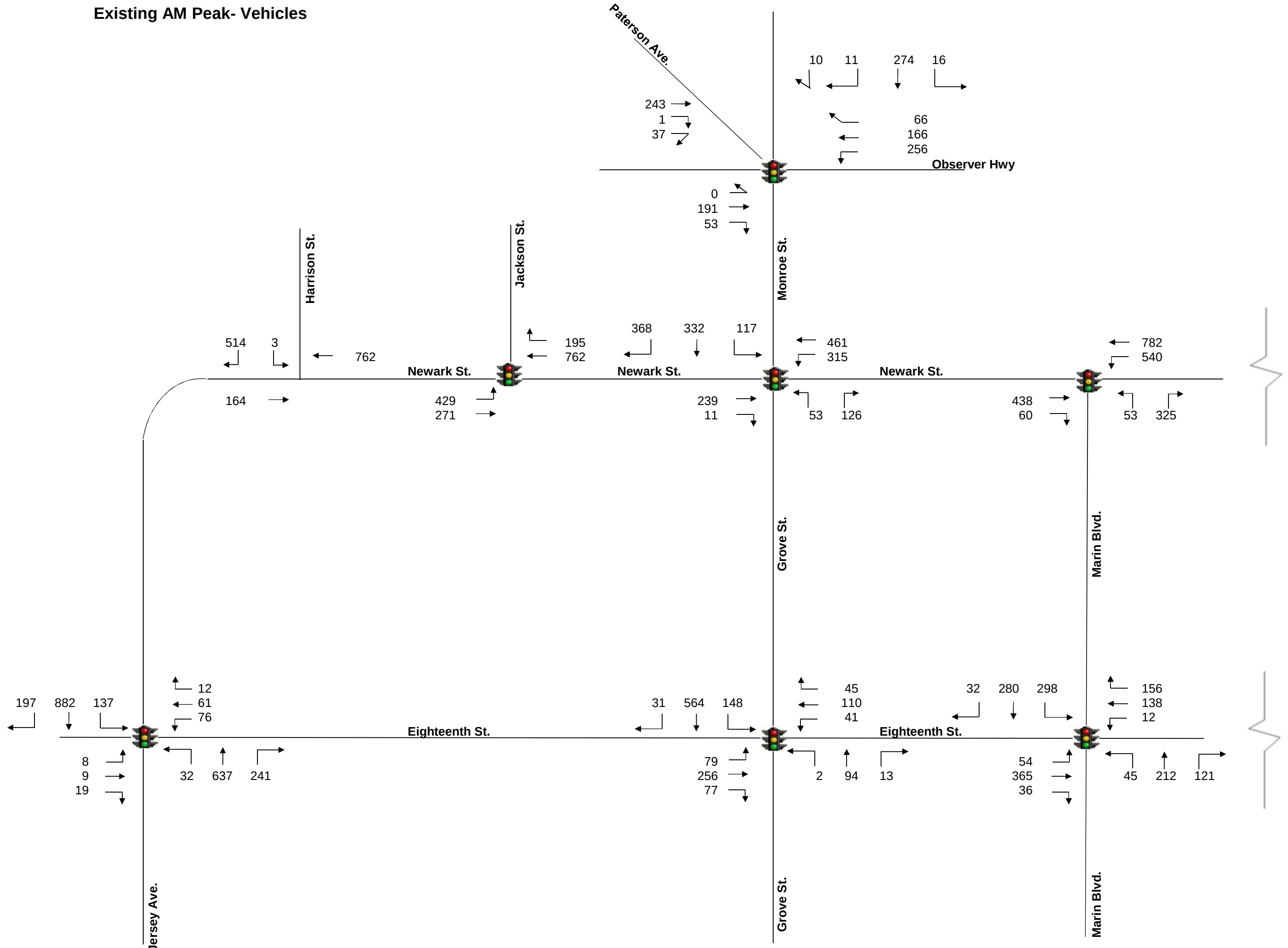
12.0 Operations and Maintenance Plan

Recognizing the extensive coordination effort between the municipalities, agencies and the community an Operations and Maintenance (O&M) plan for the RBD-HR project will be prepared. The plan will describe the procedures and responsibilities for routine maintenance, communication and timing of activation in the event of an impending storm condition. The O&M plan will include the procedures to be followed by the various stakeholders, such as NJ TRANSIT, other public transit operators and local officials so that the timing of gate closures and public transit service closures is coordinated. The participants in the O&M planning and development currently include but are not limited to entities such as the NJDEP, the cities of Hoboken, Jersey City and Weehawken, NJ TRANSIT, Port Authority of New York & New Jersey, Hudson County, Jersey City Municipal Utilities Authority, North Hudson Sewerage Authority, and the New Jersey Office of Emergency Management.

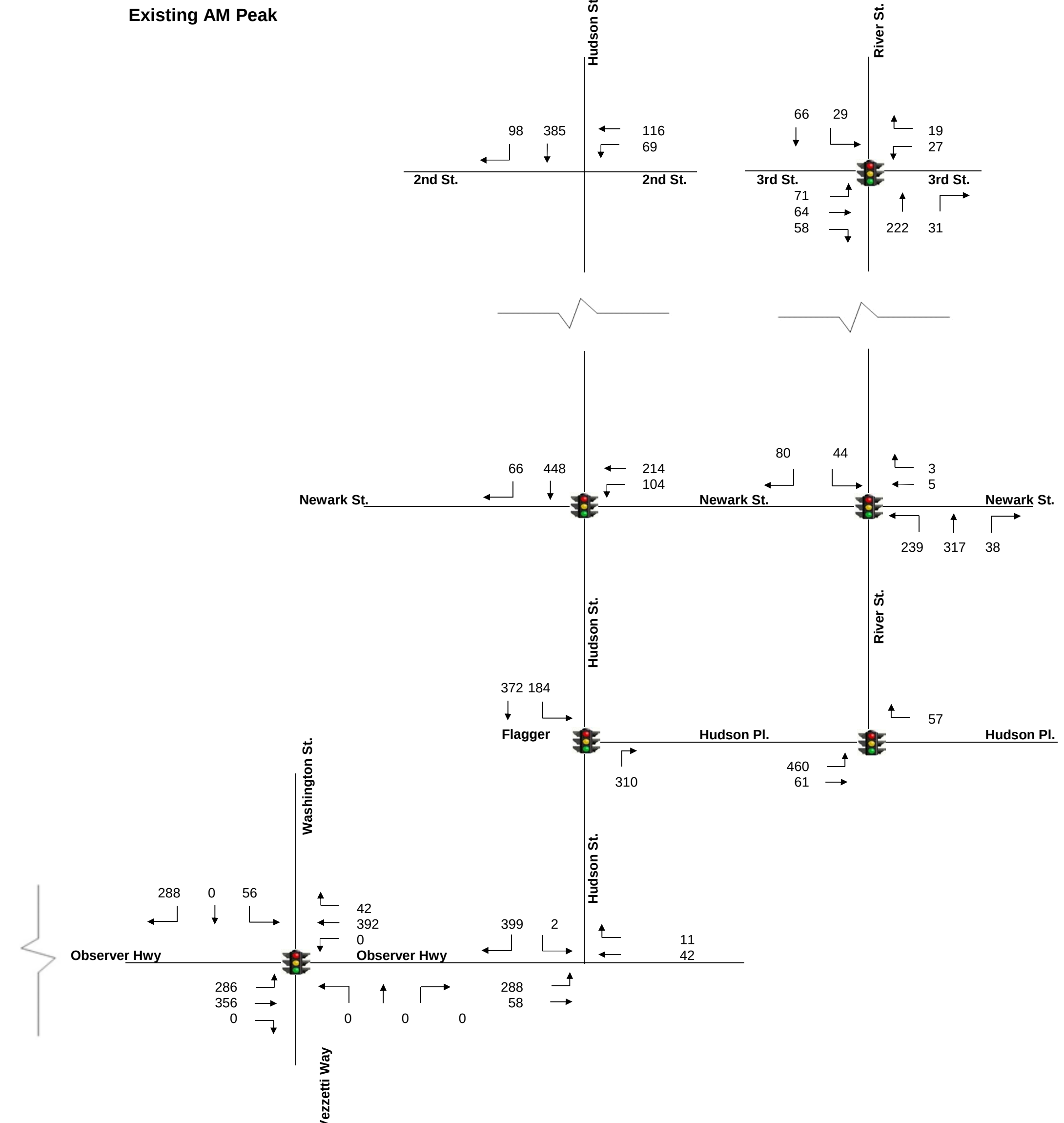


APPENDIX A – VOLUME DIAGRAMS

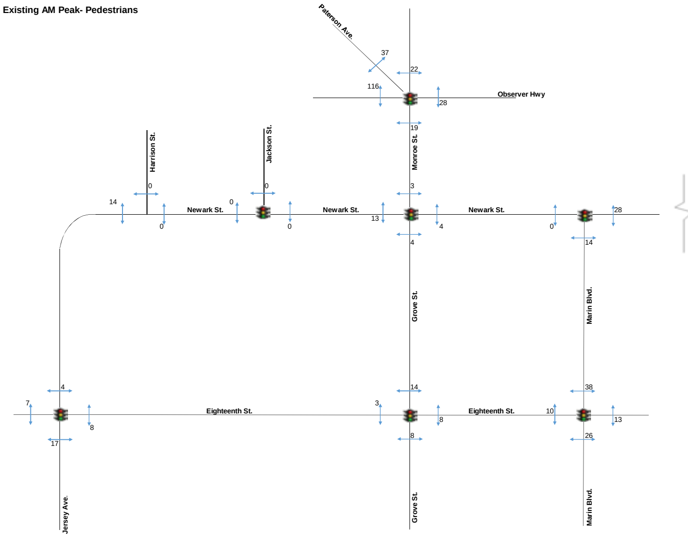
Existing AM Peak- Vehicles



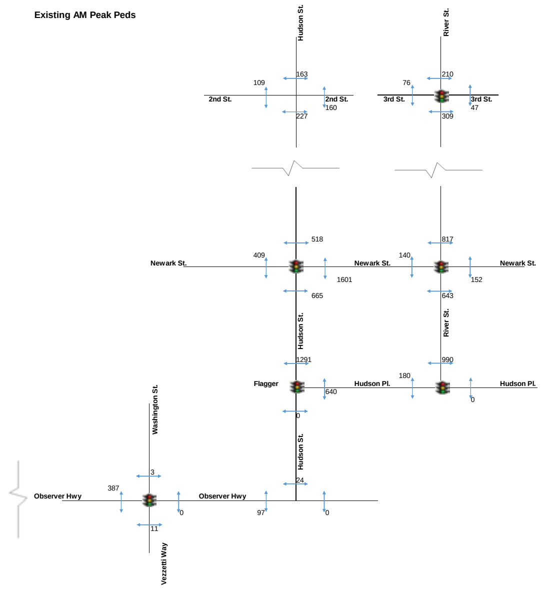
Existing AM Peak



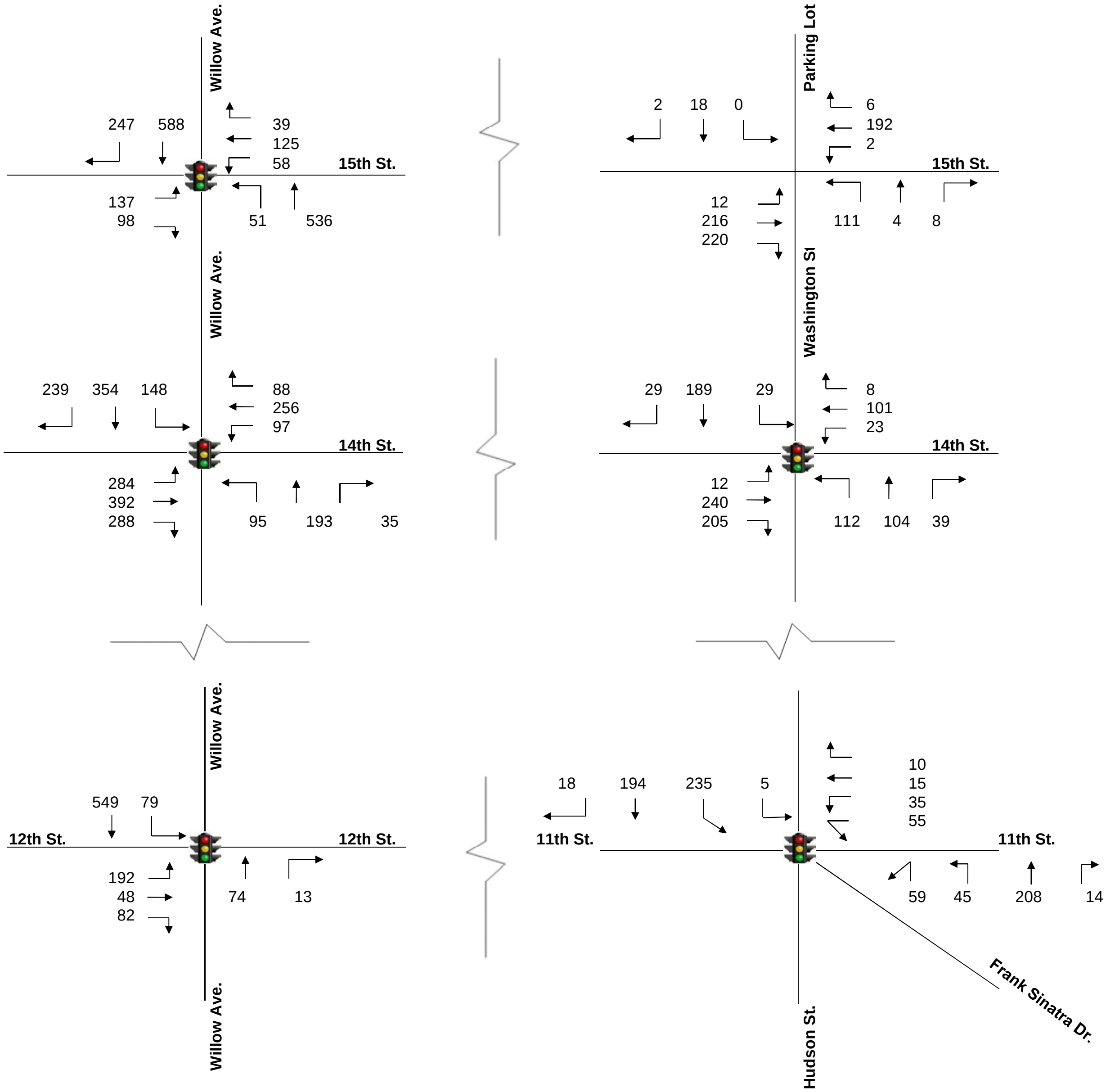
Existing AM Peak- Pedestrians



Existing AM Peak Peds



Existing AM Peak- Vehicles



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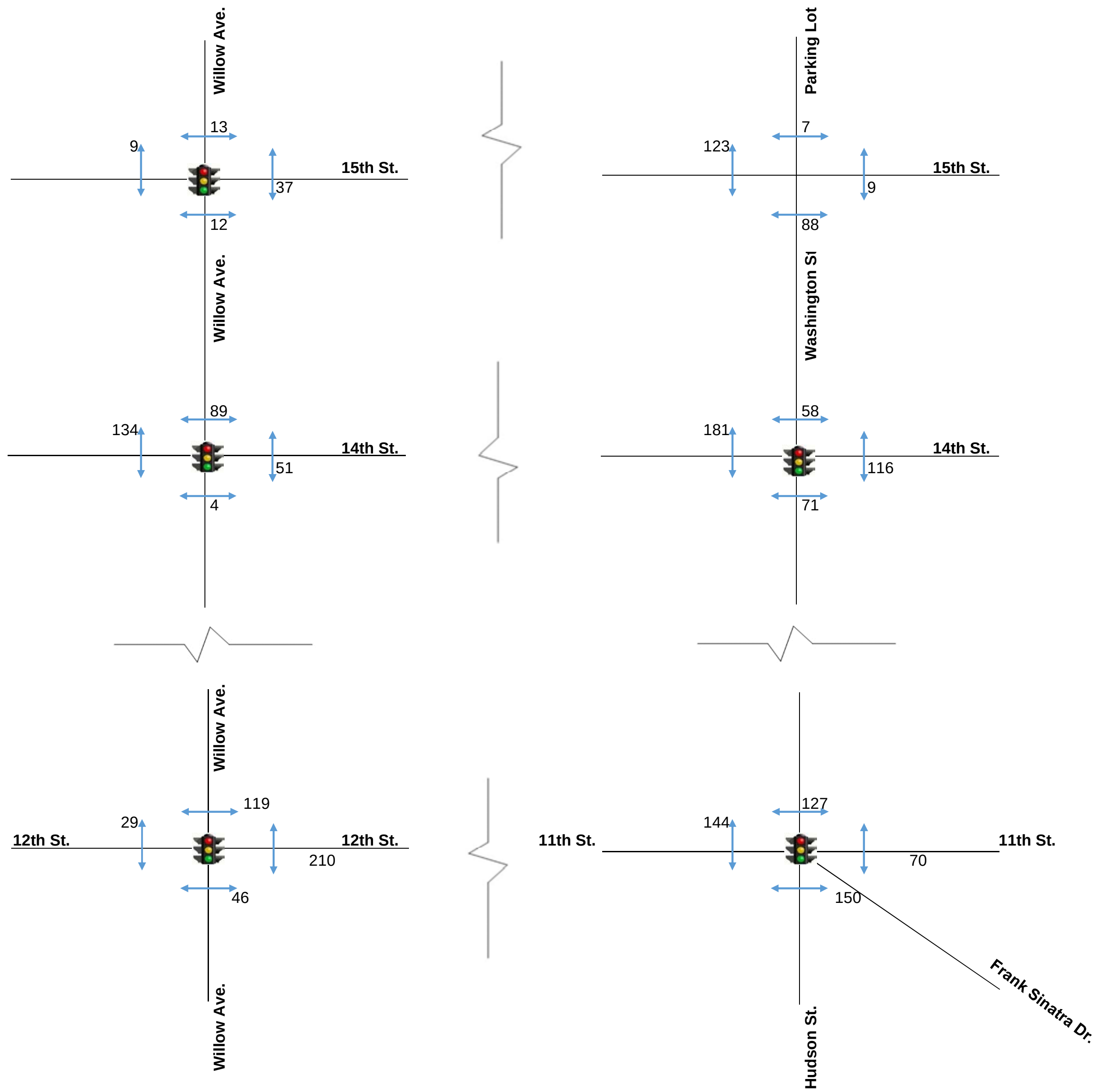

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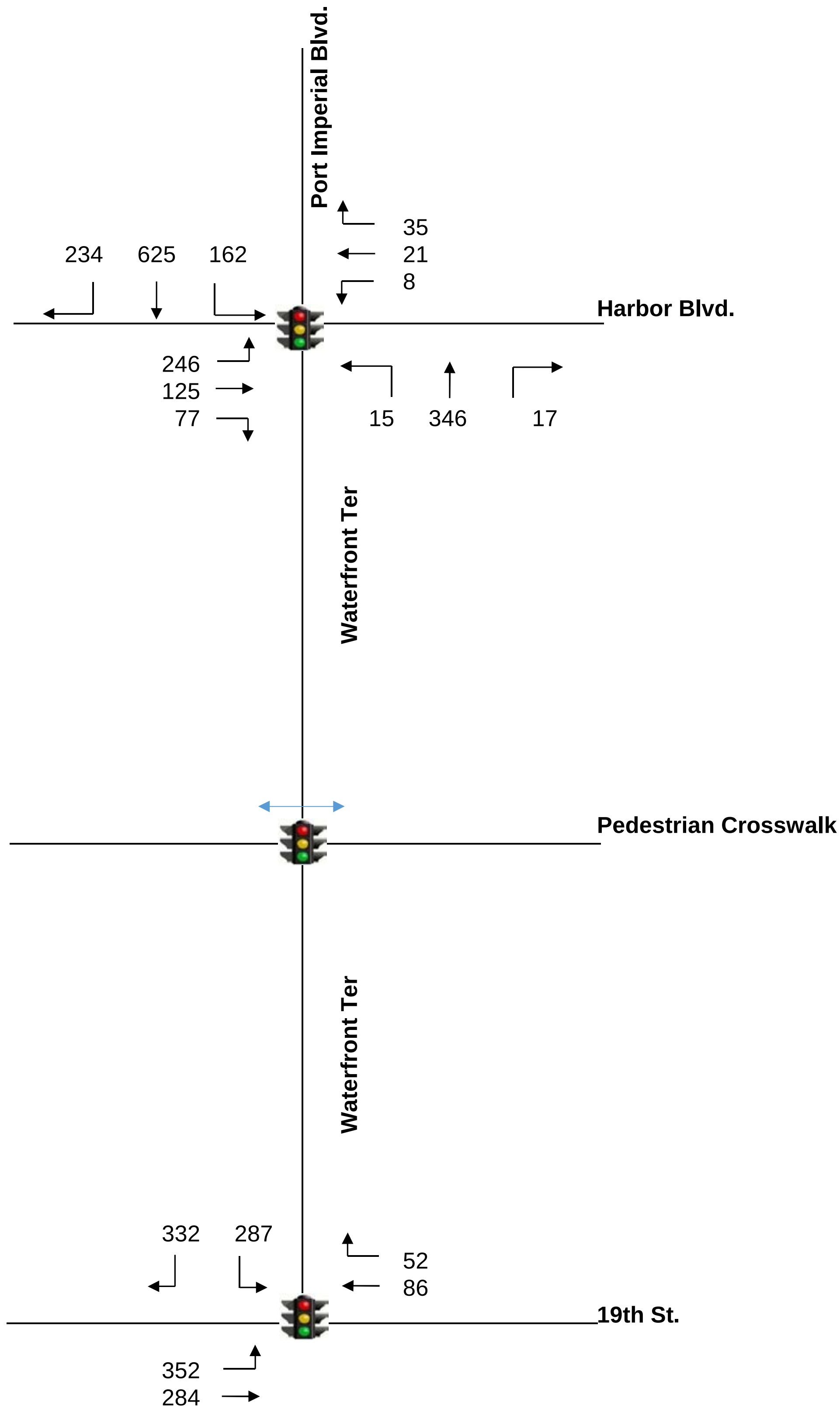
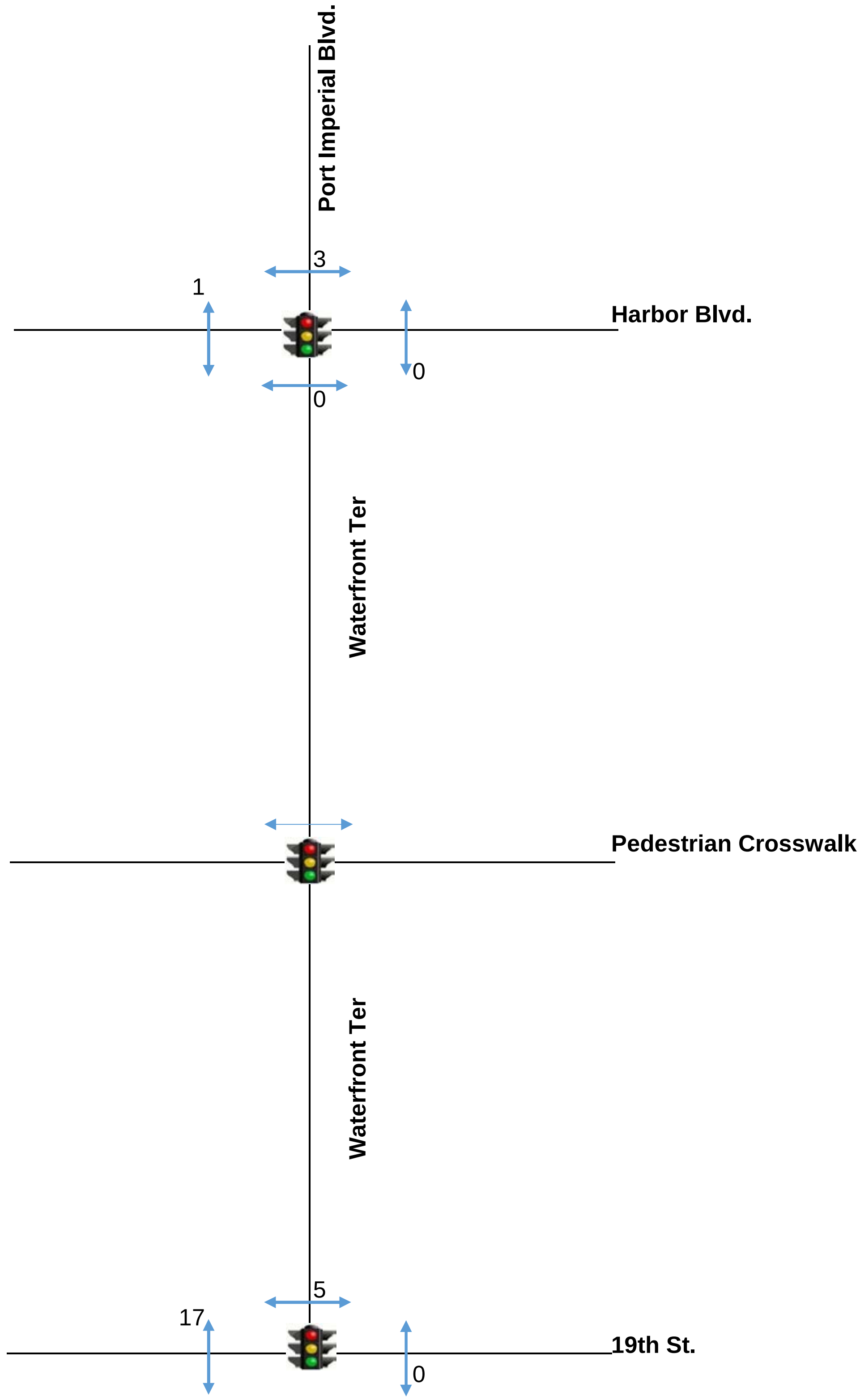


Existing AM Peak-Pedestrians



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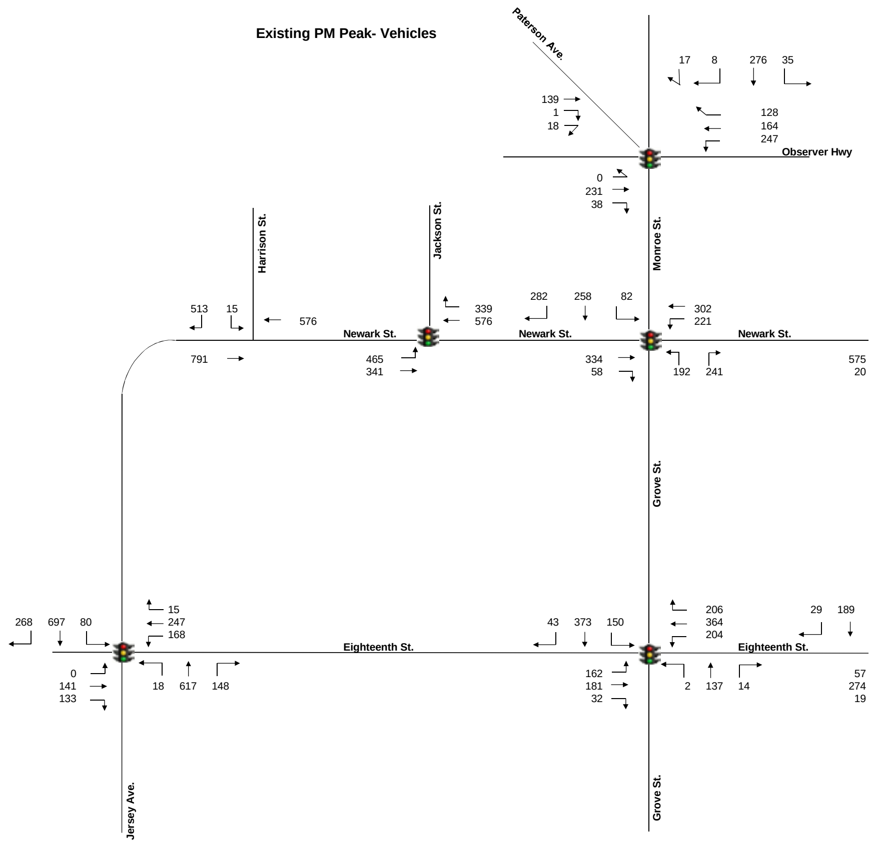

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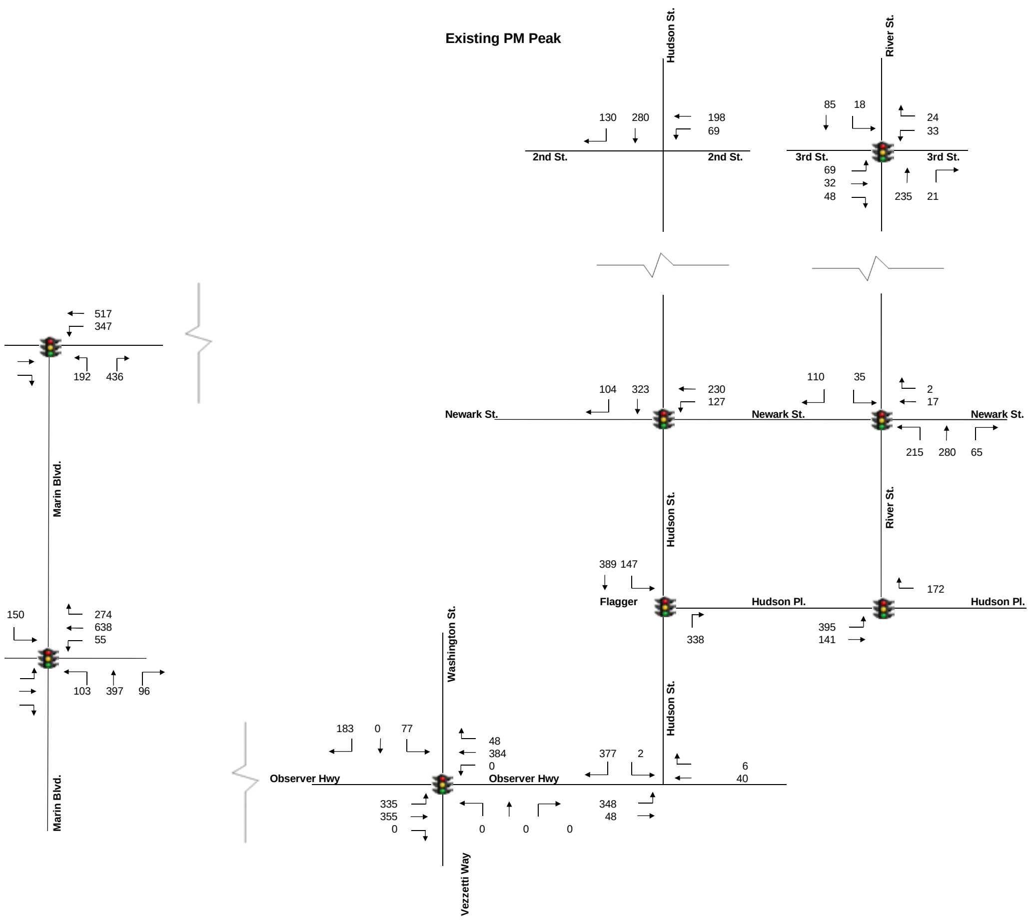

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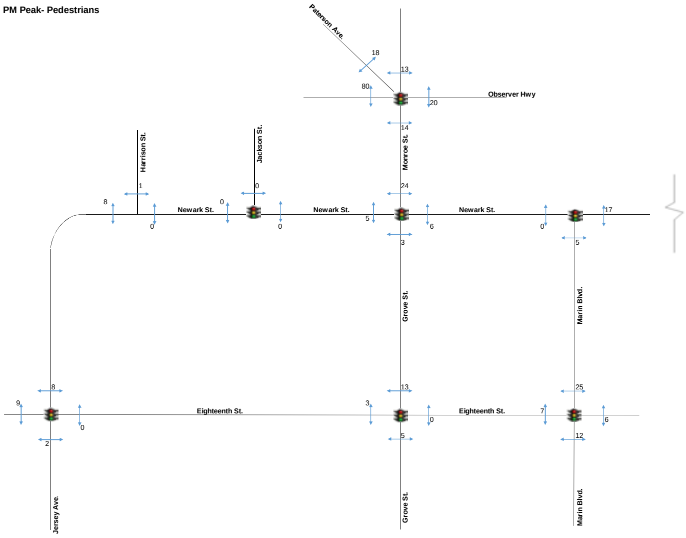

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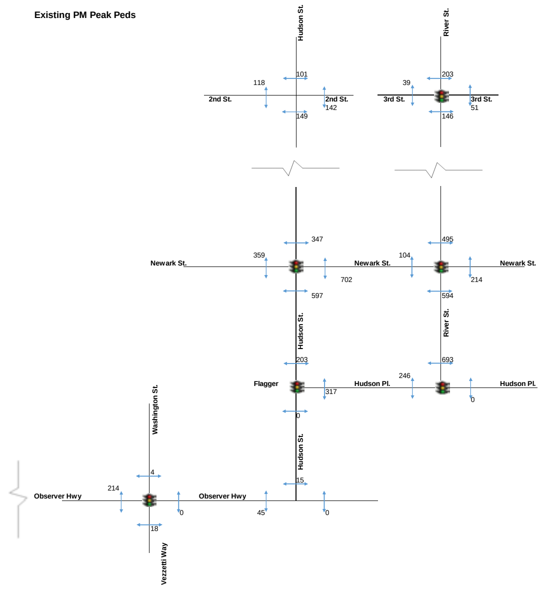

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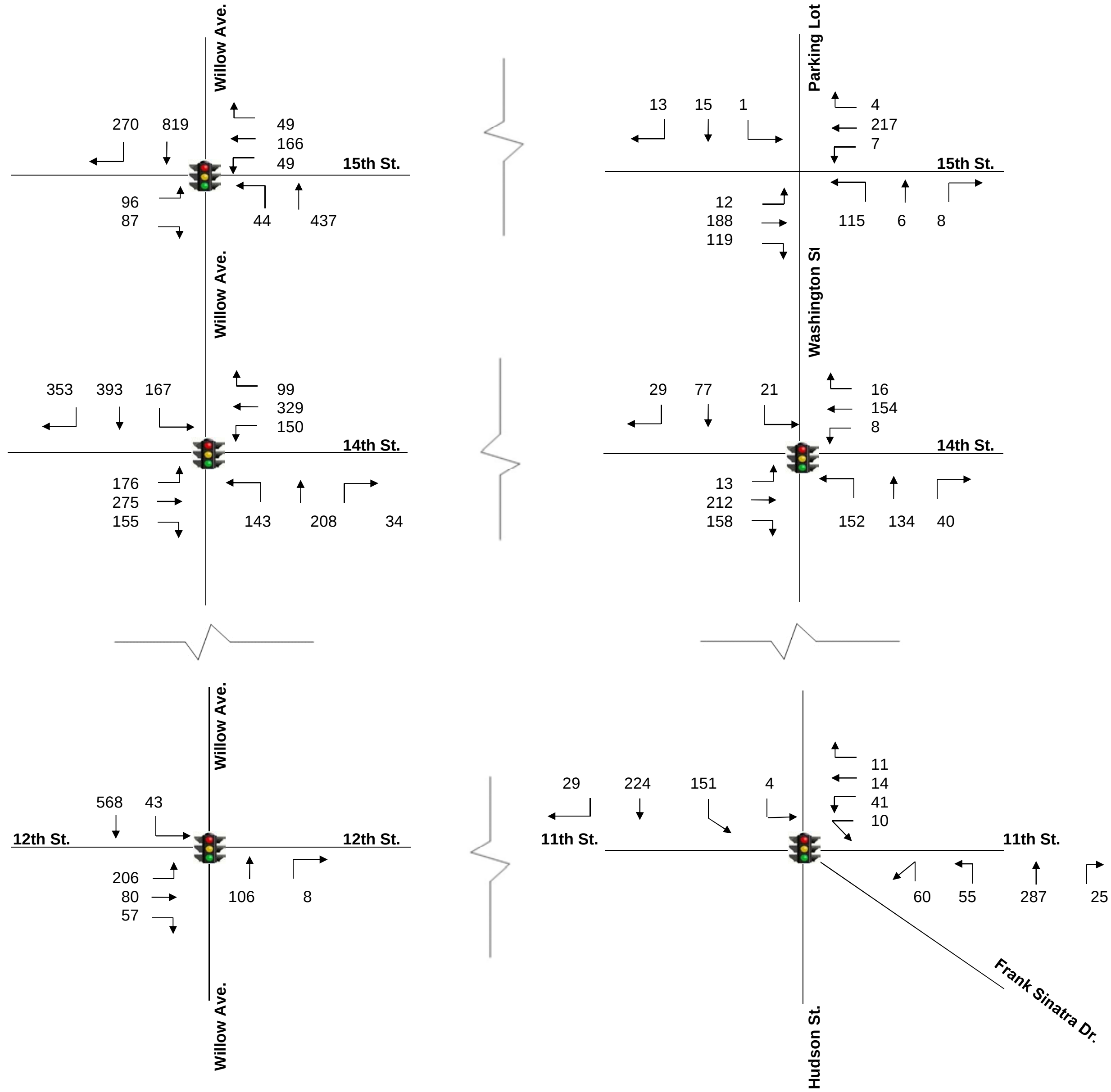

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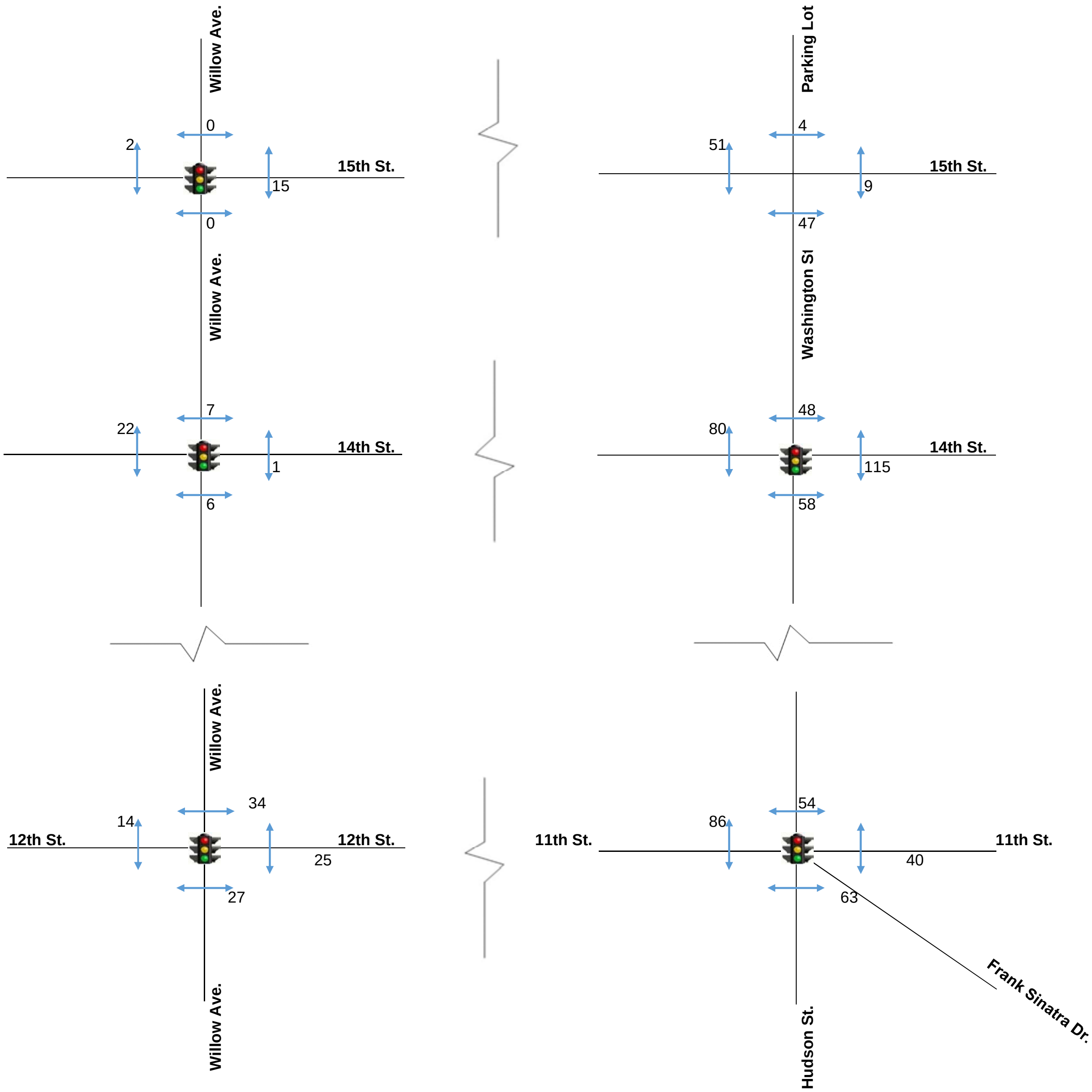

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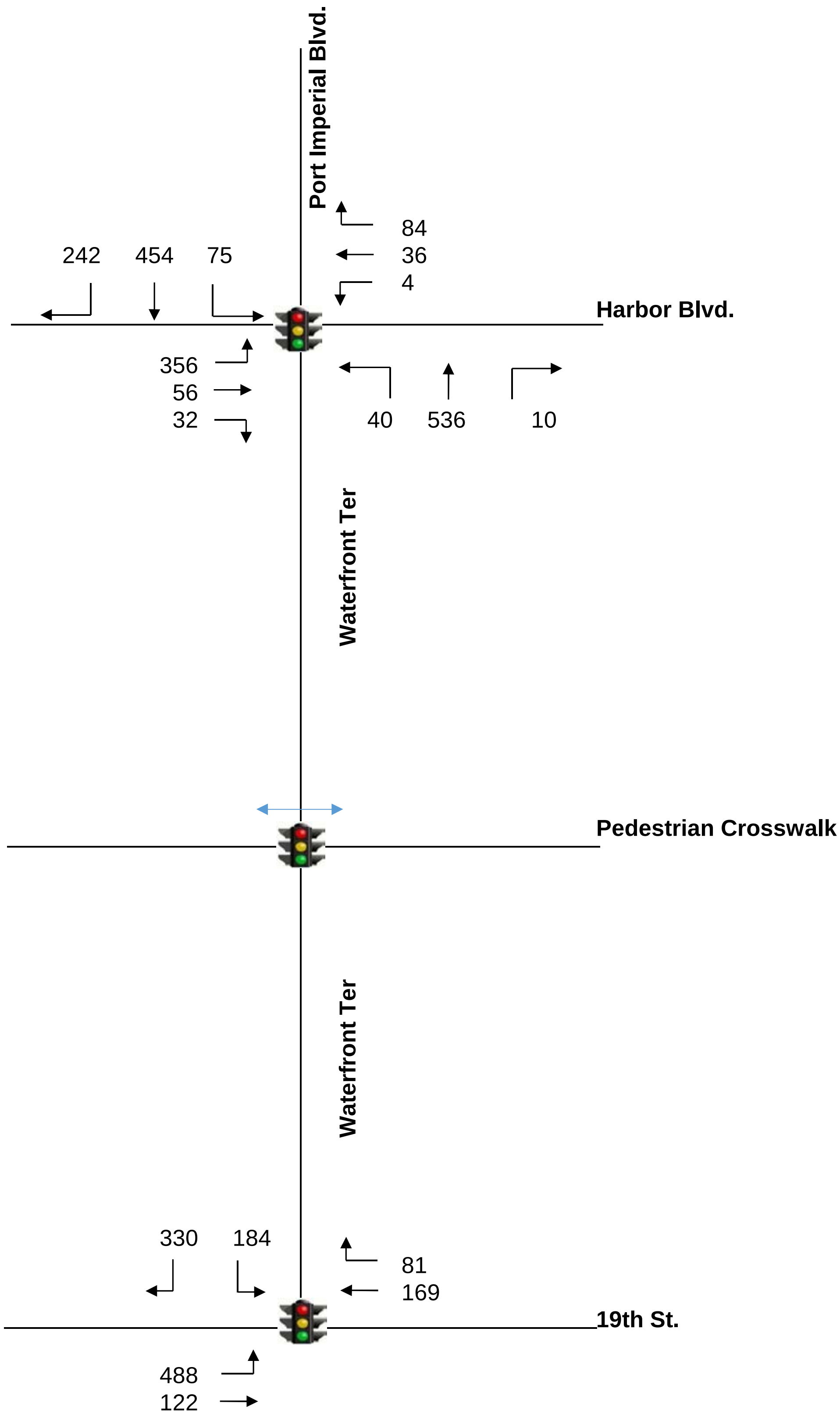

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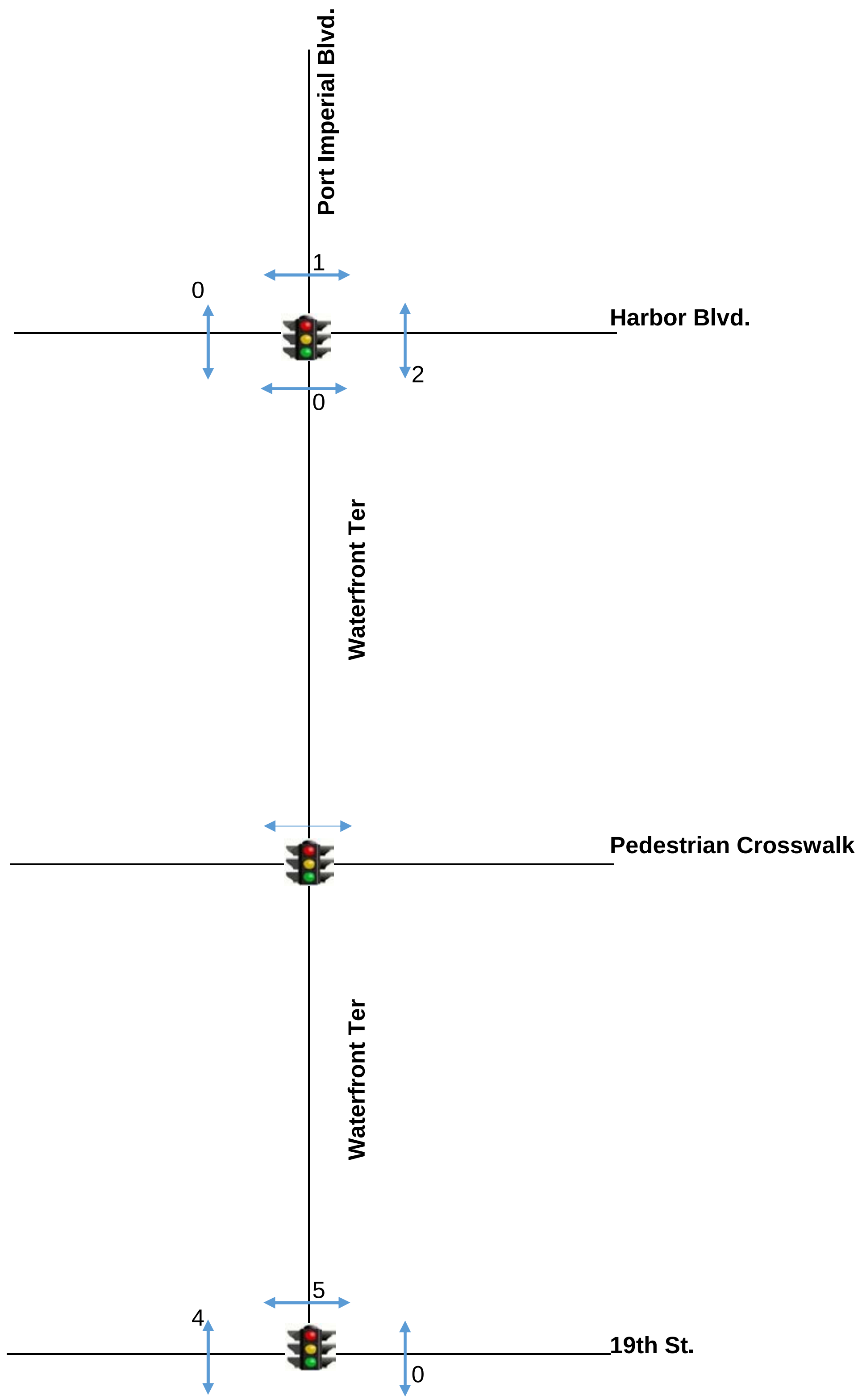

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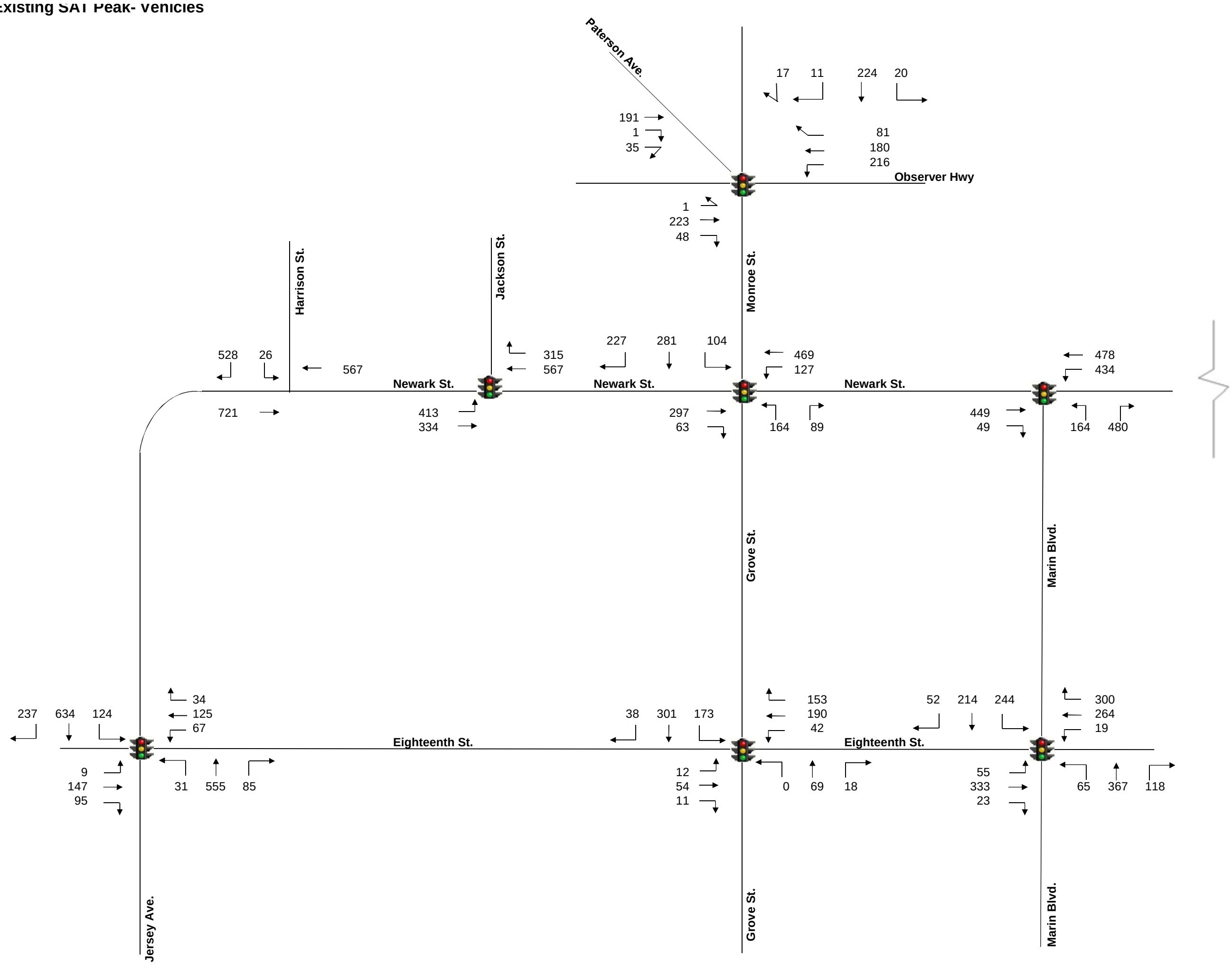

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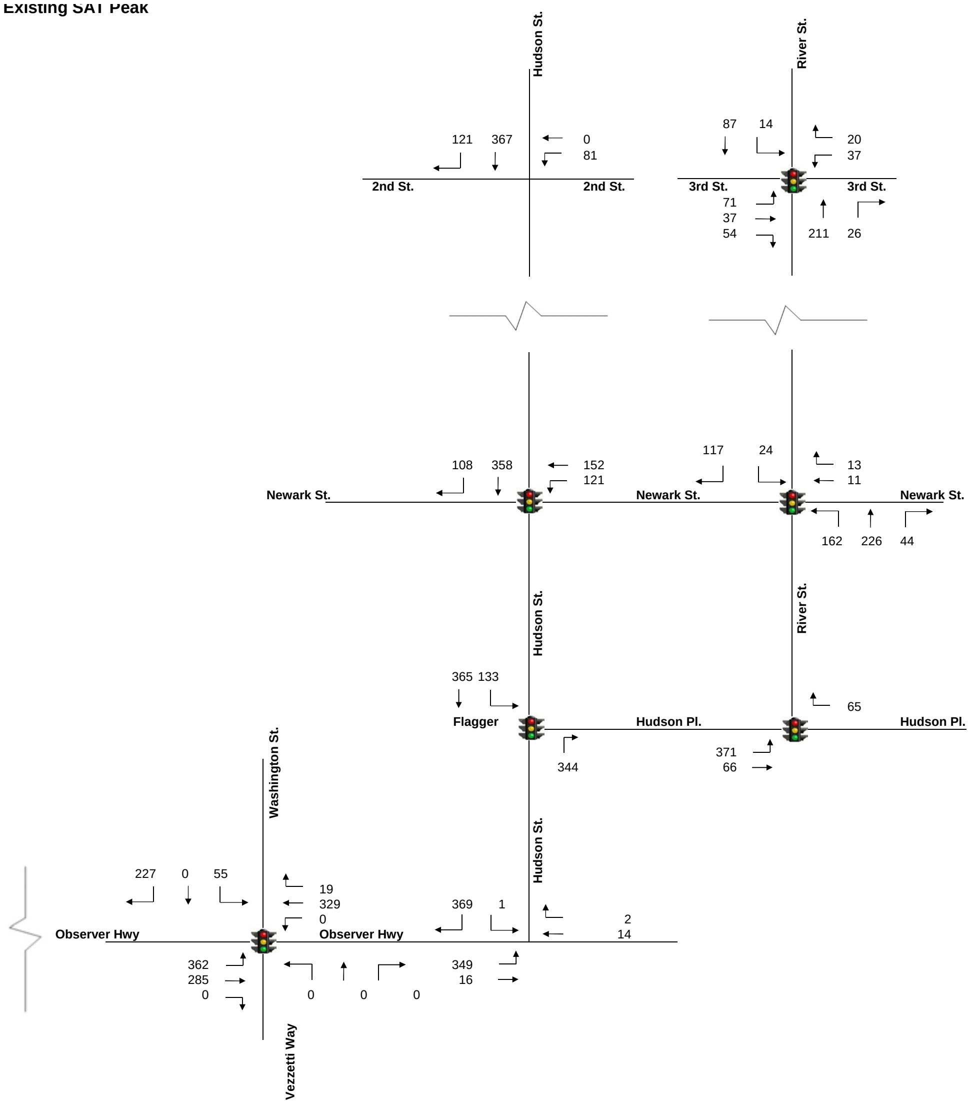

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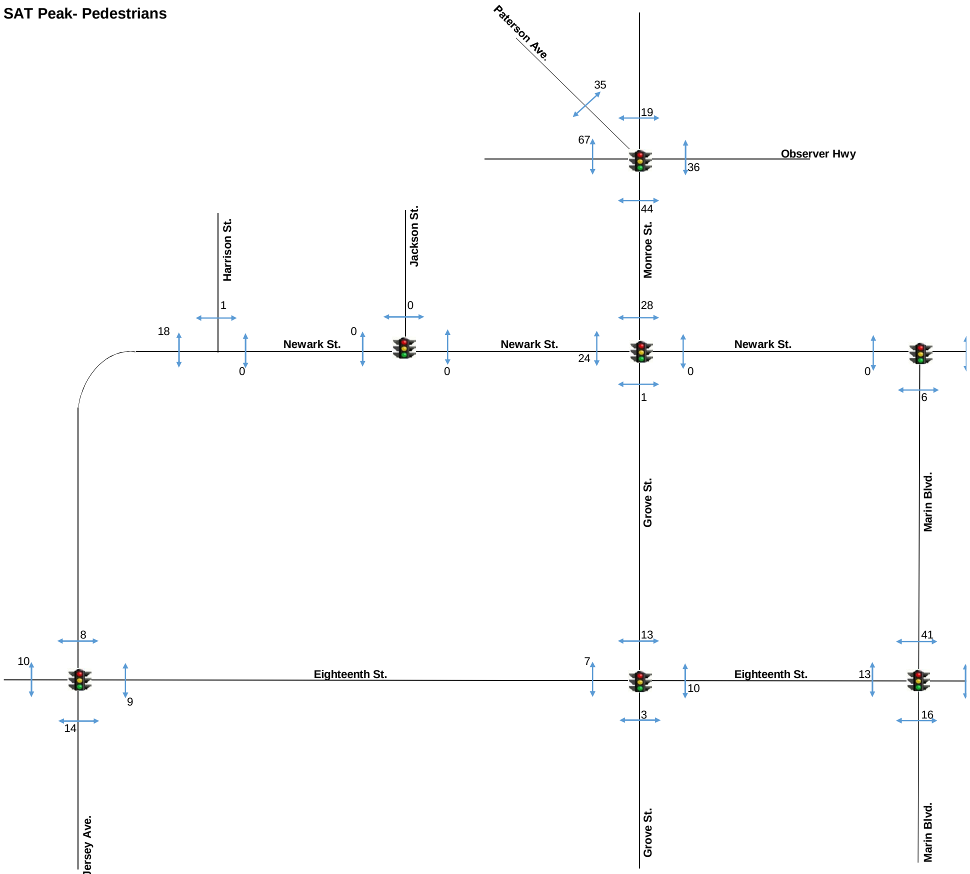

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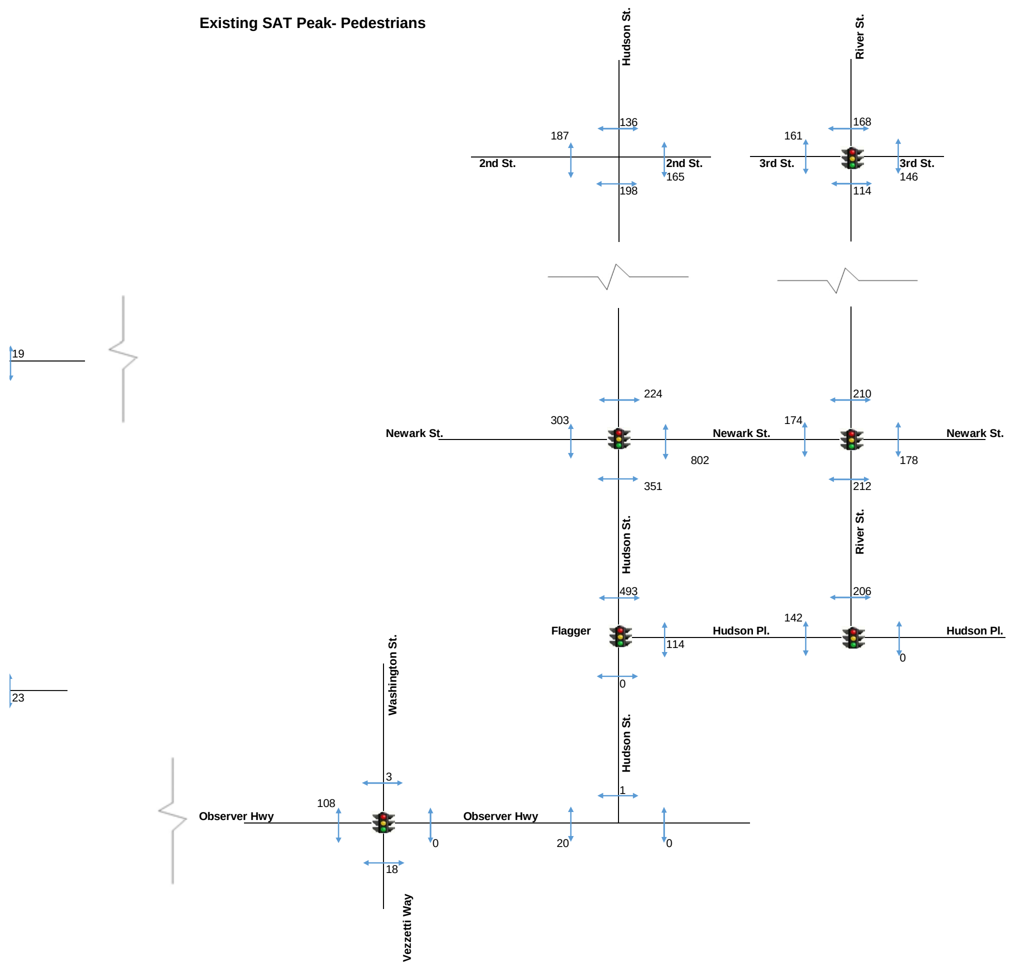

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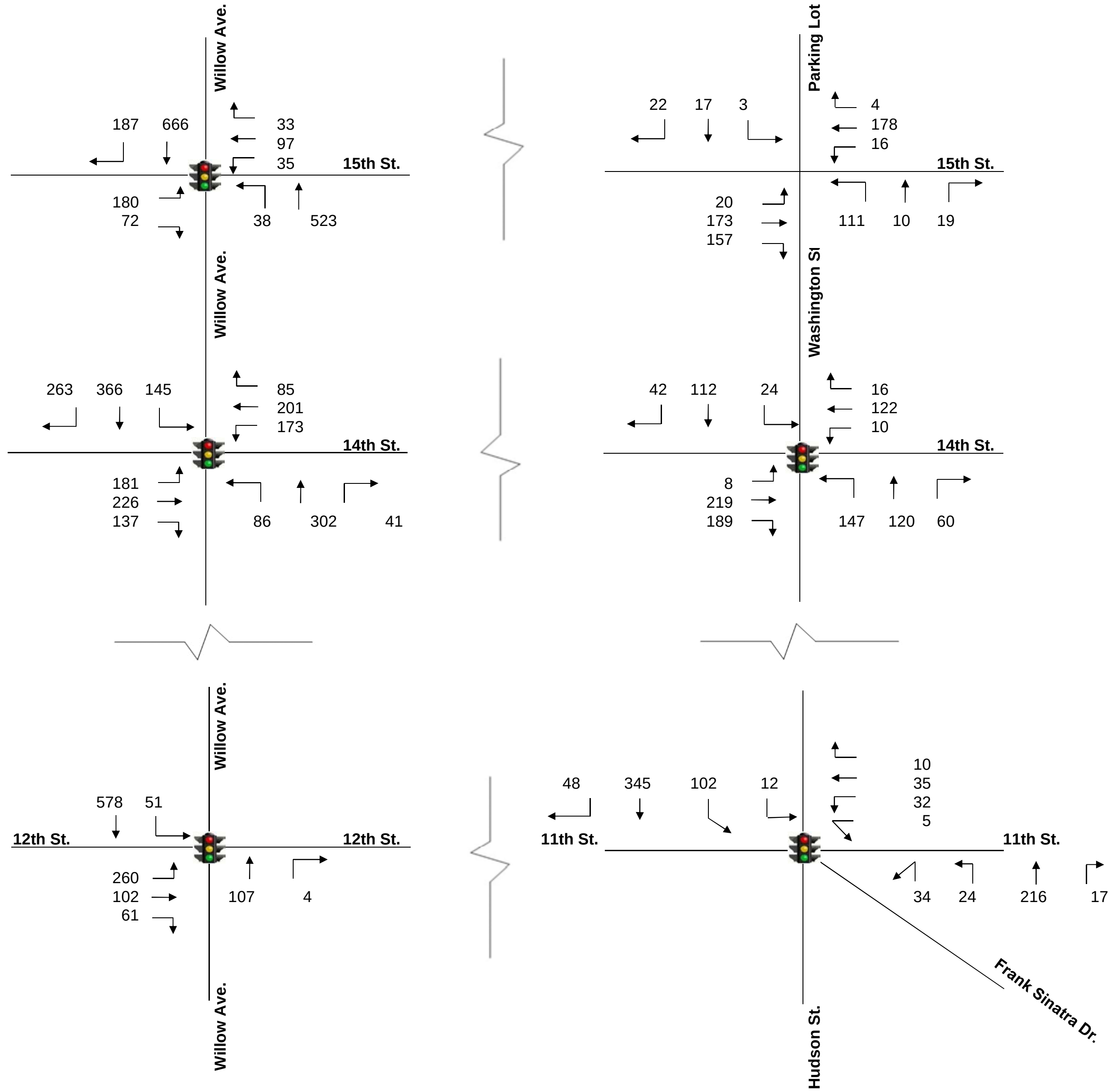

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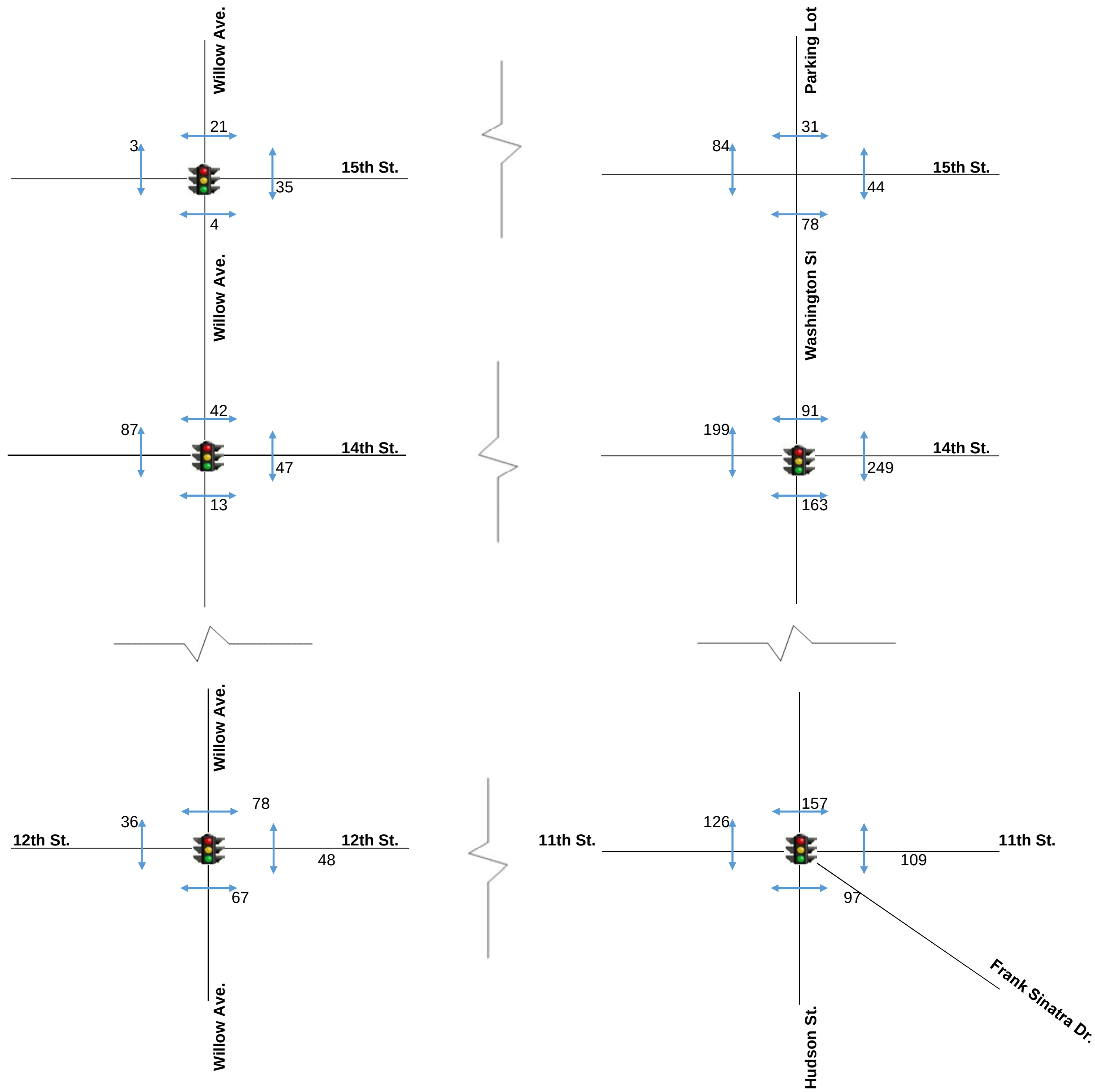

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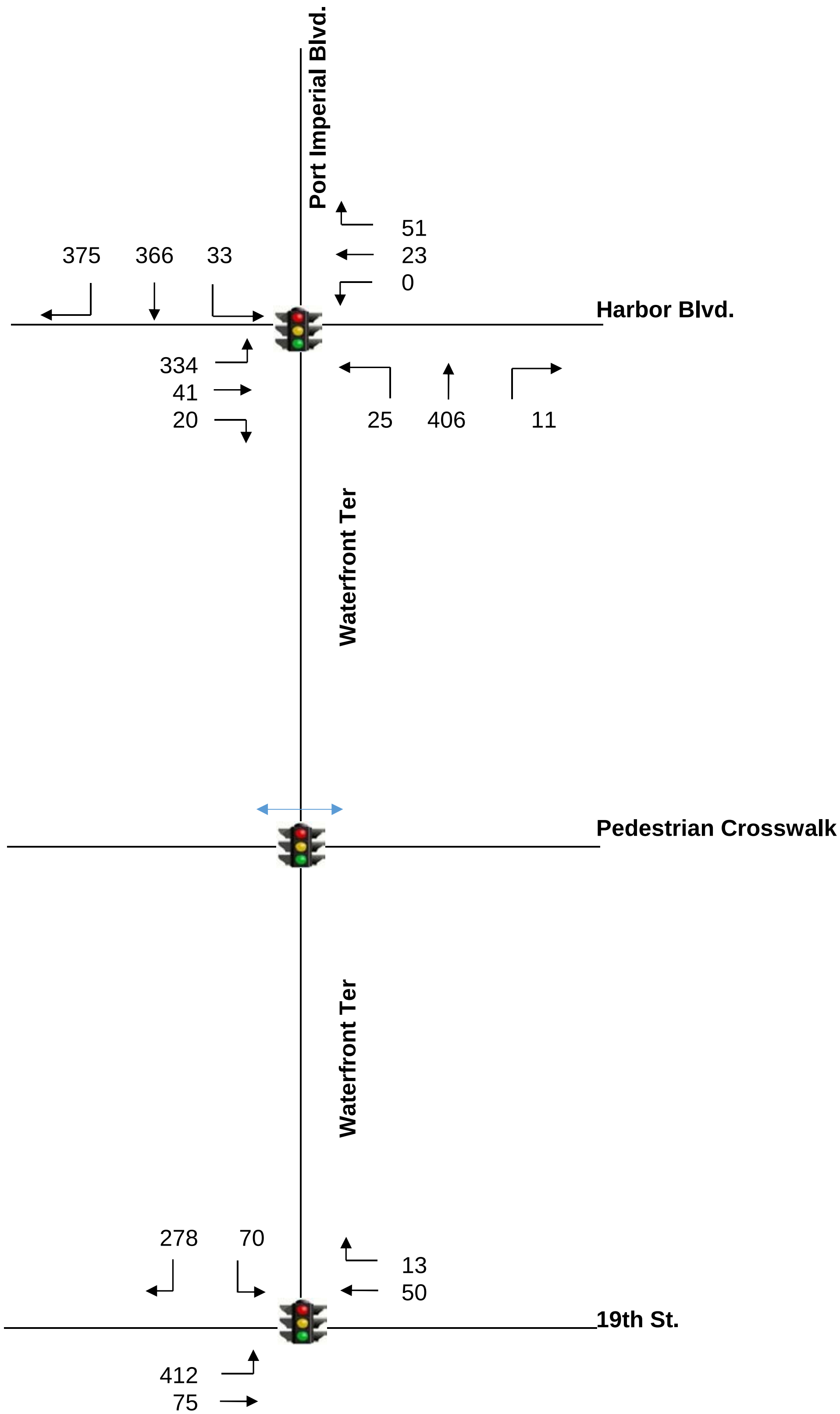

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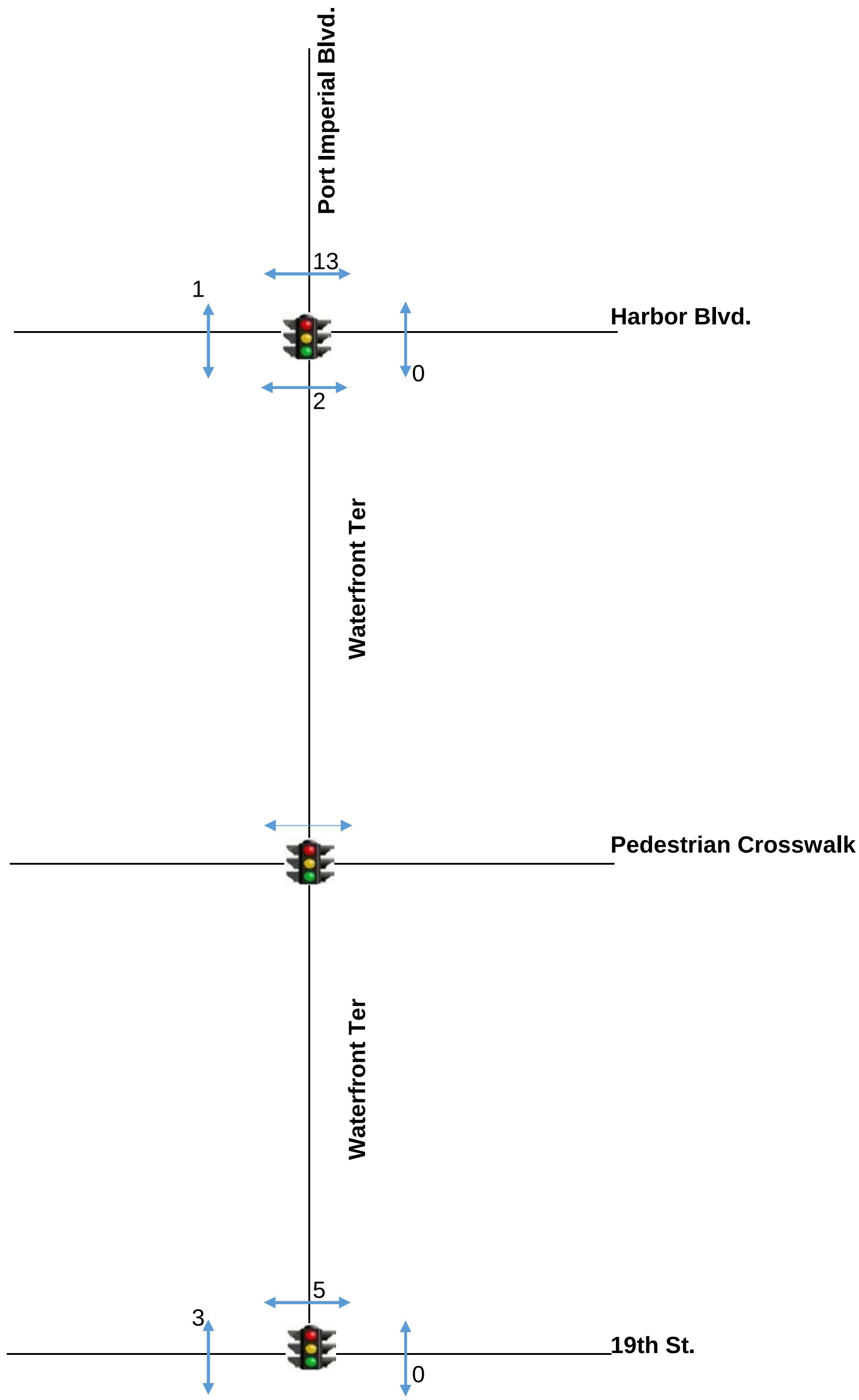
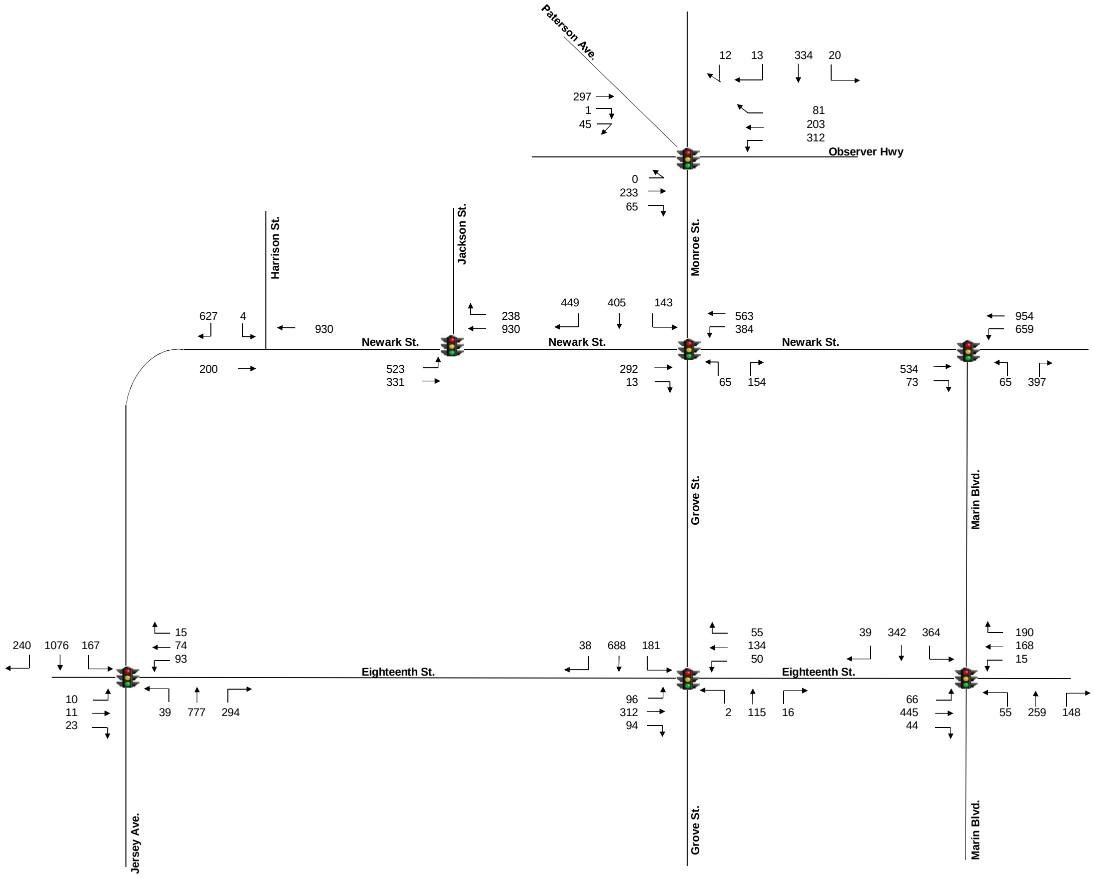


2036 No Build AM Peak- Vehicles



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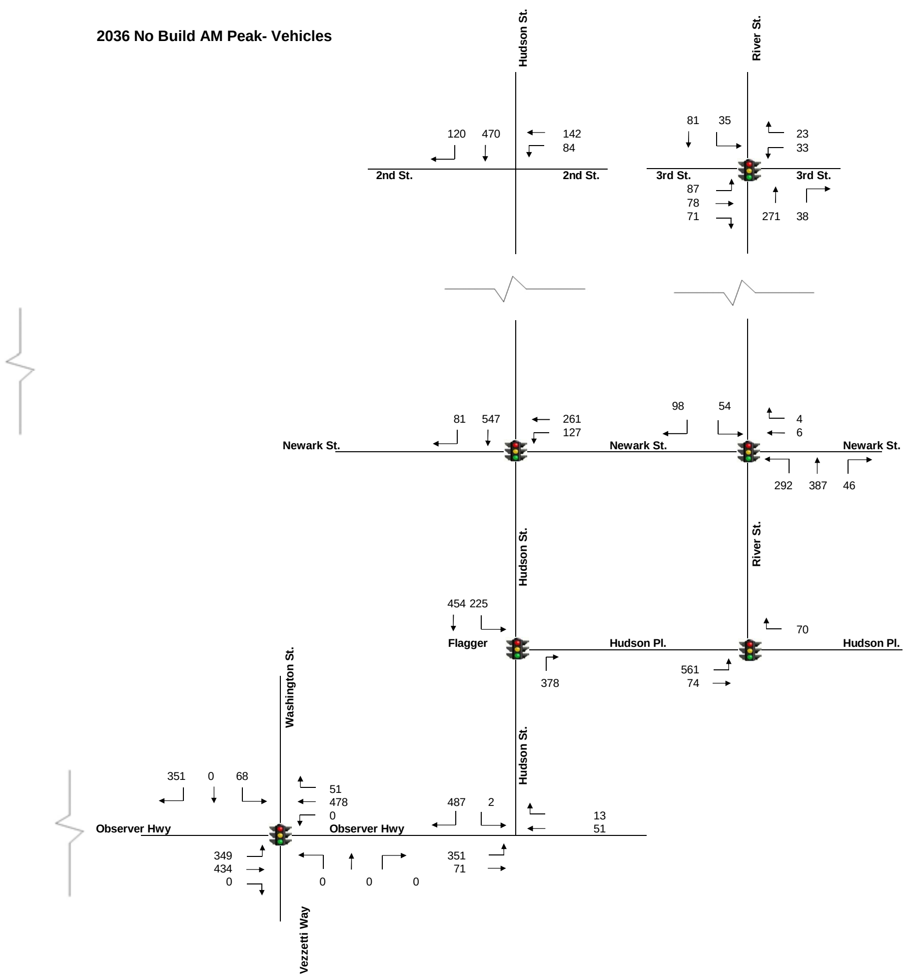

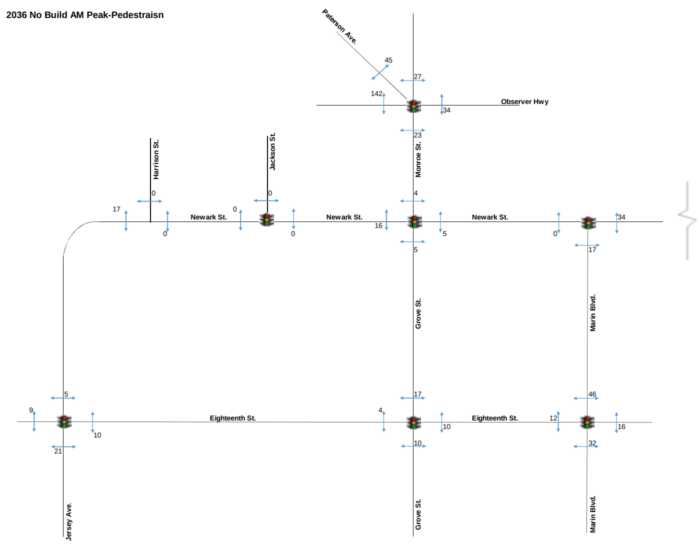
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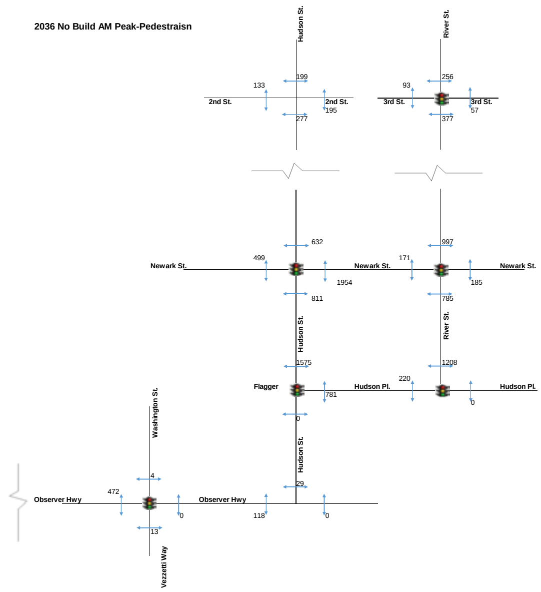
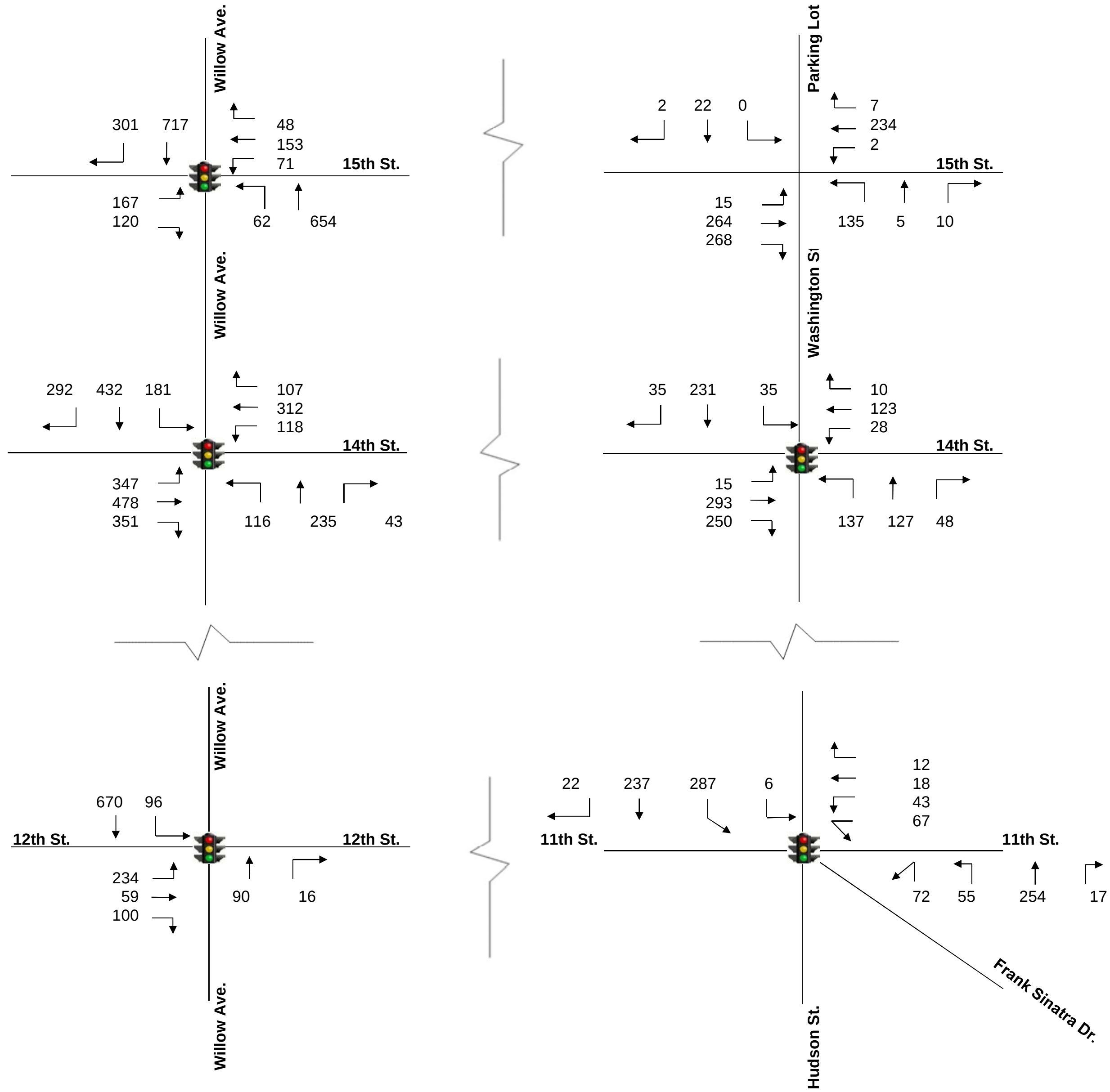
Paterson Ave.
Observer Hwy
Monroe St.
Harrison St.
Jackson St.
Newark St.
Grove St.
Marin Blvd.
Eighteenth St.
Jersey Ave.
45
27
142
34
23
4
17
0
0
0
0
0
16
5
5
0
34
17
5
9
10
21
17
4
10
10
46
12
16
32


2036 No Build AM Peak-Pedestraisn
Hudson St.
River St.
2nd St.
3rd St.
133
199
195
277
93
256
57
377
Newark St.
499
632
1954
811
171
997
185
785
Flagger
Hudson Pl.
1575
781
0
220
1208
0
Washington St.
Observer Hwy
Vezzetti Way
4
472
0
13
29
118
0

2036 No Build AM Peak- Vehicles



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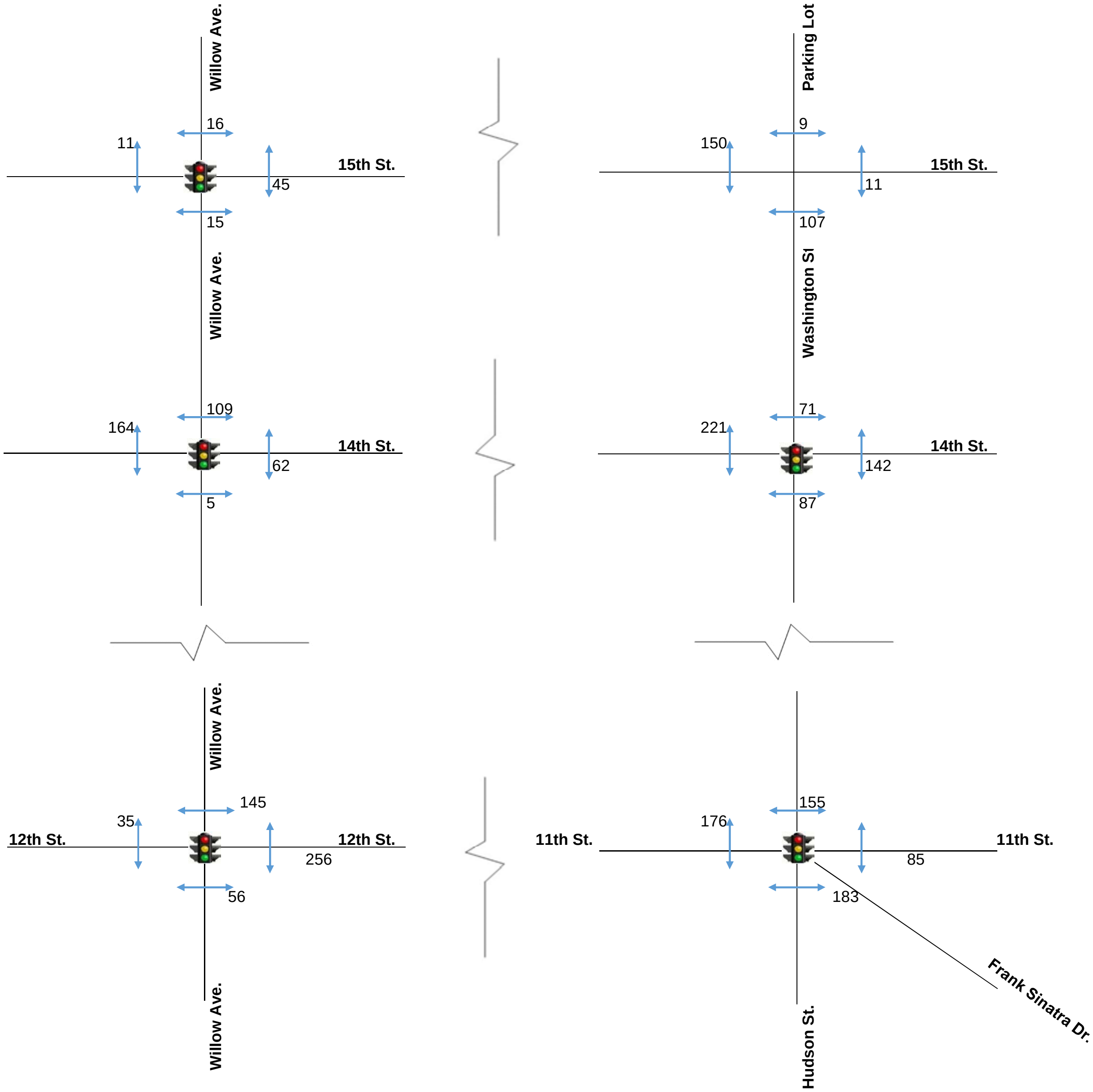

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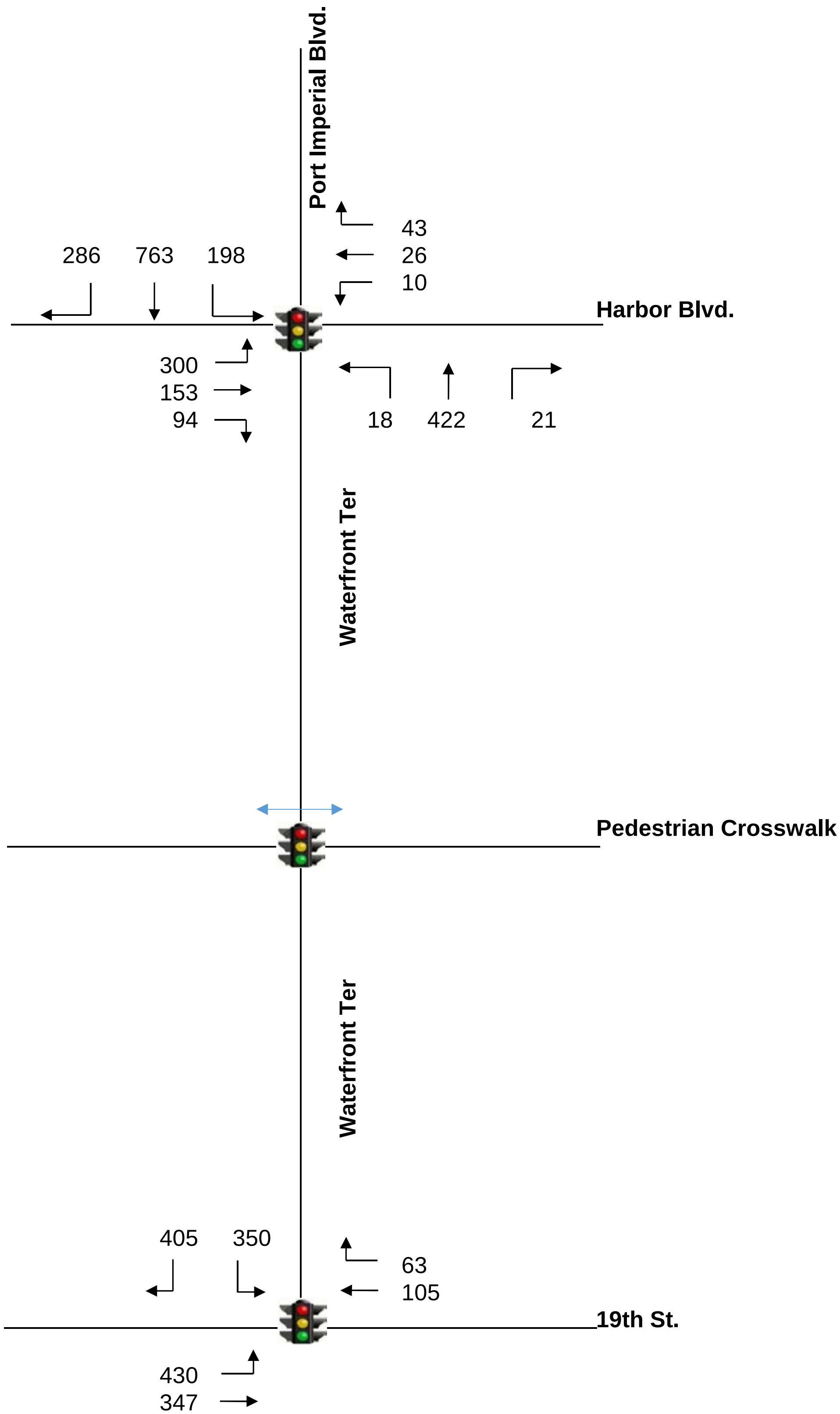

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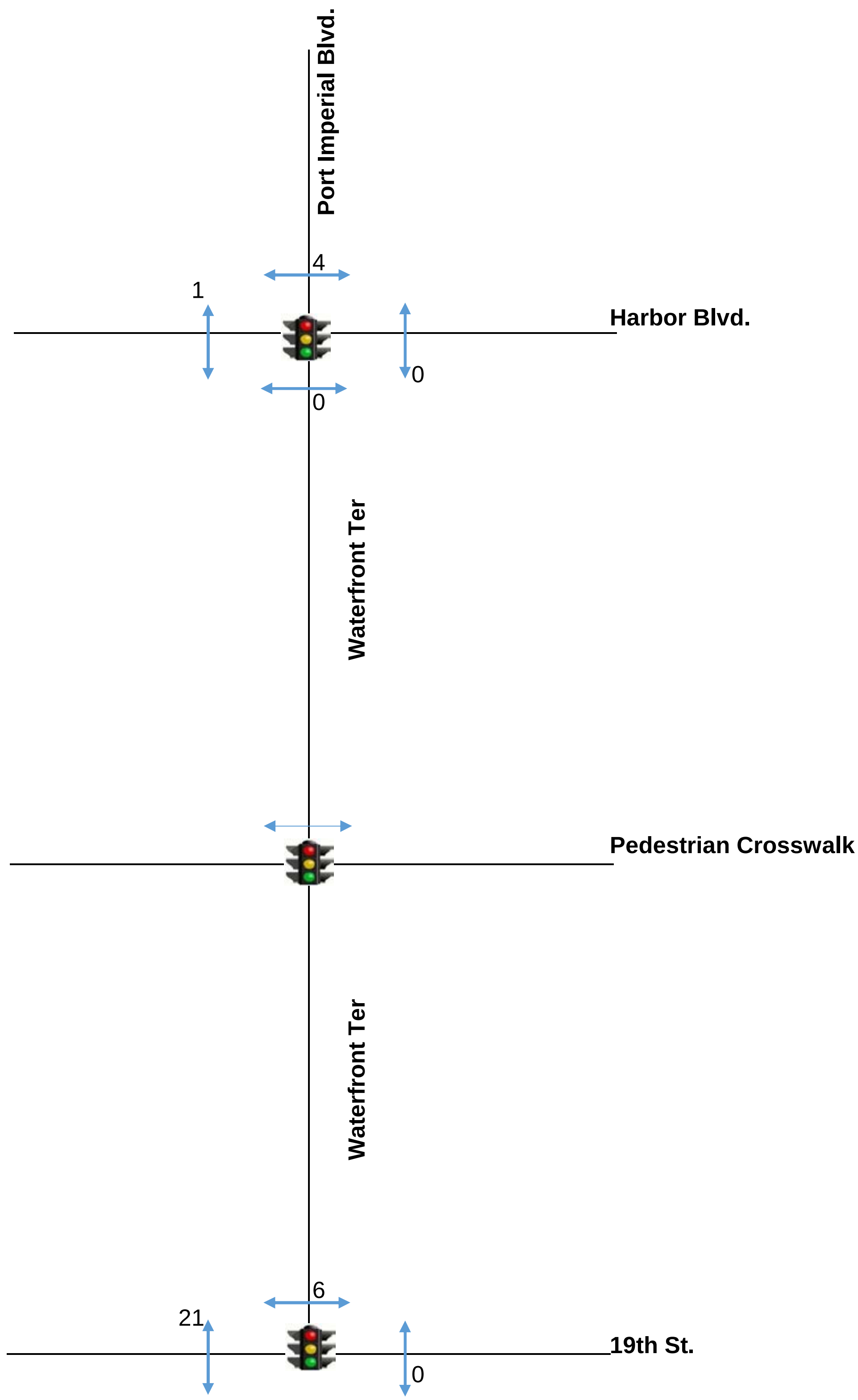

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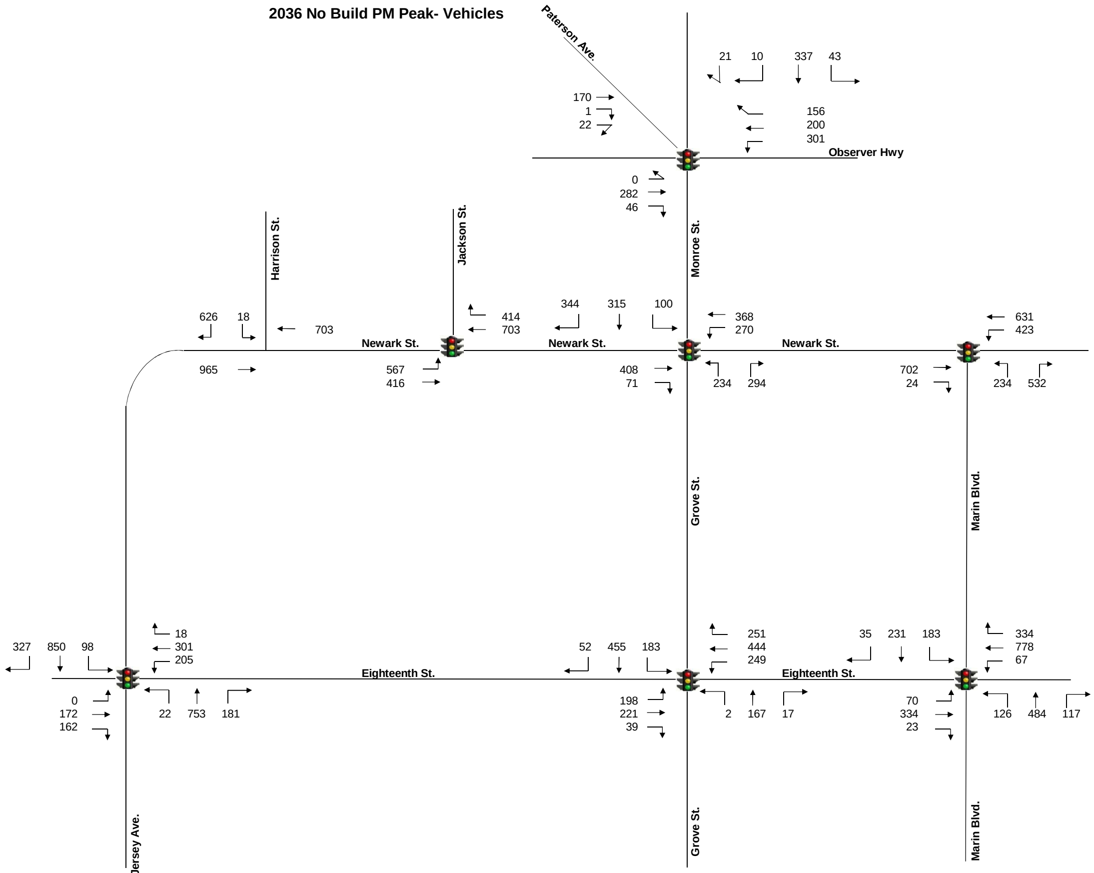

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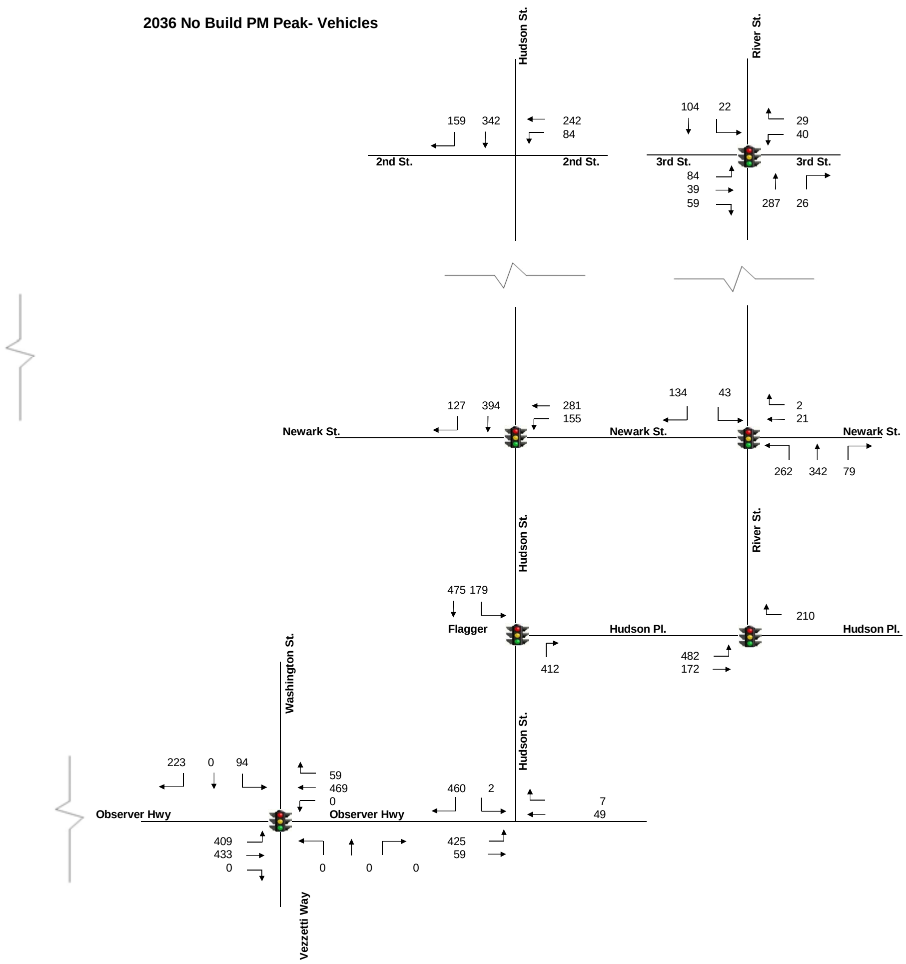

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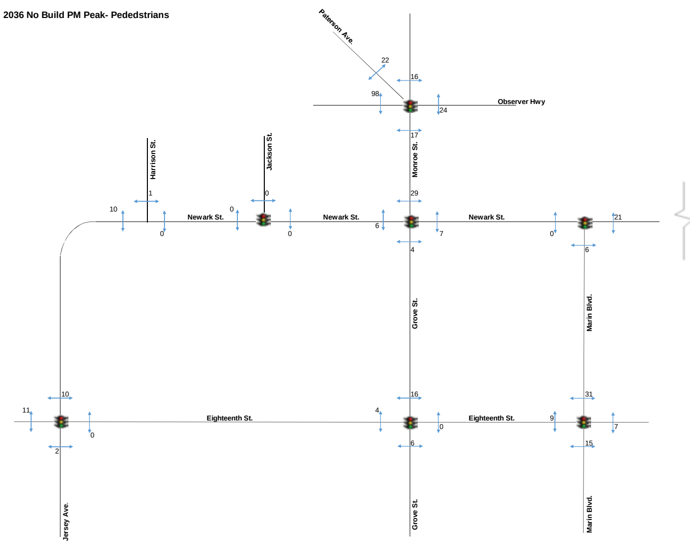

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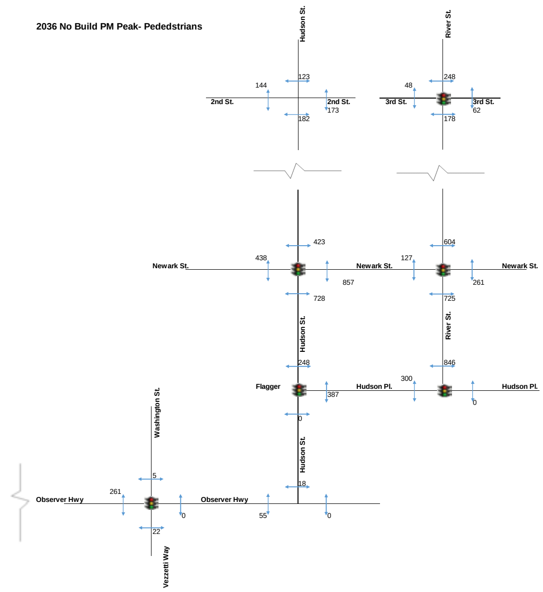

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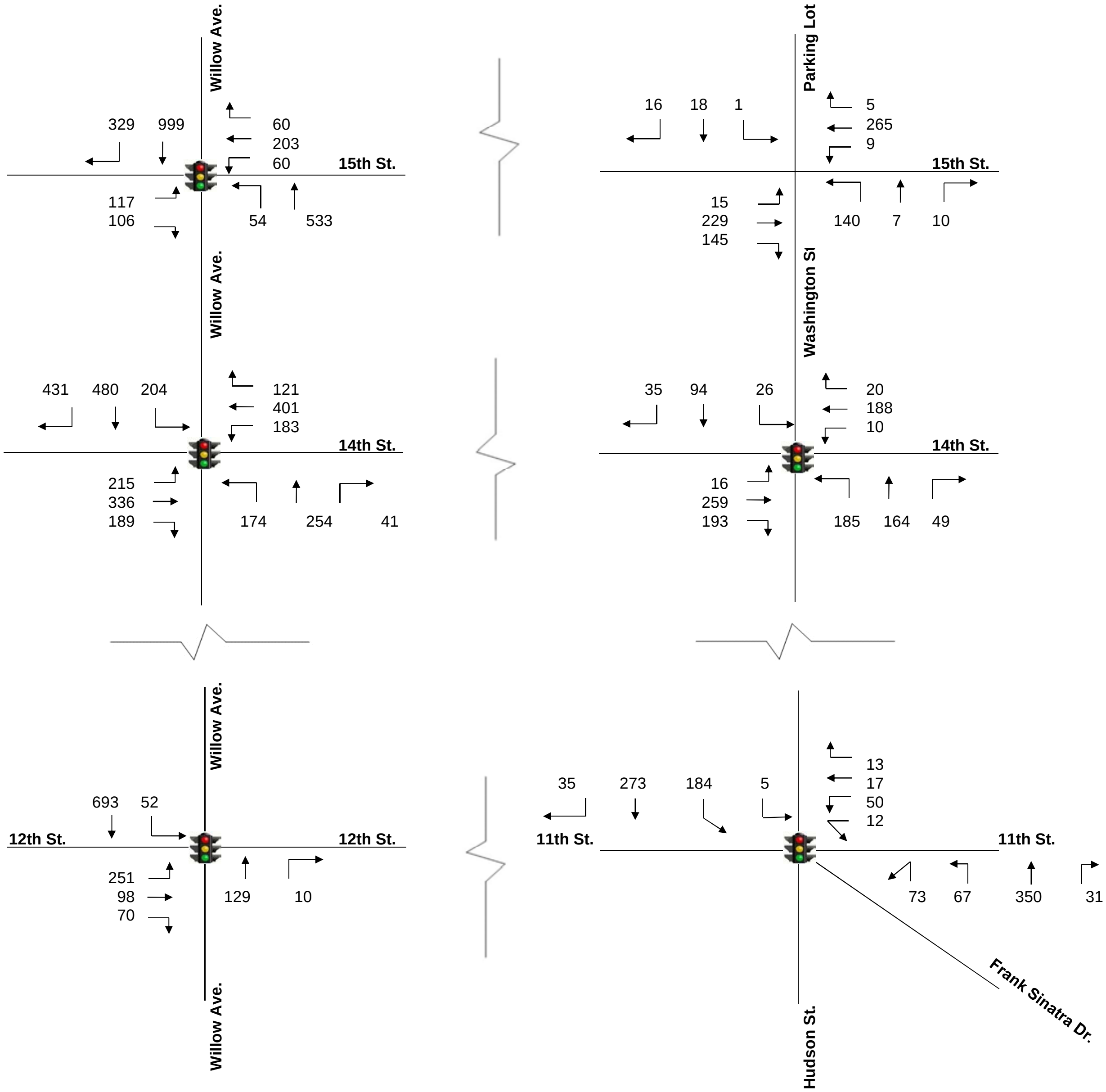

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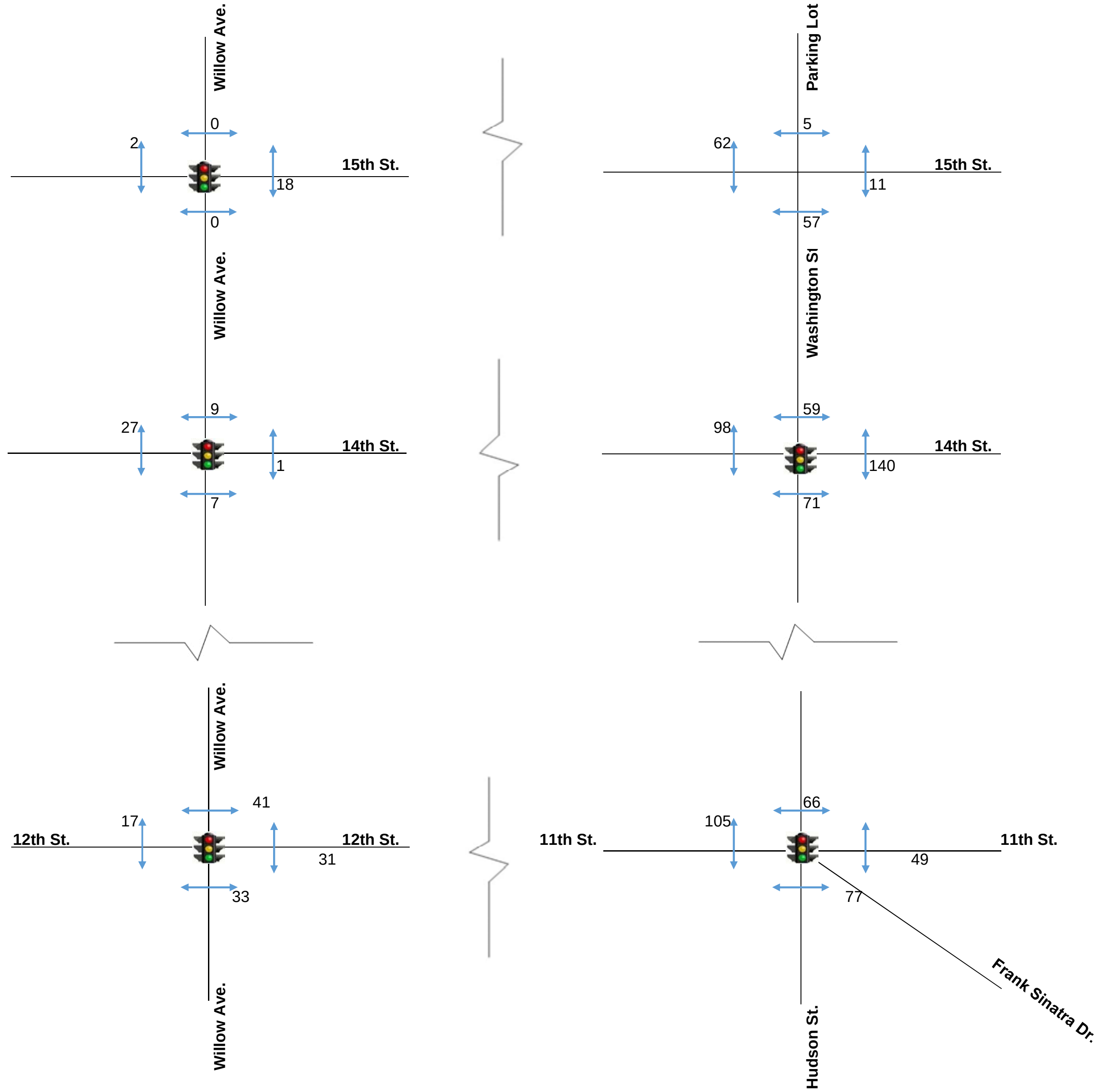

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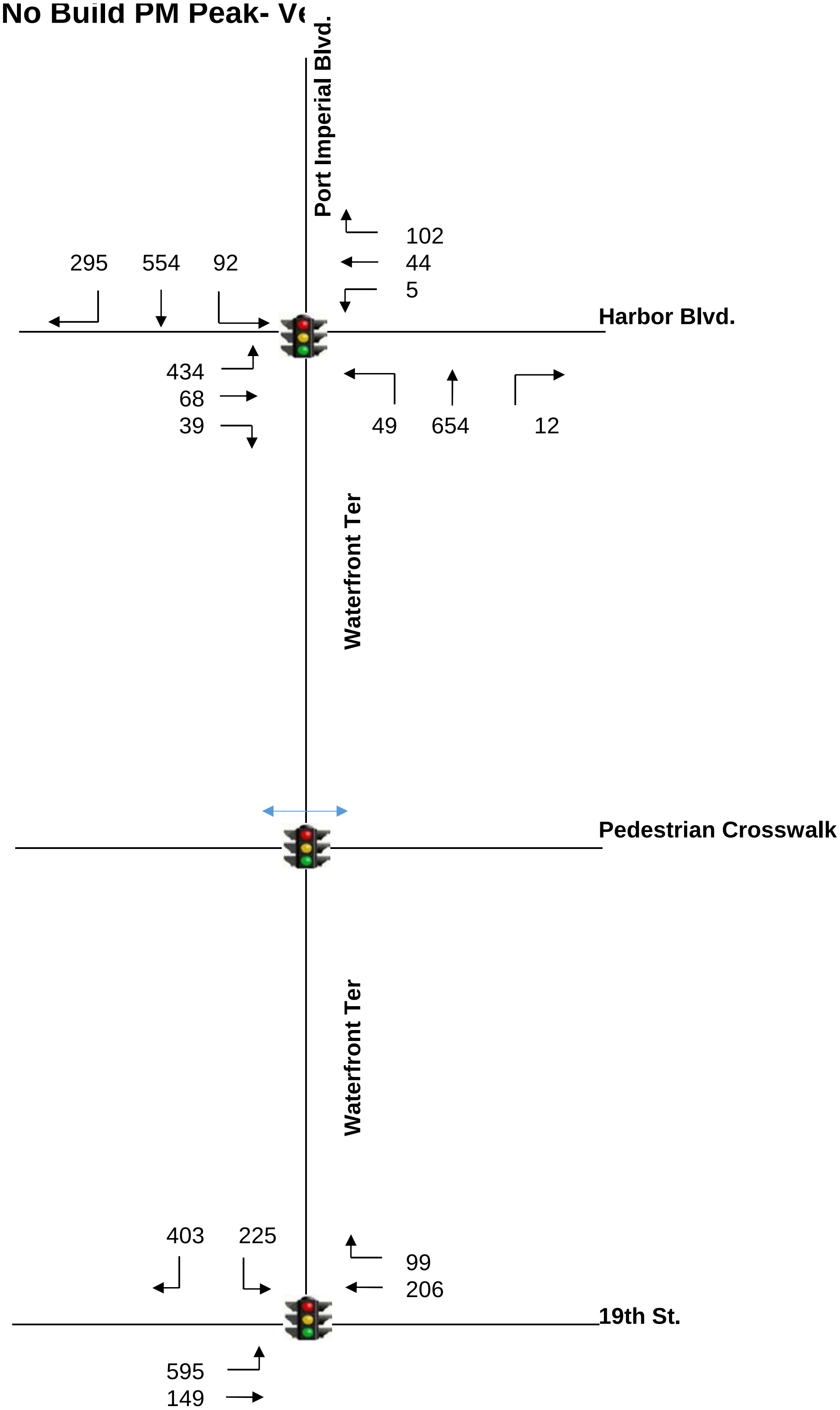

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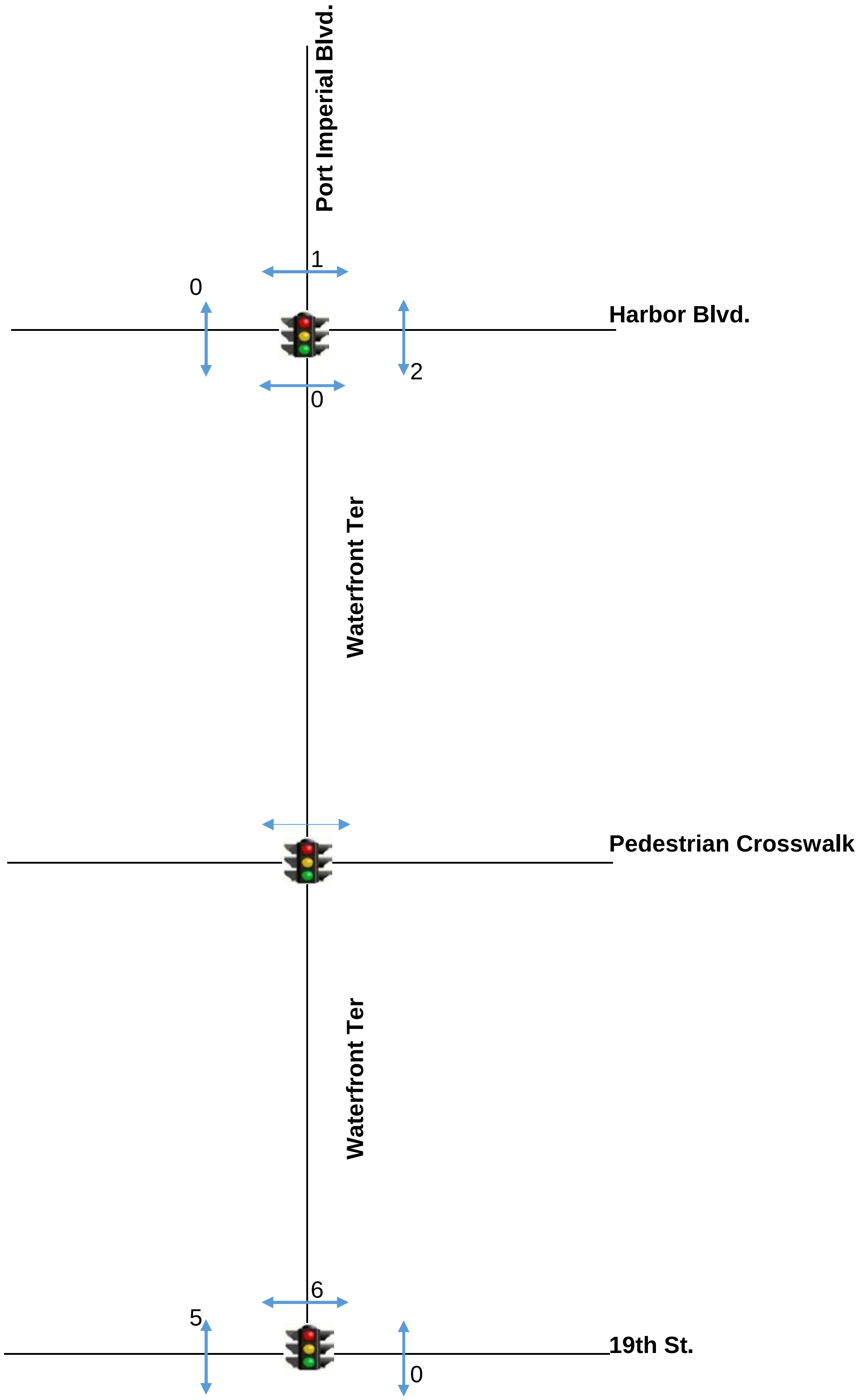

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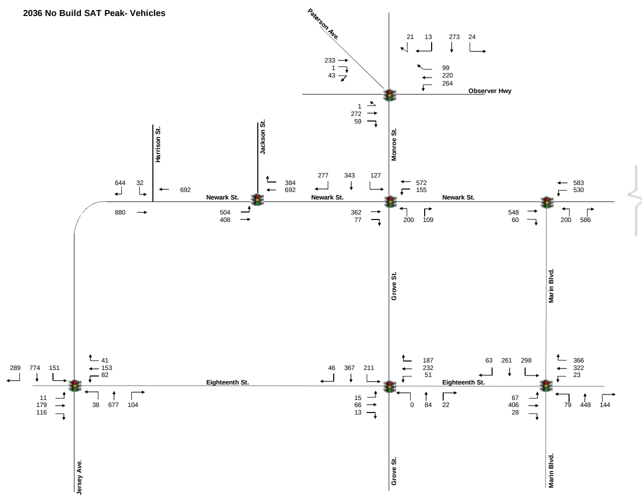

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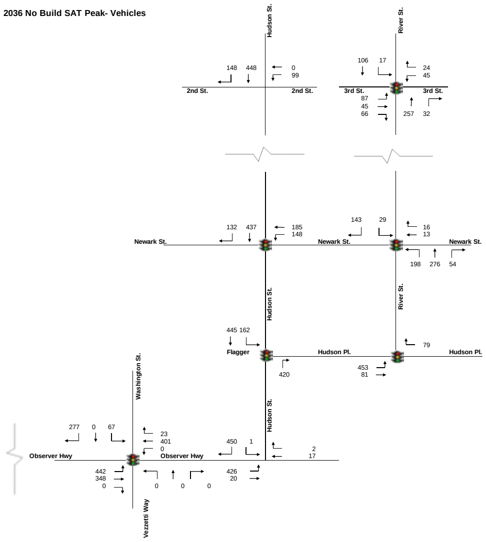

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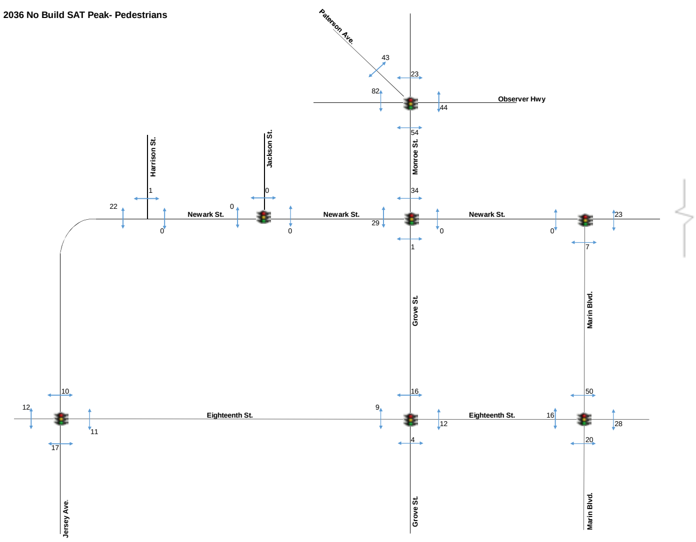

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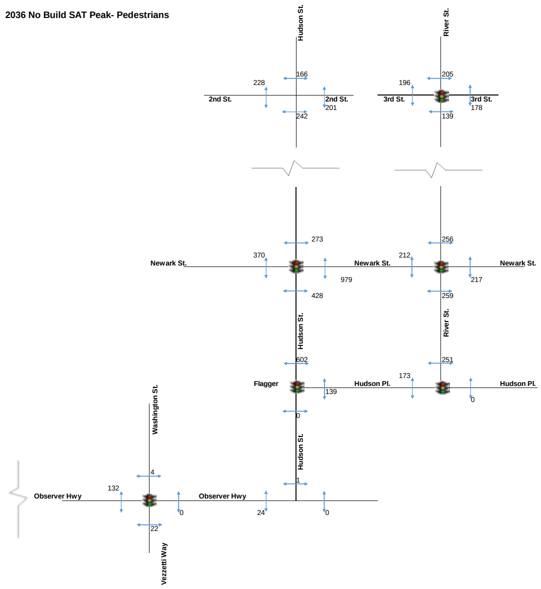

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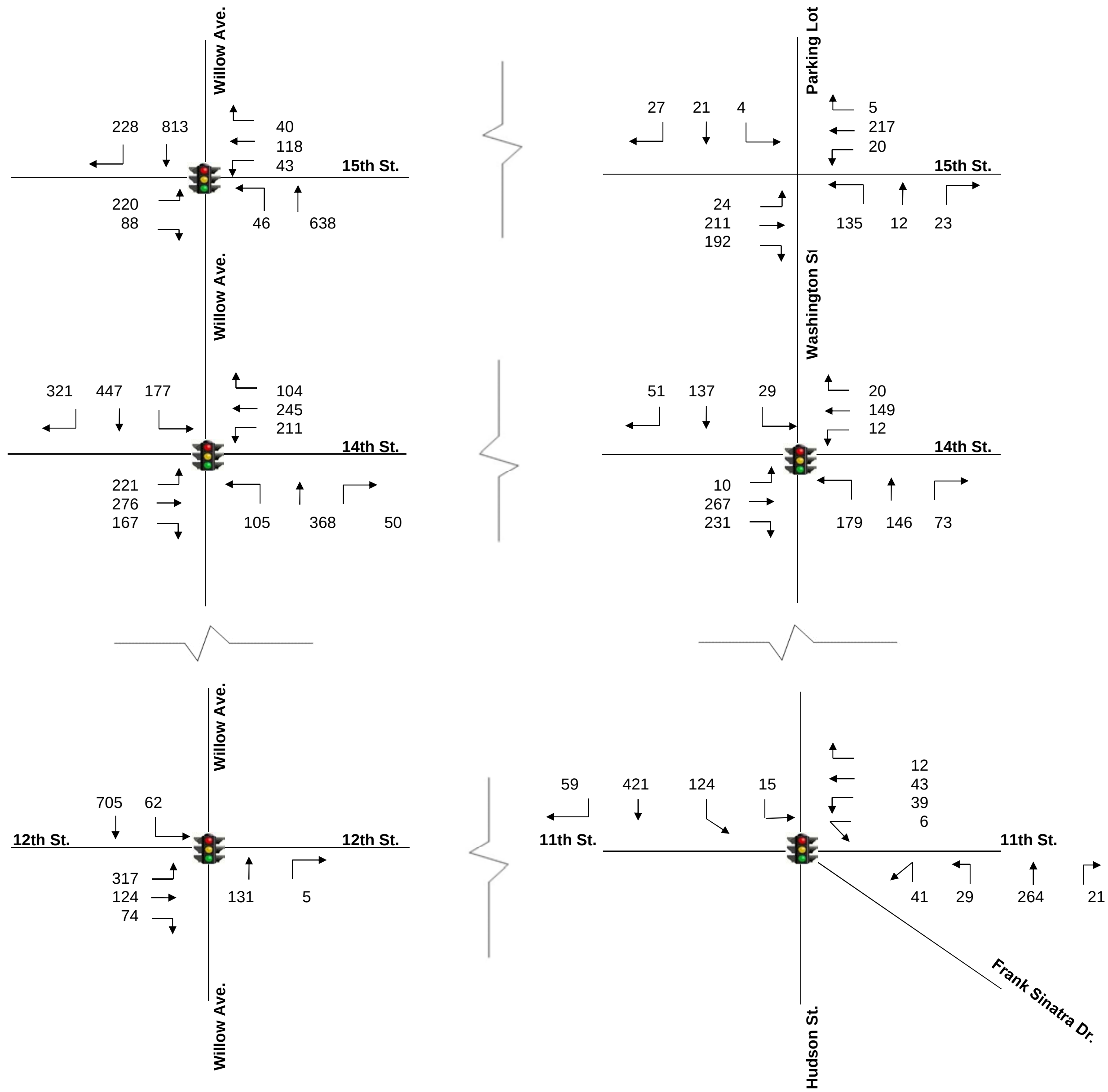

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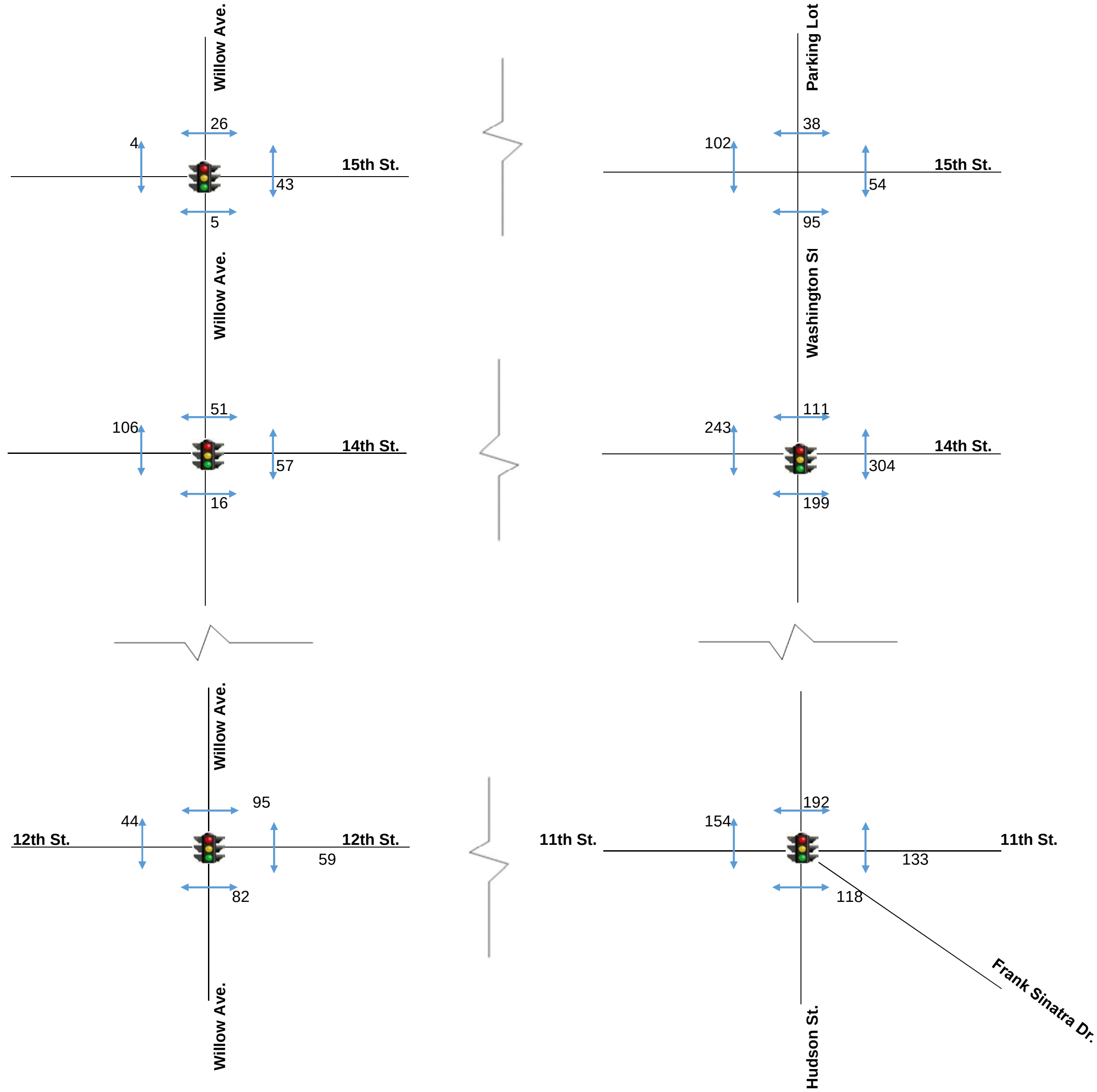

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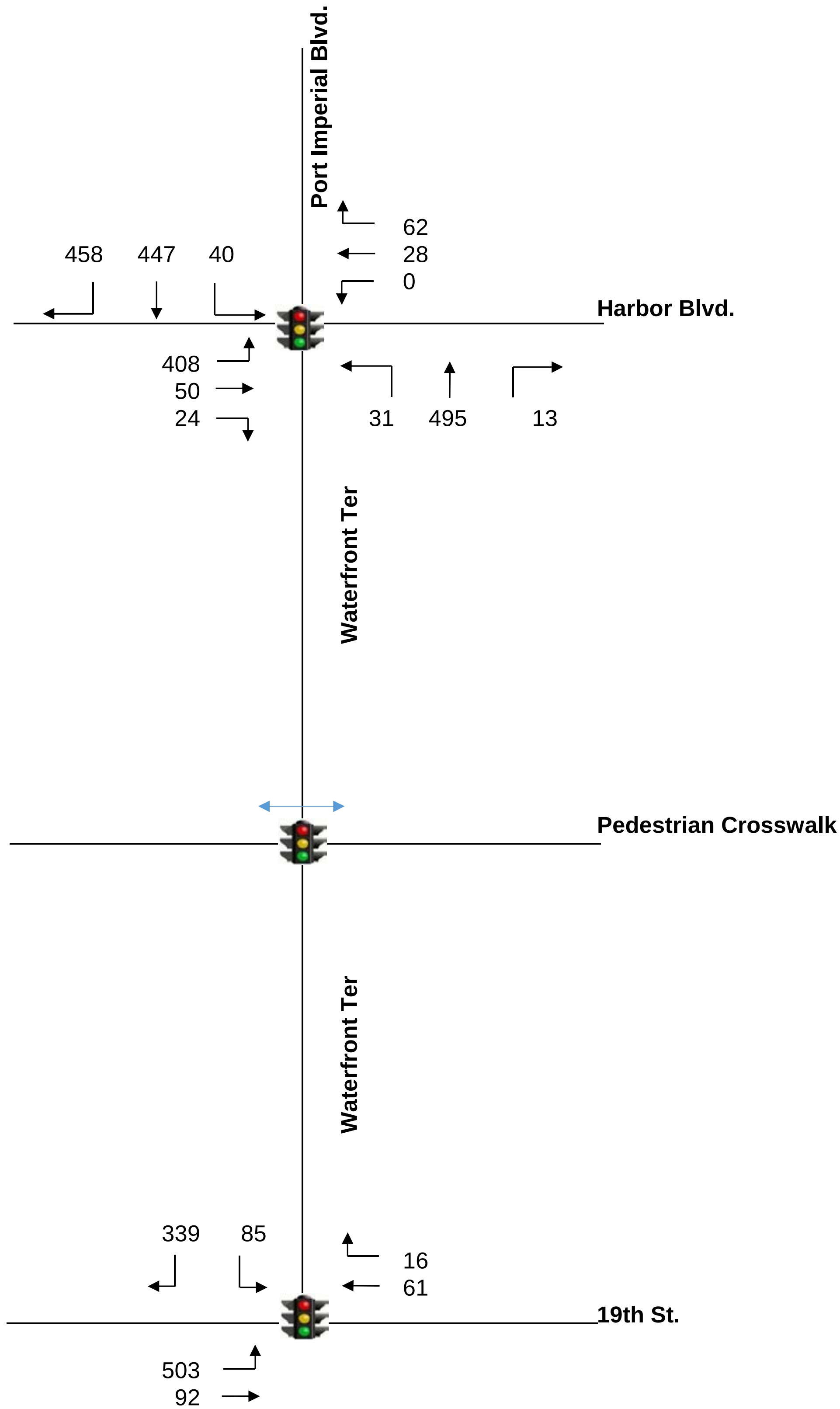

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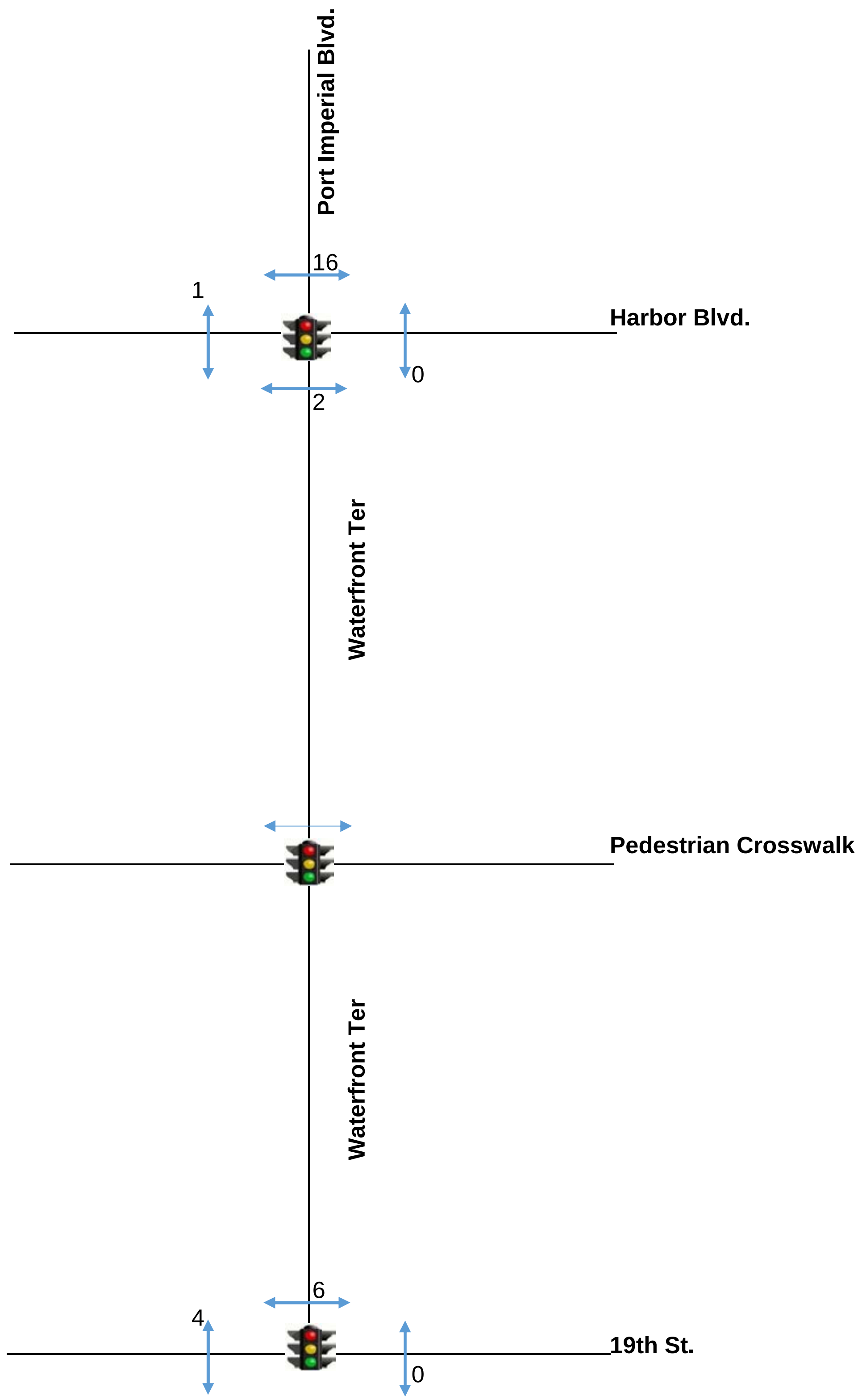
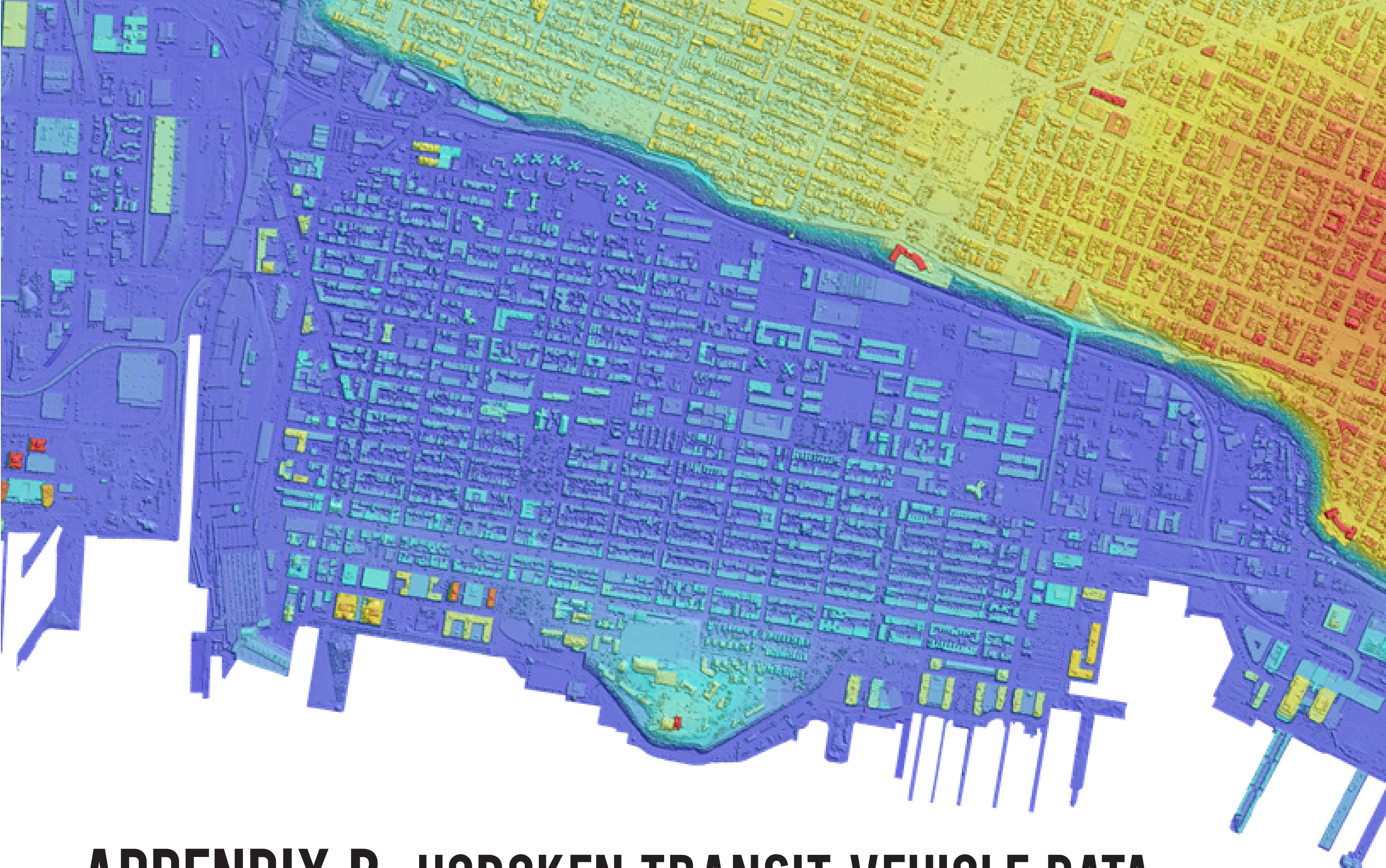




APPENDIX B–HOBOKEN TRANSIT VEHICLE DATA

Hoboken Data Collection

Peak (AM, PM or SAT) / NJ Transit Train Line	Entry	Exit	Total
Main Bergen			
AM	22	8	30
PM	9	20	29
SAT	4	7	11
Montclair Boonton			
AM	11	5	16
PM	2	12	14
SAT	2	2	4
Morris and Essex			
AM	19	7	26
PM	6	19	25
SAT	2	1	3
North Jersey Coast			
AM	4	0	4
PM	1	4	5
SAT	0	0	0
Pascack Valley			
AM	4	0	4
PM	1	4	5
SAT	3	1	4
Raritan Valley			
AM	3	0	3
PM	0	3	3
SAT	0	0	0
Train Total (AM)	**83**		
Train Total (PM)	**81**		
Train Total (SAT)	**22**		

Hoboken Data Collection

Peak (AM, PM or SAT)	Entry	Exit	Total
Hudson-Bergen Light Rail Schedule			
AM	33	33	66
PM	34	36	70
SAT	10	9	19
NY Waterway Ferries			
Hoboken/NJ Transit to WFC			
AM	19	19	38
PM	19	19	38
SAT	0	0	0
Hoboken/14th St to WFC			
AM	6	6	12
PM	7	7	14
SAT	0	0	0
Hoboken/NJ Transit to Pier 11			
AM	12	13	25
PM	12	13	25
SAT	0	0	0
Hoboken/14th St to Midtown			
AM	9	9	18
PM	9	9	18
SAT	9	9	18
Ferry Total (AM)	**93**		
Ferry Total (PM)	**95**		
Ferry Total (SAT)	**37**		

Hoboken Data Collection

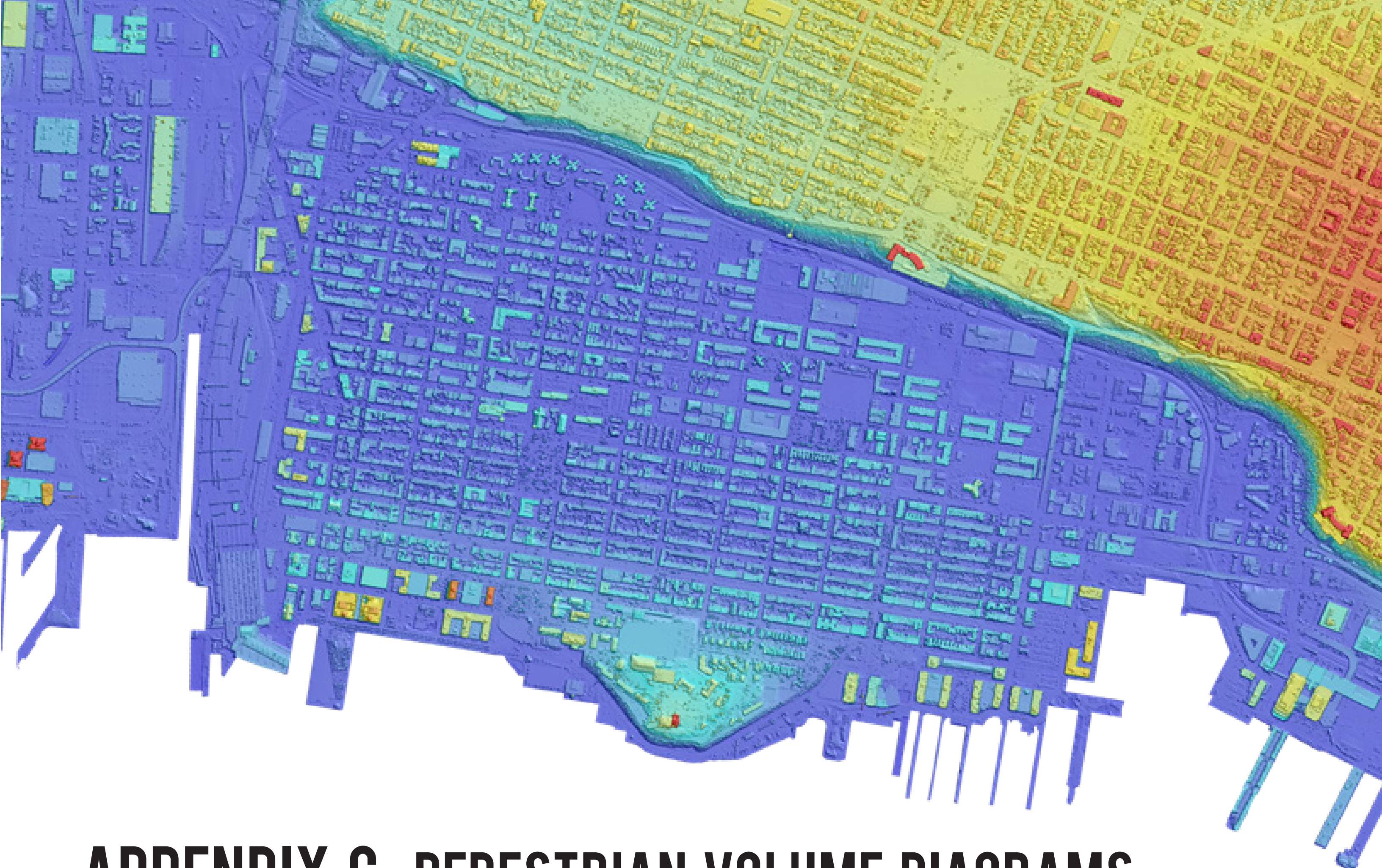
Peak (AM, PM or SAT)	Entry	Exit	Total
Bus Routes			
Bus Route 22			
AM	12	7	19
PM	6	12	18
SAT	6	6	12
Bus Route 23			
AM	2	0	2
PM	0	1	1
SAT	0	0	0
Bus Route 64			
AM	13	13	26
PM	9	9	18
SAT	0	0	0
Bus Route 68			
AM	10	10	20
PM	10	10	20
SAT	0	0	0
Bus Route 85			
AM	5	6	11
PM	6	6	12
SAT	3	3	6
Bus Route 87			
AM	22	15	37
PM	17	21	38
SAT	9	9	18
Bus Route 89			
AM	5	6	11
PM	5	5	10
SAT	3	1	4
Bus Route 126			
AM	40	86	126
PM	40	35	75
SAT	15	15	30
Bus Total (AM)	**156**		
Bus Total (PM)	**192**		
Bus Total (SAT)	**70**		

Hoboken Data Collection

Peak (AM, PM or SAT)	Entry	Exit	Total
PATH Routes			
33rd st - Hoboken			
AM	23	0	23
PM	22	0	22
SAT (33rd to Journal SQ) via hoboken	18	18	36
33rd st - Journal Square via Hoboken			
AM	1	1	2
PM	0	0	0
SAT	Same as above		
Hoboken - 33rd st			
AM	0	23	23
PM	0	23	23
SAT (Journal SQ - 33rd st) via hoboken	19	19	38
Journal Square - 33rd st via hoboken			
AM	0	0	0
PM	0	0	0
SAT	Same as above		
Hoboken to WTC			
AM	0	26	26
PM	0	28	28
SAT	0	0	0
WTC to Hoboken			
AM	25	0	25
PM	25	0	25
SAT	0	0	0
PATH Total (AM)	**99**		
PATH Total (PM)	**98**		
PATH Total (SAT)	**74**		

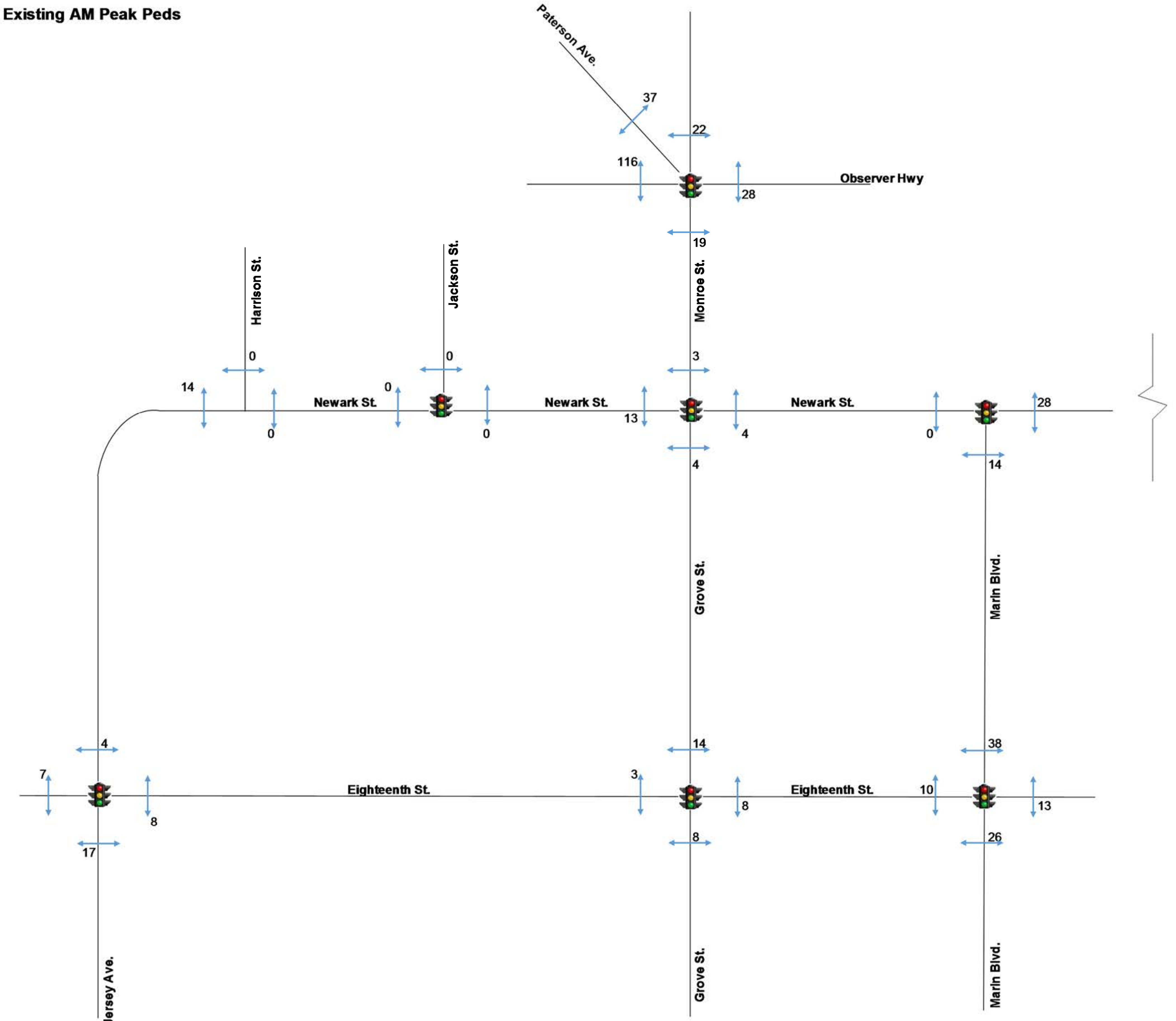
Passenger Ridership

Time	Entry	Exit	Total
PATH			
AM Peak			
6AM	1517	193	1710
7AM	5554	490	6044
8AM	8803	911	9714
9AM	3618	814	4432
PM Peak			
3PM	583	1129	1712
4PM	838	2552	3390
5PM	1283	6166	7449
6PM	1045	5954	6999
Saturday			
11AM	1000	499	1499
12PM	1018	586	1604
1PM	999	648	1647

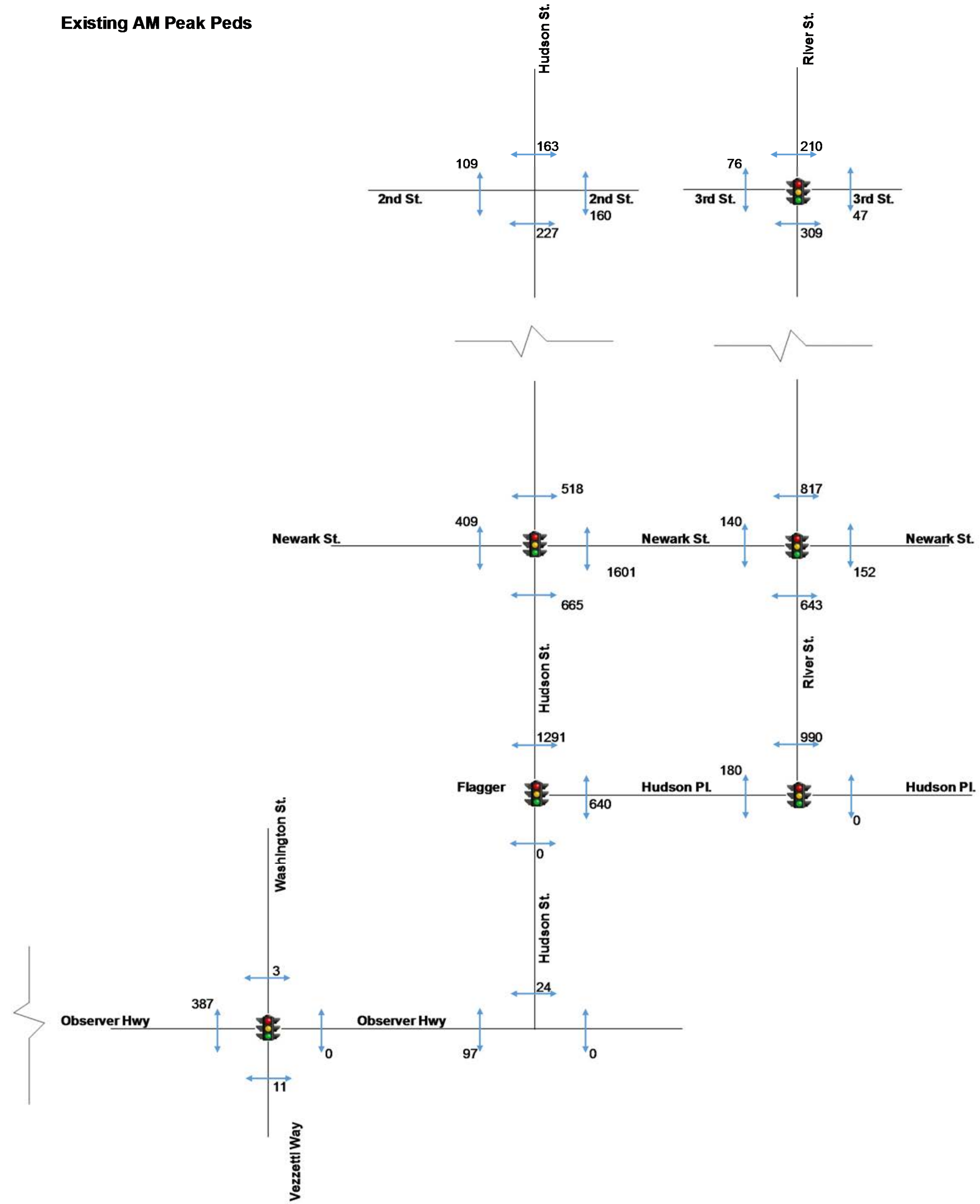


APPENDIX C–PEDESTRIAN VOLUME DIAGRAMS

Existing AM Peak Peds

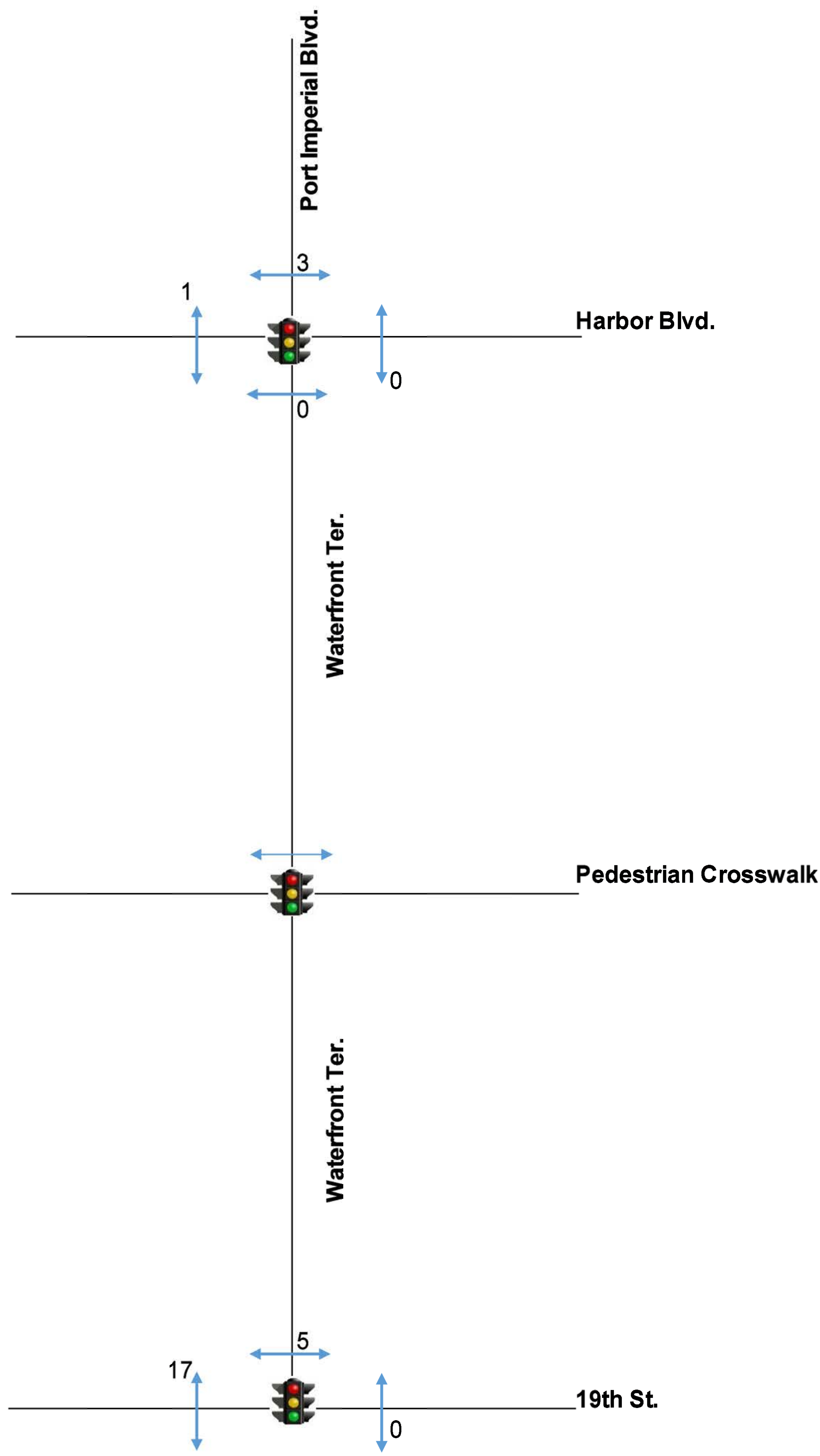


Existing AM Peak Peds

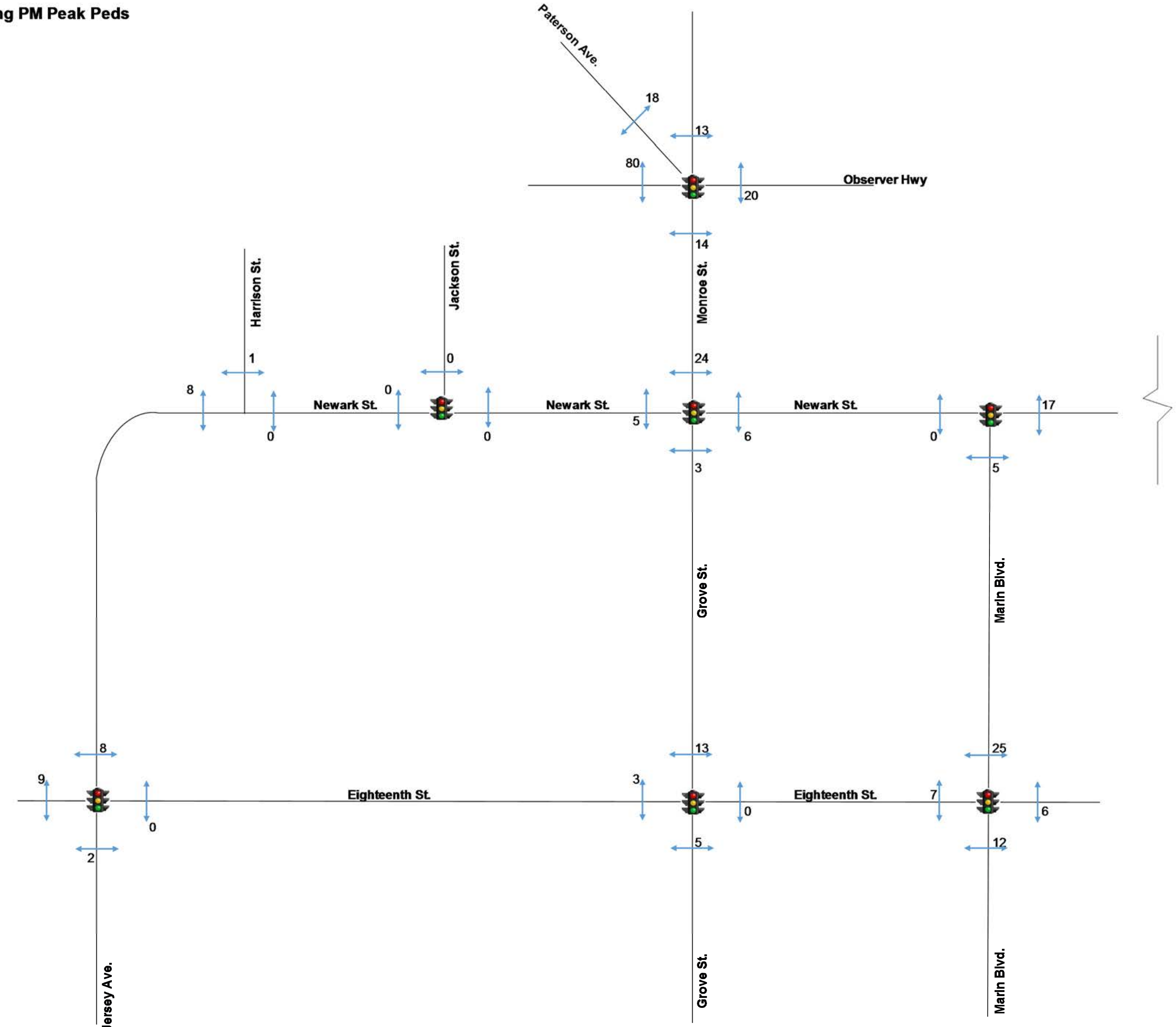


Existing AM Peak Peds

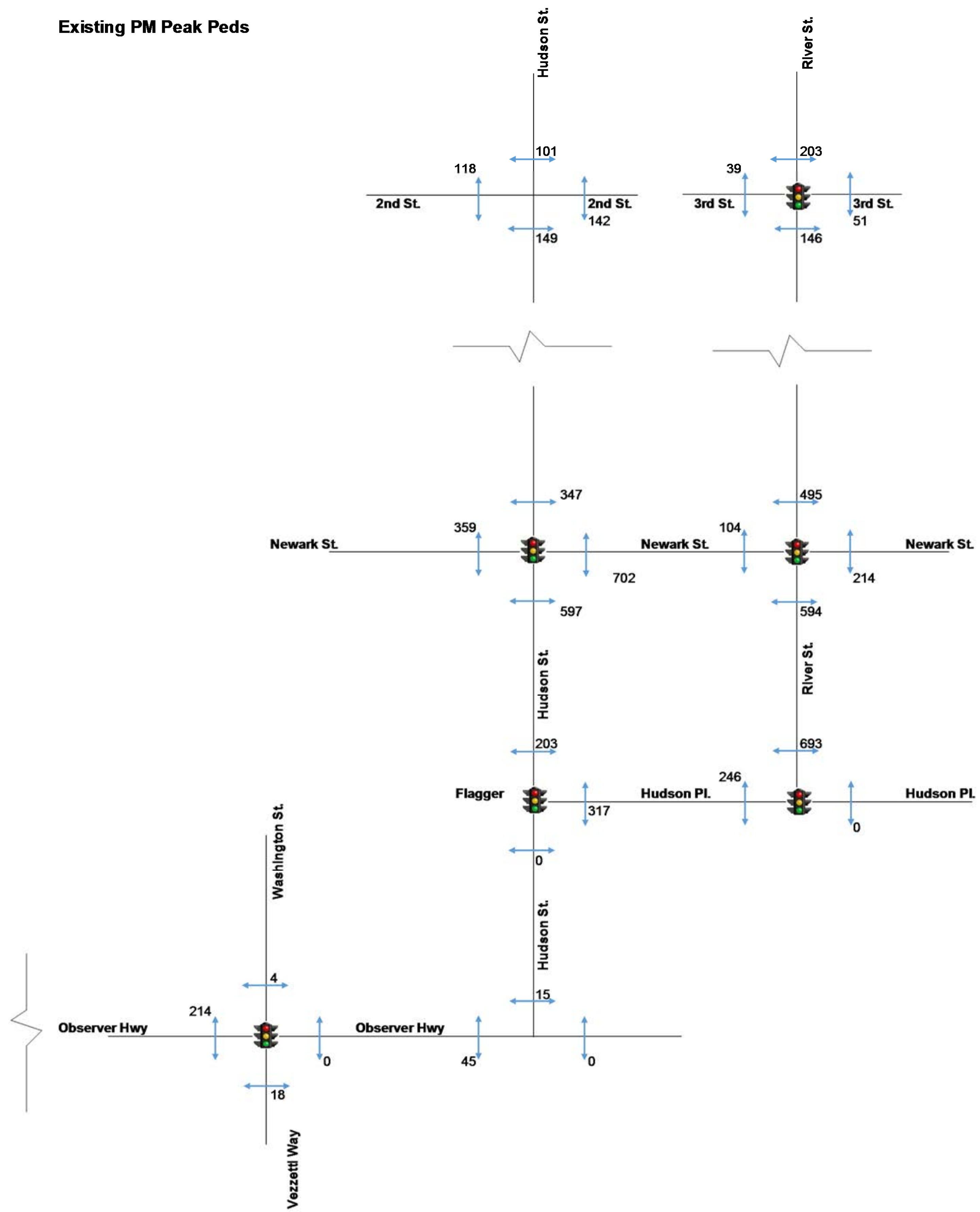
Existing AM Peak Peds



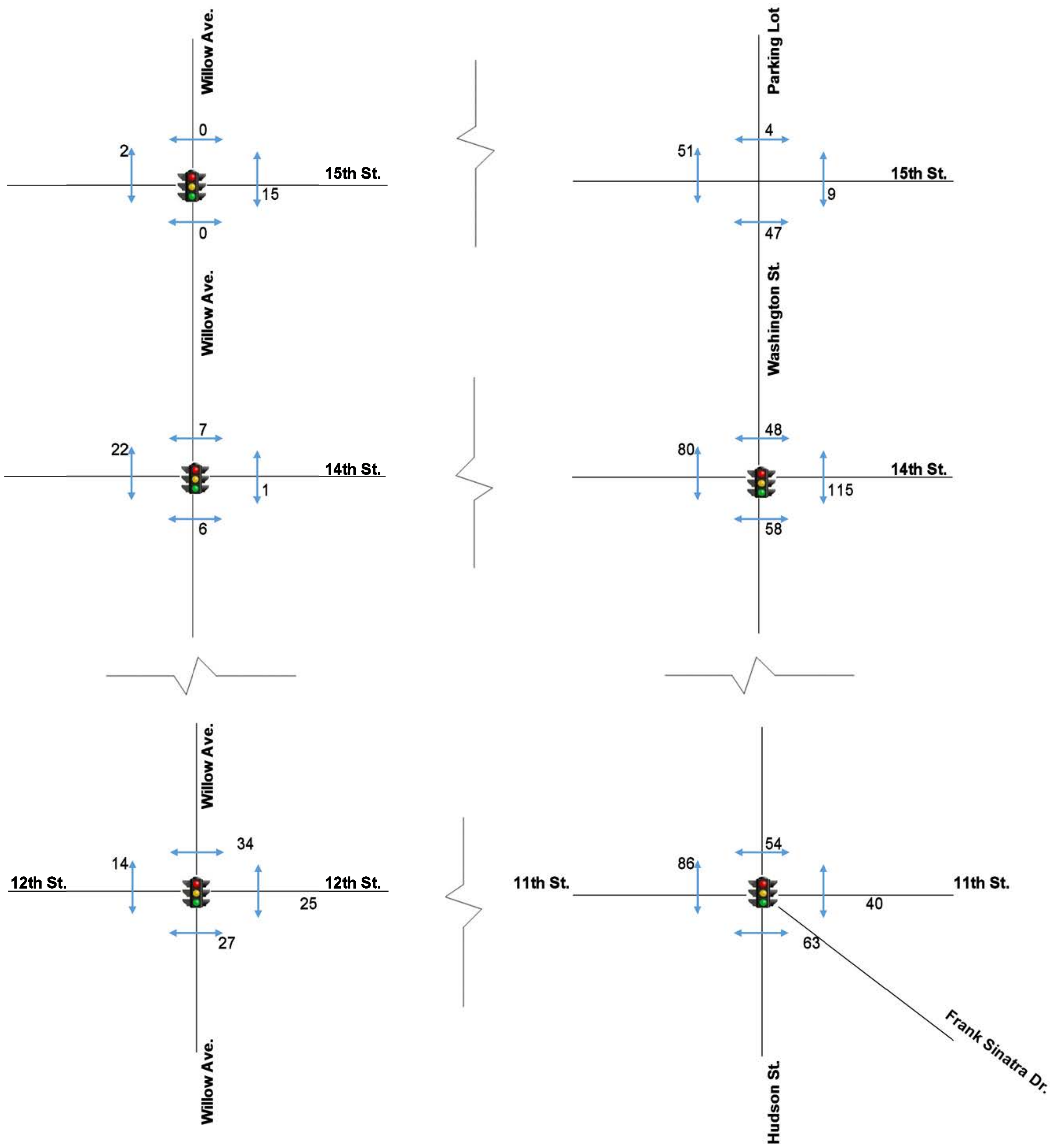
Existing PM Peak Peds



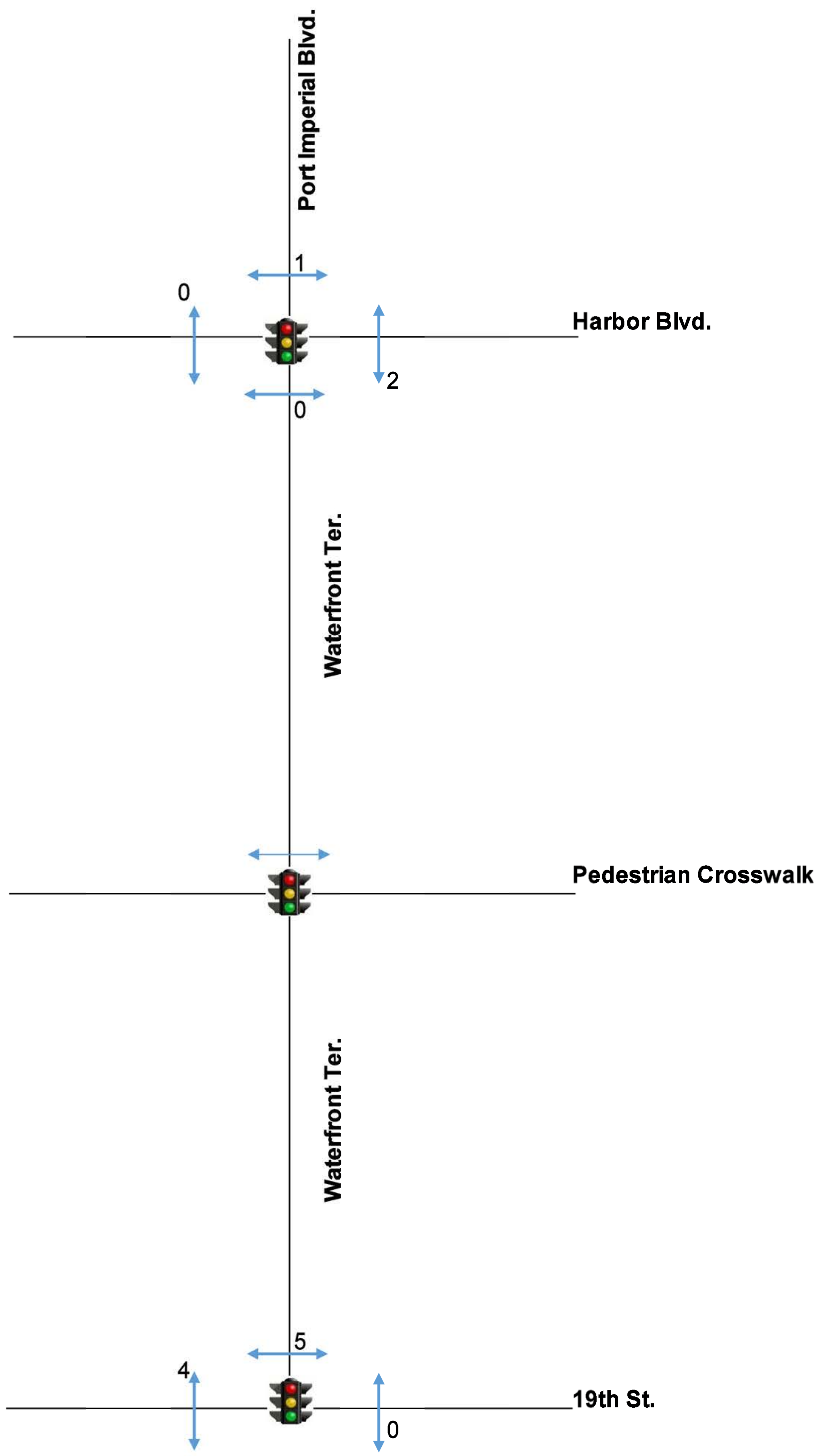
Existing PM Peak Peds



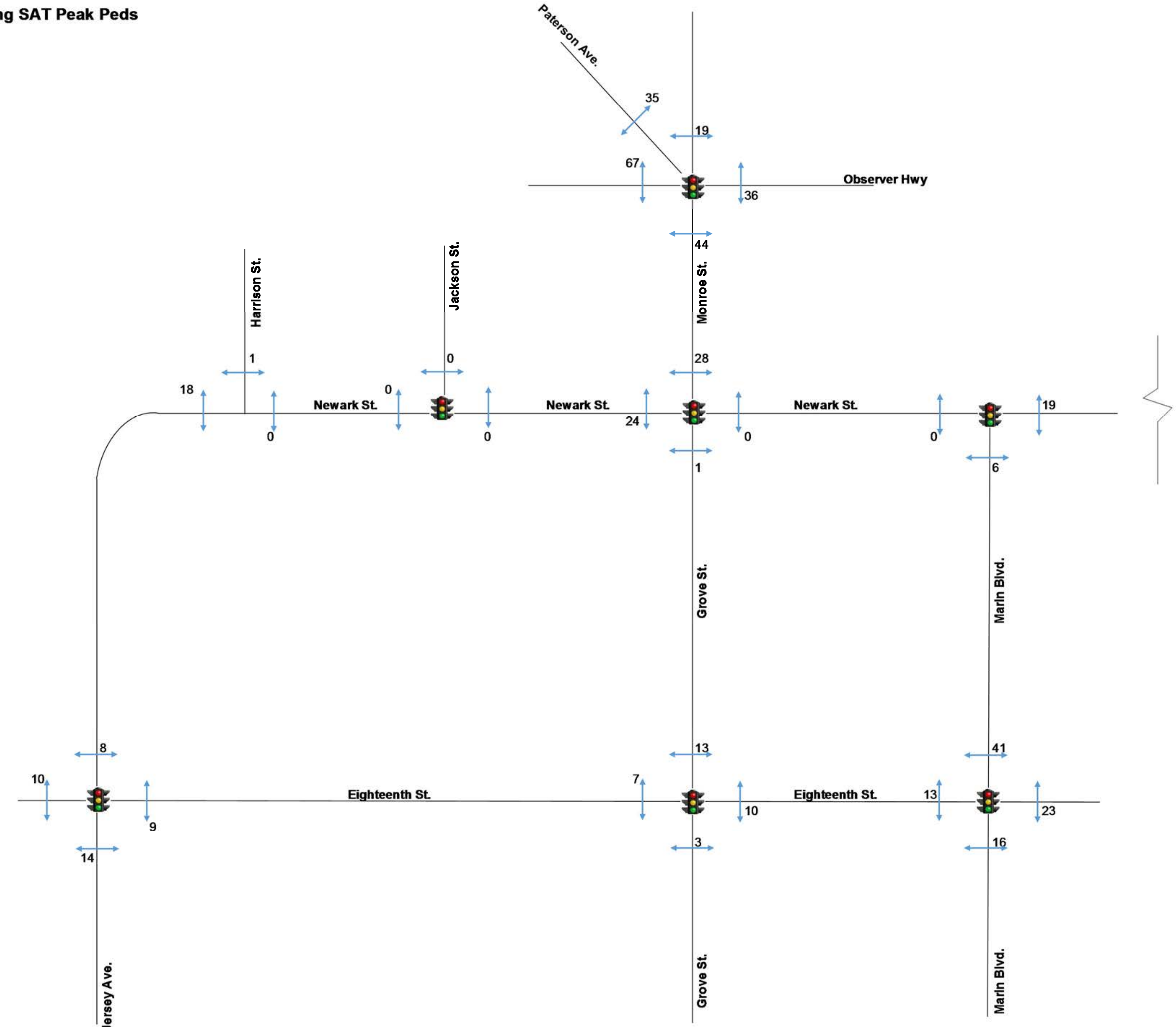
Existing PM Peak Peds



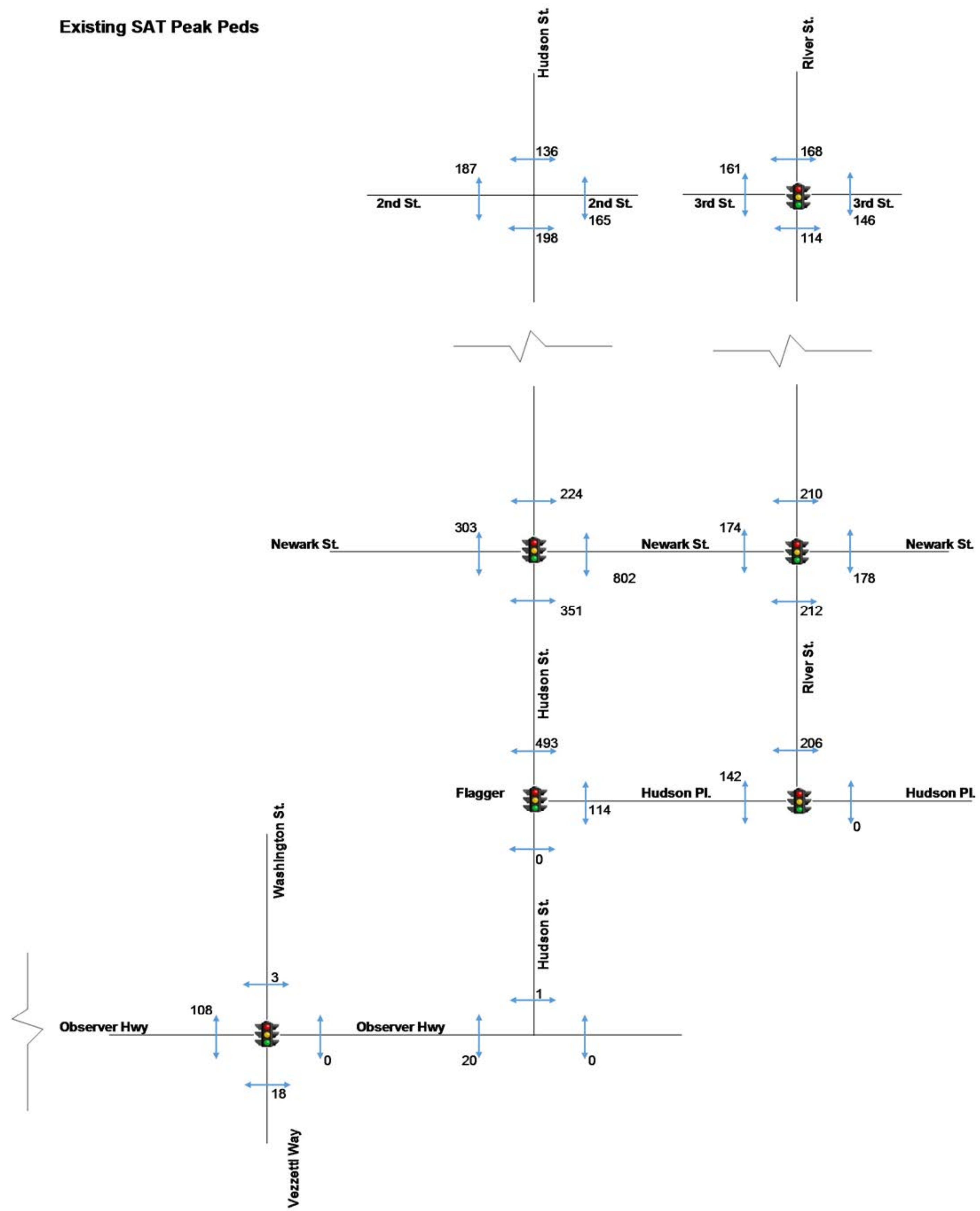
Existing PM Peak Peds



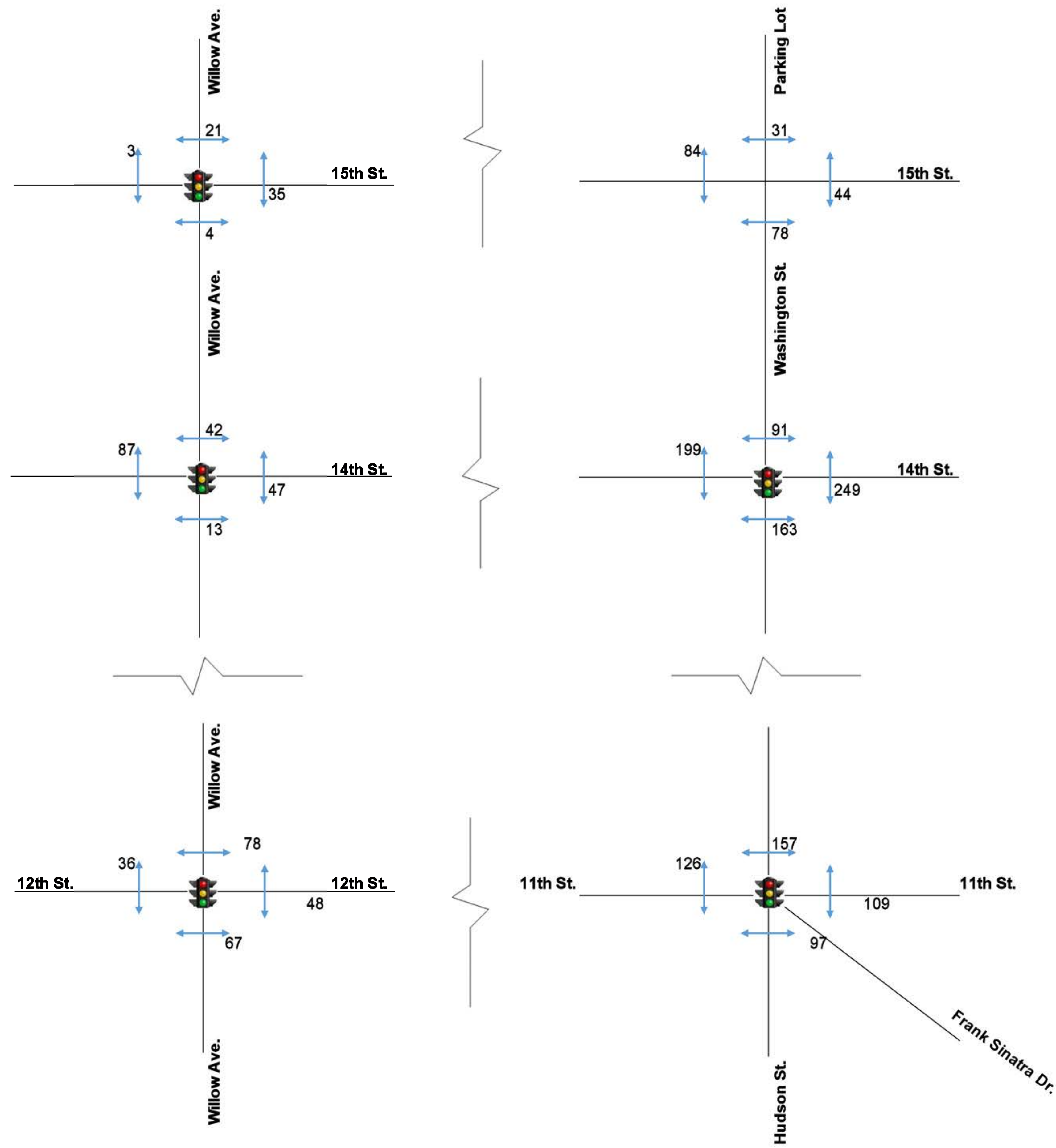
Existing SAT Peak Peds



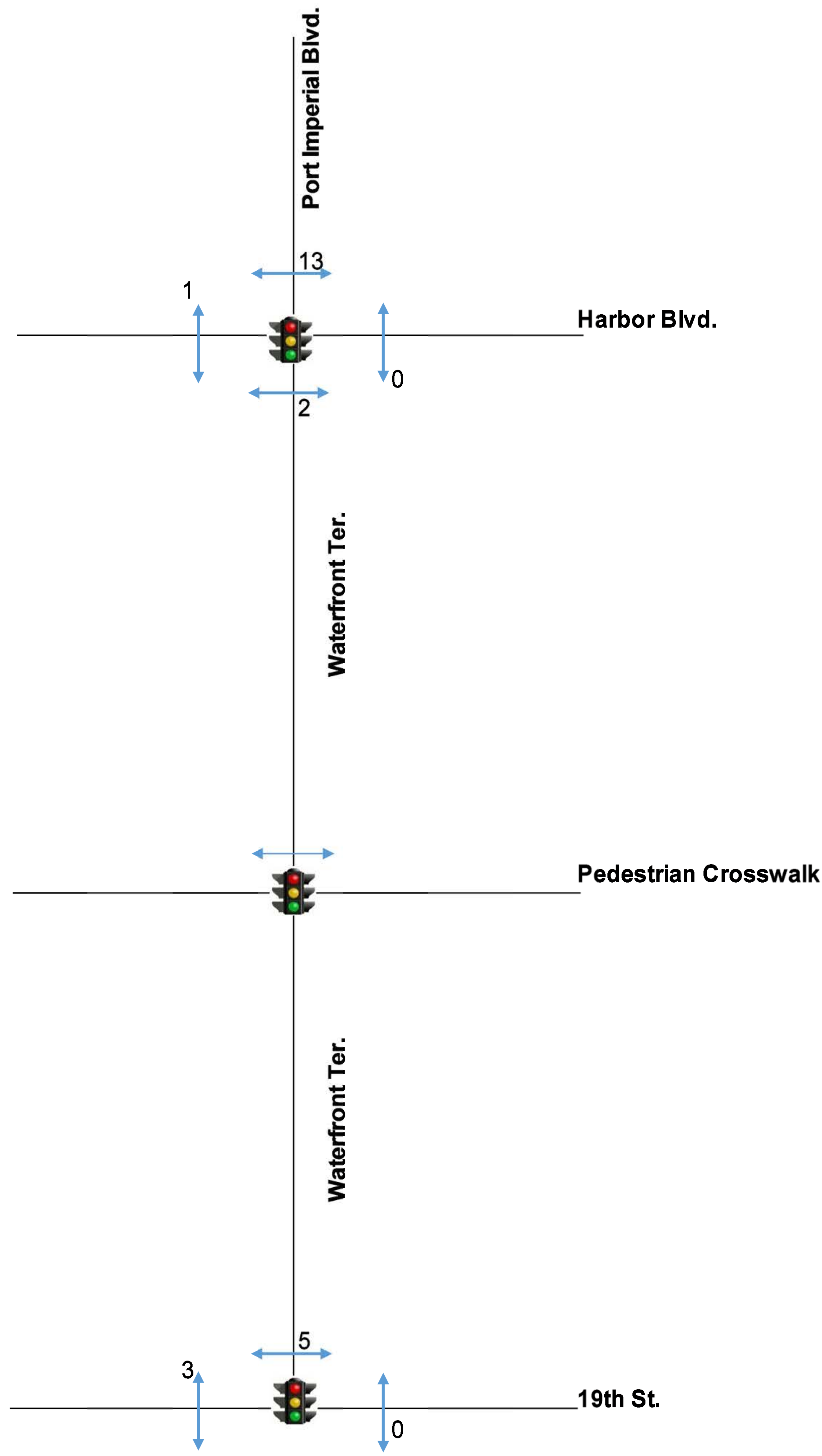
Existing SAT Peak Peds



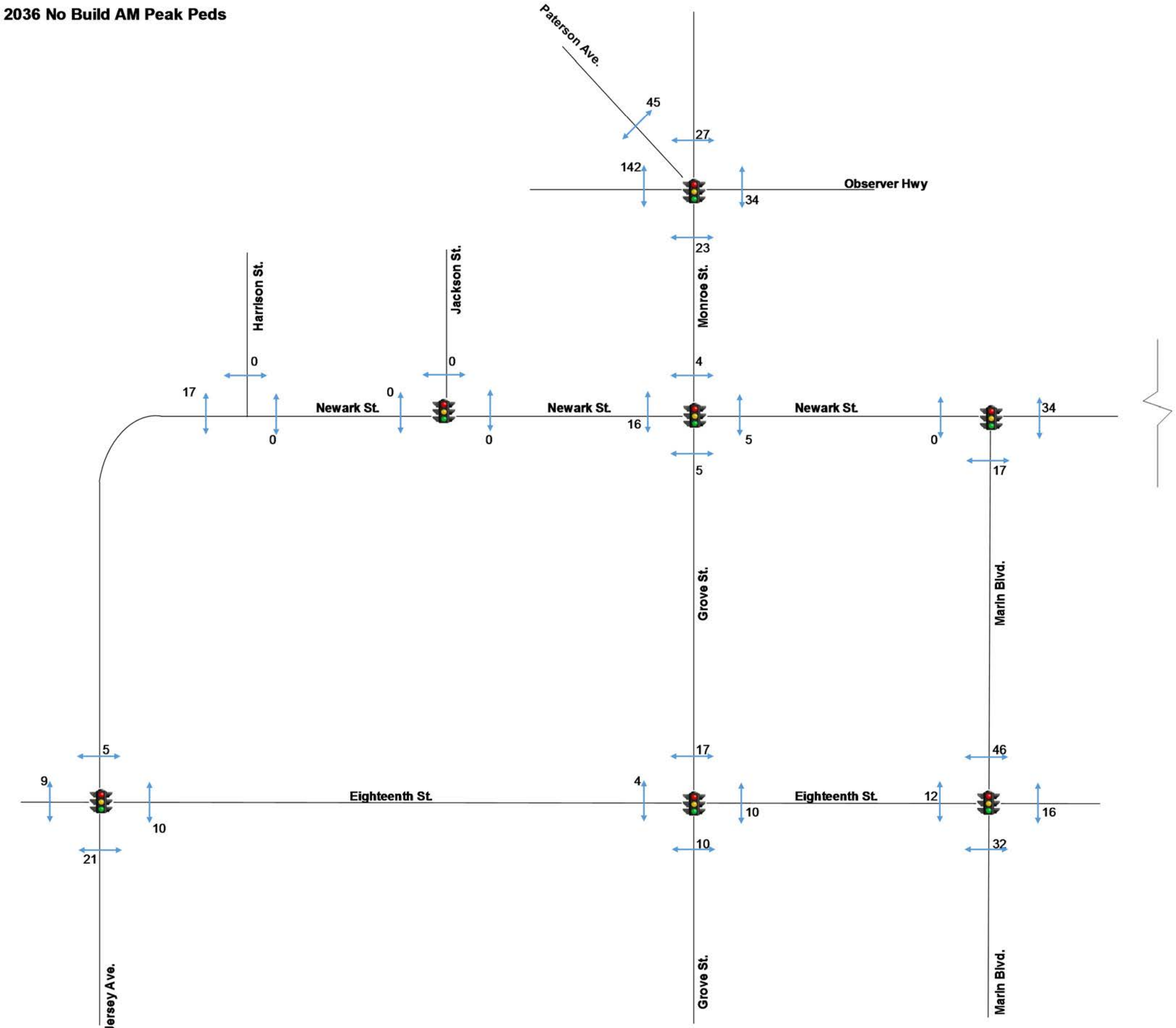
Existing SAT Peak Peds



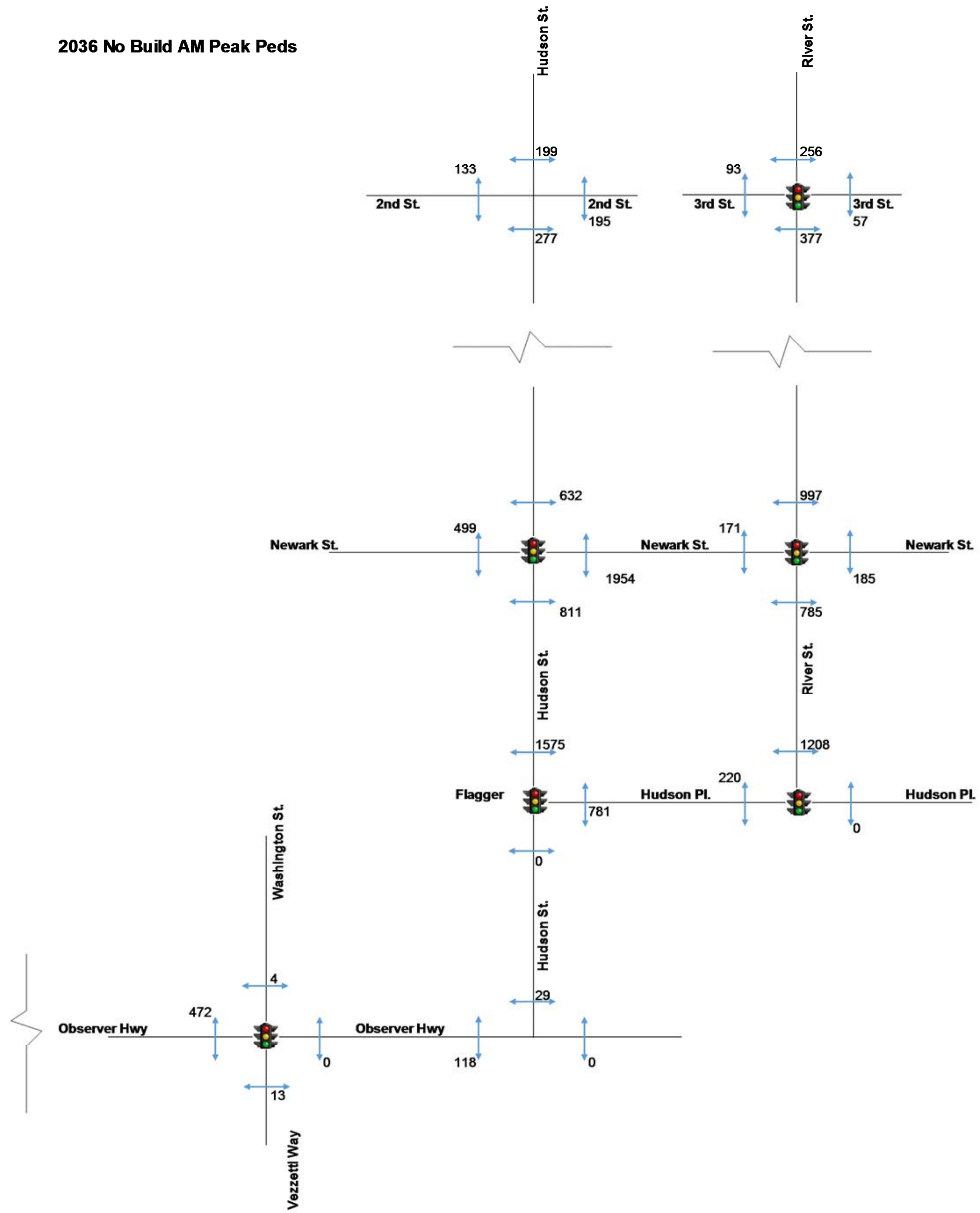
Existing SAT Peak Peds



2036 No Build AM Peak Peds

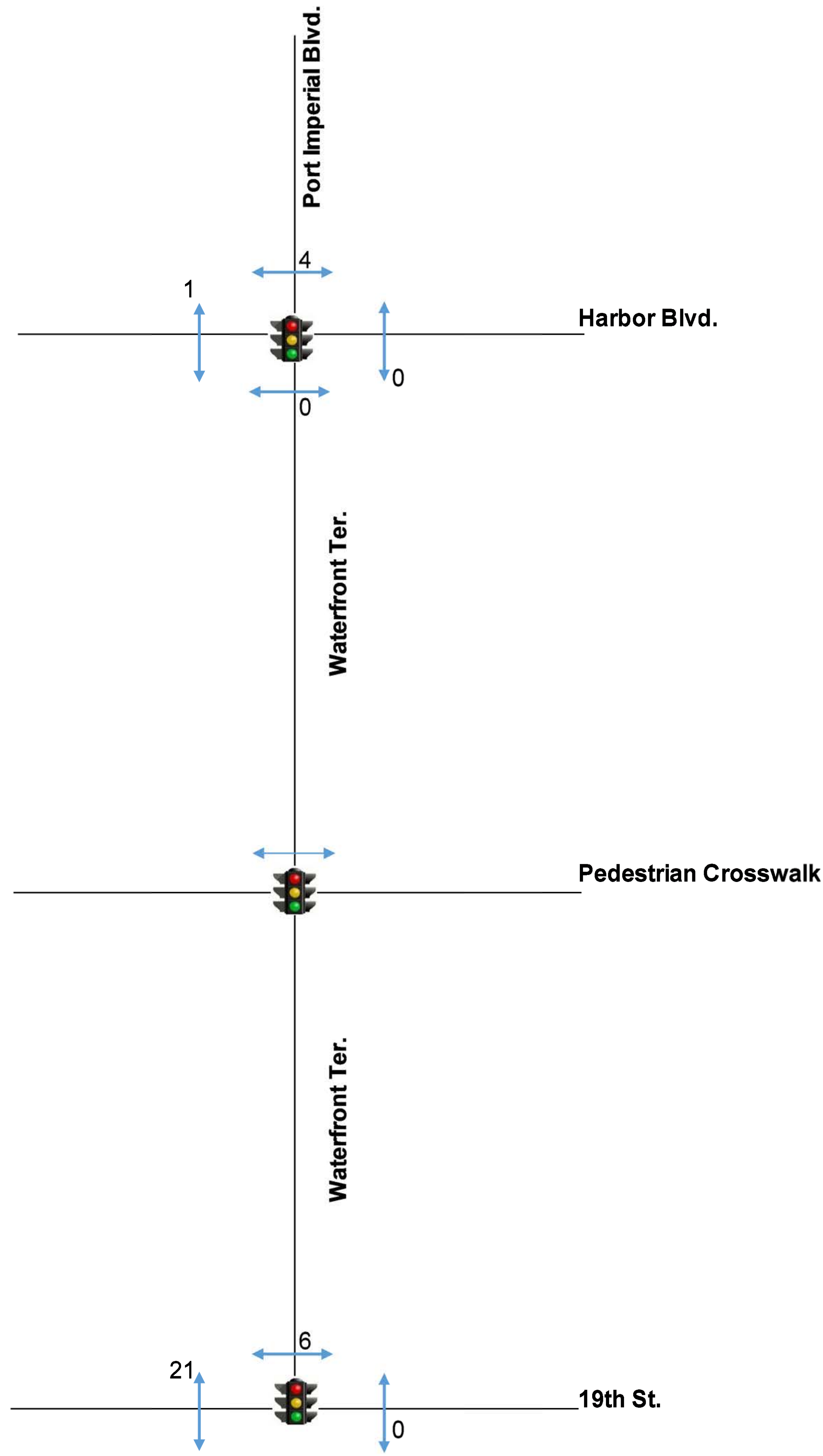


2036 No Build AM Peak Peds

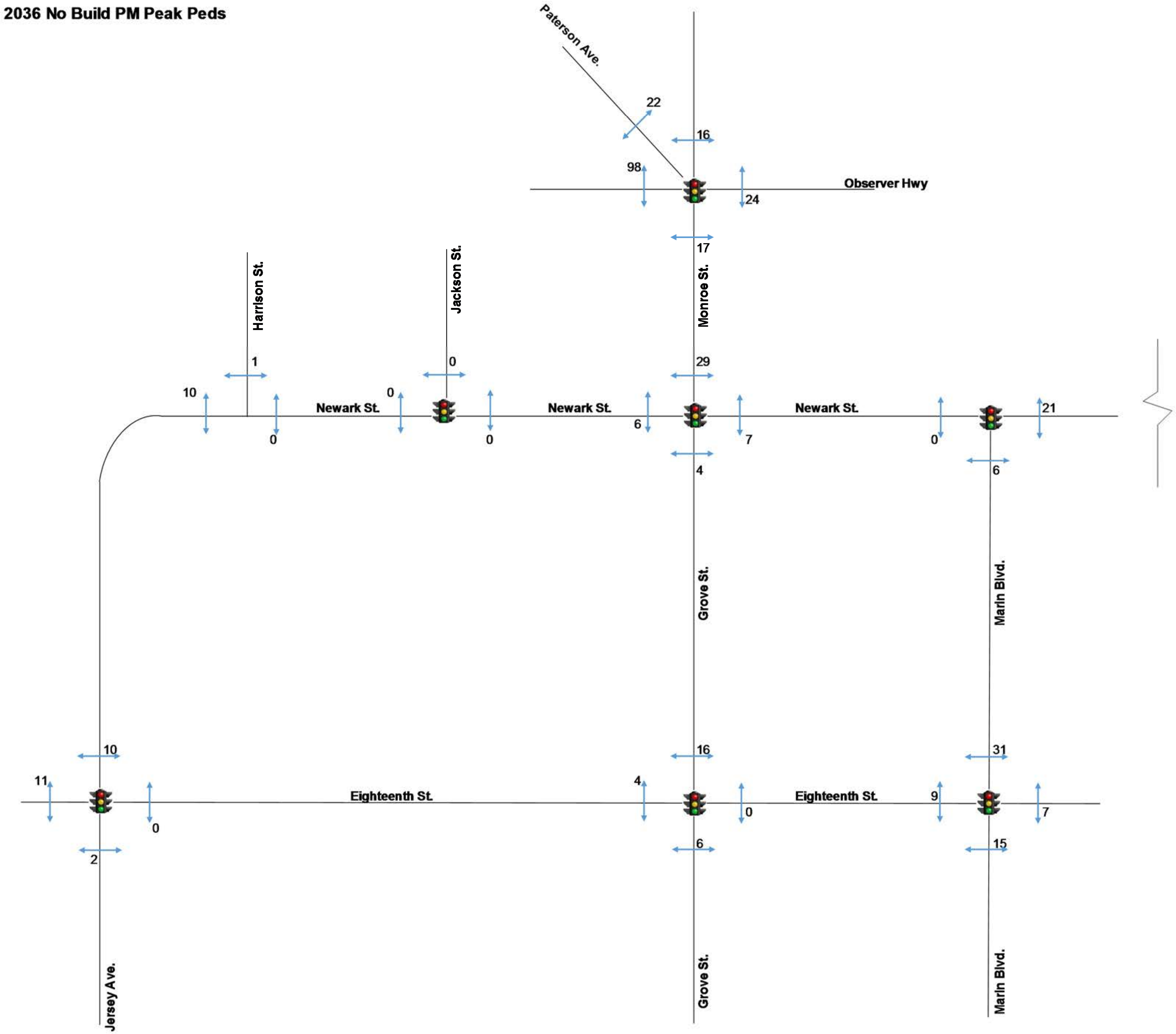


2036 No Build AM Peak Peds

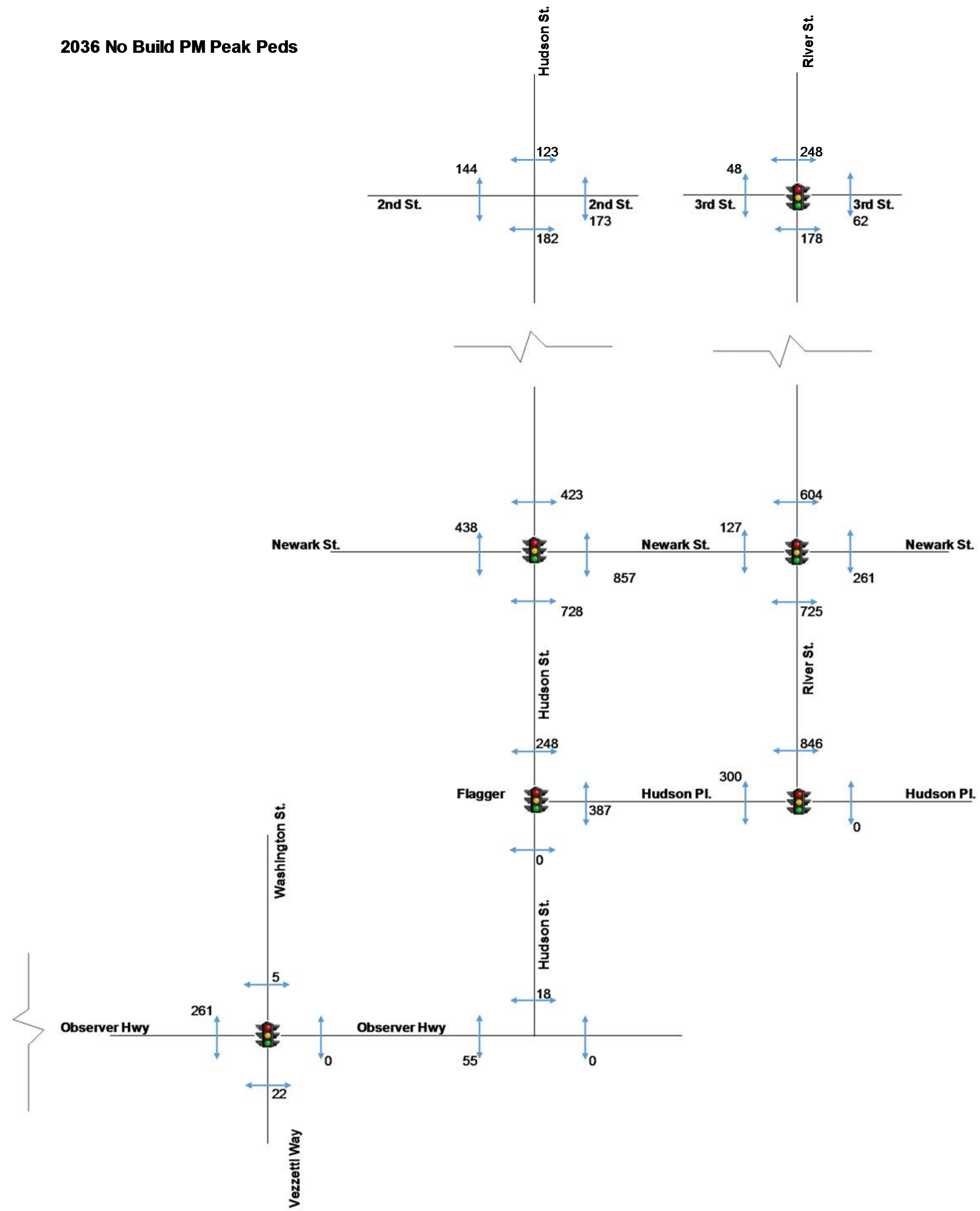
2036 No Build AM Peak Peds



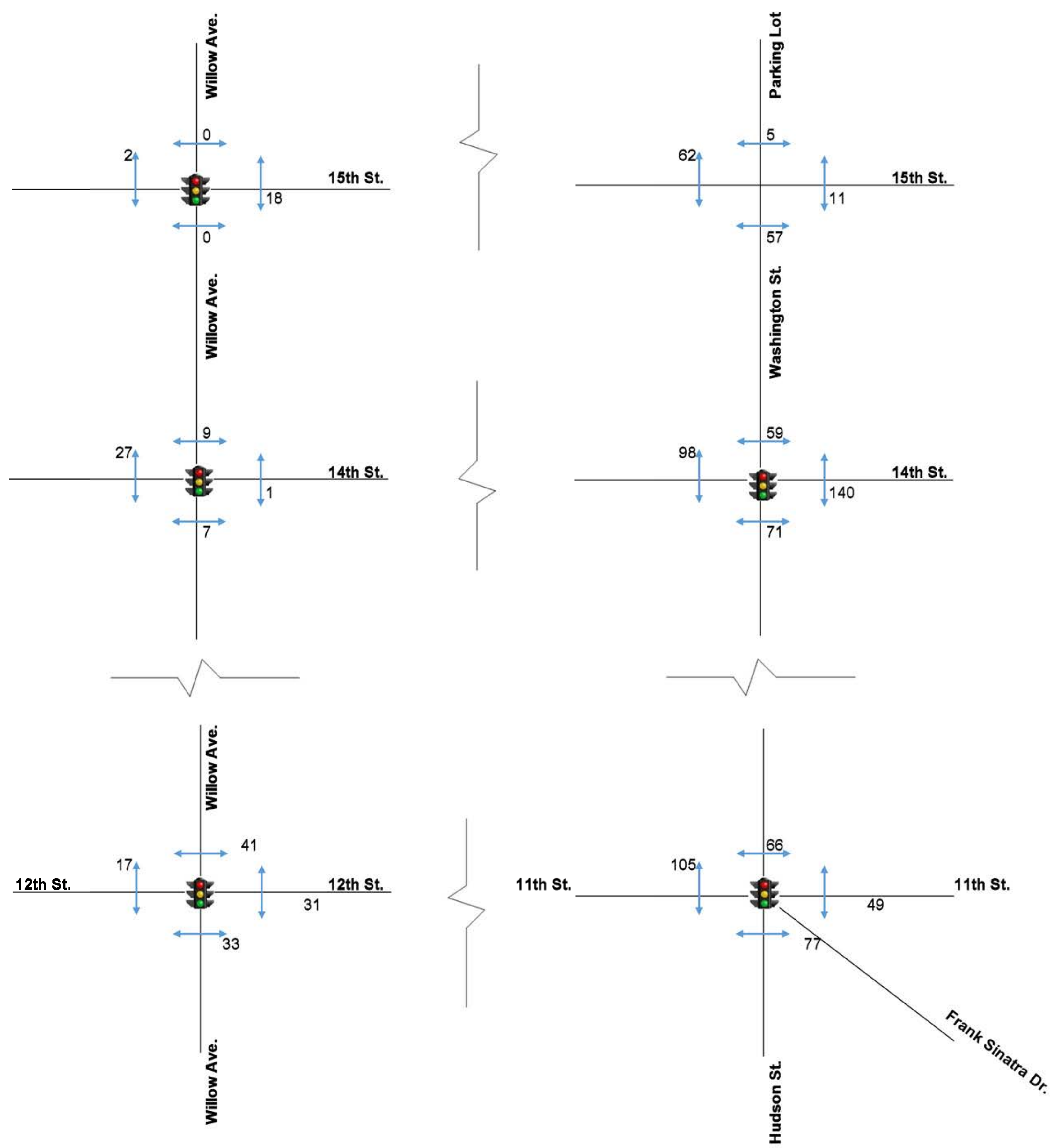
2036 No Build PM Peak Peds



2036 No Build PM Peak Peds



2036 No Build PM Peak Peds



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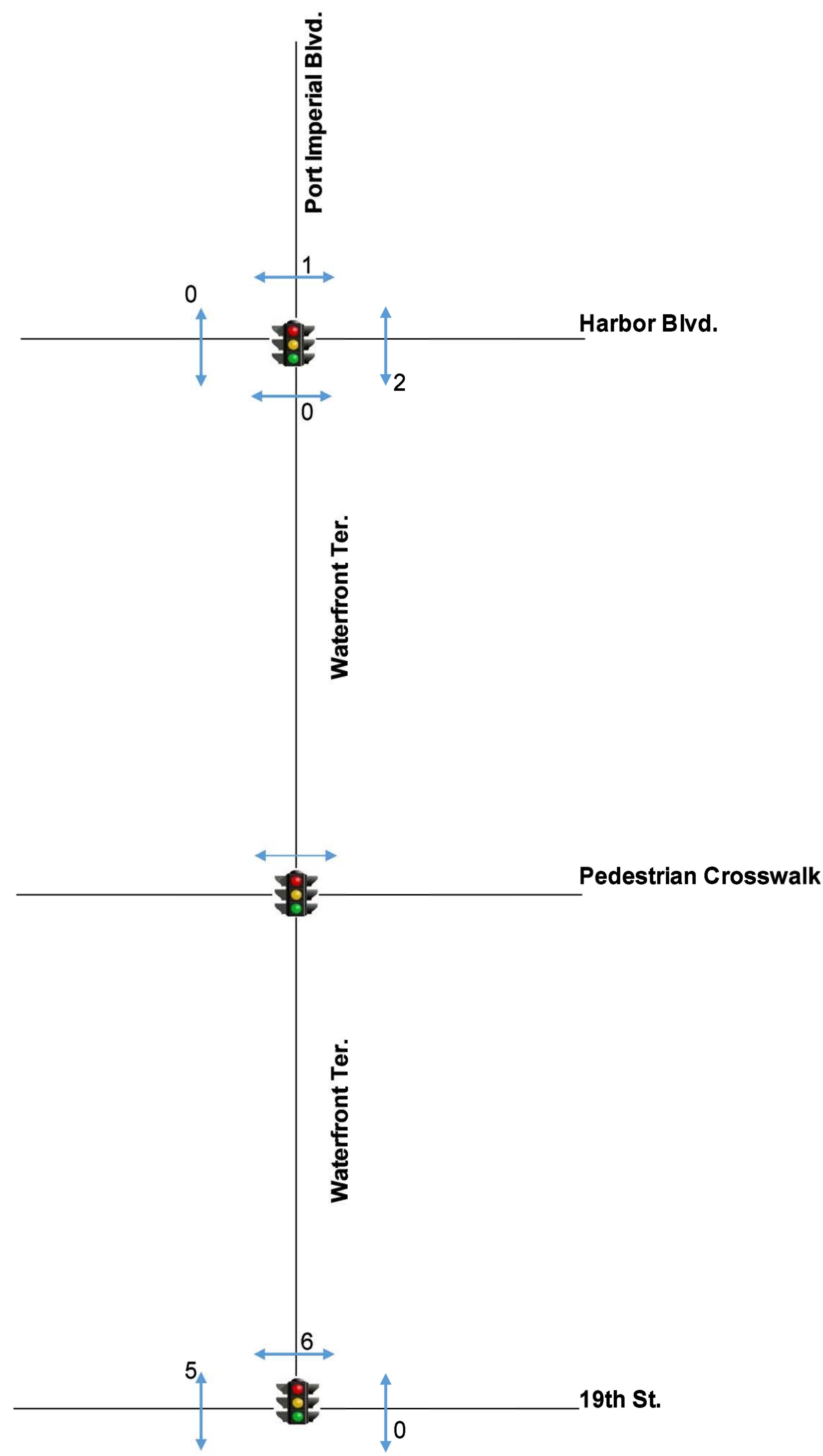
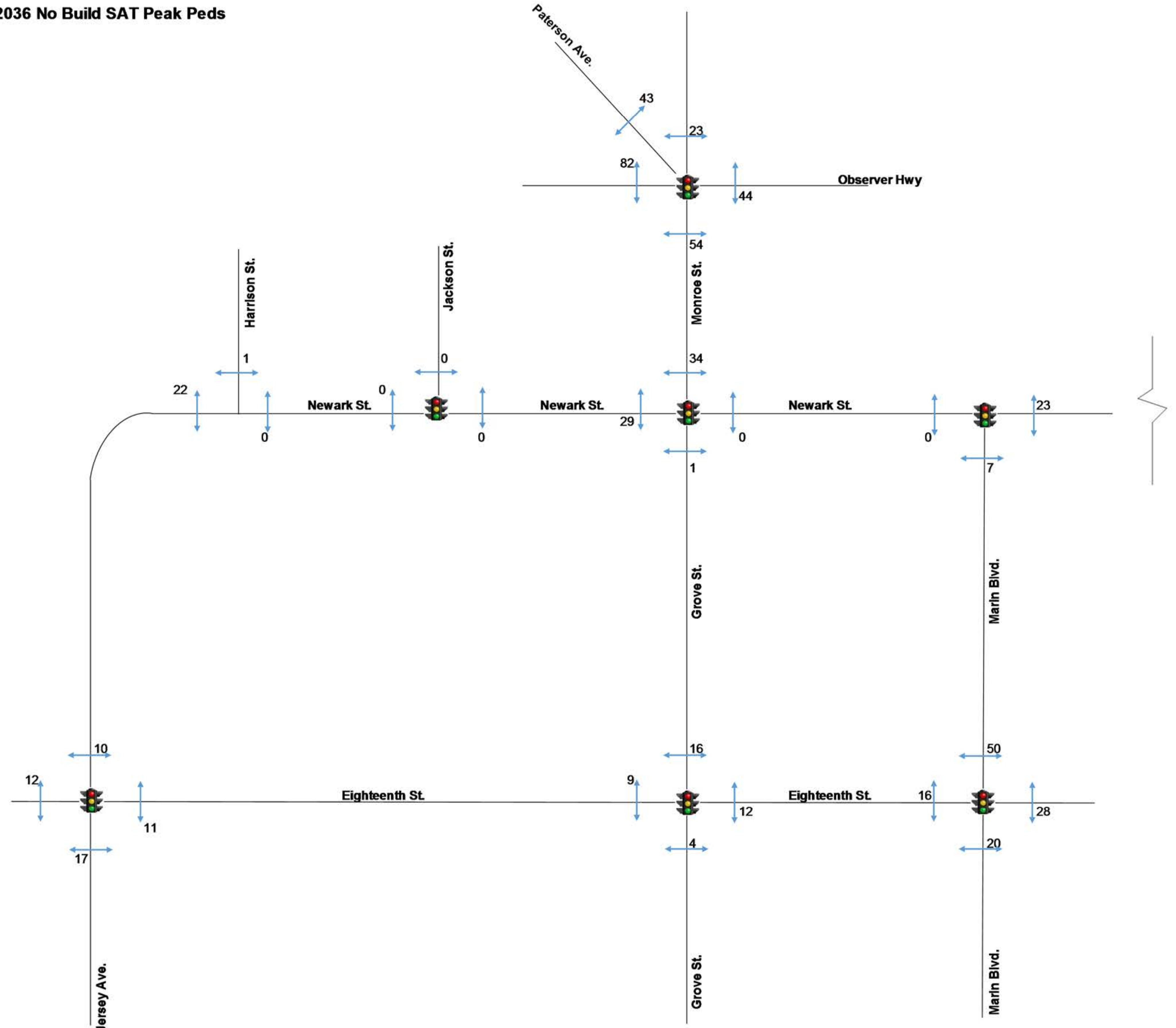


2036 No Build SAT Peak Peds



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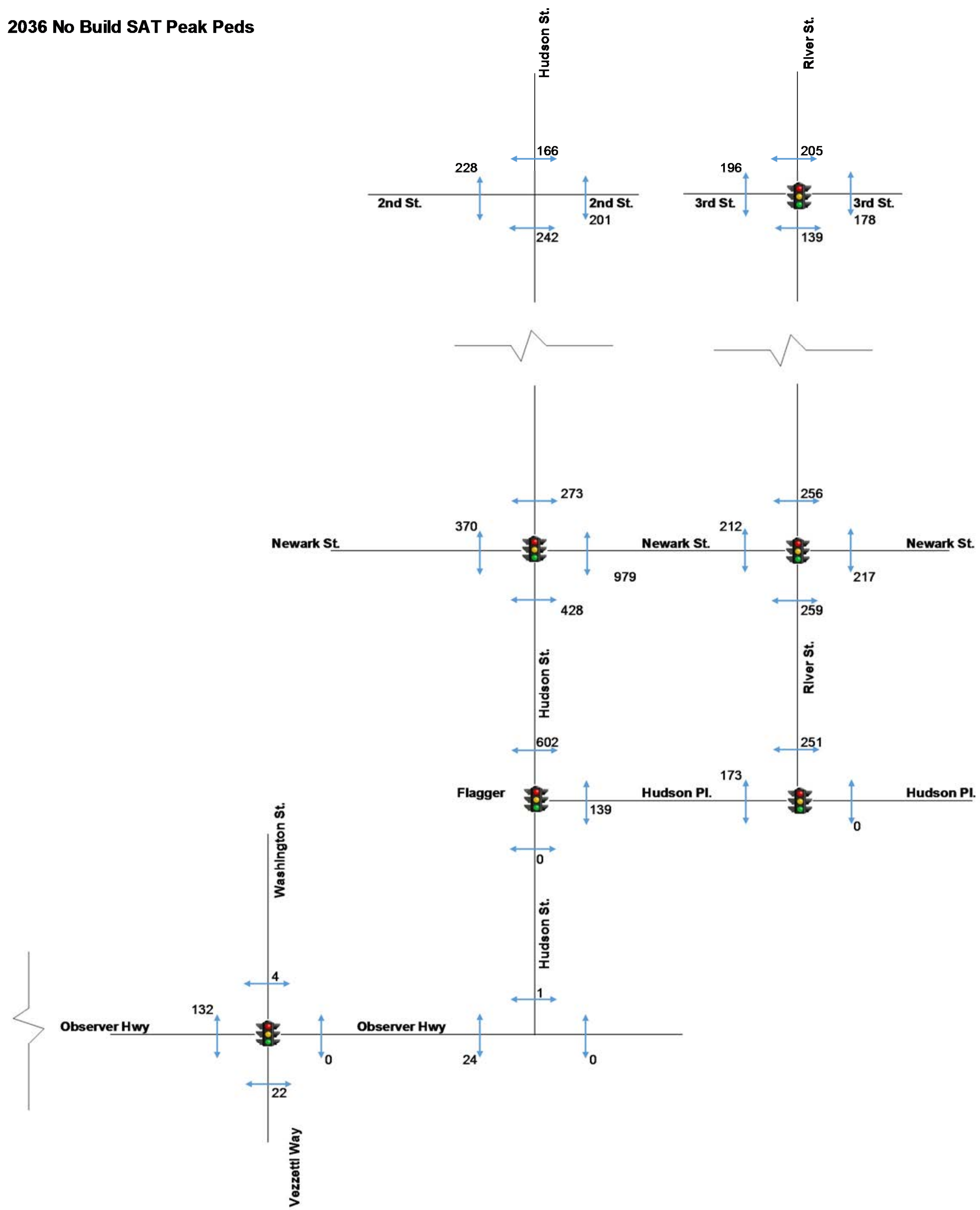
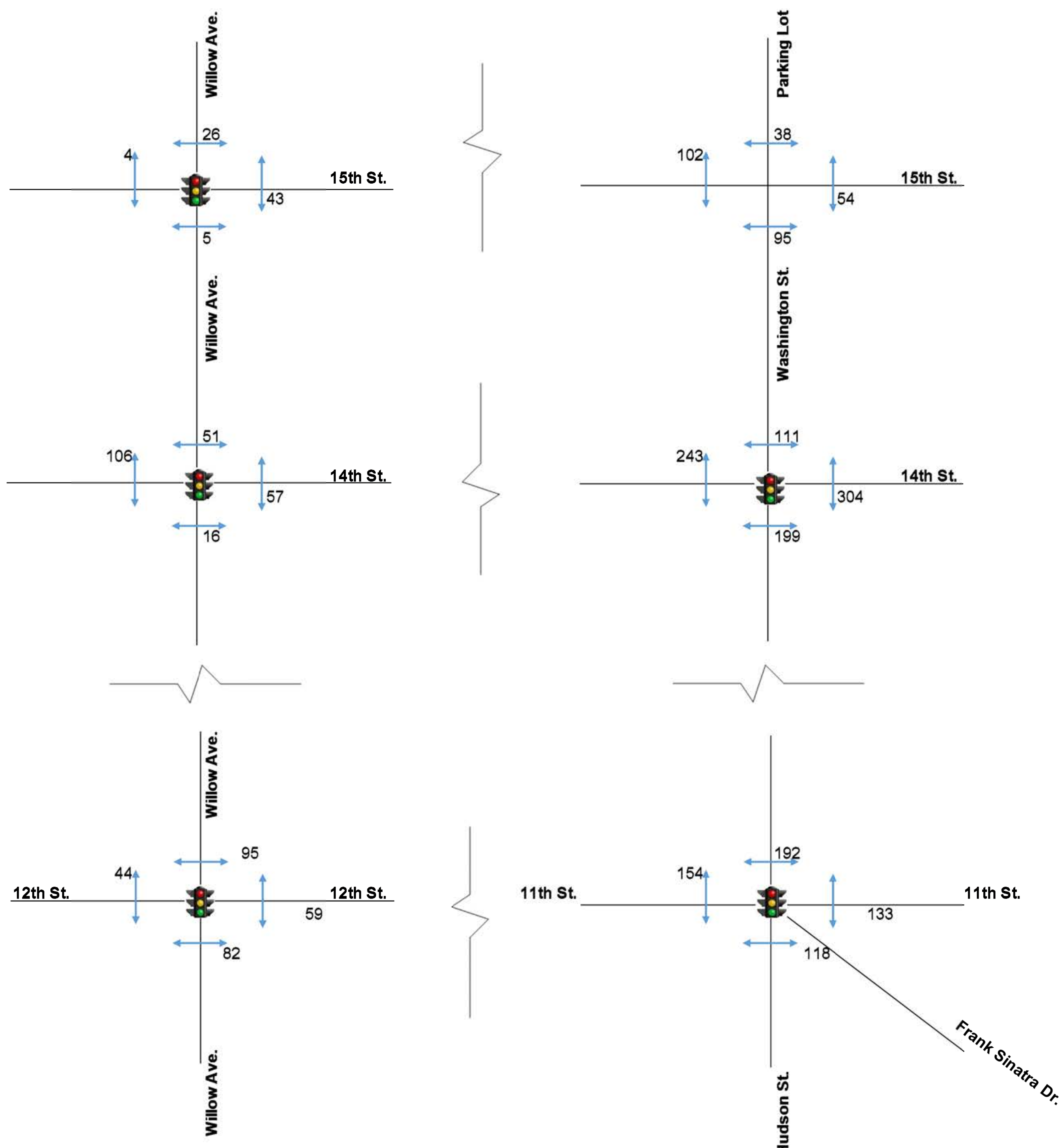
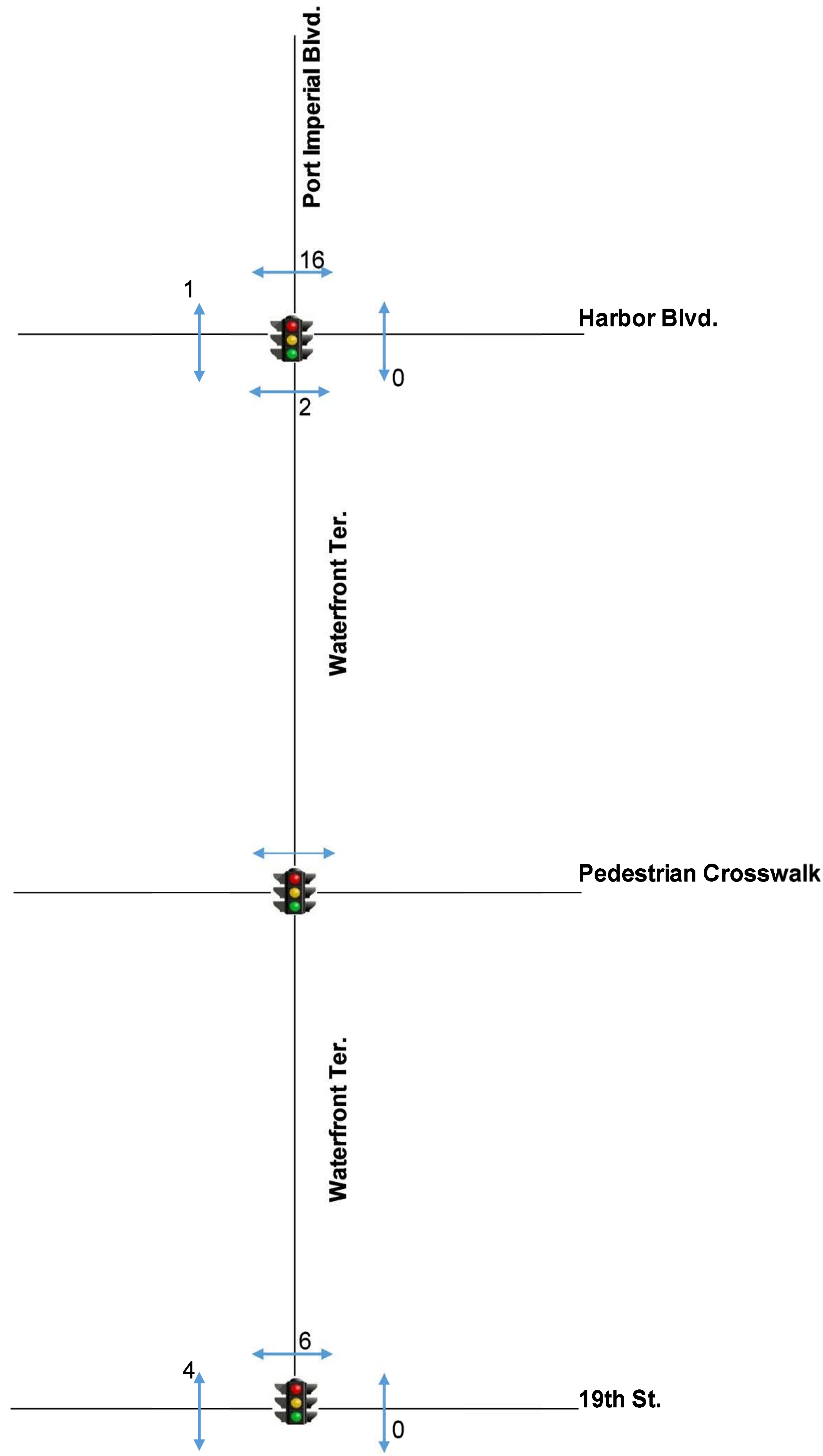
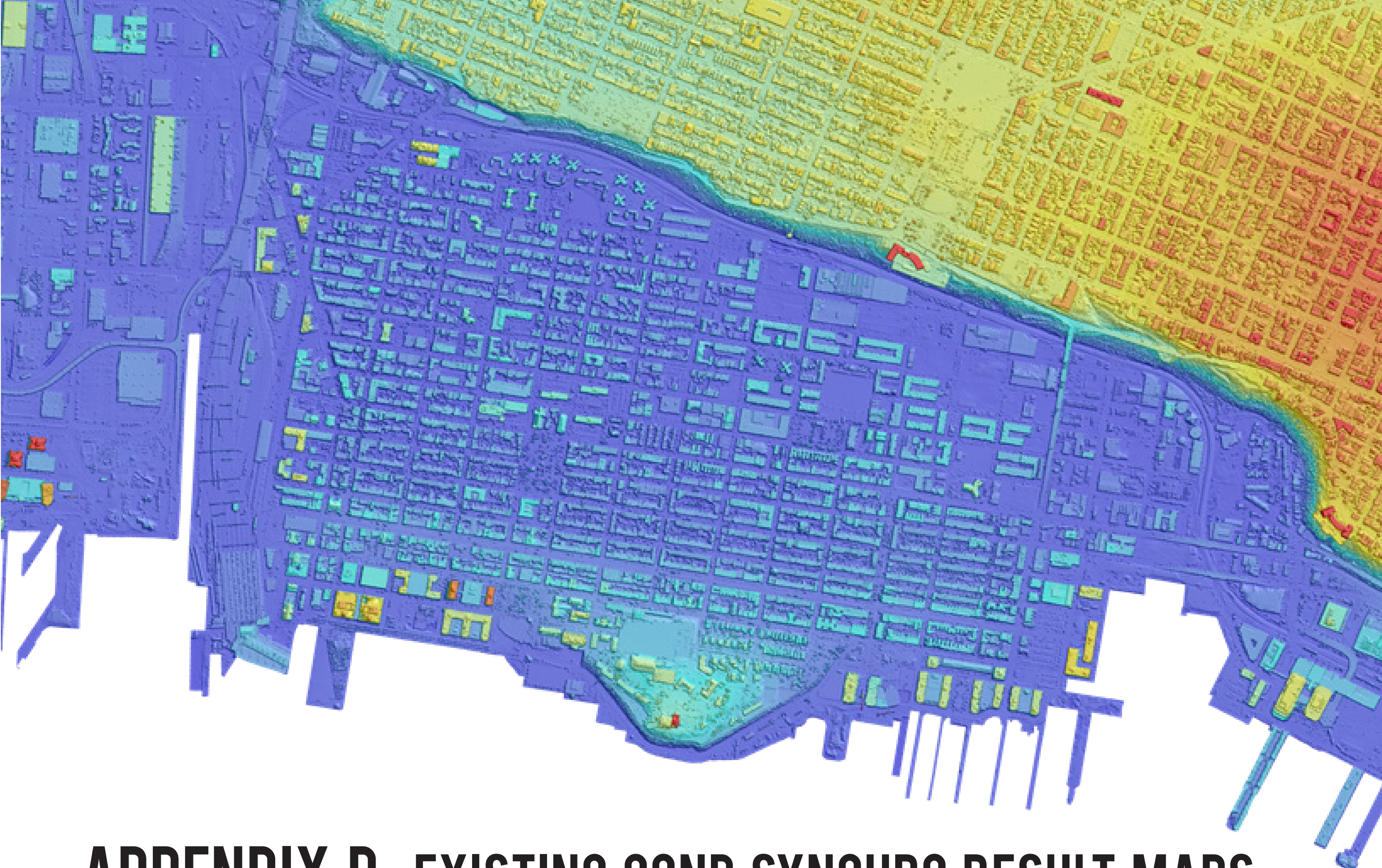


2036 No Build SAT Peak Peds

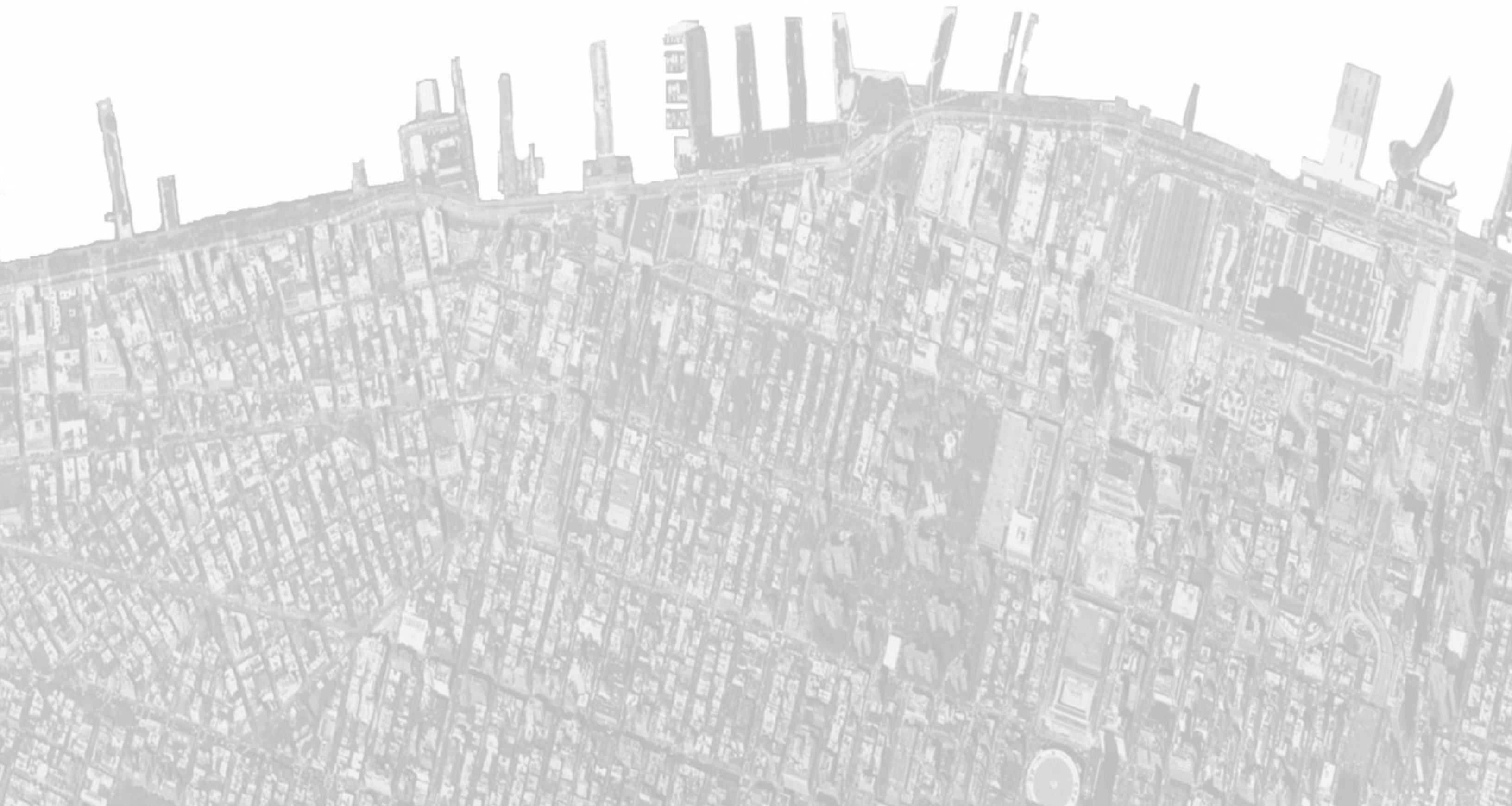


2036 No Build SAT Peak Peds

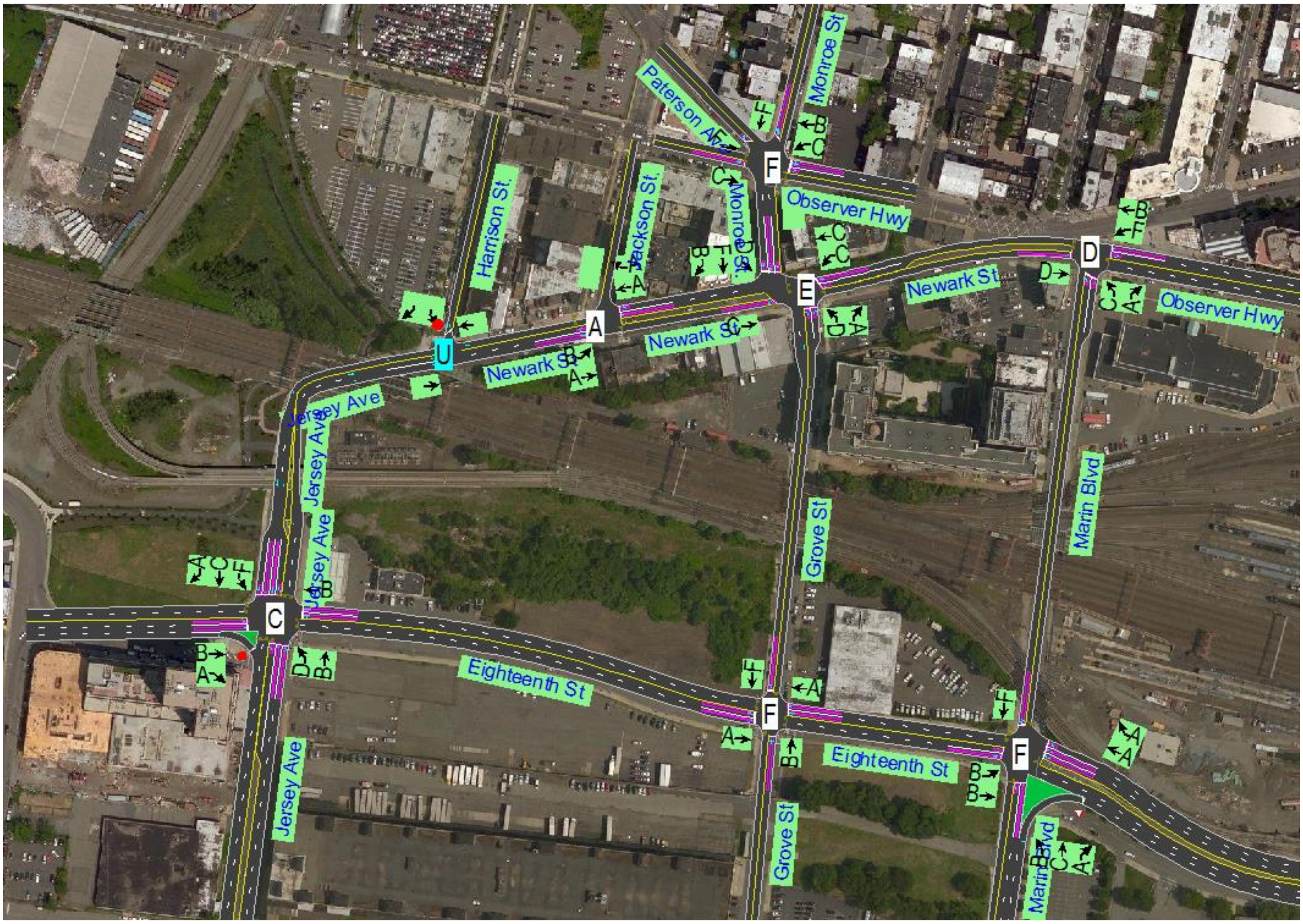


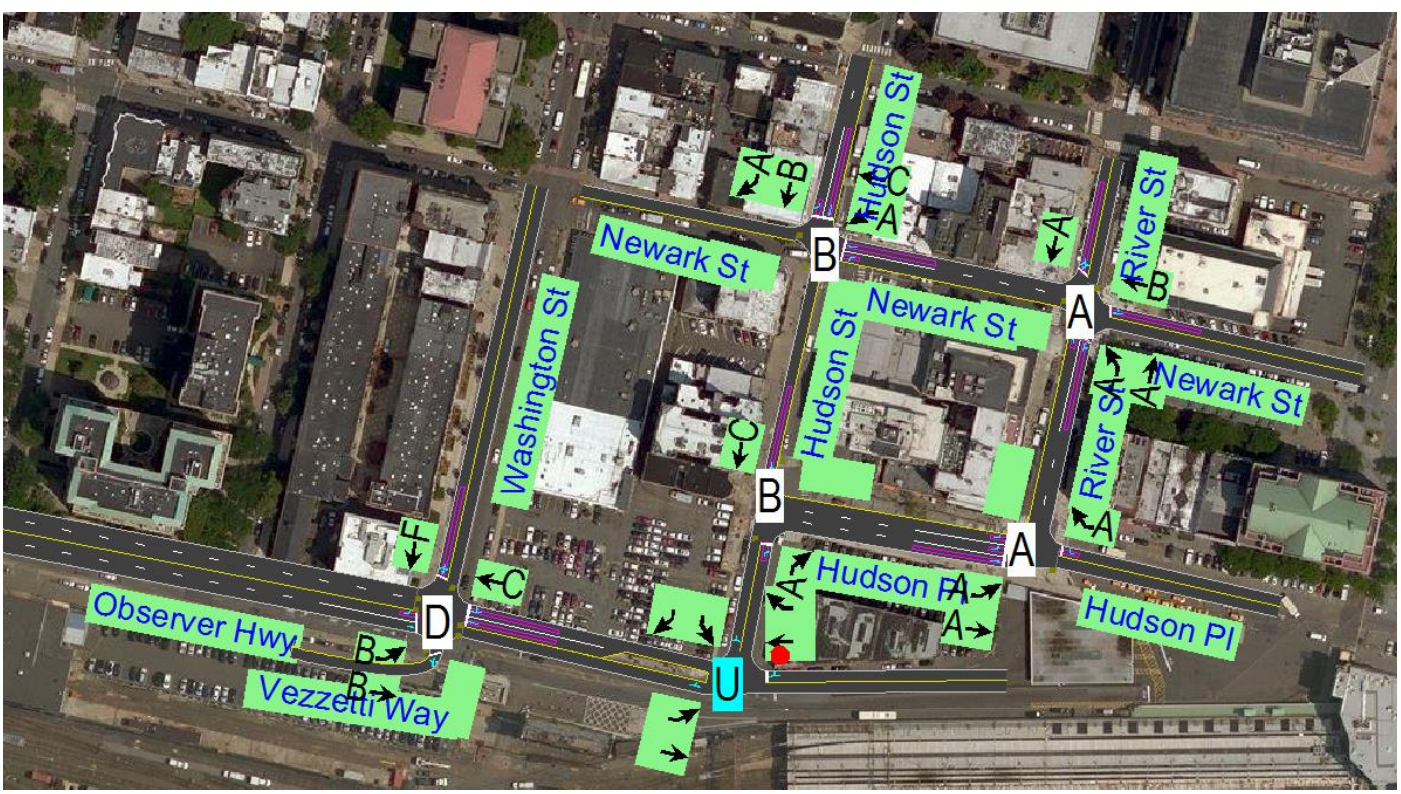


APPENDIX D—EXISTING COND SYNCHRO RESULT MAPS



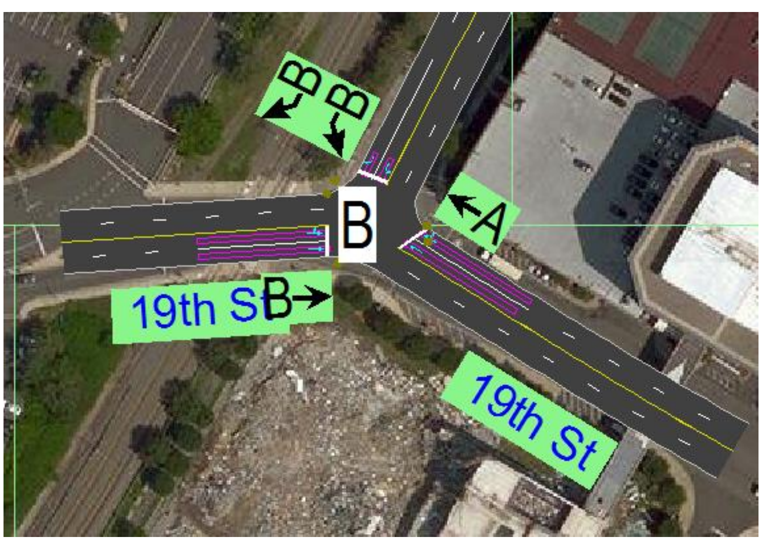
Existing AM – Lower Hoboken

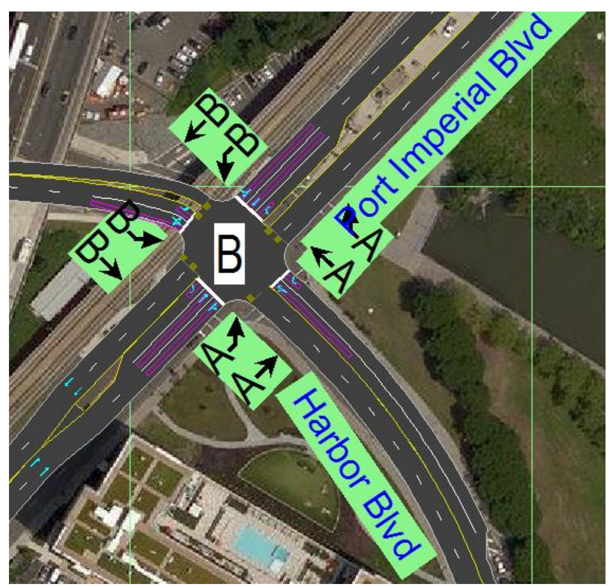




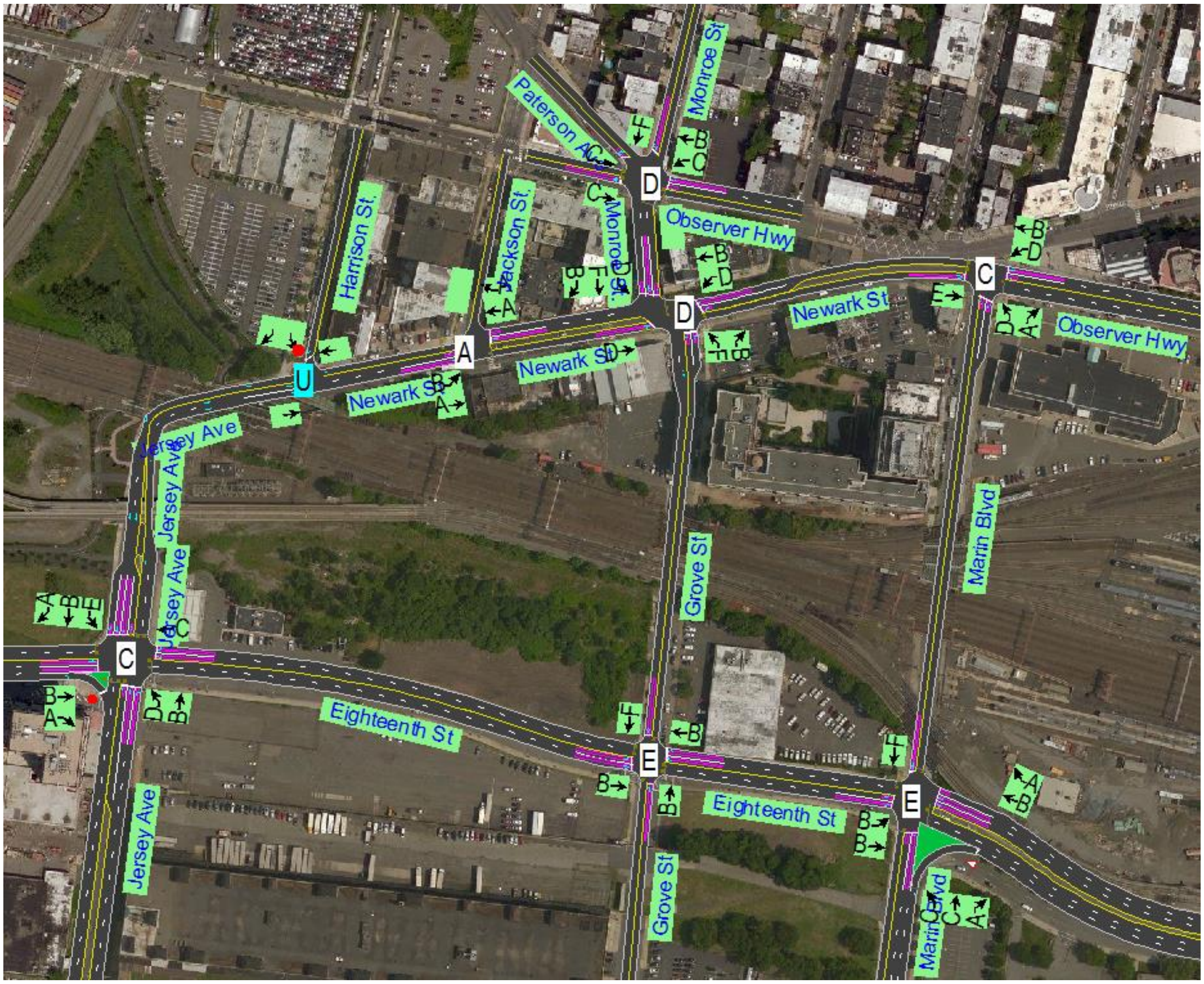
Existing AM – Upper Hoboken

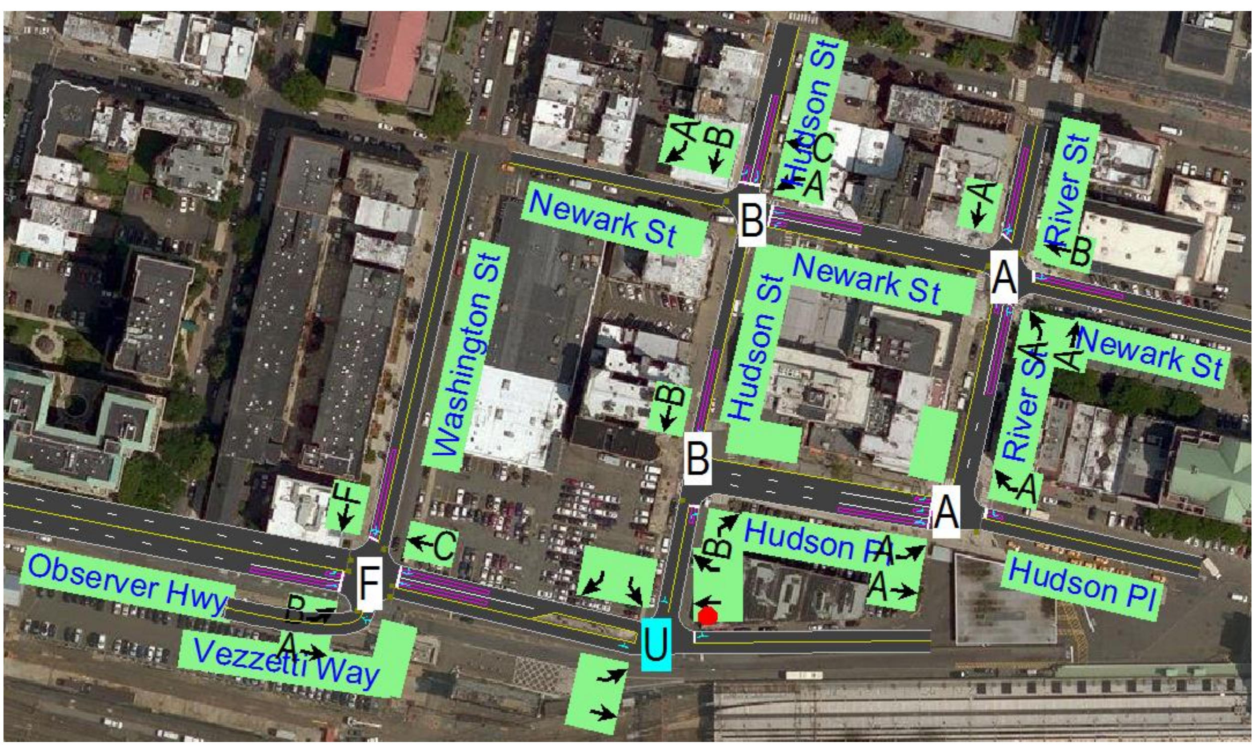
Existing AM – Weehawken

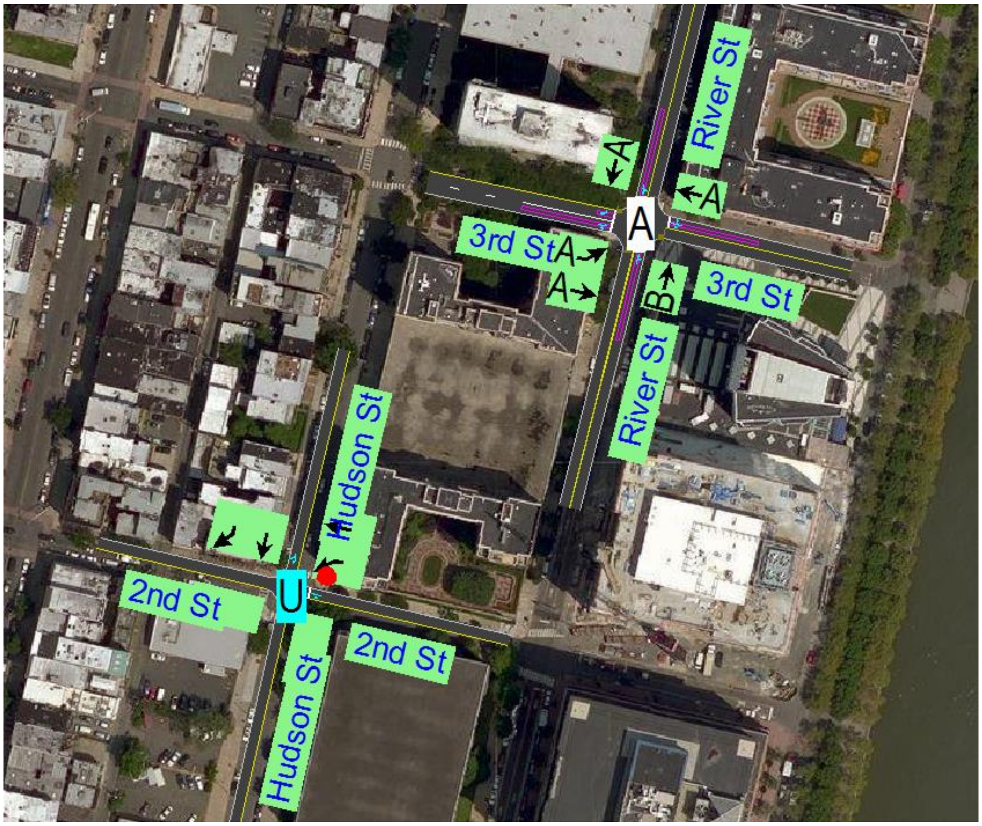




Existing PM – Lower Hoboken

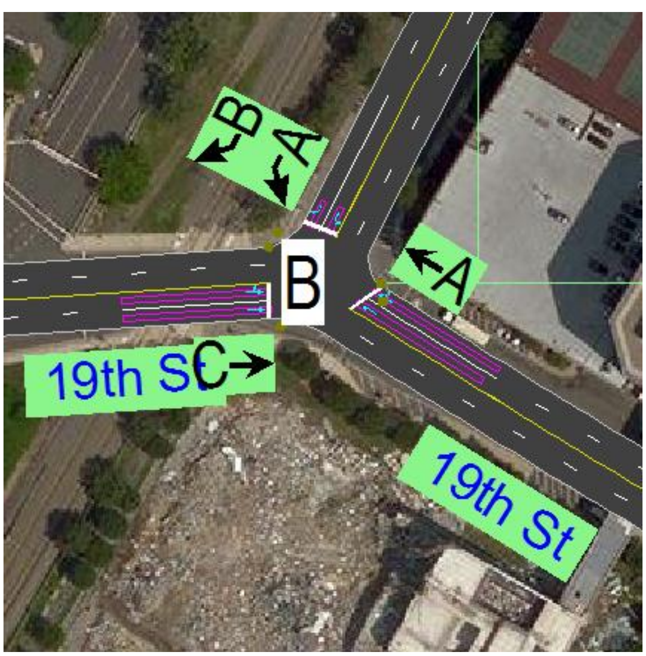


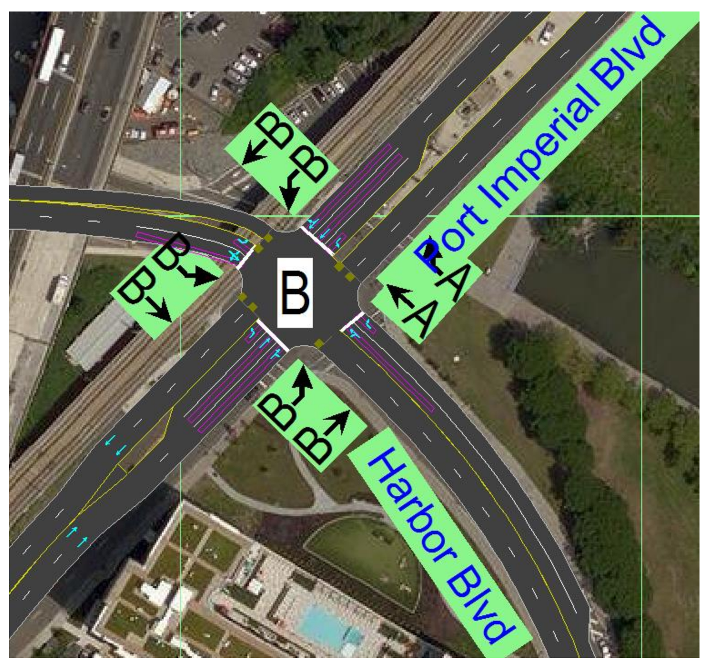




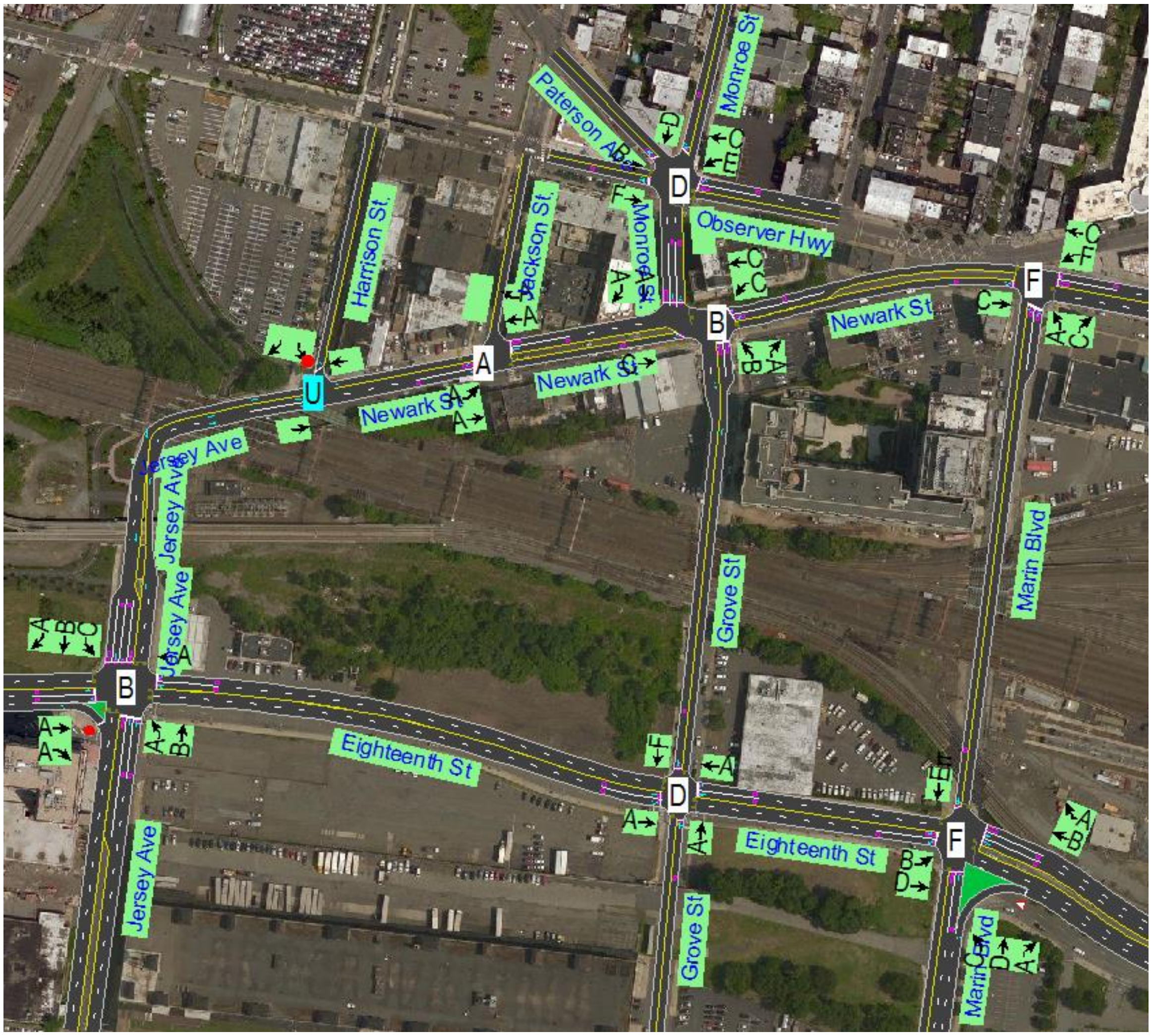
Existing PM – Upper Hoboken

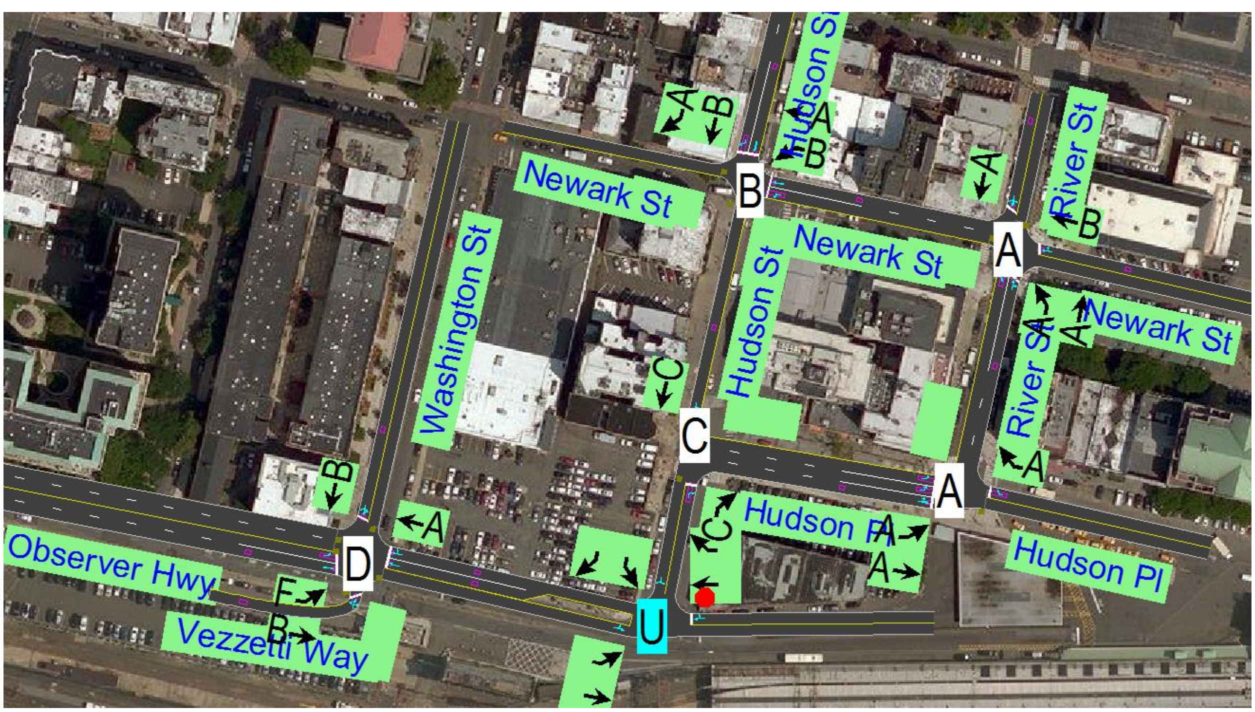
Existing PM – Weehawken

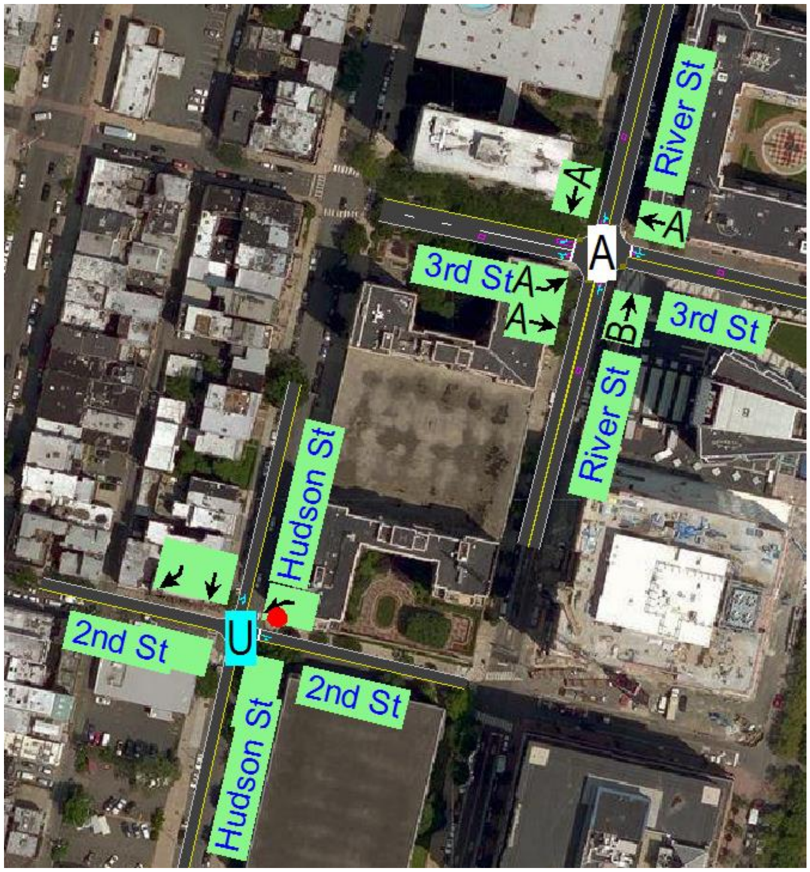




Existing SAT – Lower Hoboken

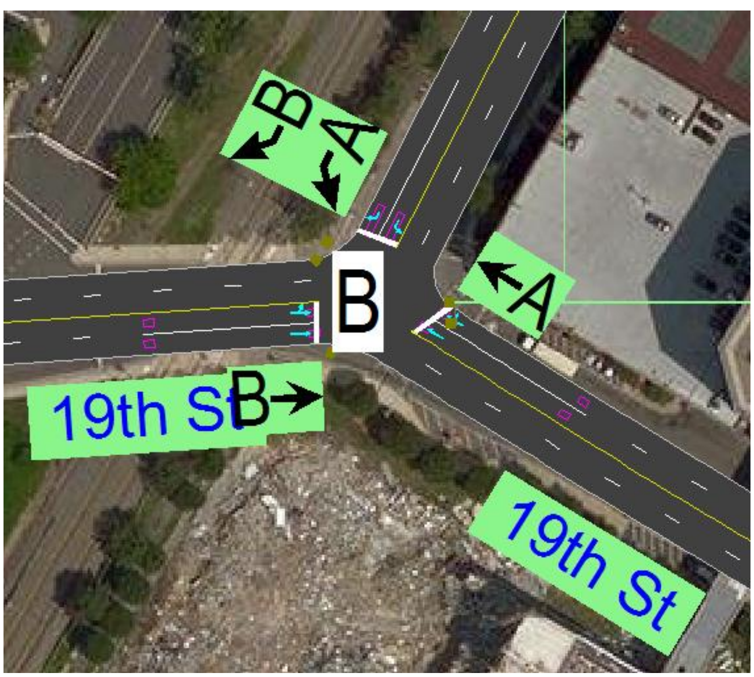


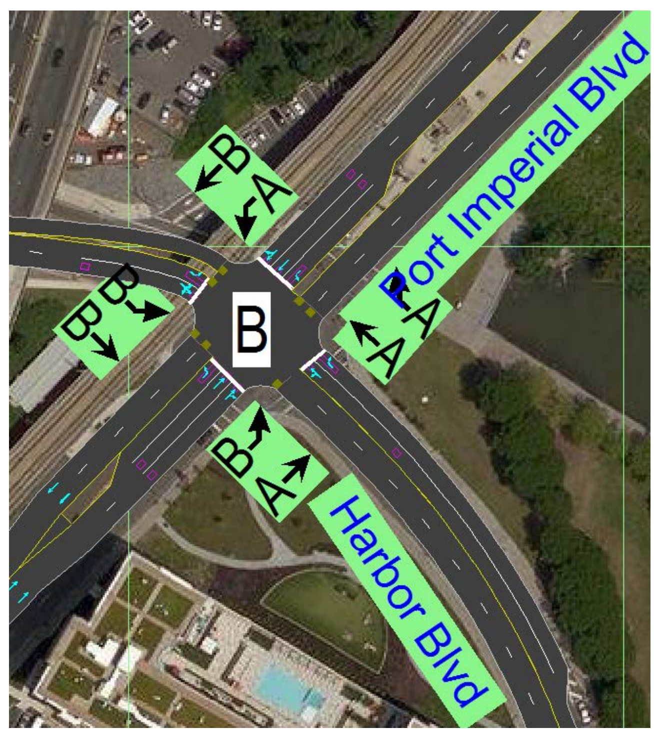




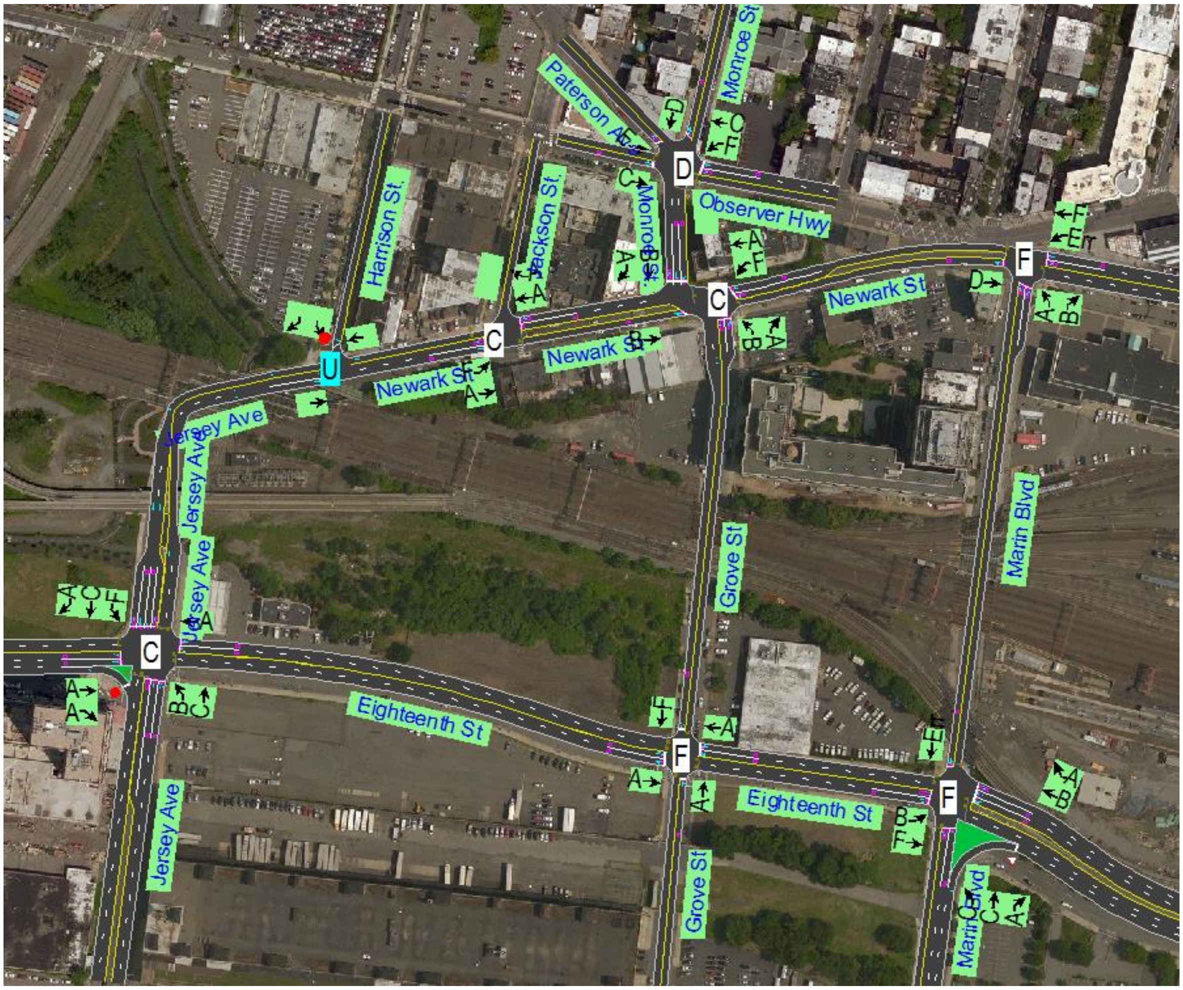
Existing SAT – Upper Hoboken

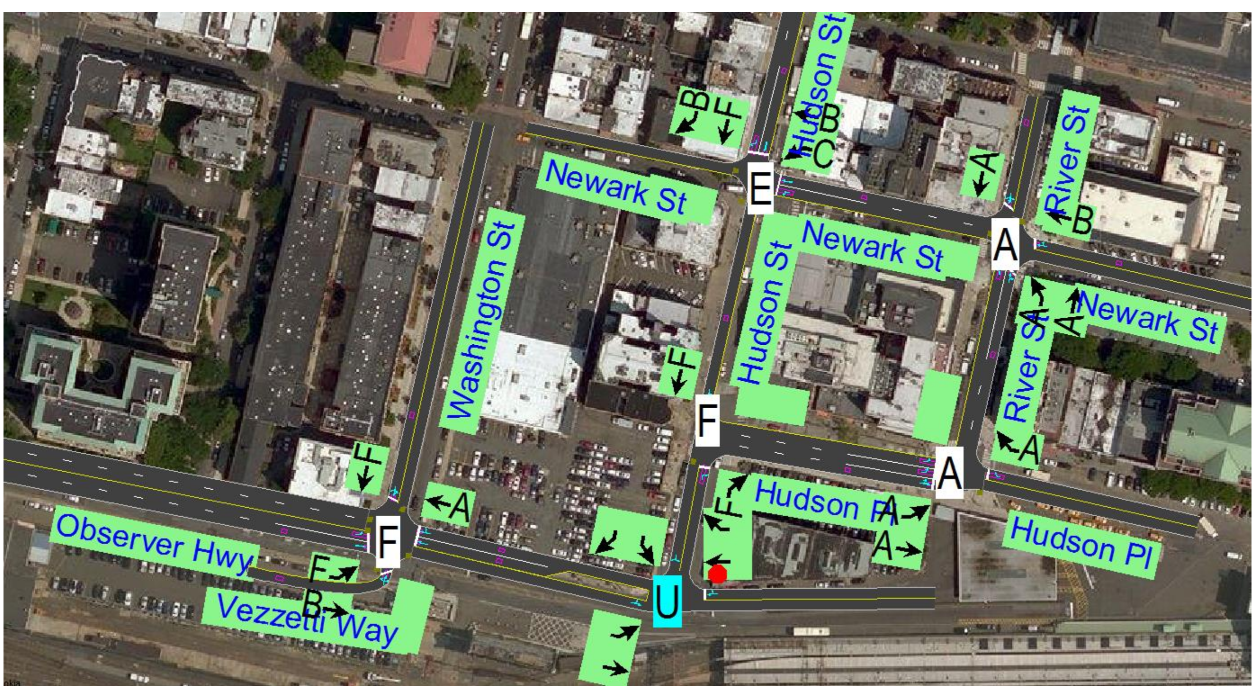
Existing SAT – Weehawken





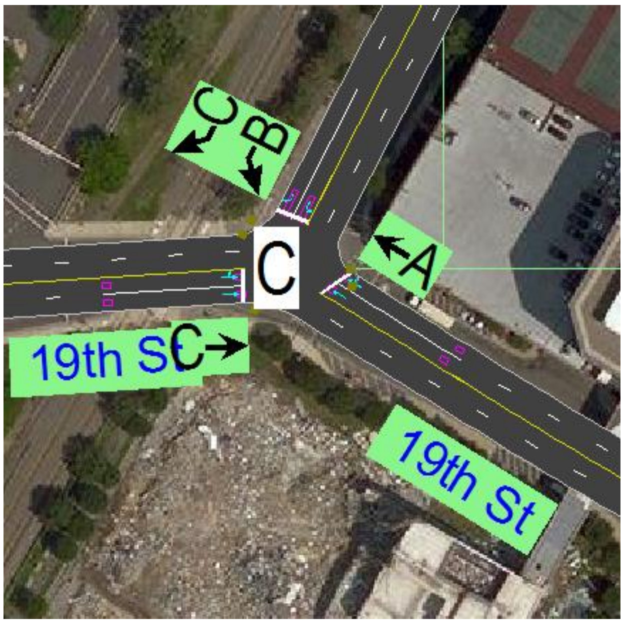
2036 No Build AM – Lower Hoboken

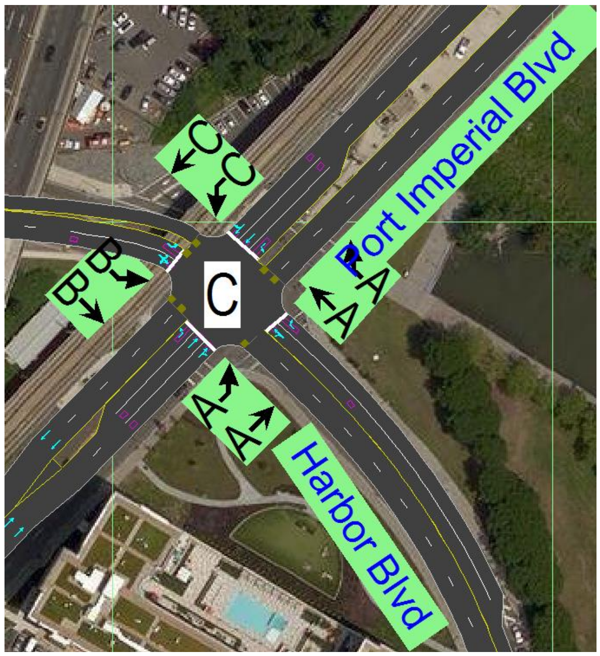




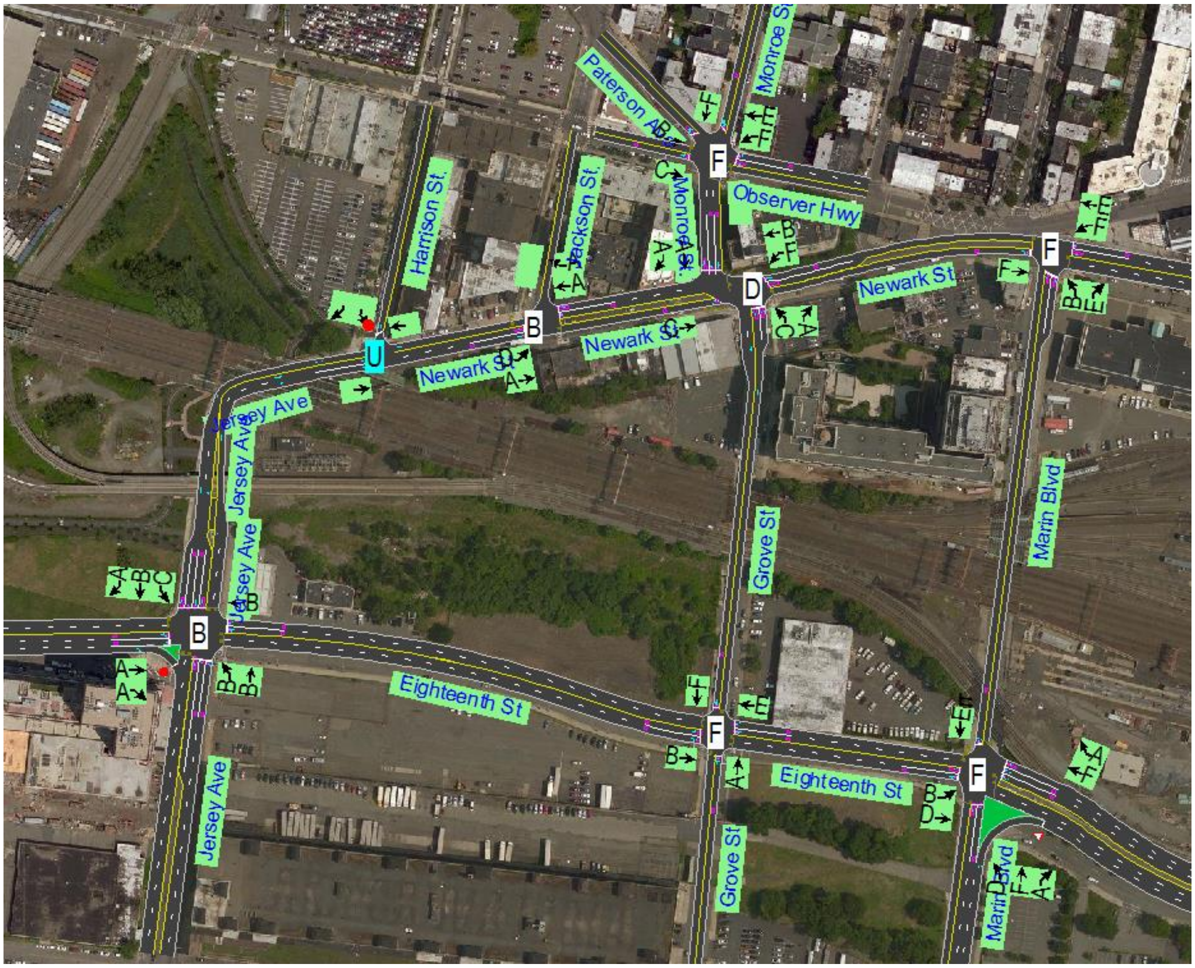
2036 No Build AM – Upper Hoboken

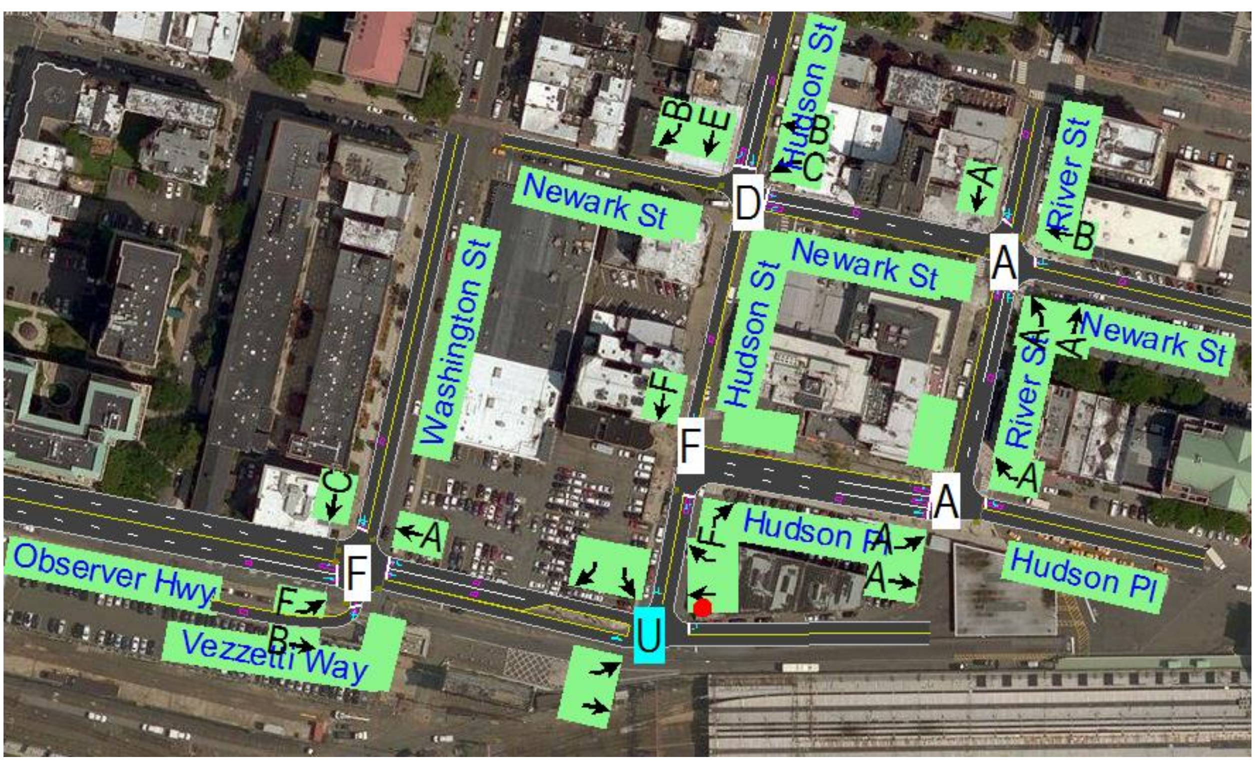
2036 No Build AM – Weehawken

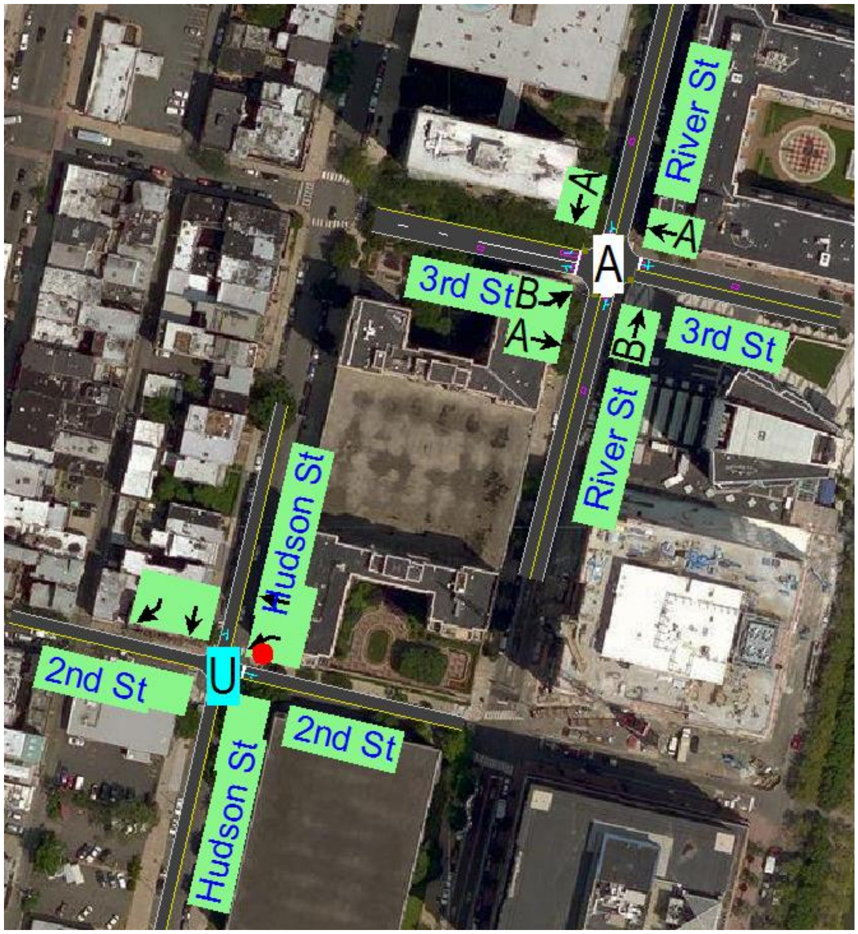




2036 No Build PM – Lower Hoboken

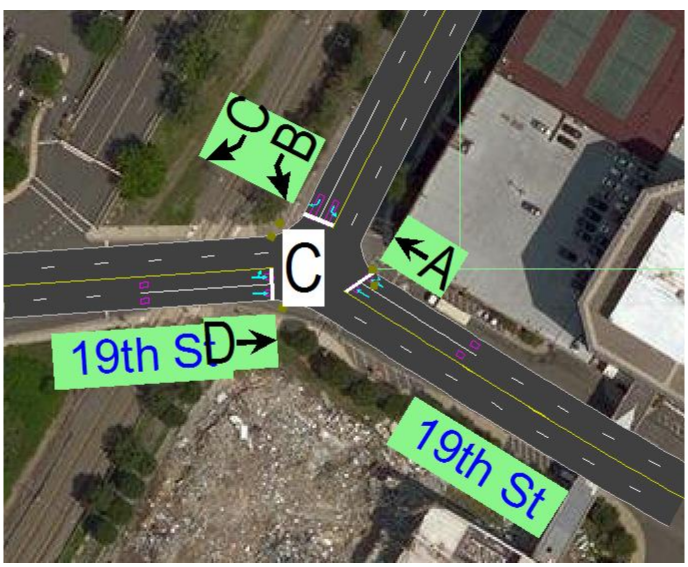


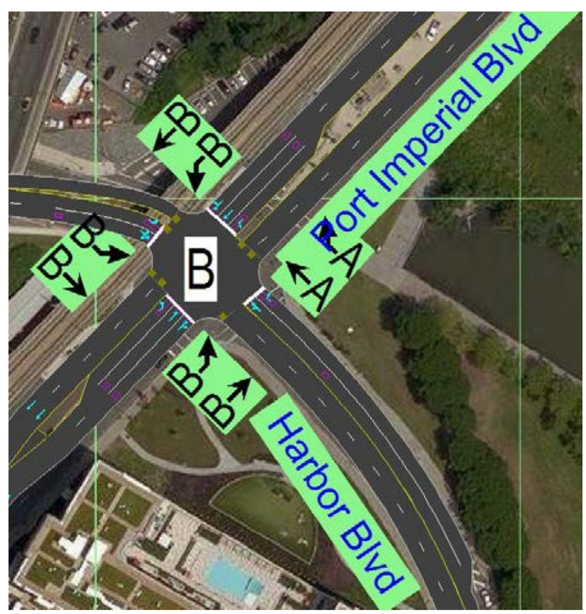




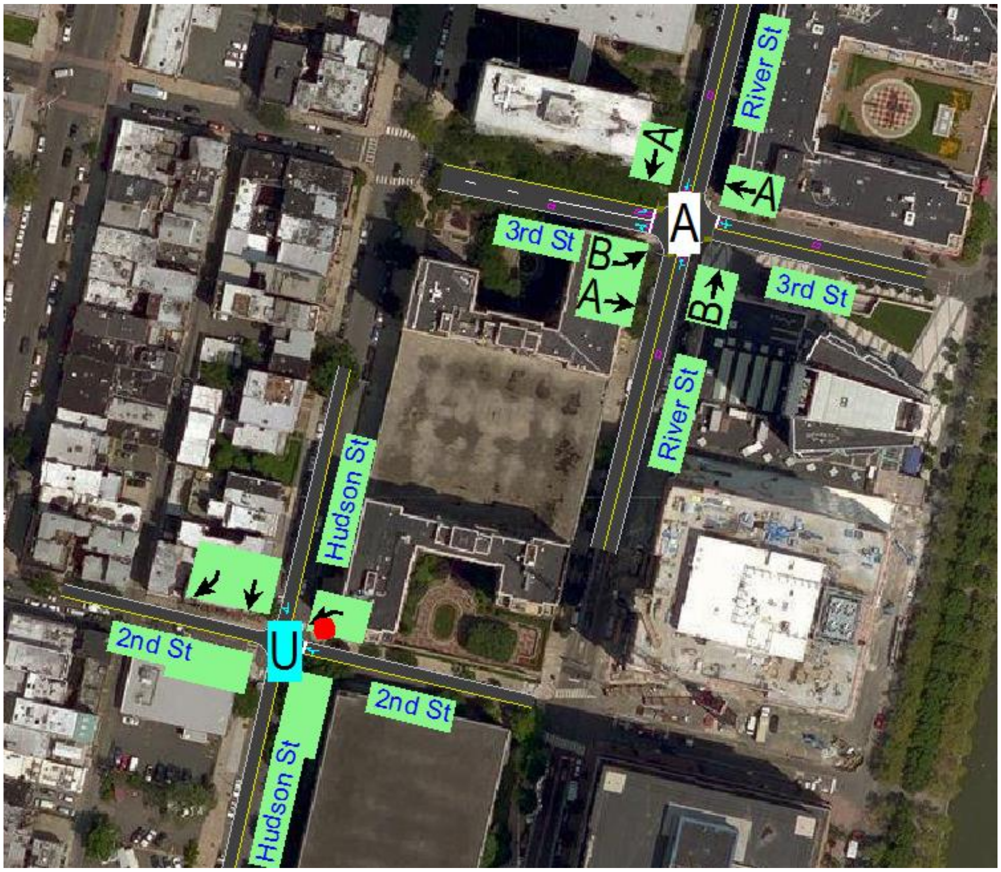
2036 No Build PM – Upper Hoboken

2036 No Build PM – Weehawken



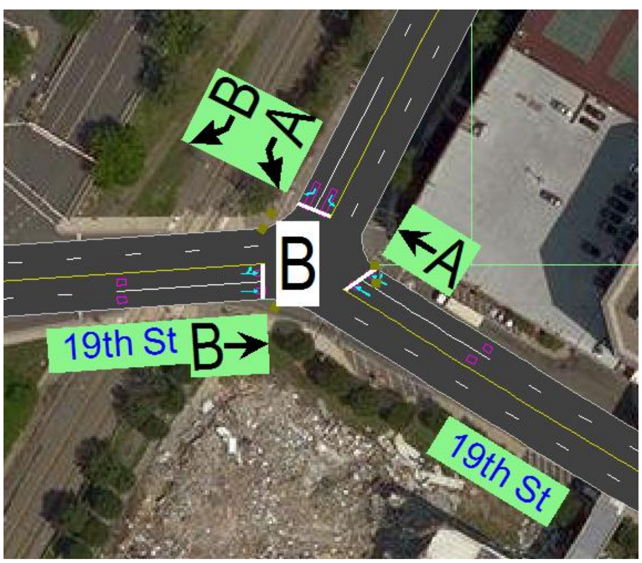


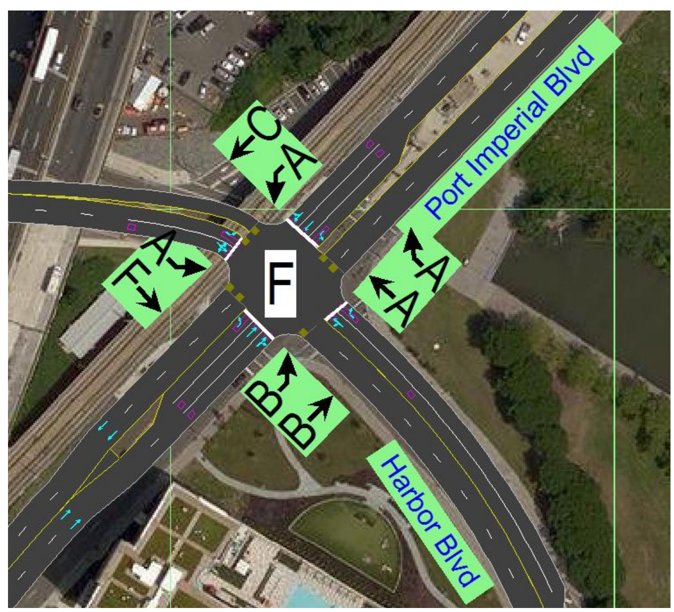
2036 No Build SAT – Lower Hoboken

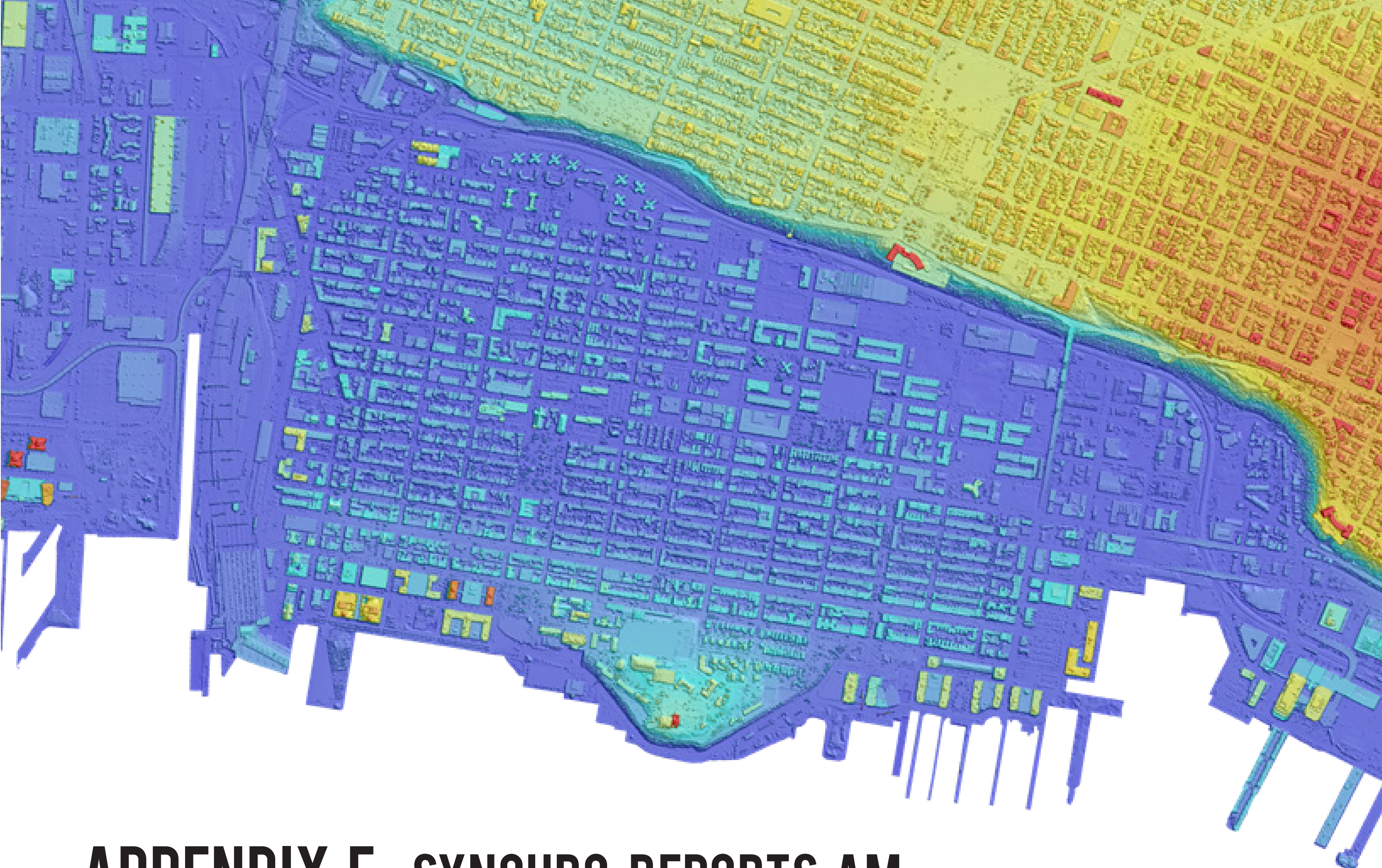


2036 No Build SAT – Upper Hoboken

2036 No Build SAT – Weehawken







APPENDIX E- SYNCHRO REPORTS AM

Intersection	
Int Delay, s/veh	106.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	164	762	0	3	514
Conflicting Peds, #/hr	0	0	0	0	0	14
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	178	828	0	3	559

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	842	0	-	0	931	842
Stage 1	-	-	-	-	842	-
Stage 2	-	-	-	-	89	-
Critical Hdwy	4.12	-	-	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.218	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	794	-	-	-	281	~ 363
Stage 1	-	-	-	-	422	-
Stage 2	-	-	-	-	925	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	794	-	-	-	274	~ 359
Mov Cap-2 Maneuver	-	-	-	-	274	-
Stage 1	-	-	-	-	417	-
Stage 2	-	-	-	-	914	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	296.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	794	-	-	-	358
HCM Lane V/C Ratio	-	-	-	-	1.57
HCM Control Delay (s)	0	-	-	-	296.7
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	32.1

Notes

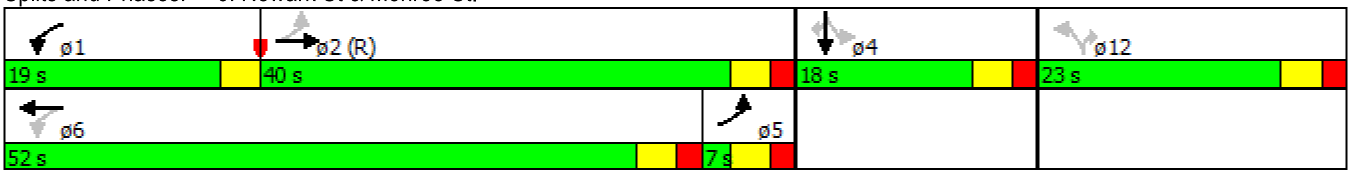
~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Satd. Flow (prot)	1676	1676	0	1676	1676	0	1676	0	1676	1593	1593	1676
Flt Permitted												
Satd. Flow (perm)	1676	1676	0	1676	1676	0	1676	0	1676	1593	1593	1676
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)			4	4			13		4			
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)										0%		
Lane Group Flow (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Turn Type	pm+pt			pm+pt			Perm		Perm	Perm		Perm
Protected Phases	5	2		1	6						4	
Permitted Phases	2			6			12		12	4		4
Minimum Split (s)	9.0	21.0		9.0	21.0		21.0		21.0	21.0	21.0	21.0
Total Split (s)	7.0	40.0		19.0	52.0		23.0		23.0	18.0	18.0	18.0
Total Split (%)	7.0%	40.0%		19.0%	52.0%		23.0%		23.0%	18.0%	18.0%	18.0%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		0.0	2.0		2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		3.0	5.0		5.0		5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Act Effct Green (s)												
Actuated g/C Ratio												
v/c Ratio												
Control Delay												
Queue Delay												
Total Delay												
LOS												
Approach Delay												
Approach LOS												
Queue Length 50th (ft)												
Queue Length 95th (ft)												
Internal Link Dist (ft)		312			453			65			153	
Turn Bay Length (ft)												
Base Capacity (vph)												
Starvation Cap Reductn												
Spillback Cap Reductn												
Storage Cap Reductn												
Reduced v/c Ratio												

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle: 75
Control Type: Pretimed
Maximum v/c Ratio: 0.00

Intersection Signal Delay: 0.0 Intersection LOS: A
Intersection Capacity Utilization 34.2% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 6: Newark St & Monroe St.



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	65.9	39.5	48.5	36.6
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	4	3	4	3
Number of Right-Turn Islands	0	0	0	0
Type of Control	None	None	None	None
Corresponding Signal Phase	4	0	2	6
Effective Walk Time (s)	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	25	25	25	25
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	50.0	50.0	50.0	50.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.15	1.95	2.15	1.95
Pedestrian Crosswalk LOS	B	A	B	A

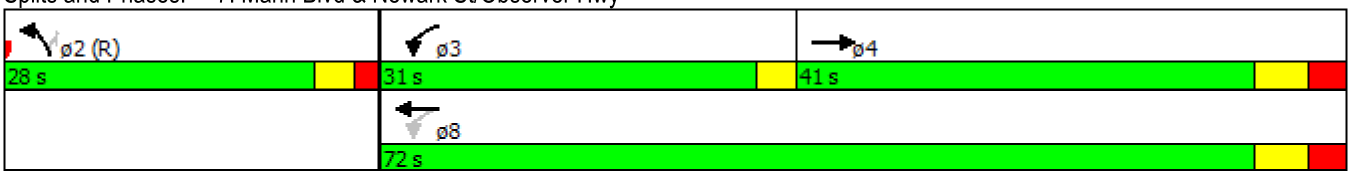
Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	0	0	0	0
Effct. Green for Bike (s)	35.0	47.0	0.0	13.0
Cross Street Width (ft)	48.5	36.6	39.5	65.9
Through Lanes Number	1	1	0	1
Through Lane Width (ft)	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	700	940	0	260
Bicycle Delay (s/bike)	21.1	14.0	0.0	37.8
Bicycle Compliance	Fair	Fair		Poor
Bicycle LOS Score	2.30	2.12	0.00	2.57
Bicycle LOS	B	B		B

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	438	60	540	782	125	325
Satd. Flow (prot)	1637	0	1593	1676	1593	1283
Flt Permitted			0.158		0.950	
Satd. Flow (perm)	1637	0	265	1676	1593	1198
Satd. Flow (RTOR)	7					353
Confl. Peds. (#/hr)		14	14			28
Confl. Bikes (#/hr)						3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)						0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	541	0	587	850	136	353
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases			8			2
Minimum Split (s)	23.0		8.0	23.0	22.0	22.0
Total Split (s)	41.0		31.0	72.0	28.0	28.0
Total Split (%)	41.0%		31.0%	72.0%	28.0%	28.0%
Yellow Time (s)	4.0		3.0	4.0	3.0	3.0
All-Red Time (s)	3.0		0.0	3.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0		3.0	7.0	5.0	5.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Act Effct Green (s)	34.0		69.0	65.0	23.0	23.0
Actuated g/C Ratio	0.34		0.69	0.65	0.23	0.23
v/c Ratio	0.96		1.06	0.78	0.37	0.65
Control Delay	63.6		79.7	18.9	36.0	9.8
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	63.6		79.7	18.9	36.0	9.8
LOS	E		E	B	D	A
Approach Delay	63.6			43.7	17.1	
Approach LOS	E			D	B	
Queue Length 50th (ft)	332		~339	348	73	0
Queue Length 95th (ft)	#552		#551	531	130	84
Internal Link Dist (ft)	453			392	853	
Turn Bay Length (ft)						100
Base Capacity (vph)	561		554	1089	366	547
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	0.96		1.06	0.78	0.37	0.65

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green
Natural Cycle: 90
Control Type: Pretimed

Maximum v/c Ratio: 1.06	
Intersection Signal Delay: 42.8	Intersection LOS: D
Intersection Capacity Utilization 89.7%	ICU Level of Service E
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 7: Marin Blvd & Newark St/Observer Hwy



Approach	EB	WB	NB
Crosswalk Length (ft)	36.0	48.0	38.3
Crosswalk Width (ft)	12.0	12.0	12.0
Total Number of Lanes Crossed	2	4	3
Number of Right-Turn Islands	0	0	0
Type of Control	None	None	None
Corresponding Signal Phase	8	2	4
Effective Walk Time (s)	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0
85th percentile speed (mph)	25	25	25
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-
Pedestrian Delay (s/p)	50.0	50.0	50.0
Pedestrian Compliance Code	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.35	2.61	2.26
Pedestrian Crosswalk LOS	B	B	B

Approach	EB	WB	NB
Bicycle Flow Rate (bike/h)	0	0	0
Total Flow Rate (veh/h)	541	1437	489
Effct. Green for Bike (s)	34.0	65.0	23.0
Cross Street Width (ft)	38.3	36.0	48.0
Through Lanes Number	1	1	1
Through Lane Width (ft)	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0
Curb Is Present?	No	No	No
On Street Parking?	No	No	No
Bicycle Lane Capacity (bike/h)	680	1300	460
Bicycle Delay (s/bike)	21.8	6.1	29.6
Bicycle Compliance	Fair	Good	Fair
Bicycle LOS Score	3.04	4.48	3.10
Bicycle LOS	C	E	C

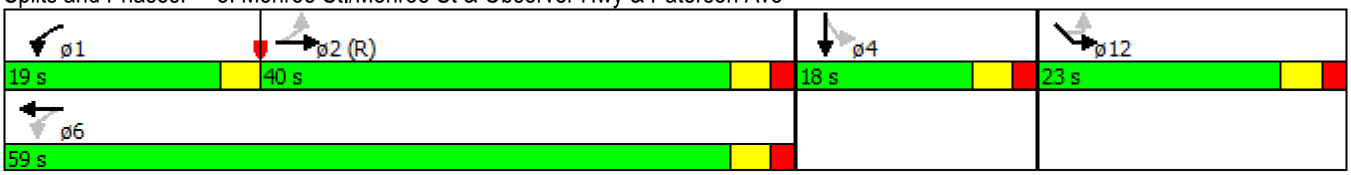
Lane Group	EBT	EBR	WBL	WBT	WBR	SBL	SBT	SBR	SBR2	SEL	SER	SER2
Lane Configurations												
Volume (vph)	191	53	256	166	66	11	274	16	10	33	243	1
Satd. Flow (prot)	1465	0	1593	1543	0	0	1429	0	0	814	0	0
Flt Permitted			0.450				0.998			0.994		
Satd. Flow (perm)	1465	0	741	1543	0	0	1424	0	0	806	0	0
Satd. Flow (RTOR)	15						1			109		
Confl. Peds. (#/hr)			19		37	28		116	37	28	19	116
Confl. Bikes (#/hr)								1	1		1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)	0	0					0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	266	0	278	252	0	0	338	0	0	301	0	0
Turn Type	NA		pm+pt	NA		Perm	NA			Prot		
Protected Phases	2		1	6			4			12		
Permitted Phases			6			4						
Minimum Split (s)	21.0		9.0	21.0		21.0	21.0			21.0		
Total Split (s)	40.0		19.0	59.0		18.0	18.0			23.0		
Total Split (%)	40.0%		19.0%	59.0%		18.0%	18.0%			23.0%		
Yellow Time (s)	3.0		3.0	3.0		3.0	3.0			3.0		
All-Red Time (s)	2.0		0.0	2.0		2.0	2.0			2.0		
Lost Time Adjust (s)	0.0		0.0	0.0			0.0			0.0		
Total Lost Time (s)	5.0		3.0	5.0			5.0			5.0		
Lead/Lag	Lag		Lead									
Lead-Lag Optimize?	Yes		Yes									
Act Effct Green (s)	35.0		56.0	54.0			13.0			18.0		
Actuated g/C Ratio	0.35		0.56	0.54			0.13			0.18		
v/c Ratio	0.51		0.50	0.30			1.83			1.28		
Control Delay	28.3		15.3	13.9			420.4			179.1		
Queue Delay	0.0		0.0	0.0			0.0			0.0		
Total Delay	28.3		15.3	13.9			420.4			179.1		
LOS	C		B	B			F			F		
Approach Delay	28.3			14.6			420.4			179.1		
Approach LOS	C			B			F			F		
Queue Length 50th (ft)	125		89	84			~330			~184		
Queue Length 95th (ft)	204		141	134			#506			#353		
Internal Link Dist (ft)	143			187			292			223		
Turn Bay Length (ft)												
Base Capacity (vph)	522		551	833			185			235		
Starvation Cap Reductn	0		0	0			0			0		
Spillback Cap Reductn	0		0	0			0			0		
Storage Cap Reductn	0		0	0			0			0		
Reduced v/c Ratio	0.51		0.50	0.30			1.83			1.28		

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle: 75
Control Type: Pretimed

Maximum v/c Ratio: 1.83	
Intersection Signal Delay: 147.2	Intersection LOS: F
Intersection Capacity Utilization 90.6%	ICU Level of Service E
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Monroe St./Monroe St & Observer Hwy & Paterson Ave



Approach	EB	WB	NB	SB	SE
Crosswalk Length (ft)	24.5	36.4	38.6	30.2	27.8
Crosswalk Width (ft)	12.0	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	2	3	3	2	2
Number of Right-Turn Islands	0	0	0	0	0
Type of Control	None	None	None	None	None
Corresponding Signal Phase	12	0	2	6	4
Effective Walk Time (s)	0.0	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0	0
85th percentile speed (mph)	25	25	30	25	25
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-	-
Pedestrian Delay (s/p)	50.0	50.0	50.0	50.0	50.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	1.92	2.17	2.25	1.87	1.89
Pedestrian Crosswalk LOS	A	B	B	A	A

Approach	EB	WB	NB	SB	SE
Bicycle Flow Rate (bike/h)	0	0	0	0	0
Total Flow Rate (veh/h)	266	530	0	338	301
Effct. Green for Bike (s)	35.0	54.0	0.0	13.0	18.0
Cross Street Width (ft)	38.6	30.2	36.4	27.8	24.5
Through Lanes Number	1	1	0	1	1
Through Lane Width (ft)	12.0	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No	No
On Street Parking?	No	No	No	No	No
Bicycle Lane Capacity (bike/h)	700	1080	0	260	360
Bicycle Delay (s/bike)	21.1	10.6	0.0	37.8	33.6
Bicycle Compliance	Fair	Fair		Poor	Poor
Bicycle LOS Score	2.59	2.90	0.00	2.54	2.43
Bicycle LOS	B	C		B	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	286	356	0	0	392	42	0	0	0	56	0	288
Satd. Flow (prot)	1593	1676	0	0	3129	0	0	1676	0	0	895	0
Flt Permitted	0.404										0.949	
Satd. Flow (perm)	675	1676	0	0	3129	0	0	1676	0	0	856	0
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)	3		11	11		3						387
Confl. Bikes (#/hr)			5									
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)										0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	311	387	0	0	472	0	0	0	0	0	374	0
Turn Type	pm+pt	NA			NA					Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4						2			6		
Minimum Split (s)	8.0	22.0			22.0		21.0	21.0		21.0	21.0	
Total Split (s)	23.0	68.0			45.0		32.0	32.0		32.0	32.0	
Total Split (%)	23.0%	68.0%			45.0%		32.0%	32.0%		32.0%	32.0%	
Yellow Time (s)	3.0	4.0			4.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	0.0	2.0			2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	
Total Lost Time (s)	3.0	6.0			6.0			5.0			5.0	
Lead/Lag	Lead				Lag							
Lead-Lag Optimize?	Yes				Yes							
Act Effct Green (s)	65.0	62.0			39.0						27.0	
Actuated g/C Ratio	0.65	0.62			0.39						0.27	
v/c Ratio	0.50	0.37			0.39						1.62	
Control Delay	10.7	10.7			23.1						325.7	
Queue Delay	0.0	0.0			0.0						0.0	
Total Delay	10.7	10.7			23.1						325.7	
LOS	B	B			C						F	
Approach Delay		10.7			23.1						325.7	
Approach LOS		B			C						F	
Queue Length 50th (ft)	78	112			111						~345	
Queue Length 95th (ft)	121	169			154						#525	
Internal Link Dist (ft)		403			237			86			396	
Turn Bay Length (ft)												
Base Capacity (vph)	622	1039			1220						231	
Starvation Cap Reductn	0	0			0						0	
Spillback Cap Reductn	0	0			0						0	
Storage Cap Reductn	0	0			0						0	
Reduced v/c Ratio	0.50	0.37			0.39						1.62	

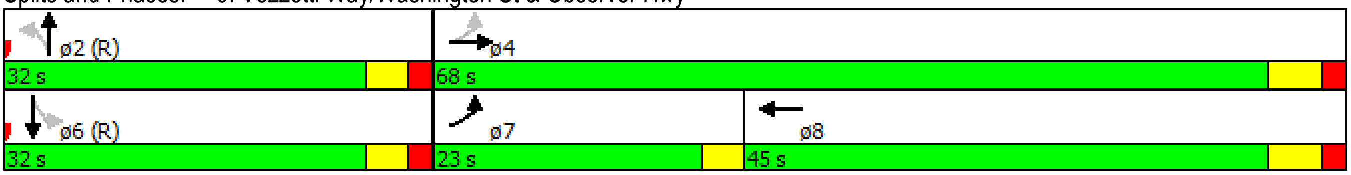
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Pretimed

Maximum v/c Ratio: 1.62	
Intersection Signal Delay: 90.8	Intersection LOS: F
Intersection Capacity Utilization 74.6%	ICU Level of Service D
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Vezzetti Way/Washington St & Observer Hwy



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	48.8	36.1	13.7	24.6
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	4	3	1	2
Number of Right-Turn Islands	0	0	0	0
Type of Control	None	None	None	None
Corresponding Signal Phase	6	2	4	8
Effective Walk Time (s)	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	25	25	25	25
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	50.0	50.0	50.0	50.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.44	2.20	1.44	2.03
Pedestrian Crosswalk LOS	B	B	A	B

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	698	472	0	374
Effct. Green for Bike (s)	62.0	39.0	27.0	27.0
Cross Street Width (ft)	13.7	24.6	36.1	48.8
Through Lanes Number	1	2	1	1
Through Lane Width (ft)	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	1240	780	540	540
Bicycle Delay (s/bike)	7.2	18.6	26.6	26.6
Bicycle Compliance	Good	Fair	Fair	Fair
Bicycle LOS Score	2.92	2.33	2.11	2.92
Bicycle LOS	C	B	B	C

Intersection						
Int Delay, s/veh	0.7					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	288	58	42	11	2	399
Conflicting Peds, #/hr	24	0	0	24	0	97
Sign Control	Free	Free	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	313	63	46	12	2	434

Major/Minor	Major1		Minor1		Major2	
Conflicting Flow All	434	0	1151	184	87	-
Stage 1	-	-	713	-	-	-
Stage 2	-	-	438	-	-	-
Critical Hdwy	-	-	6.52	6.22	4.12	-
Critical Hdwy Stg 1	-	-	5.52	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	4.018	3.318	2.218	-
Pot Cap-1 Maneuver	-	-	198	858	1509	-
Stage 1	-	-	435	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %		-				-
Mov Cap-1 Maneuver	-	-	0	773	1387	-
Mov Cap-2 Maneuver	-	-	0	-	-	-
Stage 1	-	-	0	-	-	-
Stage 2	-	-	0	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s		10	0
HCM LOS		B	

Minor Lane/Major Mvmt	EBL	EBT	WBLn1	SBL	SBR
Capacity (veh/h)	-	-	773	1387	-
HCM Lane V/C Ratio	-	-	0.075	0.002	-
HCM Control Delay (s)	-	-	10	7.6	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

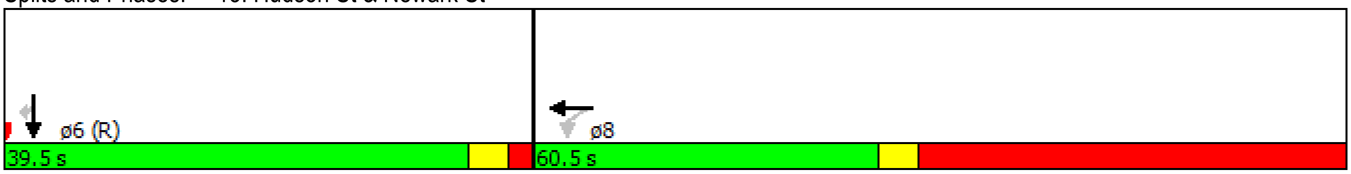
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	104	214	0	0	0	0	0	448	66
Satd. Flow (prot)	0	0	0	1433	1676	0	0	0	0	0	1509	1283
Flt Permitted				0.950								
Satd. Flow (perm)	0	0	0	479	1676	0	0	0	0	0	1509	548
Satd. Flow (RTOR)				22								349
Confl. Peds. (#/hr)				665		518	409		1601	1601		409
Confl. Bikes (#/hr)			1									
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)				0		0				0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	113	233	0	0	0	0	0	487	72
Turn Type				Perm	NA						NA	Perm
Protected Phases					8						6	
Permitted Phases				8								6
Minimum Split (s)				60.5	60.5						30.5	30.5
Total Split (s)				60.5	60.5						39.5	39.5
Total Split (%)				60.5%	60.5%						39.5%	39.5%
Yellow Time (s)				3.0	3.0						3.0	3.0
All-Red Time (s)				32.0	32.0						2.0	2.0
Lost Time Adjust (s)				0.0	0.0						0.0	0.0
Total Lost Time (s)				35.0	35.0						5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)				25.5	25.5						34.5	34.5
Actuated g/C Ratio				0.26	0.26						0.34	0.34
v/c Ratio				0.82	0.55						0.94	0.17
Control Delay				71.1	37.9						59.7	0.9
Queue Delay				0.0	7.1						0.0	0.0
Total Delay				71.1	45.0						59.7	0.9
LOS				E	D						E	A
Approach Delay					53.5						52.1	
Approach LOS					D						D	
Queue Length 50th (ft)				56	129						297	0
Queue Length 95th (ft)				#159	208						#500	0
Internal Link Dist (ft)		189			199			185			133	
Turn Bay Length (ft)												
Base Capacity (vph)				138	427						520	417
Starvation Cap Reductn				0	147						0	0
Spillback Cap Reductn				0	0						0	0
Storage Cap Reductn				0	0						0	0
Reduced v/c Ratio				0.82	0.83						0.94	0.17

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2: and 6:SBT, Start of Green
Natural Cycle: 95
Control Type: Pretimed

Maximum v/c Ratio: 0.94	
Intersection Signal Delay: 52.7	Intersection LOS: D
Intersection Capacity Utilization 80.4%	ICU Level of Service D
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 13: Hudson St & Newark St



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	16.5	24.0	13.4	24.0
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	1	2	1	2
Number of Right-Turn Islands	0	0	0	0
Type of Control	None	None	None	None
Corresponding Signal Phase	6	0	0	8
Effective Walk Time (s)	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	30	30	30	30
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	50.0	50.0	50.0	50.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	1.73	1.90	2.02	2.00
Pedestrian Crosswalk LOS	A	A	B	B

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	0	346	0	559
Effct. Green for Bike (s)	0.0	25.5	0.0	34.5
Cross Street Width (ft)	13.4	24.0	24.0	16.5
Through Lanes Number	0	1	0	1
Through Lane Width (ft)	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	0	510	0	690
Bicycle Delay (s/bike)	0.0	27.8	0.0	21.5
Bicycle Compliance		Fair		Fair
Bicycle LOS Score	0.00	2.50	0.00	2.73
Bicycle LOS		B		B

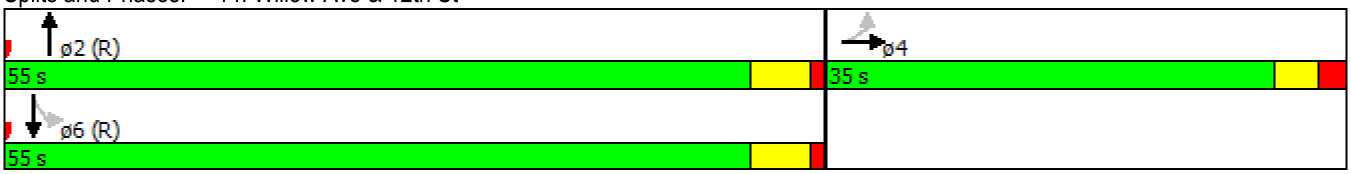
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	192	48	82	0	0	0	0	74	13	79	549	0
Satd. Flow (prot)	0	1383	0	0	0	0	0	1362	0	0	3008	0
Flt Permitted		0.971									0.898	
Satd. Flow (perm)	0	1107	0	0	0	0	0	1362	0	0	2562	0
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)	119		46	46		119	29		210	210		29
Confl. Bikes (#/hr)			1									1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)	0	0	0	0		0	0	0	0		0	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	350	0	0	0	0	0	94	0	0	683	0
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4									6		
Minimum Split (s)	24.5	24.5						21.0		21.0	21.0	
Total Split (s)	35.0	35.0						55.0		55.0	55.0	
Total Split (%)	38.9%	38.9%						61.1%		61.1%	61.1%	
Yellow Time (s)	3.0	3.0						4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0						1.0		1.0	1.0	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		5.0						5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		30.0						50.0			50.0	
Actuated g/C Ratio		0.33						0.56			0.56	
v/c Ratio		0.95						0.12			0.48	
Control Delay		67.2						10.1			13.5	
Queue Delay		0.0						0.0			0.0	
Total Delay		67.2						10.1			13.5	
LOS		E						B			B	
Approach Delay		67.2						10.1			13.5	
Approach LOS		E						B			B	
Queue Length 50th (ft)		192						24			115	
Queue Length 95th (ft)		#366						48			161	
Internal Link Dist (ft)		376			578			386			260	
Turn Bay Length (ft)												
Base Capacity (vph)		369						756			1423	
Starvation Cap Reductn		0						0			0	
Spillback Cap Reductn		0						0			0	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.95						0.12			0.48	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 50
Control Type: Pretimed

Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 29.9	Intersection LOS: C
Intersection Capacity Utilization 58.9%	ICU Level of Service B
Analysis Period (min) 15	

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 14: Willow Ave & 12th St



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	12.1	12.1	36.0	36.0
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	1	1	3	3
Number of Right-Turn Islands	0	0	0	0
Type of Control	None	None	None	None
Corresponding Signal Phase	6	2	4	0
Effective Walk Time (s)	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	25	25	25	25
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	45.0	45.0	45.0	45.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	1.72	1.56	2.16	2.21
Pedestrian Crosswalk LOS	A	A	B	B

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	350	0	94	683
Effct. Green for Bike (s)	30.0	0.0	50.0	50.0
Cross Street Width (ft)	36.0	36.0	12.1	12.1
Through Lanes Number	1	0	1	2
Through Lane Width (ft)	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	667	0	1111	1111
Bicycle Delay (s/bike)	20.0	0.0	8.9	8.9
Bicycle Compliance	Fair		Good	Good
Bicycle LOS Score	2.69	0.00	1.90	2.31
Bicycle LOS	B		A	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	284	392	288	97	256	88	95	193	35	148	354	239
Satd. Flow (prot)	3090	1549	0	1593	2935	0	1593	3066	0	1593	1676	1283
Flt Permitted	0.950			0.284			0.950			0.950		
Satd. Flow (perm)	2630	1549	0	475	2935	0	1382	3066	0	1496	1676	983
Satd. Flow (RTOR)								23				
Confl. Peds. (#/hr)	89		4	4		89	134		51	51		134
Confl. Bikes (#/hr)						2						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)									0			0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	309	739	0	105	374	0	103	248	0	161	385	260
Turn Type	Prot	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases		4		8								6
Minimum Split (s)	9.0	21.0		21.0	21.0		8.0	22.0		8.0	22.0	22.0
Total Split (s)	21.0	49.0		28.0	28.0		10.0	31.0		10.0	31.0	31.0
Total Split (%)	23.3%	54.4%		31.1%	31.1%		11.1%	34.4%		11.1%	34.4%	34.4%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0	2.0		0.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0		3.0	6.0		3.0	6.0	6.0
Lead/Lag	Lead			Lag	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	Yes
Act Effct Green (s)	16.0	44.0		23.0	23.0		7.0	25.0		7.0	25.0	25.0
Actuated g/C Ratio	0.18	0.49		0.26	0.26		0.08	0.28		0.08	0.28	0.28
v/c Ratio	0.56	0.98		0.87	0.50		0.84	0.29		1.31	0.83	0.95
Control Delay	38.3	51.8		88.7	31.3		90.0	24.1		221.6	47.4	78.2
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	38.3	51.8		88.7	31.3		90.0	24.1		221.6	47.4	78.2
LOS	D	D		F	C		F	C		F	D	E
Approach Delay		47.8			43.9			43.4			92.2	
Approach LOS		D			D			D			F	
Queue Length 50th (ft)	83	393		57	95		59	52		~118	205	145
Queue Length 95th (ft)	125	#647		#156	140		#151	84		#242	#355	#297
Internal Link Dist (ft)		463			154			261			359	
Turn Bay Length (ft)							200			250		
Base Capacity (vph)	549	757		121	750		123	868		123	465	273
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.56	0.98		0.87	0.50		0.84	0.29		1.31	0.83	0.95

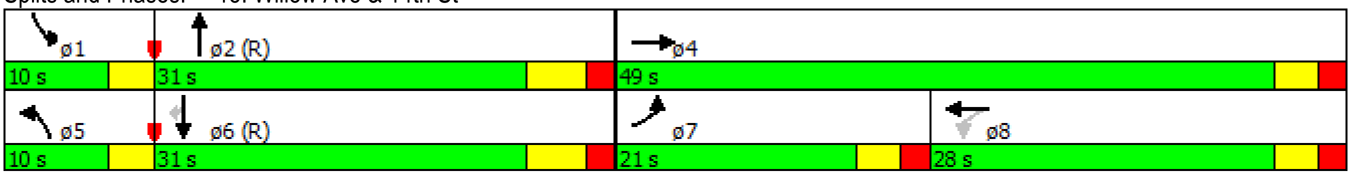
Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Pretimed

Maximum v/c Ratio: 1.31

Intersection Signal Delay: 59.9	Intersection LOS: E
Intersection Capacity Utilization 91.8%	ICU Level of Service F
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Willow Ave & 14th St



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	61.0	60.0	48.2	60.2
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	5	5	4	5
Number of Right-Turn Islands	0	0	0	0
Type of Control	None	None	None	None
Corresponding Signal Phase	6	2	4	8
Effective Walk Time (s)	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	25	30	25	30
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	45.0	45.0	45.0	45.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.58	2.53	2.38	2.59
Pedestrian Crosswalk LOS	B	B	B	B

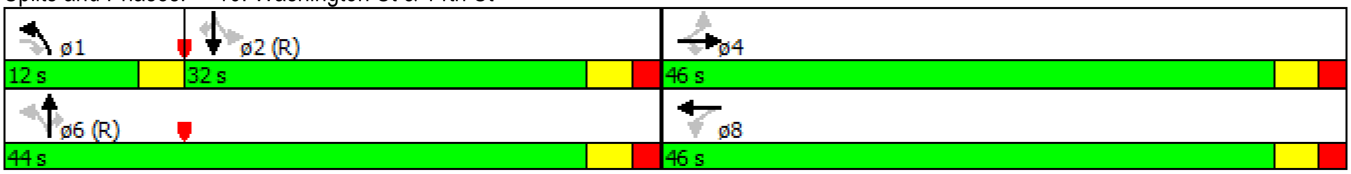
Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	1048	479	351	806
Effct. Green for Bike (s)	44.0	23.0	25.0	25.0
Cross Street Width (ft)	48.2	60.2	60.0	61.0
Through Lanes Number	1	2	2	1
Through Lane Width (ft)	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	978	511	556	556
Bicycle Delay (s/bike)	11.8	24.9	23.5	23.5
Bicycle Compliance	Fair	Fair	Fair	Fair
Bicycle LOS Score	4.03	2.88	2.77	3.82
Bicycle LOS	D	C	C	D

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	12	340	205	23	101	8	112	104	39	29	189	29
Satd. Flow (prot)	0	1409	1218	0	1630	0	0	1635	1283	0	1665	1283
Flt Permitted		0.991			0.902			0.599			0.934	
Satd. Flow (perm)	0	1394	1158	0	1471	0	0	860	1021	0	1536	625
Satd. Flow (RTOR)		4	88									61
Confl. Peds. (#/hr)	58		71	71		58	181		116	116		181
Confl. Bikes (#/hr)			1									2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)	0	0	0				0		0			0
Shared Lane Traffic (%)			10%									
Lane Group Flow (vph)	0	405	201	0	144	0	0	235	42	0	237	32
Turn Type	Perm	NA	custom	Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		1	6			2	
Permitted Phases	4		1 4	8			6		6	2		2
Minimum Split (s)	21.5	21.5		21.5	21.5		8.0	21.5	21.5	21.5	21.5	21.5
Total Split (s)	46.0	46.0		46.0	46.0		12.0	44.0	44.0	32.0	32.0	32.0
Total Split (%)	51.1%	51.1%		51.1%	51.1%		13.3%	48.9%	48.9%	35.6%	35.6%	35.6%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)		5.0			5.0			5.0	5.0		5.0	5.0
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Act Effct Green (s)		41.0	55.0		41.0			39.0	39.0		27.0	27.0
Actuated g/C Ratio		0.46	0.61		0.46			0.43	0.43		0.30	0.30
v/c Ratio		0.64	0.27		0.21			0.54	0.10		0.52	0.14
Control Delay		24.2	5.5		15.9			22.8	15.9		30.9	3.5
Queue Delay		0.0	0.0		0.0			0.0	0.0		0.0	0.0
Total Delay		24.2	5.5		15.9			22.8	15.9		30.9	3.5
LOS		C	A		B			C	B		C	A
Approach Delay		18.0			15.9			21.8			27.6	
Approach LOS		B			B			C			C	
Queue Length 50th (ft)		177	26		48			86	14		111	0
Queue Length 95th (ft)		286	61		86			142	34		184	9
Internal Link Dist (ft)		154			229			253			355	
Turn Bay Length (ft)									50			50
Base Capacity (vph)		637	741		670			432	442		460	230
Starvation Cap Reductn		0	0		0			0	0		0	0
Spillback Cap Reductn		0	0		0			0	0		0	0
Storage Cap Reductn		0	0		0			0	0		0	0
Reduced v/c Ratio		0.64	0.27		0.21			0.54	0.10		0.52	0.14

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
Natural Cycle: 60
Control Type: Pretimed

Maximum v/c Ratio: 0.64	
Intersection Signal Delay: 20.6	Intersection LOS: C
Intersection Capacity Utilization 68.0%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 16: Washington St & 14th St



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	36.0	38.1	48.0	36.0
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	3	3	4	3
Number of Right-Turn Islands	0	0	0	0
Type of Control	None	None	None	None
Corresponding Signal Phase	2	6	4	8
Effective Walk Time (s)	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	30	30	25	30
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	45.0	45.0	45.0	45.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.23	2.14	2.29	2.08
Pedestrian Crosswalk LOS	B	B	B	B

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	606	144	277	269
Effct. Green for Bike (s)	41.0	41.0	39.0	27.0
Cross Street Width (ft)	48.0	36.0	38.1	36.0
Through Lanes Number	1	1	1	1
Through Lane Width (ft)	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	911	911	867	600
Bicycle Delay (s/bike)	13.3	13.3	14.4	22.0
Bicycle Compliance	Fair	Fair	Fair	Fair
Bicycle LOS Score	3.29	2.35	2.60	2.55
Bicycle LOS	C	B	B	B

Intersection	
Intersection Delay, s/veh	11.9
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	12	216	220	0	2	192	6	0	111	4	8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	13	235	239	0	2	209	7	0	121	4	9
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	13.4	10	10.2
HCM LOS	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	90%	3%	1%	0%
Vol Thru, %	3%	48%	96%	90%
Vol Right, %	7%	49%	3%	10%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	123	448	200	20
LT Vol	111	12	2	0
Through Vol	4	216	192	18
RT Vol	8	220	6	2
Lane Flow Rate	134	487	217	22
Geometry Grp	1	1	1	1
Degree of Util (X)	0.209	0.587	0.295	0.035
Departure Headway (Hd)	5.639	4.342	4.877	5.772
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	630	828	730	624
Service Time	3.736	2.395	2.947	3.772
HCM Lane V/C Ratio	0.213	0.588	0.297	0.035
HCM Control Delay	10.2	13.4	10	9
HCM Lane LOS	B	B	A	A
HCM 95th-tile Q	0.8	3.9	1.2	0.1

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	0	18	2
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	0	20	2
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	9
HCM LOS	A

Lane

Lane Group	EBT	WBL2	WBL	WBT	WBR	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	55	35	15	10	59	45	208	14	5	194	235
Satd. Flow (prot)	1676	0	0	1541	0	0	0	1462	0	0	1079	0
Flt Permitted				0.772				0.716			0.999	
Satd. Flow (perm)	1676	0	0	828	0	0	0	965	0	0	1078	0
Satd. Flow (RTOR)				5							1	
Confl. Peds. (#/hr)			150		127	150	144		70	70		150
Confl. Bikes (#/hr)					2				3			2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)						0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	125	0	0	0	354	0	0	476	0
Turn Type		Perm	Perm	NA		Perm	Perm	NA		Split	NA	
Protected Phases	4			8				2		1	1	
Permitted Phases		8	8			2	2					
Minimum Split (s)	21.0	21.0	21.0	21.0		21.0	21.0	21.0		9.0	9.0	
Total Split (s)	23.0	23.0	23.0	23.0		29.0	29.0	29.0		38.0	38.0	
Total Split (%)	25.6%	25.6%	25.6%	25.6%		32.2%	32.2%	32.2%		42.2%	42.2%	
Yellow Time (s)	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0			0.0				0.0			0.0	
Total Lost Time (s)	5.0			5.0				5.0			5.0	
Lead/Lag						Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Act Effct Green (s)				18.0				24.0			33.0	
Actuated g/C Ratio				0.20				0.27			0.37	
v/c Ratio				0.74				1.38			1.20	
Control Delay				59.9				222.1			141.5	
Queue Delay				0.0				0.0			0.0	
Total Delay				59.9				222.1			141.5	
LOS				E				F			F	
Approach Delay				59.9				222.1			141.5	
Approach LOS				E				F			F	
Queue Length 50th (ft)				65				~269			~334	
Queue Length 95th (ft)				#157				#438			#526	
Internal Link Dist (ft)	228			184				538			359	
Turn Bay Length (ft)												
Base Capacity (vph)				169				257			396	
Starvation Cap Reductn				0				0			0	
Spillback Cap Reductn				0				0			0	
Storage Cap Reductn				0				0			0	
Reduced v/c Ratio				0.74				1.38			1.20	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:, Start of Green
Natural Cycle: 130
Control Type: Pretimed

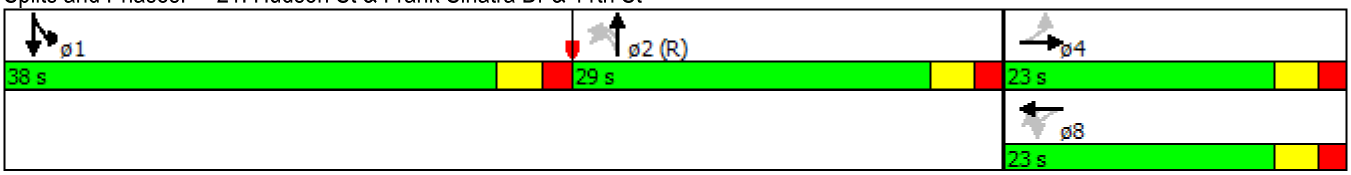
Lane Group	SBR2
Lane Configurations	
Volume (vph)	5
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	144
Confl. Bikes (#/hr)	2
Peak Hour Factor	0.92
Parking (#/hr)	0
Shared Lane Traffic (%)	
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Minimum Split (s)	
Total Split (s)	
Total Split (%)	
Yellow Time (s)	
All-Red Time (s)	
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Maximum v/c Ratio: 1.38	
Intersection Signal Delay: 160.7	Intersection LOS: F
Intersection Capacity Utilization 77.4%	ICU Level of Service D
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 21: Hudson St & Frank Sinatra Dr & 11th St

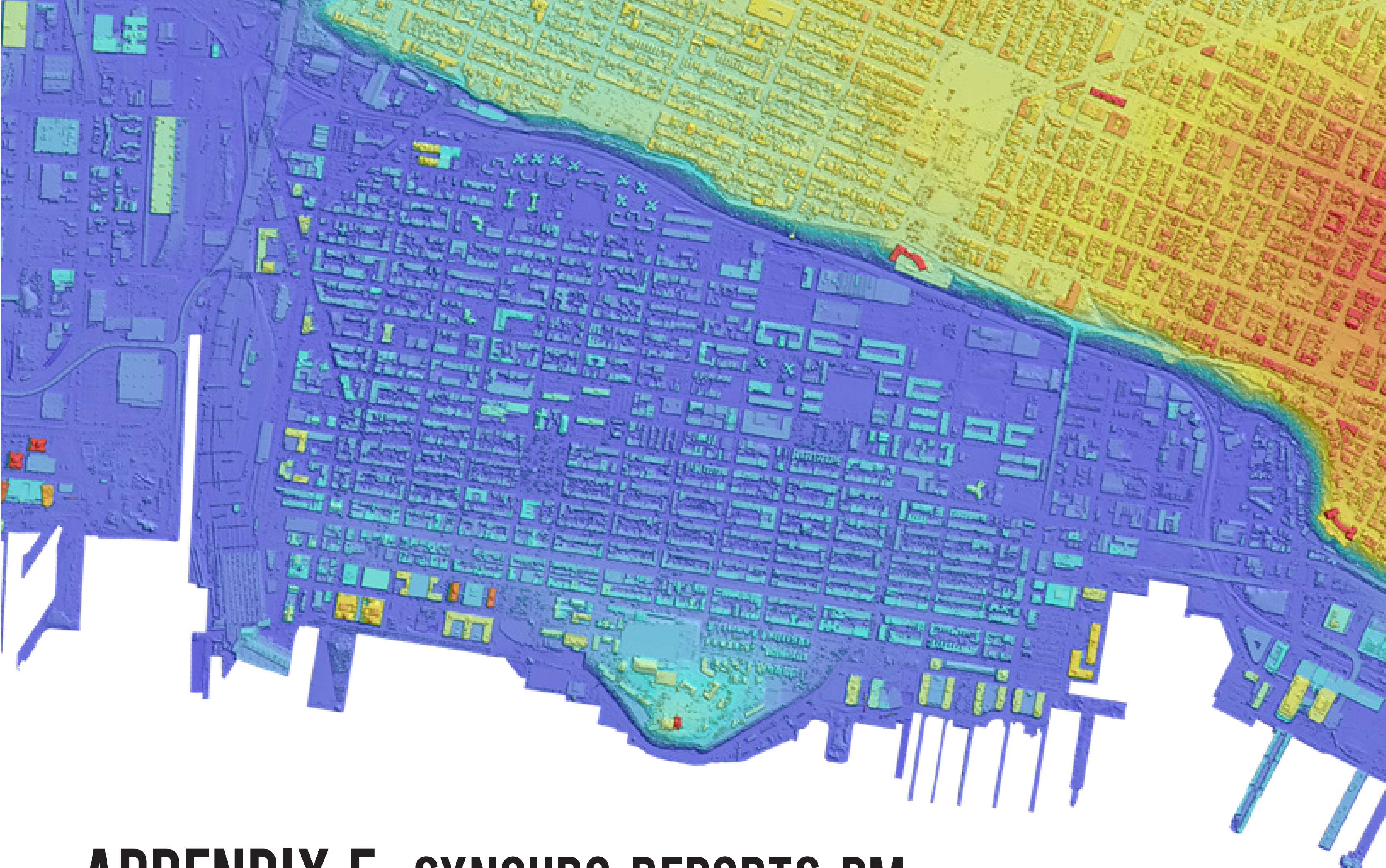


Approach	EB	WB	NB	SB	NE
Bicycle Flow Rate (bike/h)	0	0	0	0	0
Total Flow Rate (veh/h)	0	125	354	476	0
Effct. Green for Bike (s)	18.0	18.0	24.0	33.0	0.0
Cross Street Width (ft)	29.2	24.0	37.9	36.1	27.9
Through Lanes Number	1	1	1	1	0
Through Lane Width (ft)	12.0	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No	No
On Street Parking?	No	No	No	No	No
Bicycle Lane Capacity (bike/h)	400	400	533	733	0
Bicycle Delay (s/bike)	28.8	28.8	24.2	18.0	0.0
Bicycle Compliance	Fair	Fair	Fair	Fair	
Bicycle LOS Score	2.01	2.13	2.72	2.90	0.00
Bicycle LOS	B	B	B	C	

Intersection												
Int Delay, s/veh	0											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	69	116	0	0	0	0	0	385	98
Conflicting Peds, #/hr	0	0	0	227	0	163	109	0	160	160	0	109
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	75	126	0	0	0	0	0	418	107

Major/Minor	Minor1			Major2		
Conflicting Flow All	699	752	387	227	0	0
Stage 1	227	227	-	-	-	-



APPENDIX F- SYNCHRO REPORTS PM

Intersection	
Int Delay, s/veh	42.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	0	791	576	0	15	513
Conflicting Peds, #/hr	0	0	0	1	0	8
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	860	626	0	16	558

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	634	0	-	0	1064	634
Stage 1	-	-	-	-	634	-
Stage 2	-	-	-	-	430	-
Critical Hdwy	4.12	-	-	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	2.218	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	949	-	-	-	232	~ 478
Stage 1	-	-	-	-	527	-
Stage 2	-	-	-	-	625	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	949	-	-	-	229	~ 475
Mov Cap-2 Maneuver	-	-	-	-	229	-
Stage 1	-	-	-	-	523	-
Stage 2	-	-	-	-	621	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	154
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	949	-	-	-	461
HCM Lane V/C Ratio	-	-	-	-	1.245
HCM Control Delay (s)	0	-	-	-	154
HCM Lane LOS	A	-	-	-	F
HCM 95th %tile Q(veh)	0	-	-	-	23.3

Notes

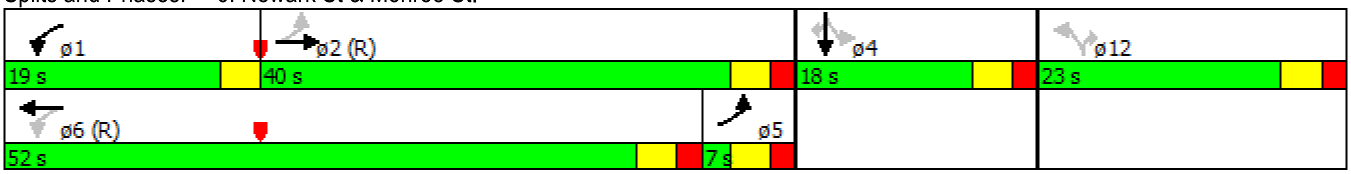
~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	334	58	221	302	0	192	0	241	82	258	282
Satd. Flow (prot)	1676	1635	0	1593	1676	0	1593	0	1425	1513	1589	1425
Flt Permitted				0.213			0.575			0.950	0.998	
Satd. Flow (perm)	1676	1635	0	357	1676	0	958	0	1370	1485	1589	1388
Satd. Flow (RTOR)		10							187			307
Confl. Peds. (#/hr)			3	3			5		6	6		5
Confl. Bikes (#/hr)												3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)										10%		
Lane Group Flow (vph)	0	426	0	240	328	0	209	0	262	80	289	307
Turn Type	pm+pt	NA		pm+pt	NA		Perm		Perm	Perm	NA	Perm
Protected Phases	5	2		1	6						4	
Permitted Phases	2			6			12		12	4		4
Minimum Split (s)	9.0	21.0		8.0	21.0		21.0		21.0	21.0	21.0	21.0
Total Split (s)	7.0	40.0		19.0	52.0		23.0		23.0	18.0	18.0	18.0
Total Split (%)	7.0%	40.0%		19.0%	52.0%		23.0%		23.0%	18.0%	18.0%	18.0%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0		3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		0.0	2.0		2.0		2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		3.0	5.0		5.0		5.0	5.0	5.0	5.0
Lead/Lag	Lag	Lag		Lead	Lead							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Act Effct Green (s)		35.0		49.0	47.0		18.0		18.0	13.0	13.0	13.0
Actuated g/C Ratio		0.35		0.49	0.47		0.18		0.18	0.13	0.13	0.13
v/c Ratio		0.74		0.65	0.42		1.22		0.66	0.41	1.40	0.69
Control Delay		36.8		27.5	20.8		175.6		20.7	47.3	242.5	13.6
Queue Delay		5.3		0.0	0.0		0.0		0.0	0.0	0.0	0.0
Total Delay		42.1		27.5	20.8		175.6		20.7	47.3	242.5	13.6
LOS		D		C	C		F		C	D	F	B
Approach Delay		42.1			23.7						115.4	
Approach LOS		D			C						F	
Queue Length 50th (ft)		230		100	138		~164		42	50	~261	0
Queue Length 95th (ft)		349		178	230		#308		130	100	#432	84
Internal Link Dist (ft)		312			453			65			153	
Turn Bay Length (ft)				150					60			
Base Capacity (vph)		578		372	787		172		399	193	206	447
Starvation Cap Reductn		99		0	0		0		0	0	0	0
Spillback Cap Reductn		0		0	0		0		0	0	0	0
Storage Cap Reductn		0		0	0		0		0	0	0	0
Reduced v/c Ratio		0.89		0.65	0.42		1.22		0.66	0.41	1.40	0.69

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Pretimed
Maximum v/c Ratio: 1.40

Intersection Signal Delay: 70.8	Intersection LOS: E
Intersection Capacity Utilization 80.5%	ICU Level of Service D
Analysis Period (min) 15	
~ Volume exceeds capacity, queue is theoretically infinite.	
Queue shown is maximum after two cycles.	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 6: Newark St & Monroe St.



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	65.9	39.5	48.5	36.6
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	4	3	4	3
Number of Right-Turn Islands	0	0	0	0
Type of Control	None	None	None	None
Corresponding Signal Phase	4	0	2	6
Effective Walk Time (s)	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	25	25	25	25
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	50.0	50.0	50.0	50.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.40	2.30	2.36	2.14
Pedestrian Crosswalk LOS	B	B	B	B

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	426	568	471	676
Effct. Green for Bike (s)	35.0	47.0	0.0	13.0
Cross Street Width (ft)	48.5	36.6	39.5	65.9
Through Lanes Number	1	1	0	1
Through Lane Width (ft)	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	700	940	0	260
Bicycle Delay (s/bike)	21.1	14.0	0.0	37.8
Bicycle Compliance	Fair	Fair		Poor
Bicycle LOS Score	3.00	3.06	0.00	3.68
Bicycle LOS	C	C		D

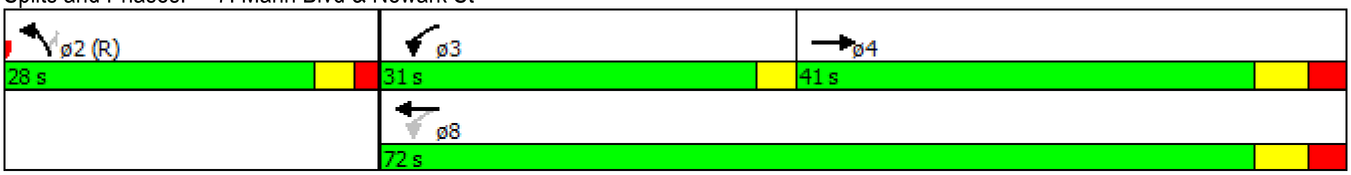
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	575	20	347	517	192	436
Satd. Flow (prot)	1666	0	1593	1676	1593	1283
Flt Permitted			0.108		0.950	
Satd. Flow (perm)	1666	0	181	1676	1593	1227
Satd. Flow (RTOR)	2					474
Confl. Peds. (#/hr)		5	5			17
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)						0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	647	0	377	562	209	474
Turn Type	NA		pm+pt	NA	Prot	Perm
Protected Phases	4		3	8	2	
Permitted Phases			8			2
Minimum Split (s)	23.0		8.0	23.0	21.0	21.0
Total Split (s)	41.0		31.0	72.0	28.0	28.0
Total Split (%)	41.0%		31.0%	72.0%	28.0%	28.0%
Yellow Time (s)	4.0		3.0	4.0	3.0	3.0
All-Red Time (s)	3.0		0.0	3.0	2.0	2.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	7.0		3.0	7.0	5.0	5.0
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Act Effct Green (s)	34.0		69.0	65.0	23.0	23.0
Actuated g/C Ratio	0.34		0.69	0.65	0.23	0.23
v/c Ratio	1.14		0.72	0.52	0.57	0.73
Control Delay	112.2		29.5	11.3	41.2	10.8
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	112.2		29.5	11.3	41.2	10.8
LOS	F		C	B	D	B
Approach Delay	112.2			18.6	20.1	
Approach LOS	F			B	C	
Queue Length 50th (ft)	~499		159	170	119	0
Queue Length 95th (ft)	m#716		270	252	195	106
Internal Link Dist (ft)	453			392	853	
Turn Bay Length (ft)						100
Base Capacity (vph)	567		520	1089	366	647
Starvation Cap Reductn	0		0	0	0	0
Spillback Cap Reductn	0		0	0	0	0
Storage Cap Reductn	0		0	0	0	0
Reduced v/c Ratio	1.14		0.72	0.52	0.57	0.73

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green
Natural Cycle: 90
Control Type: Pretimed
Maximum v/c Ratio: 1.14

Intersection Signal Delay: 45.7	Intersection LOS: D
Intersection Capacity Utilization 83.0%	ICU Level of Service E
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Marin Blvd & Newark St



Approach	EB	WB	NB
Crosswalk Length (ft)	36.0	48.0	38.3
Crosswalk Width (ft)	12.0	12.0	12.0
Total Number of Lanes Crossed	2	4	3
Number of Right-Turn Islands	0	0	0
Type of Control	None	None	None
Corresponding Signal Phase	8	2	4
Effective Walk Time (s)	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0
85th percentile speed (mph)	25	25	25
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-
Pedestrian Delay (s/p)	50.0	50.0	50.0
Pedestrian Compliance Code	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.31	2.56	2.25
Pedestrian Crosswalk LOS	B	B	B

Approach	EB	WB	NB
Bicycle Flow Rate (bike/h)	0	0	0
Total Flow Rate (veh/h)	647	939	683
Effct. Green for Bike (s)	34.0	65.0	23.0
Cross Street Width (ft)	38.3	36.0	48.0
Through Lanes Number	1	1	1
Through Lane Width (ft)	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0
Curb Is Present?	No	No	No
On Street Parking?	No	No	No
Bicycle Lane Capacity (bike/h)	680	1300	460
Bicycle Delay (s/bike)	21.8	6.1	29.6
Bicycle Compliance	Fair	Good	Fair
Bicycle LOS Score	3.21	3.66	3.42
Bicycle LOS	C	D	C

Lane Group	EBT	EBR	WBL	WBT	WBR	SBL	SBT	SBR	SBR2	SEL2	SEL	SER
Lane Configurations												
Volume (vph)	231	38	247	164	128	35	276	8	17	13	20	14
Satd. Flow (prot)	1472	0	1593	1509	0	0	1450	0	0	0	891	0
Flt Permitted			0.410				0.995				0.987	
Satd. Flow (perm)	1472	0	679	1509	0	0	1440	0	0	0	871	0
Satd. Flow (RTOR)	9						2				106	
Confl. Peds. (#/hr)		14	14		18	20		80	18		28	19
Confl. Bikes (#/hr)					8							3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)	0	0					0	0	0		0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	292	0	268	317	0	0	365	0	0	0	138	0
Turn Type	NA		pm+pt	NA		Perm	NA			Perm	Prot	
Protected Phases	2		1	6			4				12	
Permitted Phases			6			4				12		
Minimum Split (s)	21.0		8.0	21.0		21.0	21.0			21.0	21.0	
Total Split (s)	40.0		19.0	59.0		21.0	21.0			23.0	23.0	
Total Split (%)	38.8%		18.4%	57.3%		20.4%	20.4%			22.3%	22.3%	
Yellow Time (s)	3.0		3.0	3.0		3.0	3.0			3.0	3.0	
All-Red Time (s)	2.0		0.0	2.0		2.0	2.0			2.0	2.0	
Lost Time Adjust (s)	0.0		0.0	0.0			0.0				0.0	
Total Lost Time (s)	5.0		3.0	5.0			5.0				5.0	
Lead/Lag	Lag		Lead									
Lead-Lag Optimize?	Yes		Yes									
Act Effct Green (s)	35.0		56.0	54.0			16.0				18.0	
Actuated g/C Ratio	0.34		0.54	0.52			0.16				0.17	
v/c Ratio	0.58		0.52	0.40			1.62				0.58	
Control Delay	32.5		17.0	16.7			330.1				22.6	
Queue Delay	0.0		0.0	0.0			0.0				0.0	
Total Delay	32.5		17.0	16.7			330.1				22.6	
LOS	C		B	B			F				C	
Approach Delay	32.5			16.8			330.1				22.6	
Approach LOS	C			B			F				C	
Queue Length 50th (ft)	152		92	120			~350				18	
Queue Length 95th (ft)	241		144	186			#534				84	
Internal Link Dist (ft)	143			187			292				223	
Turn Bay Length (ft)												
Base Capacity (vph)	506		511	791			225				239	
Starvation Cap Reductn	0		0	0			0				0	
Spillback Cap Reductn	0		0	0			0				0	
Storage Cap Reductn	0		0	0			0				0	
Reduced v/c Ratio	0.58		0.52	0.40			1.62				0.58	

Intersection Summary

Cycle Length: 103
Actuated Cycle Length: 103
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90
Control Type: Pretimed

Lane Group	SER2
Lane Configurations	
Volume (vph)	80
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	116
Confl. Bikes (#/hr)	3
Peak Hour Factor	0.92
Parking (#/hr)	0
Shared Lane Traffic (%)	
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Minimum Split (s)	
Total Split (s)	
Total Split (%)	
Yellow Time (s)	
All-Red Time (s)	
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Approach	EB	WB	NB	SB	SE
Crosswalk Length (ft)	24.5	36.4	38.6	30.2	27.8
Crosswalk Width (ft)	12.0	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	2	3	3	2	2
Number of Right-Turn Islands	0	0	0	0	0
Type of Control	None	None	None	None	None
Corresponding Signal Phase	12	0	2	6	4
Effective Walk Time (s)	0.0	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0	0
85th percentile speed (mph)	25	25	30	25	25
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-	-
Pedestrian Delay (s/p)	51.5	51.5	51.5	51.5	51.5
Pedestrian Compliance Code	Poor	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	1.96	2.20	2.16	1.88	1.85
Pedestrian Crosswalk LOS	A	B	B	A	A

Maximum v/c Ratio: 1.62	
Intersection Signal Delay: 103.6	Intersection LOS: F
Intersection Capacity Utilization 92.4%	ICU Level of Service F
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Monroe St./Monroe St & Observer Hwy & Paterson Ave

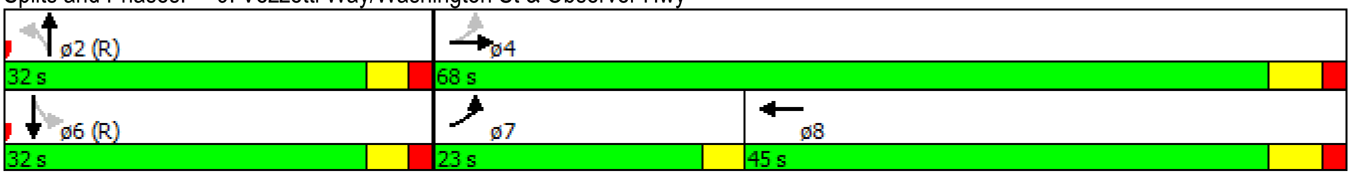
Approach	EB	WB	NB	SB	SE
Bicycle Flow Rate (bike/h)	0	0	0	0	0
Total Flow Rate (veh/h)	292	585	0	365	138
Effct. Green for Bike (s)	35.0	54.0	0.0	16.0	18.0
Cross Street Width (ft)	38.6	30.2	36.4	27.8	24.5
Through Lanes Number	1	1	0	1	1
Through Lane Width (ft)	12.0	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No	No
On Street Parking?	No	No	No	No	No
Bicycle Lane Capacity (bike/h)	680	1049	0	311	350
Bicycle Delay (s/bike)	22.4	11.7	0.0	36.7	35.1
Bicycle Compliance	Fair	Fair		Poor	Poor
Bicycle LOS Score	2.63	2.99	0.00	2.59	2.16
Bicycle LOS	B	C		B	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	335	355	0	0	384	48	0	0	0	77	183	288
Satd. Flow (prot)	1593	1676	0	0	3120	0	0	1676	0	0	1154	0
Flt Permitted	0.406										0.952	
Satd. Flow (perm)	677	1676	0	0	3120	0	0	1676	0	0	1106	0
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)	4		18	18		4						214
Confl. Bikes (#/hr)			3						1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)										0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	364	386	0	0	469	0	0	0	0	0	596	0
Turn Type	pm+pt	NA			NA					Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4						2			6		
Minimum Split (s)	10.0	24.0			22.0		21.0	21.0		21.0	21.0	
Total Split (s)	23.0	68.0			45.0		32.0	32.0		32.0	32.0	
Total Split (%)	23.0%	68.0%			45.0%		32.0%	32.0%		32.0%	32.0%	
Yellow Time (s)	3.0	4.0			4.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	0.0	2.0			2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0	0.0			0.0			0.0			0.0	
Total Lost Time (s)	3.0	6.0			6.0			5.0			5.0	
Lead/Lag	Lead				Lag							
Lead-Lag Optimize?	Yes				Yes							
Act Effct Green (s)	65.0	62.0			39.0						27.0	
Actuated g/C Ratio	0.65	0.62			0.39						0.27	
v/c Ratio	0.58	0.37			0.39						2.00	
Control Delay	12.1	10.7			23.1						485.9	
Queue Delay	0.0	0.0			0.0						0.0	
Total Delay	12.1	10.7			23.1						485.9	
LOS	B	B			C						F	
Approach Delay		11.4			23.1						485.9	
Approach LOS		B			C						F	
Queue Length 50th (ft)	95	111			111						~596	
Queue Length 95th (ft)	146	168			153						#805	
Internal Link Dist (ft)		403			237			86			396	
Turn Bay Length (ft)												
Base Capacity (vph)	623	1039			1216						298	
Starvation Cap Reductn	0	0			0						0	
Spillback Cap Reductn	0	0			0						0	
Storage Cap Reductn	0	0			0						0	
Reduced v/c Ratio	0.58	0.37			0.39						2.00	

Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Pretimed

Maximum v/c Ratio: 2.00
Intersection Signal Delay: 170.2 Intersection LOS: F
Intersection Capacity Utilization 85.9% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 9: Vezzetti Way/Washington St & Observer Hwy



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	48.0	36.1	25.0	24.6
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	4	3	2	2
Number of Right-Turn Islands	0	0	0	0
Type of Control	None	None	None	None
Corresponding Signal Phase	6	2	4	8
Effective Walk Time (s)	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	25	25	25	25
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	50.0	50.0	50.0	50.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.45	2.21	1.81	2.14
Pedestrian Crosswalk LOS	B	B	A	B

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	750	469	0	596
Effct. Green for Bike (s)	62.0	39.0	27.0	27.0
Cross Street Width (ft)	25.0	24.6	36.1	48.0
Through Lanes Number	1	2	1	1
Through Lane Width (ft)	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	1240	780	540	540
Bicycle Delay (s/bike)	7.2	18.6	26.6	26.6
Bicycle Compliance	Good	Fair	Fair	Fair
Bicycle LOS Score	3.18	2.32	2.11	3.28
Bicycle LOS	C	B	B	C

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	348	48	42	11	2	377
Conflicting Peds, #/hr	15	0	0	15	0	45
Sign Control	Free	Free	Stop	Stop	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	378	52	46	12	2	410

Major/Minor	Major1		Minor1		Major2	
Conflicting Flow All	410	0	1238	112	67	-
Stage 1	-	-	824	-	-	-
Stage 2	-	-	414	-	-	-
Critical Hdwy	-	-	6.52	6.22	4.12	-
Critical Hdwy Stg 1	-	-	5.52	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	4.018	3.318	2.218	-
Pot Cap-1 Maneuver	-	-	176	941	1535	-
Stage 1	-	-	387	-	-	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %		-				-
Mov Cap-1 Maneuver	-	-	0	894	1477	-
Mov Cap-2 Maneuver	-	-	0	-	-	-
Stage 1	-	-	0	-	-	-
Stage 2	-	-	0	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s		9.3	0
HCM LOS		A	

Minor Lane/Major Mvmt	EBL	EBT	WBLn1	SBL	SBR
Capacity (veh/h)	-	-	894	1477	-
HCM Lane V/C Ratio	-	-	0.064	0.001	-
HCM Control Delay (s)	-	-	9.3	7.4	-
HCM Lane LOS	-	-	A	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	127	230	0	0	0	0	0	323	104
Satd. Flow (prot)	0	0	0	1433	1676	0	0	0	0	0	1509	1283
Flt Permitted				0.950								
Satd. Flow (perm)	0	0	0	325	1676	0	0	0	0	0	1509	472
Satd. Flow (RTOR)				22								349
Confl. Peds. (#/hr)	347		597	597		347	359		702	702		359
Confl. Bikes (#/hr)			3									
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)				0		0				0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	138	250	0	0	0	0	0	351	113
Turn Type				Perm	NA						NA	Perm
Protected Phases					8						6	
Permitted Phases				8								6
Minimum Split (s)				51.0	51.0						21.0	21.0
Total Split (s)				57.0	57.0						43.0	43.0
Total Split (%)				57.0%	57.0%						43.0%	43.0%
Yellow Time (s)				3.0	3.0						3.0	3.0
All-Red Time (s)				32.0	32.0						2.0	2.0
Lost Time Adjust (s)				0.0	0.0						0.0	0.0
Total Lost Time (s)				35.0	35.0						5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)				22.0	22.0						38.0	38.0
Actuated g/C Ratio				0.22	0.22						0.38	0.38
v/c Ratio				1.57	0.68						0.61	0.29
Control Delay				329.6	46.3						30.6	1.8
Queue Delay				0.0	13.2						0.0	0.0
Total Delay				329.6	59.5						30.6	1.8
LOS				F	E						C	A
Approach Delay					155.6						23.6	
Approach LOS					F						C	
Queue Length 50th (ft)				~114	147						178	0
Queue Length 95th (ft)				#238	234						275	0
Internal Link Dist (ft)		189			199			185			133	
Turn Bay Length (ft)												
Base Capacity (vph)				88	368						573	395
Starvation Cap Reductn				0	97						0	0
Spillback Cap Reductn				0	0						0	0
Storage Cap Reductn				0	0						0	0
Reduced v/c Ratio				1.57	0.92						0.61	0.29

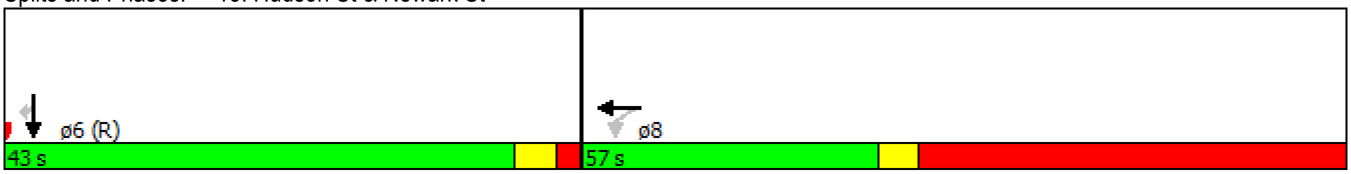
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2: and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Pretimed

Maximum v/c Ratio: 1.57

Intersection Signal Delay: 83.7	Intersection LOS: F
Intersection Capacity Utilization 65.7%	ICU Level of Service C
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 13: Hudson St & Newark St



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	16.5	24.0	13.4	24.0
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	1	2	1	2
Number of Right-Turn Islands	0	0	0	0
Type of Control	None	None	None	None
Corresponding Signal Phase	6	0	0	8
Effective Walk Time (s)	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	30	30	30	30
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	50.0	50.0	50.0	50.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	1.79	1.92	1.91	1.96
Pedestrian Crosswalk LOS	A	A	A	A

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	0	388	0	464
Effct. Green for Bike (s)	0.0	22.0	0.0	38.0
Cross Street Width (ft)	13.4	24.0	24.0	16.5
Through Lanes Number	0	1	0	1
Through Lane Width (ft)	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	0	440	0	760
Bicycle Delay (s/bike)	0.0	30.4	0.0	19.2
Bicycle Compliance		Poor		Fair
Bicycle LOS Score	0.00	2.57	0.00	2.58
Bicycle LOS		B		B

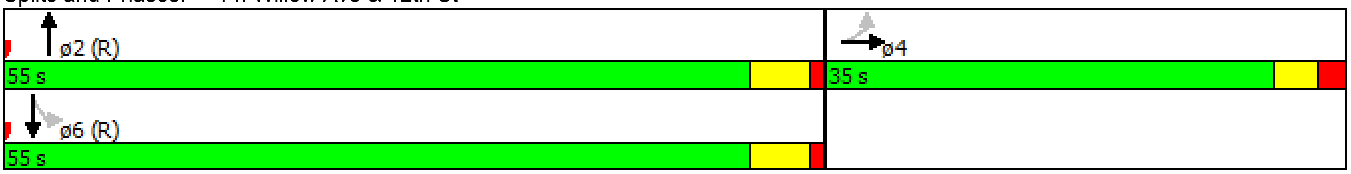
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	206	80	57	0	0	0	0	106	8	43	568	0
Satd. Flow (prot)	0	1419	0	0	0	0	0	1484	0	0	3014	0
Flt Permitted		0.971									0.925	
Satd. Flow (perm)	0	1338	0	0	0	0	0	1484	0	0	2787	0
Satd. Flow (RTOR)												
Confl. Peds. (#/hr)	34		27	27		34	14		25	25		14
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)	0	0	0	0		0	0	0	0		0	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	373	0	0	0	0	0	124	0	0	664	0
Turn Type	Perm	NA						NA		Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4									6		
Minimum Split (s)	21.0	21.0						21.0		21.0	21.0	
Total Split (s)	35.0	35.0						55.0		55.0	55.0	
Total Split (%)	38.9%	38.9%						61.1%		61.1%	61.1%	
Yellow Time (s)	3.0	3.0						4.0		4.0	4.0	
All-Red Time (s)	2.0	2.0						1.0		1.0	1.0	
Lost Time Adjust (s)		0.0						0.0			0.0	
Total Lost Time (s)		5.0						5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)		30.0						50.0			50.0	
Actuated g/C Ratio		0.33						0.56			0.56	
v/c Ratio		0.84						0.15			0.43	
Control Delay		46.2						10.3			12.8	
Queue Delay		0.0						0.0			0.0	
Total Delay		46.2						10.3			12.8	
LOS		D						B			B	
Approach Delay		46.2						10.3			12.8	
Approach LOS		D						B			B	
Queue Length 50th (ft)		194						32			108	
Queue Length 95th (ft)		#351						60			149	
Internal Link Dist (ft)		376			578			386			260	
Turn Bay Length (ft)												
Base Capacity (vph)		446						824			1548	
Starvation Cap Reductn		0						0			0	
Spillback Cap Reductn		0						0			0	
Storage Cap Reductn		0						0			0	
Reduced v/c Ratio		0.84						0.15			0.43	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed

Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 23.3	Intersection LOS: C
Intersection Capacity Utilization 58.8%	ICU Level of Service B
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 14: Willow Ave & 12th St



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	12.1	12.1	36.0	36.0
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	1	1	3	3
Number of Right-Turn Islands	0	0	0	0
Type of Control	None	None	None	None
Corresponding Signal Phase	6	2	4	0
Effective Walk Time (s)	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	25	25	25	25
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	45.0	45.0	45.0	45.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	1.74	1.55	2.17	2.22
Pedestrian Crosswalk LOS	A	A	B	B

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	373	0	124	664
Effct. Green for Bike (s)	30.0	0.0	50.0	50.0
Cross Street Width (ft)	36.0	36.0	12.1	12.1
Through Lanes Number	1	0	1	2
Through Lane Width (ft)	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	667	0	1111	1111
Bicycle Delay (s/bike)	20.0	0.0	8.9	8.9
Bicycle Compliance	Fair		Good	Good
Bicycle LOS Score	2.73	0.00	1.95	2.29
Bicycle LOS	B		A	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	176	275	155	150	329	99	143	208	34	167	393	353
Satd. Flow (prot)	3090	1565	0	1593	3057	0	1593	3112	0	1593	1676	1283
Flt Permitted	0.950			0.495			0.950			0.950		
Satd. Flow (perm)	3058	1565	0	823	3057	0	1560	3112	0	1591	1676	1220
Satd. Flow (RTOR)								20				
Confl. Peds. (#/hr)	7		6	6		7	22		1	1		22
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)									0			0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	191	467	0	163	466	0	155	263	0	182	427	384
Turn Type	Prot	NA		Perm	NA		Prot	NA		Prot	NA	Perm
Protected Phases	7	4			8		5	2		1	6	
Permitted Phases				8								6
Minimum Split (s)	9.0	21.0		21.0	21.0		8.0	22.0		8.0	22.0	22.0
Total Split (s)	21.0	49.0		28.0	28.0		10.0	31.0		10.0	31.0	31.0
Total Split (%)	23.3%	54.4%		31.1%	31.1%		11.1%	34.4%		11.1%	34.4%	34.4%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	4.0		3.0	4.0	4.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0	2.0		0.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	5.0		3.0	6.0		3.0	6.0	6.0
Lead/Lag	Lead			Lag	Lag		Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?	Yes			Yes	Yes		Yes	Yes		Yes	Yes	Yes
Act Effct Green (s)	16.0	44.0		23.0	23.0		7.0	25.0		7.0	25.0	25.0
Actuated g/C Ratio	0.18	0.49		0.26	0.26		0.08	0.28		0.08	0.28	0.28
v/c Ratio	0.35	0.61		0.78	0.60		1.26	0.30		1.48	0.92	1.14
Control Delay	34.5	21.0		57.7	33.2		204.1	24.7		286.9	59.0	123.8
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	34.5	21.0		57.7	33.2		204.1	24.7		286.9	59.0	123.8
LOS	C	C		E	C		F	C		F	E	F
Approach Delay		24.9			39.5			91.2			125.8	
Approach LOS		C			D			F			F	
Queue Length 50th (ft)	49	185		86	122		~111	56		~144	235	~256
Queue Length 95th (ft)	81	288		#192	174		#233	90		#273	#413	#430
Internal Link Dist (ft)		463			154			261			359	
Turn Bay Length (ft)							200			250		
Base Capacity (vph)	549	765		210	781		123	878		123	465	338
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.35	0.61		0.78	0.60		1.26	0.30		1.48	0.92	1.14

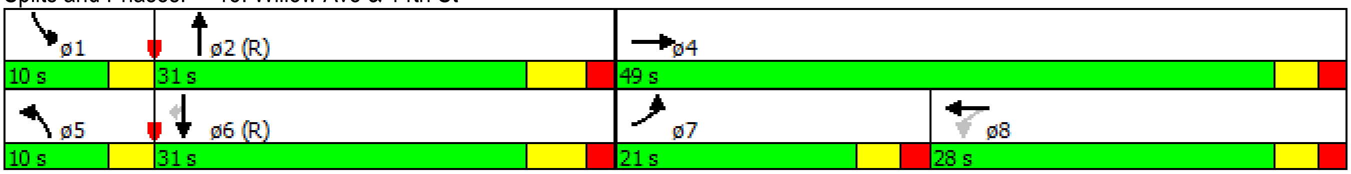
Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 48 (53%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 70
Control Type: Pretimed
Maximum v/c Ratio: 1.48

Intersection Signal Delay: 75.7	Intersection LOS: E
Intersection Capacity Utilization 84.5%	ICU Level of Service E
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Willow Ave & 14th St



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	61.0	60.0	48.2	60.2
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	5	5	4	5
Number of Right-Turn Islands	0	0	0	0
Type of Control	None	None	None	None
Corresponding Signal Phase	6	2	4	8
Effective Walk Time (s)	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	25	30	25	30
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	45.0	45.0	45.0	45.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.56	2.53	2.38	2.61
Pedestrian Crosswalk LOS	B	B	B	B

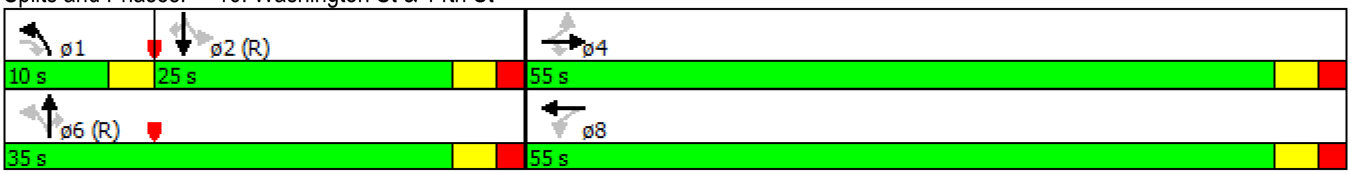
Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	658	629	418	993
Effct. Green for Bike (s)	44.0	23.0	25.0	25.0
Cross Street Width (ft)	48.2	60.2	60.0	61.0
Through Lanes Number	1	2	2	1
Through Lane Width (ft)	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	978	511	556	556
Bicycle Delay (s/bike)	11.8	24.9	23.5	23.5
Bicycle Compliance	Fair	Fair	Fair	Fair
Bicycle LOS Score	3.38	3.00	2.82	4.13
Bicycle LOS	C	C	C	D

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	13	212	158	8	154	16	152	134	40	21	77	29
Satd. Flow (prot)	0	1405	1218	0	1631	0	0	1633	1283	0	1658	1283
Flt Permitted		0.984			0.986			0.676			0.885	
Satd. Flow (perm)	0	1379	1087	0	1606	0	0	1028	1023	0	1443	972
Satd. Flow (RTOR)		6	155									61
Confl. Peds. (#/hr)	48		58	58		48	80		115	115		80
Confl. Bikes (#/hr)			1									1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)	0	0	0				0		0			0
Shared Lane Traffic (%)			10%									
Lane Group Flow (vph)	0	261	155	0	193	0	0	311	43	0	107	32
Turn Type	Perm	NA	custom	Perm	NA		pm+pt	NA	Perm	Perm	NA	Perm
Protected Phases		4			8		1	6			2	
Permitted Phases	4		1 4	8			6		6	2		2
Minimum Split (s)	21.0	21.0		21.0	21.0		21.0	21.0	21.0	21.0	21.0	21.0
Total Split (s)	55.0	55.0		55.0	55.0		10.0	35.0	35.0	25.0	25.0	25.0
Total Split (%)	61.1%	61.1%		61.1%	61.1%		11.1%	38.9%	38.9%	27.8%	27.8%	27.8%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		0.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0			0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)		5.0			5.0			5.0	5.0		5.0	5.0
Lead/Lag							Lead			Lag	Lag	Lag
Lead-Lag Optimize?							Yes			Yes	Yes	Yes
Act Effct Green (s)		50.0	62.0		50.0			30.0	30.0		20.0	20.0
Actuated g/C Ratio		0.56	0.69		0.56			0.33	0.33		0.22	0.22
v/c Ratio		0.34	0.19		0.22			0.83	0.13		0.33	0.12
Control Delay		12.2	1.4		10.9			47.0	22.2		32.9	3.7
Queue Delay		0.0	0.0		0.0			0.0	0.0		0.0	0.0
Total Delay		12.2	1.4		10.9			47.0	22.2		32.9	3.7
LOS		B	A		B			D	C		C	A
Approach Delay		8.2			10.9			44.0			26.2	
Approach LOS		A			B			D			C	
Queue Length 50th (ft)		77	0		52			144	17		51	0
Queue Length 95th (ft)		130	17		89			#283	42		100	10
Internal Link Dist (ft)		154			229			253			355	
Turn Bay Length (ft)									50			50
Base Capacity (vph)		768	797		892			376	341		320	263
Starvation Cap Reductn		0	0		0			0	0		0	0
Spillback Cap Reductn		0	0		0			0	0		0	0
Storage Cap Reductn		0	0		0			0	0		0	0
Reduced v/c Ratio		0.34	0.19		0.22			0.83	0.13		0.33	0.12

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:SBTL and 6:NBTL, Start of Green
Natural Cycle: 65
Control Type: Pretimed

Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 22.4	Intersection LOS: C
Intersection Capacity Utilization 56.8%	ICU Level of Service B
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 16: Washington St & 14th St



Approach	EB	WB	NB	SB
Crosswalk Length (ft)	36.0	38.1	48.0	36.0
Crosswalk Width (ft)	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	3	3	4	3
Number of Right-Turn Islands	0	0	0	0
Type of Control	None	None	None	None
Corresponding Signal Phase	2	6	4	8
Effective Walk Time (s)	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0
85th percentile speed (mph)	30	30	25	30
Right Corner Area per Ped (sq.ft)	0.0	0.0	0.0	0.0
Right Corner Quality of Service	-	-	-	-
Ped. Circulation Area (sq.ft)	0.0	0.0	0.0	0.0
Crosswalk Circulation Code	-	-	-	-
Pedestrian Delay (s/p)	45.0	45.0	45.0	45.0
Pedestrian Compliance Code	Poor	Poor	Poor	Poor
Pedestrian Crosswalk Score	2.20	2.11	2.27	2.05
Pedestrian Crosswalk LOS	B	B	B	B

Approach	EB	WB	NB	SB
Bicycle Flow Rate (bike/h)	0	0	0	0
Total Flow Rate (veh/h)	416	193	354	139
Effct. Green for Bike (s)	50.0	50.0	30.0	20.0
Cross Street Width (ft)	48.0	36.0	38.1	36.0
Through Lanes Number	1	1	1	1
Through Lane Width (ft)	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No
On Street Parking?	No	No	No	No
Bicycle Lane Capacity (bike/h)	1111	1111	667	444
Bicycle Delay (s/bike)	8.9	8.9	20.0	27.2
Bicycle Compliance	Good	Good	Fair	Fair
Bicycle LOS Score	2.98	2.43	2.73	2.34
Bicycle LOS	C	B	B	B

Lane Group	EBT	WBL2	WBL	WBT	WBR	NBL2	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	10	41	14	11	60	55	287	25	4	151	224
Satd. Flow (prot)	1676	0	0	1550	0	0	0	1466	0	0	1162	0
Flt Permitted				0.811				0.760				
Satd. Flow (perm)	1676	0	0	1144	0	0	0	1060	0	0	1161	0
Satd. Flow (RTOR)				8							5	
Confl. Peds. (#/hr)			63		54	63	86		40	40		
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Parking (#/hr)						0	0	0	0	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	83	0	0	0	464	0	0	443	0
Turn Type		Perm	Perm	NA		Perm	Perm	NA		Split	NA	
Protected Phases	4			8				2		1	1	
Permitted Phases		8	8			2	2					
Minimum Split (s)	21.0	21.0	21.0	21.0		21.0	21.0	21.0		21.0	21.0	
Total Split (s)	23.0	23.0	23.0	23.0		34.0	34.0	34.0		33.0	33.0	
Total Split (%)	25.6%	25.6%	25.6%	25.6%		37.8%	37.8%	37.8%		36.7%	36.7%	
Yellow Time (s)	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0	2.0	2.0		2.0	2.0	2.0		2.0	2.0	
Lost Time Adjust (s)	0.0			0.0				0.0			0.0	
Total Lost Time (s)	5.0			5.0				5.0			5.0	
Lead/Lag						Lag	Lag	Lag		Lead	Lead	
Lead-Lag Optimize?						Yes	Yes	Yes		Yes	Yes	
Act Effct Green (s)				18.0				29.0			28.0	
Actuated g/C Ratio				0.20				0.32			0.31	
v/c Ratio				0.35				1.36			1.22	
Control Delay				32.9				208.7			150.3	
Queue Delay				0.0				0.0			0.0	
Total Delay				32.9				208.7			150.3	
LOS				C				F			F	
Approach Delay				32.9				208.7			150.3	
Approach LOS				C				F			F	
Queue Length 50th (ft)				37				~350			~311	
Queue Length 95th (ft)				81				#536			#498	
Internal Link Dist (ft)	228			184				538			359	
Turn Bay Length (ft)												
Base Capacity (vph)				235				341			364	
Starvation Cap Reductn				0				0			0	
Spillback Cap Reductn				0				0			0	
Storage Cap Reductn				0				0			0	
Reduced v/c Ratio				0.35				1.36			1.22	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL, Start of Green
Natural Cycle: 140
Control Type: Pretimed

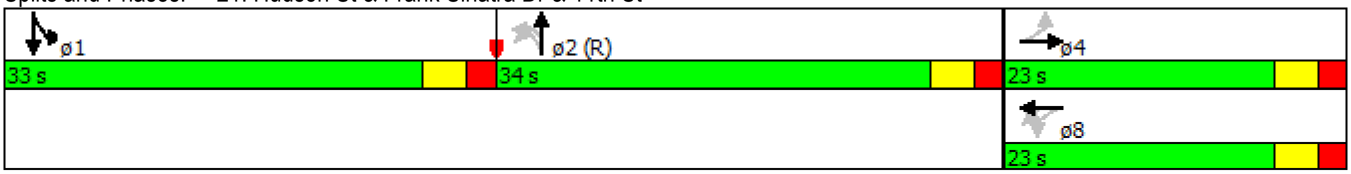
Lane Group	SBR2
Lane Configurations	
Volume (vph)	29
Satd. Flow (prot)	0
Flt Permitted	
Satd. Flow (perm)	0
Satd. Flow (RTOR)	
Confl. Peds. (#/hr)	86
Confl. Bikes (#/hr)	
Peak Hour Factor	0.92
Parking (#/hr)	0
Shared Lane Traffic (%)	
Lane Group Flow (vph)	0
Turn Type	
Protected Phases	
Permitted Phases	
Minimum Split (s)	
Total Split (s)	
Total Split (%)	
Yellow Time (s)	
All-Red Time (s)	
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Approach	EB	WB	NB	SB	NE
Crosswalk Length (ft)	36.1	37.9	27.9	24.0	29.2
Crosswalk Width (ft)	12.0	12.0	12.0	12.0	12.0
Total Number of Lanes Crossed	2	2	2	2	1
Number of Right-Turn Islands	0	0	0	0	0
Type of Control	None	None	None	None	None
Corresponding Signal Phase	1	2	0	8	4
Effective Walk Time (s)	0.0	0.0	0.0	0.0	0.0
Right Corner Size A (ft)	9.0	9.0	9.0	9.0	9.0
Right Corner Size B (ft)	9.0	9.0	9.0	9.0	9.0
Right Corner Curb Radius (ft)	0.0	0.0	0.0	0.0	0.0
Right Corner Total Area (sq.ft)	81.00	81.00	81.00	81.00	81.00
Ped. Left-Right Flow Rate (p/h)	0	0	0	0	0
Ped. Right-Left Flow Rate (p/h)	0	0	0	0	0
Ped. R. Sidewalk Flow Rate (p/h)	0	0	0	0	0
Veh. Perm. L. Flow in Walk (v/h)	0	0	0	0	0
Veh. Perm. R. Flow in Walk (v/h)	0	0	0	0	0
Veh. RTOR Flow in Walk (v/h)	0	0	0	0	0

Maximum v/c Ratio: 1.36
Intersection Signal Delay: 167.8 Intersection LOS: F
Intersection Capacity Utilization 81.3% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 21: Hudson St & Frank Sinatra Dr & 11th St



Approach	EB	WB	NB	SB	NE
Bicycle Flow Rate (bike/h)	0	0	0	0	0
Total Flow Rate (veh/h)	0	83	464	443	0
Effct. Green for Bike (s)	18.0	18.0	29.0	28.0	0.0
Cross Street Width (ft)	29.2	24.0	37.9	36.1	27.9
Through Lanes Number	1	1	1	1	0
Through Lane Width (ft)	12.0	12.0	12.0	12.0	12.0
Bicycle Lane Width (ft)	0.0	0.0	0.0	0.0	0.0
Paved Shoulder Width (ft)	0.0	0.0	0.0	0.0	0.0
Curb Is Present?	No	No	No	No	No
On Street Parking?	No	No	No	No	No
Bicycle Lane Capacity (bike/h)	400	400	644	622	0
Bicycle Delay (s/bike)	28.8	28.8	20.7	21.4	0.0
Bicycle Compliance	Fair	Fair	Fair	Fair	
Bicycle LOS Score	2.01	2.06	2.91	2.84	0.00
Bicycle LOS	B	B	C	C	

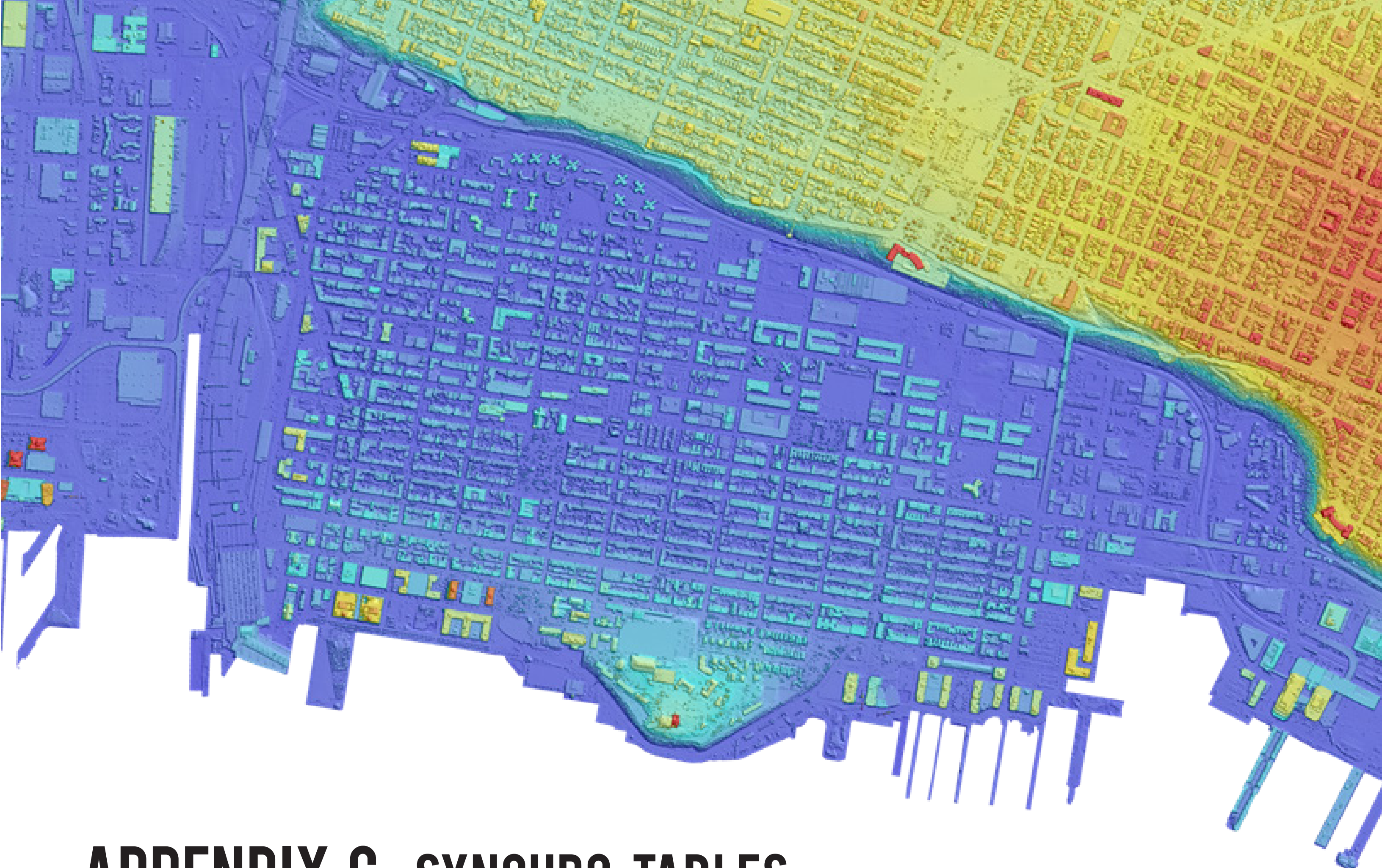
Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	0	0	0	69	198	0	0	0	0	0	280	130
Conflicting Peds, #/hr	118	0	142	149	0	101	118	0	142	142	0	118
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	75	215	0	0	0	0	0	304	141

Major/Minor	Minor1			Major2		
Conflicting Flow All	524	595	291	149	0	0
Stage 1	149	149	-	-	-	-
Stage 2	375	446	-	-	-	-
Critical Hdwy	7.12	6.52	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	-	-	-
Follow-up Hdwy	3.518	4.018	-	-	-	-
Pot Cap-1 Maneuver	464	417	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	646	574	-	-	-	-
Platoon blocked, %					-	-
Mov Cap-1 Maneuver	406	0	-	-	-	-
Mov Cap-2 Maneuver	406	0	-	-	-	-
Stage 1	-	0	-	-	-	-
Stage 2	646	0	-	-	-	-

Approach	WB	SB
HCM Control Delay, s		0
HCM LOS	-	

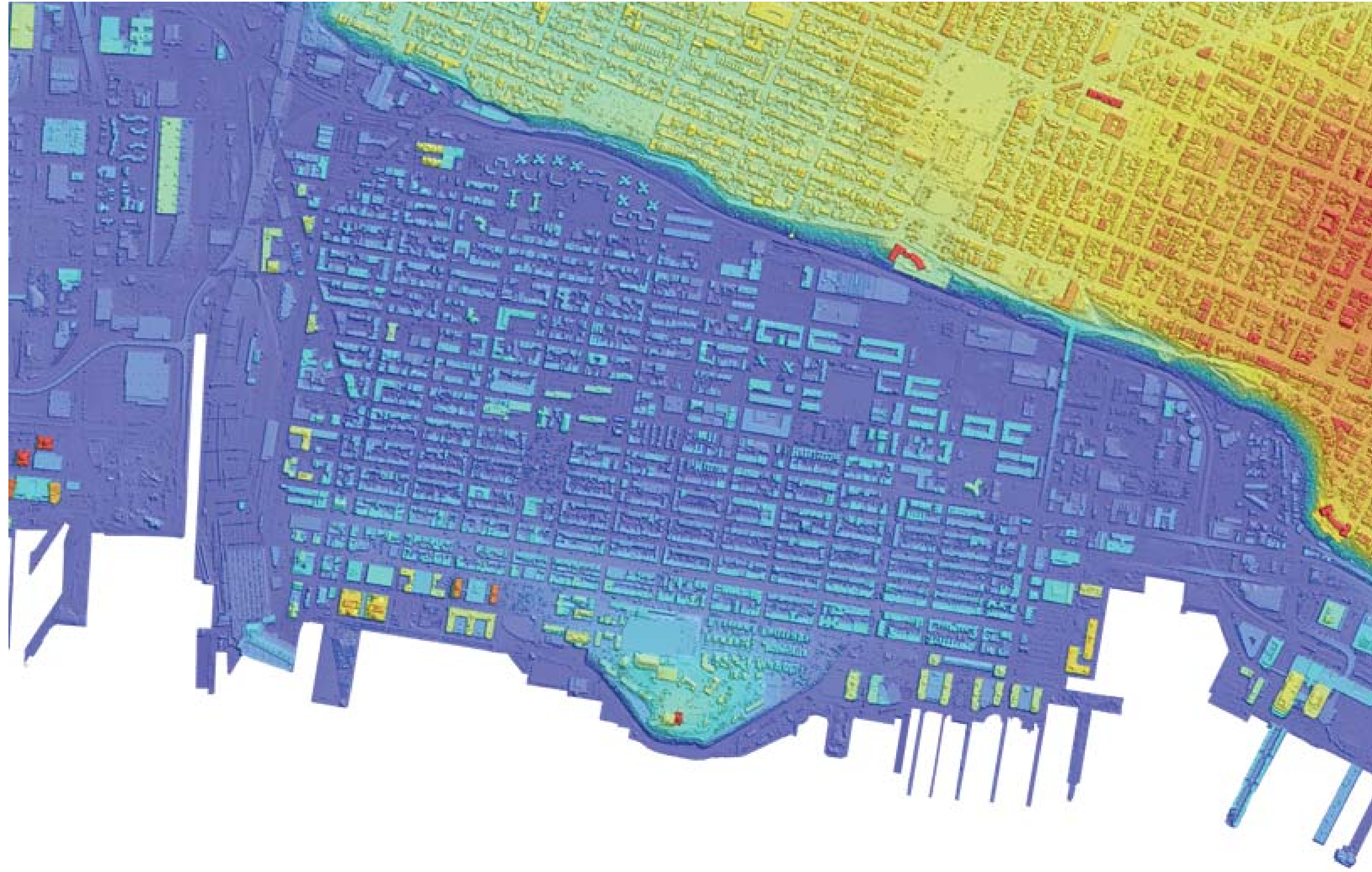
Minor Lane/Major Mvmt	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	-	0	-	-
HCM Lane LOS	-	A	-	-
HCM 95th %tile Q(veh)	-	-	-	-

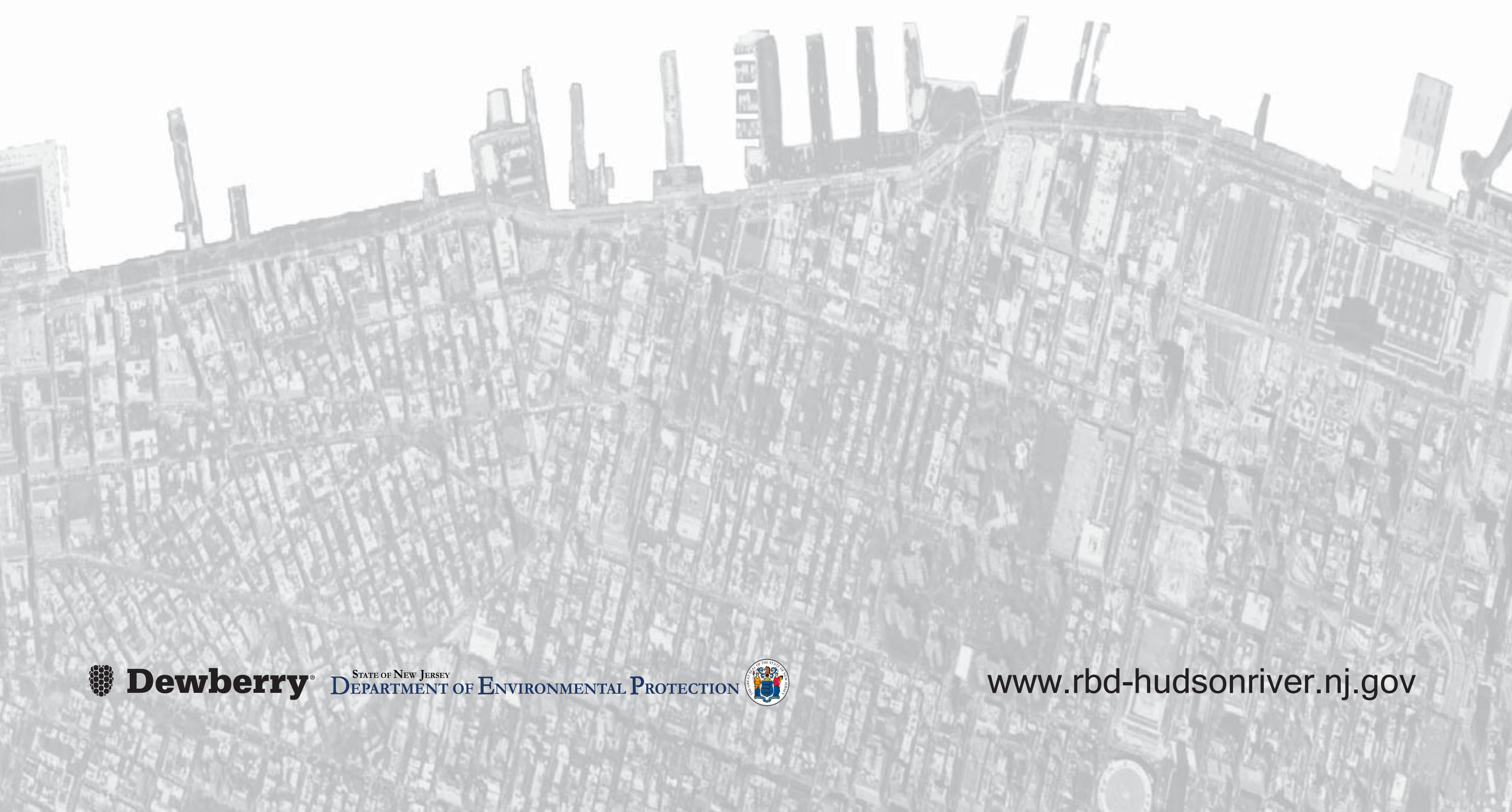


APPENDIX G– SYNCHRO TABLES

Existing AM Summary Table												
Node	North/South St	East/West St	Region	Intersection LOS	Vehicle Delay	Total Ped X-ings	Ped Crosswalk LOS	Ped Delay	Total Bikes in Crosswalk	Avg Bike Crosswalk LOS	Max Bike Delay	Notes
1	Jersey Ave	Eighteenth St	Jersey City	C	28.9	36	B	31.5	3	C	17.6	
2	Grove St	Eighteenth St	Jersey City	F	198.1	33	B	40	2	B	15.6	
3	Marin Blvd	Eighteenth St	Jersey City	F	146.3	87	B	40	12	C	15.7	
4	Harrison St	Newark St	Southwest	F	106.3	14	-	124.55 (EB)	1			* STOP CONTROLLED
6	Grove St	Newark St	Southwest	E	73	24	B	50	1	D	37	
7	Marin Blvd	Newark St	Southwest	D	47.1	42	B	50	3	D	28.9	
8	Grove St	Observer Hwy	Southwest	F	80	222	B	50	2	B	34.4	
9	Washington St	Observer Hwy	Southeast	D	52.3	401	B	50	5	C	22.4	
10	Hudson St	Observer Hwy	Southeast	A	4.2	121	-	1.03 (SB)	0			*STOP CONTROLLED
11	Hudson St	Hudson Pl	Southeast			1931			2			*FLAGGER- No signal
12	River St	Hudson Pl	Southeast			1170			5			
13	Hudson St	Newark St	Southeast	B	13.8	3193	B	50	1	B	29.6	
14	Willow Ave	12th St	North	C	22.2	404	B	45	2	B	19.3	
15	Willow Ave	14th St	North	E	60.6	278	B	45	2	D	23.2	
16	Washington St	14th St	Northeast	B	19.4	426	B	45	3	B	21.4	
17	Willow Ave	15th St	North			71			3			
18	Washington St	15th St	Northeast	B	11.9	227			2			*STOP CONTROLLED
19	Waterfront Terr	19th St	Weehawken			22			3			
20	Waterfront Terr	Harbour Blvd	Weehawken			4			1			
21	Hudson St	11th St/Frank Sinatra	Northeast	F	354.5	491			8			
22	River St	Newark St	Southeast			1752			9			
23	Hudson St	2nd St	Southeast	C	6.2	659	-	4.65 (SB)	0			* STOP CONTROLLED
24	River St	3rd St	Southeast			642			4			

Existing PM Summary Table												
Node	North/South St	East/West St	Region	Intersection LOS	Vehicle Delay	Total Ped X-ings	Ped Crosswalk LOS	Ped Delay	Total Bikes in Crosswalk	Avg Bike Crosswalk LOS	Max Bike Delay	Notes
1	Jersey Ave	Eighteenth St	Jersey City	C	20.5	19	A	31.5	0	C	17.6	
2	Grove St	Eighteenth St	Jersey City	E	63.7	21	B	40	6	B	15.6	
3	Marin Blvd	Eighteenth St	Jersey City	E	70.1	50	B	40	19	D	15.7	
4	Harrison St	Newark St	Southwest	F	42.6	9	-	519.52 (EB)	5			* STOP CONTROLLED
6	Grove St	Newark St	Southwest	D	54.1	38	B	50	3	C	31.2	
7	Marin Blvd	Newark St	Southwest	C	32.7	22	B	50	0	C	28.8	
8	Grove St	Observer Hwy	Southwest	D	51	145	B	50	12	B	34.4	
9	Washington	Observer Hwy	Southeast	F	145.4	236	B	50	4	C	25.9	
10	Hudson St	Observer Hwy	Southeast	A	4.7	60	-	0.85	0			*STOP CONTROLLED
11	Hudson St	Hudson Pl	Southeast			520			2			*FLAGGER- No signal
12	River St	Hudson Pl	Southeast			939			0			
13	Hudson St	Newark St	Southeast	B	12.4	2005	A	50	3	B	29.6	
14	Willow Ave	12th St	North	C	20.9	100	B	45	1	B	19.3	
15	Willow Ave	14th St	North	D	70.1	36	B	45	0	C	24.2	
16	Washington	14th St	Northeast	B	16.4	301	B	45	2	B	21.4	
17	Willow Ave	15th St	North			17			0			
18	Washington	15th St	Northeast	B	10.4	111			0			*STOP CONTROLLED
19	Waterfront Terr	19th St	Weehawken			9			0			
20	Waterfront Terr	Harbour Blvd	Weehawken			3			0			
21	Hudson St	11th St/Frank Sinatra	Northeast	D	354.5	243			1			
22	River St	Newark St	Southeast			1407			3			
23	Hudson St	2nd St	Southeast	C	8.2	610	-	3.1	5			* STOP CONTROLLED
24	River St	3rd St	Southeast			439			2			





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