APPENDIX A

ENGINEERING REPORT

Appendix A.1 - Below Deck Infrastructure Matrix

Appendix A.2 - Proposed Changes to Amtrak Yard

Appendix A.3 - Design Process & Methodology

Appendix A.4 - Mid Day Storage Yard Analysis

Appendix A.5 - Deck Coverage Evaluation

Appendix A.6 - Conceptual Deck Design

Appendix A.7 - Potential Early Investments

APPENDIX A.4

Mid-Day Storage Yard Analysis

PROJECT: Sunnyside Yard Master Plan
LEAD: HNTB/Thornton Tomasetti
DATE: 07/03/19
SUBJECT: MTA LIRR Mid-Day Storage Yard Analysis

I. Overview

This memorandum summarizes the proposed design approach, including any modifications or new systems needed, to facilitate the construction of an overbuild deck and associated design scenarios for the Sunnyside Yard Master Plan (SSY-MP) project above the Long Island Rail Road (LIRR) Mid-Day Storage Yard (MDSY). For this analysis the following elements were contemplated and addressed:

- MDSY Anticipated Existing Conditions
  - Facility Program
  - Operating Plan
- MTA Design Standards
  - Horizontal Clearances
  - Vertical Clearances
- Design Approach at MDSY
  - Column and Design Spacing
  - Existing DOT Bridges
  - Lighting, personnel access footbridge, and other vertical elements
- Approach to Overbuild Health and Safety
  - Crash Protection
  - Ventilation
  - Fire & Life Safety

Over the course of the SSY-MP development, the design team met with LIRR engineers to review MTA's design standards, operational needs, and the proposed SSY-MP design and safety approach. Following those meetings the design approach was modified to reflect LIRR's feedback. This report reflects the outcome of those meetings and is the documentation of the final approach taken by the design team as part of the Master Plan effort.

II. LIRR MDSY Yard Anticipated Existing Conditions

Currently under construction by Metropolitan Transit Authority - Capital Construction (MTA-CC), MDSY will provide LIRR additional storage and maintenance capacity to accommodate new commuter train service into Grand Central Terminal as part of the MTA's East Side Access (ESA) program. This $300 million contract commenced in April 2017 and is scheduled for completion in late 2020. This section discusses the team's understanding of MTA-CC's proposed as-built and operational conditions for MDSY based on a review of materials provided by the MTA. Understanding this program will help the SSY-MP team avoid or minimize any proposed impacts to the MTA's newly constructed yard and facilities.

A. Programmatic Understanding

MDSY is 8,000 feet (1.5 miles) in length and covers 35 acres (1.5 million square feet). Key construction elements of MDSY include:

- Demolition of the various buildings, catenary structures, and the Montauk Cutoff Bridge and Ramp

- Installation of 81 switches
- Construction of 9 miles of track and 11 miles of third rail (288 rail car capacity)
- Installation of 3 substations
- Installation of 552,000 linear feet of concrete-encased conduit
- More than one million linear feet of wire and cable
- 193 utility poles supporting more than 600 lighting fixtures and security cameras
- Construction of retaining wall and action block walls
- 61,000 linear feet of fire, water, storm, sanitary and underdrain lines
- One sanitary pump station
- 130 electric manholes
- 57 sewer manholes
- 112 car service consoles
- 8 Central Instrumentation Locations (CILS) that will house the new microprocessors controlling signals, switches, and train movements in Harold interlocking

MDSY will comprise the following service and support structures:

- Storage building
- Toilet servicing building
- Cart storage and charging building
- Personnel Access Footbridge including 10 access stairways
- 24 Car appearance maintainers (CAM) platforms and inspection pits

B. Operational Understanding

As a component of LIRR's ESA Project, MDSY will be a critical part of the operating plan, specifically in supporting the storage of trains for Grand Central Terminal. In operation, the yard will have two peaks during the day, receiving trains from Grand Central Terminal during the morning and sending equipment to Grand Central Terminal for the evening departures. Train operations will also be supported by Arch Street Shop and Yard, for the servicing and light repair of rolling stock and equipment.

An important feature of the yard design is the ability for LIRR to transfer equipment between Penn Station and Grand Central Terminal. This interchange of trains between both terminals allows LIRR to maximize the utilization of equipment and staff. LIRR can reassign train layovers from the West Side Yard to MDSY and determine assignments for crews and equipment.

LIRR trains can access the yard from both Penn Station (via "F" Interlocking) with connections to MDSY east leads via Loop 1A to "R" and from the west end of yard to "Q" Interlocking" via connections to the East River Tunnels. Trains from Grand Central Terminal will access by "PLAZA" Interlocking via the Yard Lead Tunnel and connections to east end of the yard via a future "T" Interlocking. Given the importance of MDSY for LIRR operations the SSY-MP design team assumed that there could be no change or decrease in the operational functions of the Yard. Any proposed modifications to the yard outlined in the sections below do not impact the yard's operational functions.

III. Design Standards

This section documents the SSY-MP team's understanding of design standards related to horizontal and vertical clearances. These design standards were reviewed with LIRR engineers at coordination meetings during the SSY-MP process.

A. Horizonal Clearances

Minimum horizontal track clearance requirements for column locations within the LIRR MDSY are as follows:

- 12'-4 ¼" from centerline of track. Standard side clearance on all permanent obstructions as per LIRR Standard Drawing 820-10 *Minimum Railway Clearances*
- 8'-6" from centerline of track. Minimum legal side clearance as per New York State law

These clearances must be increased through track curvature to account for excesses the vehicle generates as it navigates curved track. This is due to the nature of a rigid straight vehicles being located on a curve resulting in what is called Center and End Vehicle Overhang.

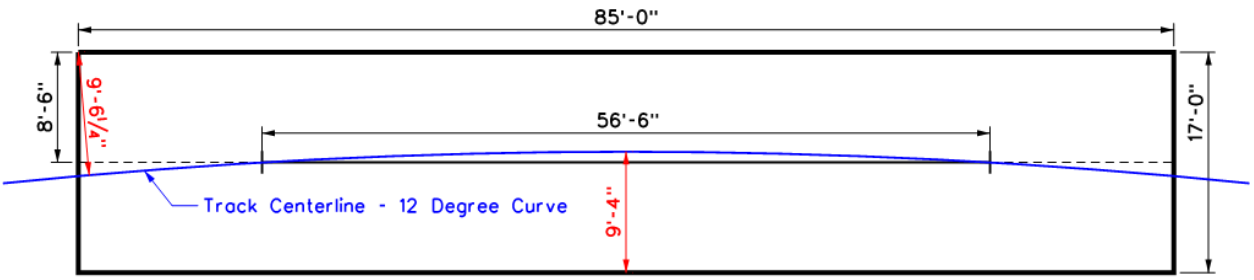


Figure 1: Vehicle Excess from Track Curvature

As shown in Figure 1, an 85'-0" long vehicle with trucks (wheels) spaced at 56'-6" and drawn at 17'-0" wide to represent the 8'-6" clearance to either side. As shown, the physical offset from centerline of track, at the center of the vehicle, increases from 8'-6" to 9'-4", representing the additional center overhang. A similar overhang can be seen at the ends of the vehicle known as "end overhang".

To accurately model the excesses generated by track curvature, and to account for the transition between tangent and curved clearances, the vehicle clearance envelopes were "pushed" along each alignment and through switches within MDSY. This modeling creates a footprint known as the Vehicle Swept Path representing an 8'-6" clearance from centerline of track that accounts for all excesses due to curvature. It is outside of the vehicle swept path footprint that columns can be located and remain clear of the 8'-6" minimum clearance requirement. An example of the column clearance footprint can be seen in Figure 2.

For locations within the yard where the inspection and servicing of train consists is required, which would encompass the full storage length of the yard tracks, an additional clearance must be provided. The required clearance to perform these duties is defined as 4'-0" minimum from a standing vehicle which in turn translates to a minimum of 9'-4" required between the centerline of track and the face of columns.

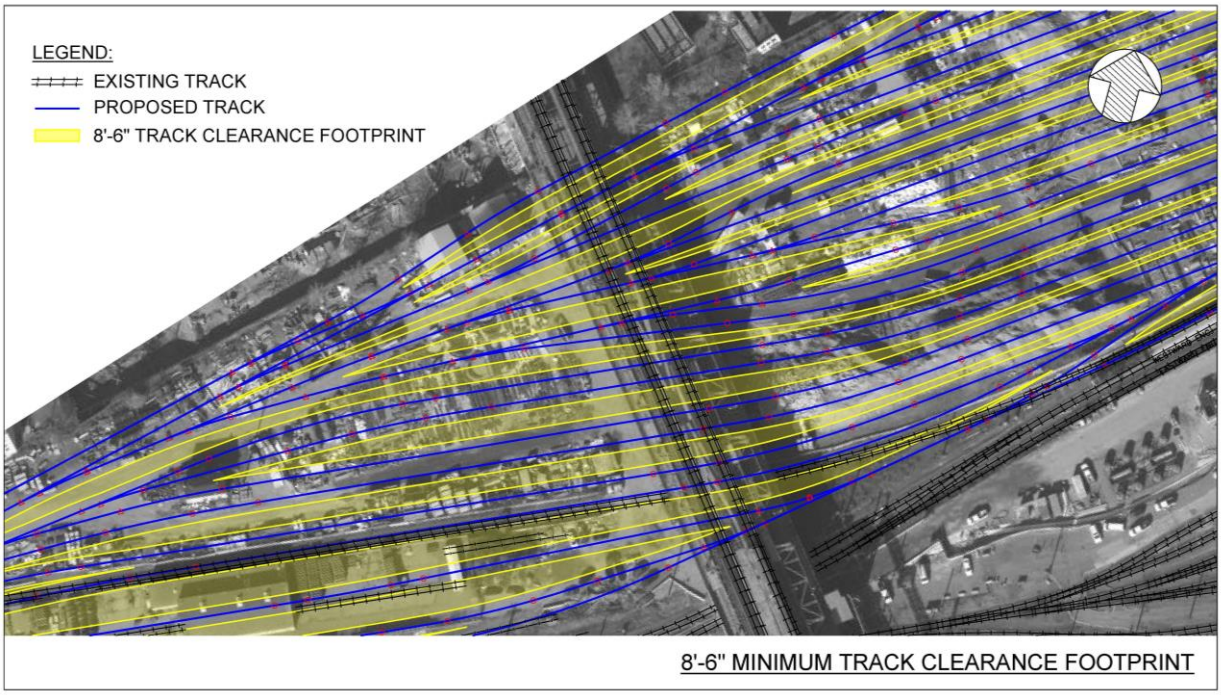


Figure 2: Minimum Track Clearance Footprint

B. Vertical Clearances

Per LIRR requirements, vertical clearances from top of rail to underside of structural deck or fixtures are minimum 22'-0". Refer to Appendix A.4.A for LIRR Clearance Diagrams. Although the LIRR storage tracks do not use overhead catenary power, 60 new lighting structures will be installed as part of MDSY construction: 54 cross catenary structures and 6 rigid structures in the launch shaft area ("Q-tip"). Each lighting pole will have a maximum height of 36-feet and will be encased in a 3-foot diameter pole foundation.

A Personnel Access Footbridge is also currently under construction within MDSY. Upon completion, the footbridge will span across all tracks within MDSY and maintain a minimum clearance of 18'-6" above the top of the tracks. A total of 10 stairways will provide access to the footbridge.

IV. SSY- MP Design Approach at MDSY

This section discusses the SSY-MP approach to designing the deck over MDSY, including any proposed modifications given the programmatic, operational and design standards discussed earlier in this memo.

A. Horizontal Clearance Impact on Column Design and Spacing

Where practical and achievable, the deck design will meet or exceed the 12'-4 ¼"' minimal horizonal clearance requirement. An absolute minimum 8'-6" clearance will be maintained for locations where the 12'-4 ¼" is not achievable.

Several strategies were implemented to develop the final conceptual scheme presented in Appendix A.4.B. The implications of those strategies on horizontal clearances were considered.

MDSY includes several closely-spaced zones where columns could potentially be located and still meet the minimum 8'-6" horizontal cartway clearance requirement from centerline of track to face of column. To meet the cartway clearance, a structural design requirement was developed to use rectangular concrete column profiles that are a maximum of 2'-8" wide in the cross-track direction. All of the design scenarios associated with different column line spacings are able to accommodate this criteria, but they vary in length in the direction along the tracks in response to the different loading. See Appendix A.4.E which illustrates the 2'-8" column width, as well as a proposed scheme for locating the columns to provide optimal clearances for the cartways in response to the LIRR's comments at the 3/12/2019 meeting.

In terms of which column lines were selected for the proposed optimal scenario presented in Appendix A.4.B, it was initially assumed that columns may skip every other zone in order to minimize the number of pieces required to construct the deck. The tradeoff is that the depth of the structural deck would need to be thicker to accommodate the longer deck span, which would then impact the vertical clearance profile. In order to meet the proposed criteria where the bottom of deck structure does not extend lower than the existing bottom of bridge structure, additional column lines were added to cut the structural spans and therefore the deck thickness.

Structural solutions were also studied to consider more closely spaced framing in order to reduce the structural depths. In this scenario, beams were set at approximately 5 feet on center and the slab would be constructed of either a lightweight plank and a topping slab or a slab on metal deck. Alternatively, when this strategy was not sufficient to decrease the structural deck thickness, the loading was reduced from the baseline loading scenario. Refer to Table 1 for the Loading Assumptions.

Table 1 – Loading Assumptions

Baseline Loading Scheme		Reduced Loading Scheme	
Superimposed Load (Amtrak / LIRR Below)	30 psf	Superimposed Load (Amtrak / LIRR Below)	30 psf
Superimposed Load (Overbuild)	600 psf	Superimposed Load (Overbuild)	250 psf
Live Load	300 psf	Live Load	300 psf

For the purposes of comparing column profiles, Figure 3 below shows a sample of possible column-line layouts. These schemes include the incorporation of the massing plans from PAU from the April 12 deliverable to NYCEDC, which includes high-rises. Scheme 2, specifically, is presented to address interest in reducing the number of column lines that are required in order to minimize the impact on the rail yard below during construction. However, this scheme will result in increased deck spans and depth which may expand the vertical clearance variance regions presented in Appendix A.4.D.

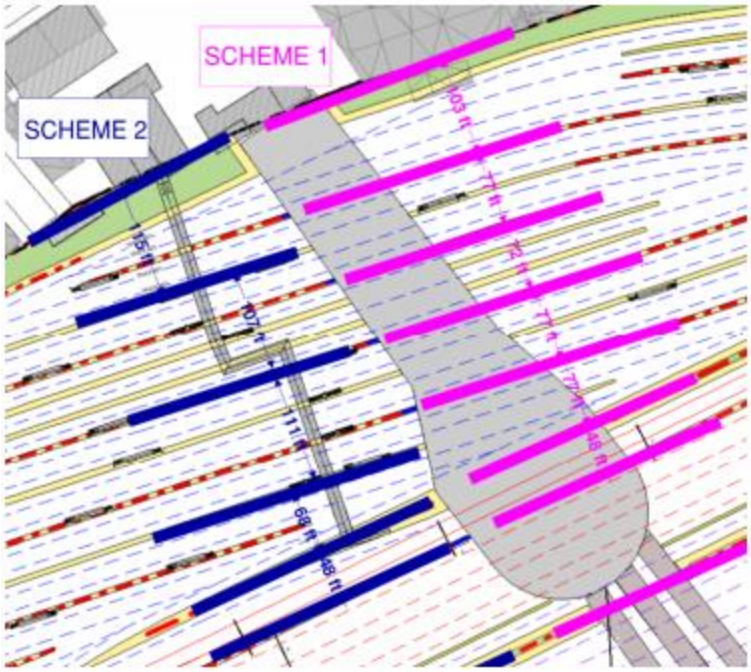


Figure 3. Sample of Updated Schemes 1 and 2 in MDSY Storage Area, Sector C

Table 2 summarizes the column dimensions in Schemes 1 and 2 compared to earlier schemes. Note that updated Scheme 2 requires columns wider than those in Scheme 1 by 2” to 4”, but it can greatly reduce the number of columns overall.

Table 2 – Column Dimensions for Schemes 1 & 2	
Scheme 1- Rectangular Option 2’-8” X	Scheme 2- Rectangular Option 2’-8” X
4’-9”	5’-1”

As the design is further developed, if there are instances in which the minimum clearance of 8’-6” cannot be met, a variance may be pursued through either the LIRR and/or NYSDOT as appropriate. Currently, there are no instances of this scenario as part of the SSY-MP design.

B. Vertical Clearance Variances and Modifications

The minimum vertical clearance of 22’-0” is achievable and can be maintained for the majority of the deck design. Below is a discussion of the known instances where variances and modifications would be needed.

1. Deck Interface with DOT Bridges

The existing clearances under the bridges at Thompson Avenue, Queens Boulevard, Honeywell Street, and 39th Street do not currently meet the 22’-0” standard. Refer to Appendix A.4.A for LIRR Clearance

Diagrams. To achieve access from the existing bridges onto the deck, a vertical clearance variance would be needed to allow for this transition zone between the deck area and the existing bridges.

Based on an analysis of the existing NYCDOT bridge drawings, the lowest vertical clearances below the bridges within MDSY are as listed in Table 3:

Table 3 - Existing Clearances at NYCDOT Bridges	
Bridge	Approximate Lowest Clearance
Thomson Avenue	19'-2"
Queens Blvd	15'-6"
Honeywell Street	16'-7"
39th Street	17'-10"

To determine the vertical clearance variances that would be required throughout MDSY for the construction of the deck, several sections were studied at Thompson Avenue, Queens Boulevard, Honeywell Street, and 39th Street Bridges.

The following is a summary of the design criteria that were established to define the limits of the new deck:

- Where possible, the bottom of the deck structure shall not be lower than the existing bottom of bridge structure elevations
- The top of deck shall be stepped up in order to achieve the minimum clearance required as quickly as possible
- The first 60 foot width of deck parallel to the bridge is assumed to remain flat to allow flexibility for a transition zone to access the deck. The deck would start to slope after this point
- A slope of 1 to 20 was assumed at top of structure to provide the ideal slope for pedestrians and car access to transition from the bridge to the overbuild deck
- Existing cross track feeders would need to be relocated and re-supported at the underside of deck

The plan layout in Appendix A.4.B presents a scheme which achieves this vertical clearance criteria. This is illustrated in the cross sections presented in Appendix A.4.C at each bridge. Because the SSY-MP project directive is for the deck to interface with the existing bridges, which do not meet the vertical clearance requirements, the regions of new deck directly adjacent to the bridges will require vertical clearance variances. These regions are illustrated in plan in Appendix A.4.D, and are coordinated with the scheme presented in Appendices A.4.B & A.4.C. As is shown, the plan extents of the regions requiring variances range from 60 – 150 feet.

2. Deck Interface with MDSY Vertical Structures

Any deck structure must either clear MDSY lighting structures and footbridge or these elements must be modified as part of the deck construction. As the proposed deck elevations are set based on typical vertical track clearance, the SSY-MP design proposes lowering and mounting the lighting structures on the underside of the deck construction and integrating a new footbridge into the construction of the deck.

3. Other Considerations

The additional strategies listed below may also be implemented to further limit the reduced vertical clearances. However, these options are not included in these studies at this time.

- Additional areas could be studied with a reduced loading scheme, however this would impact the flexibility of the overbuild structures.
- A study could also be done to verify the impact of increasing the top of deck slope from 1:20 to 1:12, which still satisfies ADA requirements but is less desirable from an access point of view.
- Custom sections could be designed for the steel or precast options to achieve more compact structures, however this will likely increase material costs and weights which can also impact constructability and financial feasibility of the project.

V. Approach to Overbuild Health and Safety at MDSY

An overbuild at MDSY will be designed to maintain health and safety for occupants of the yard. This section reviews the approach to implementing crash protection, ventilation, fire, life and safety design criteria, as well as any resulting modifications to MDSY.

A. Crash Protection

As a slow speed area, MDSY will contain columns designed to withstand direct impact from a derailed train. Additionally, along track segments running adjacent to columns, guard rails will be installed to minimize the distance that a derailed train could diverge from the track.

To calculate the forces a column would have to absorb without failing, a LIRR twelve car Bi-Level trainset was used for modeling. The trainset and weights are listed below.

- 1 DM30 AC Locomotive = 299,844 lbs. Each
- 5 LIRR Bi-Level Trailer Car (w/out toilet) = 141,375 lbs. Each
- 5 LIRR Bi-Level Trailer Car (w toilet) = 144,338 lbs. Each
- 1 LIRR Bi-Level Cab Car = 148,771 lbs. Each

These weights assume empty equipment, no passengers, and results in a total weight of 1,877,180 lbs. for the full trainset. The speeds used to calculate the force to be absorbed by the columns will be the restricted speeds as given in the operating agencies timetable. For all tracks through the yard the restricted speed is 5 MPH.

B. Ventilation

MDSY, as constructed for ESA, will not include equipment required for ventilation of decked areas. A ventilation system will have to be integrated into the overbuild construction. MTA's yard operations (i.e. hot works for rolling stock repair, rail grinding and other activities requiring ventilation and fire protection activities) will require management interface with systems installed by others. The following is a description of the conceptual approach to ventilation and associated design criteria identified as part of the SSY-MP effort.

Ventilation systems to mitigate fire hazards within the overbuild should be configured as a zoned ceiling exhaust system that utilize stratification of hot smoke at the ceiling. Ventilation plants would be constructed inside ventilation plant buildings at key locations on the overbuild to accommodate each ventilation zones capacity demands. The design proposes reversible tube-axial ventilation fans to provide exhaust from under the overbuild with discharge stacks located at a minimum of 10' above ventilation plant buildings finished grade. Figure 4 provides estimated ventilation zones within the yard area with the approximate ventilation plant buildings locations.

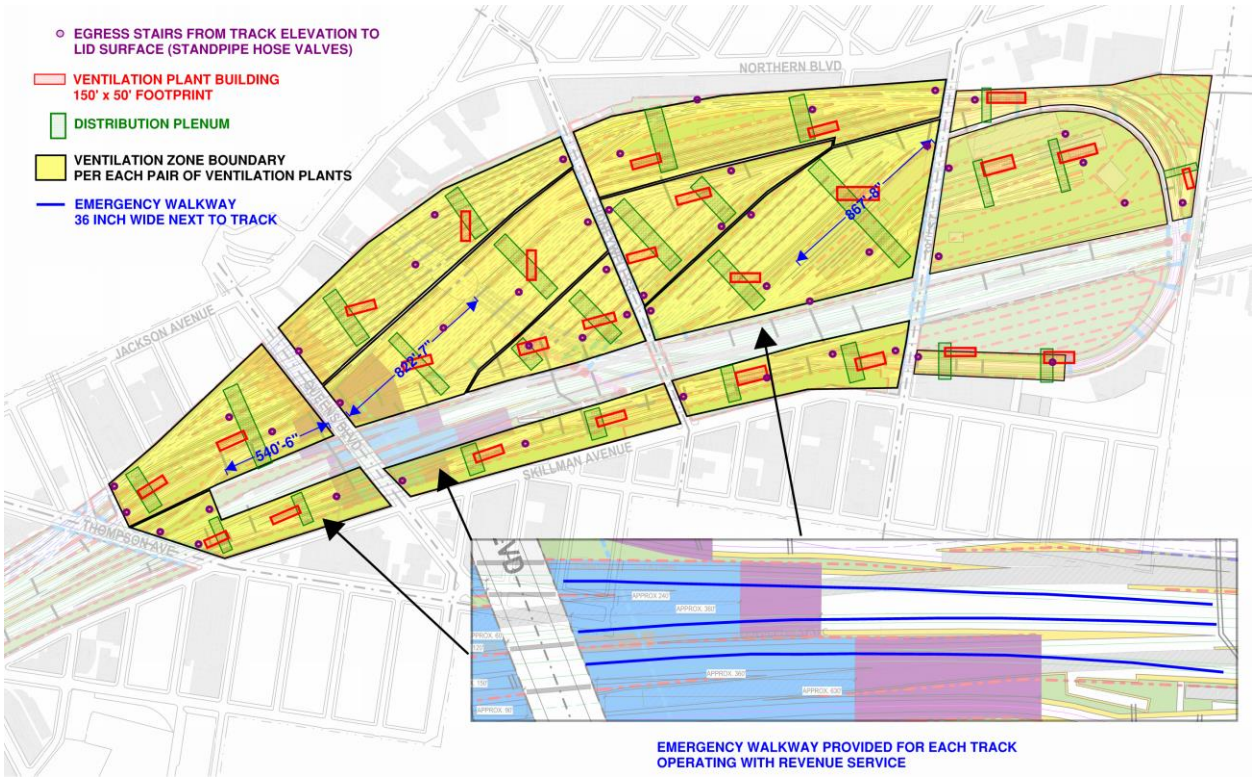


Figure 4. Overall Ventilation Plant Building and Egress Stairs Locations

The ventilation fans would be configured in duplex arrangement to provide the required ventilation demand for each ventilation zone. Total number of ventilation plants should also be configured to provide equipment redundancy for unexpected equipment failures or maintenance required shutdown conditions. Ventilation plants would need to be sized according to fire scenarios applicable to required standards and to avoid the occurrence of plugholing. Initial calculations by the Sunnyside Yard Master Plan engineering team estimate that two 500 kCFM ventilation plants would be required per each ventilation zone with each of the 2 plants configured with two 250 kCFM tube-axial ventilation fans for equipment redundancy.

Ventilation fan plants would be designed to meet MTA design guidelines including but not limited to:

a) Preference for horizontal flow configuration of axial reversible fans to facilitate equipment removal and maintenance operations with the following features:
   i) Tube-axial fan equipment shall be removable from facility as one unit including power, instrumentation and controls terminal boxes.
   ii) Removal of tube-axial fan shall not require major disassembly of other equipment components
   iii) Ventilation plant shall include trolley beams configured for major equipment removal
   iv) Equipment shall be configured for maintenance from plant floor whenever feasible
   v) Equipment shall be configured such that entire assembly including terminal boxes can be removed through hatch directly to street.

b) Tunnel Ventilation Fan Plant and other support facilities design concepts
   i) Utility service electrical equipment shall be located in a separate room (2 hr rated construction) from control equipment used for local control of the plant for maintenance.
   ii) Equipment for systems other than that of the fan plant (e.g. tunnel lighting, signals) shall not be installed in the fan plant
   iii) Fan plant facility shall be designed with 2 means of egress
   iv) Air plenums shall not be used to access any rooms constructed within the fan plant.

v) Portable fire extinguishers shall be provided in fan plant.
vi) No equipment shall be mounted directly to any floor. Concrete pads shall be provided and equipment anchored to floor.
vii) Fan plant shall include separate enclosed local control room configured such that view ports would allow observation of all moving equipment (fans, and automatic dampers).

c) Ventilation discharge stack design including integration into city scape and adjacent building construction with the following design features:
   i) Limited noise transmission to ambient from ventilation equipment
   ii) Ventilation discharge protection from rain water and storm drainage flows
   iii) Ventilation discharge location to limit smoke re-entrainment into adjacent ventilation plant operating in supply mode
   iv) MTA yard areas where Amtrak passenger coaches are not allowed to operate, design fire load shall include medium growth fire to peak heat release rate of 5 MW with a radiation energy component of 30%
   v) Push/pull ventilation systems designed for stratified smoke will be designed to maintain tenable environment with 10-meter local visibility to reflective surfaces below 6' elevation.

Smoke exhaust would be gathered by an exhaust distribution plenum system that would be integrated into the deck's structural interstitial space above rail yard ceiling surface. Exhaust openings through ceiling would be configured to distribute mass flow and prevent inefficient smoke exhaust conditions. Structural fire durability provisions such as thermal protection board and fire sprinklers would need to be incorporated into design of plenum exhaust distribution system in the event exhaust is not conveyed in ductwork.

Structural fire durability would be provided by either ceiling surface constructed between structural members and yard space below or systems applied directly to deck structural members (i.e. spray fire proofing, PPP fiber). Fire durability design criteria for fire protection thermal insulation board will depend on ceiling elevation geometry for the yard. Water based overhead fire protection sprinkler systems can also be designed to provide structural fire protection. There will need to be further work with the MTA and the FDNY to determine the appropriate systems to ensure adequate ventilation and fire durability design.

Overbuild construction will require modifications to existing MTA wayside structures beneath the overbuild. These modifications would include providing code compliant stairways designed to provide egress from inside the enclosed environment of the rail yard to the open-air public way at street surface level of the overbuild. Wayside structures would also require design elements to mitigate additional acoustic and air quality demands created by enclosed space under deck structure.

Design of the overbuild will include openings (with or without doors) large enough to permit fire trucks and other emergency response vehicles to access fire hydrants, fire department connections and other key locations and/or equipment in track wayside areas. Based on the existing fire hydrant locations, Figure 5 and Figure 6 provide overall plan view and schematic diagram of the fire protection system within the yard area with preferred fire department connection locations and standpipe network to reach each fire hose valves located in the egress stairs locations. Hydrants and water connections will have to be reviewed and approved by MTA and FDNY prior to installation.

Figure 5. Overall Fire Protection System with Standpipe Network within Yard Area

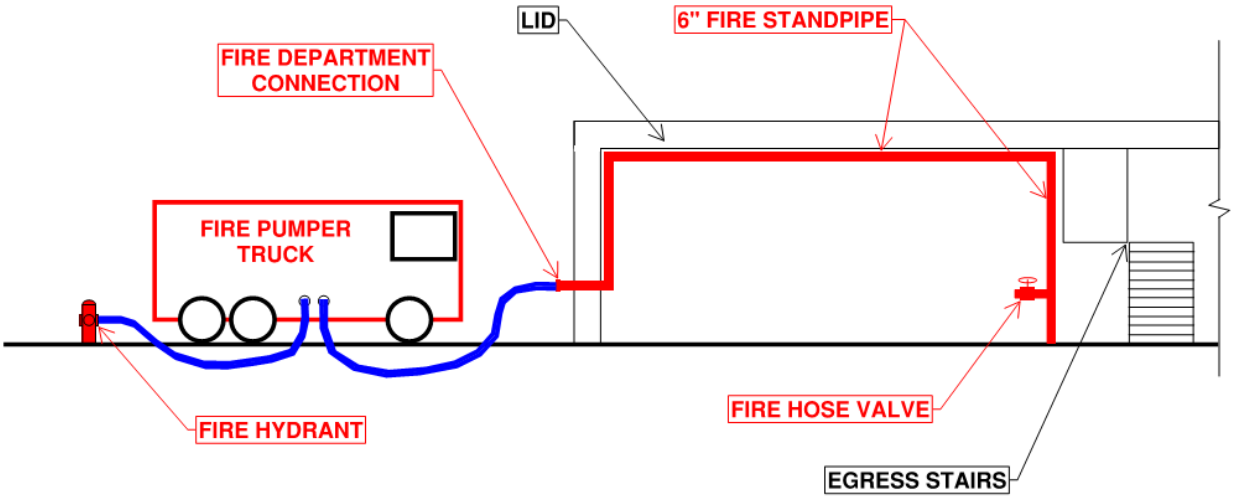


Figure 6. Fire Protection System Schematic Diagram

C. Fire Dynamics

Fire design scenarios proposed in this study are recommended based on rail and other vehicles operating within train platform gallery region under train shed area of the station. These design fire scenarios are consistent with the "Overbuild of Amtrak right-of-way design policy." Design fire loads presented by MTA rolling stock would incorporated into yard sections where Amtrak rail traffic can be excluded. As the phases of the Master Plan move forward further fire design scenarios may need to be studied to ensure that the appropriate factors are being accounted for the deck design.

Typical possible fire scenarios are listed below:

<u>Train Fire Below Platform Concourse Within Train Shed Area</u>
In this scenario, fire is assumed to start maliciously from passenger seat in a stationary train below within train shed area. If fire is ignited maliciously, initial fire source may involve the use of limited amount of accelerant. Fire is assumed to be directly adjacent to a non-incident train such that fire can

spread from one passenger coach to another and reach peak heat release rate of 52MW with three stages of fire growth. Within the first three minutes, fire reaches 5MW of HRR and remains constant for the next seven minutes. Fire then linearly grows to 10MW of HRR within three minutes and remains constant for the next seven minutes. After the constant period, fire then linearly grows again to 52MW within six minutes and remains constant until the conclusion of simulation at thirty minutes. Table 4 and Figure 7 below provide the full breakdown list and graph of the fire growth rate applied in this study.

Table 4. Table of Fire Growth Rate Applied in This Study

Time (s)	Heat Release Rate (MW)	Heat Release Rate (MBTU/hr)
0	0	0
180	5	17.060
600	5	17.060
780	10	34.120
1200	10	34.120
1560	52	177.476
>1560	52	177.476

Figure 7. Chart of Fire Growth Rate Applied in This Study

<u>Locomotive Train Fire</u>

Diesel locomotive train fire in the yard area and mainline are not considered a credible fire load due to the following reasons,

- Standard operation protocols consist of electrified train operations on mainline.
- In the event of abnormal operating conditions where locomotive is required to pull train into yard, special fire safety operation protocols will be followed. Active monitoring by yard manager is expected to limit fire hazard risks to occupants.
- In the event of abnormal operating conditions where locomotive is required to pull train on mainline, special fire safety operation protocols will be followed. Active monitoring by train engineer is expected to limit fire hazard risks to occupants.

D. Structural Fire Durability

For this stage of the design work it was assumed structural fire durability would be based on criteria from the following:

- NFPA 130 – Standard for Fixed Guideway Transit and Passenger Rail Systems
- NFPA 502 – Standard for Road Tunnels, Brides and other Limited Access Highways, sections on air right structures
- ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials
- ASCE\SEI\SFPE 29-05 – Standard Calculation Methods for Structural Fire Protection

Given the size of the Yard present codes may be inadequate in providing sufficient fire durability. As phases of the Sunnyside Yard Master Plan move forward fire durability analysis for the overbuild deck will be needed to determine the appropriate structural and fire protection systems configuration required to prevent progressive collapse of the overbuild deck in the event of a design fire incident. Systems would be designed to maintain structural integrity without collapse due to elevated temperatures caused by a fire within the overbuild. Industry accepted design methods would be employed that may include analysis using Computational Fluid Dynamics (CFD) to determine the surface temperature of the overbuild support structure over time to determine if there is a possibility structural failure. The analysis will be based on the peak fire heat release rate and growth rate described in the Fire Dynamics section, as well as the thermal conductivity of the material.

E. Site Fire Life Safety

The design for the Fire Life Safety system within the overbuild deck will need to be agreed upon by the MTA and the FNDY for future phases of the Master Plan. For this early conceptual work the engineering team followed the 2014 New York Building, and Fire Code to inform the design approach for Fire Life Safety systems within the proposed deck. NFPA 130 was used as it is applicable to areas that include passenger terminals and transit ways used for public occupied trains. Using this standard, the design of egress elements will be based on the following criteria:

- Means of Egress is continuous to a public way (2014 ed. NYCBC 1007.2)
- Occupancy classification of buildings defined by Chapter 3 of 2014 ed. NYCBC
- Fire-resistance rating of enclosed exits based on section 1019.1 of 2014 ed. NYCBC
- Standpipe system shall be provided in enclosed trainways where physical factors prevent or impede access to the water supply or fire apparats, where required by the jurisdiction. (2017 ed. NFPA 130 6.4.5.1)

In the event of a fire within the overbuild, occupants at Sunnyside Yard will need a means of safe egress through fire rated enclosed staircases. These staircases will lead to openings in the overbuild deck above, allowing occupants to traverse vertically to a public way while providing emergency responder access between the deck above and the yard.

Overbuild construction will require existing structures below the overbuild deck, additional retrofit construction of fire rated code compliant stairs and corridors from the buildings in enclosed rail yard environment to a public way space above the overbuild deck. The retrofit stairs could be separate structures located adjacent to existing buildings provided egress path length within the building does not exceed code accepted distances.

Performance based code development would be required to demonstrate acceptable egress distances for stair locations within the rail yard area based on building code Industrial occupancy classification. It is expected that high ceiling clearance within hard areas in conjunction with ventilation systems will mitigate fire hazards and provide sufficient egress time for the egress stair locations indicated in Figure 8.

Headhouses for the stairways above the deck would need to be coordinated, headhouses on the deck may compromise the value of open spaces, and it may be preferable to incorporate stairways into buildings on the deck instead.

A fixed fire suppression system will need to be provided. Dry type pre-action deluge sprinkler system could be provided with a positive alarm sequence to allow traction power shut down and contact wire grounding by yard power desk prior to operation. This system allows for freeze protection and safe operations within yard area with active power contact systems. Sprinkler heads will be located underneath the overbuild and spaced along the tracks to provide coverage to trains in the event of a fire.

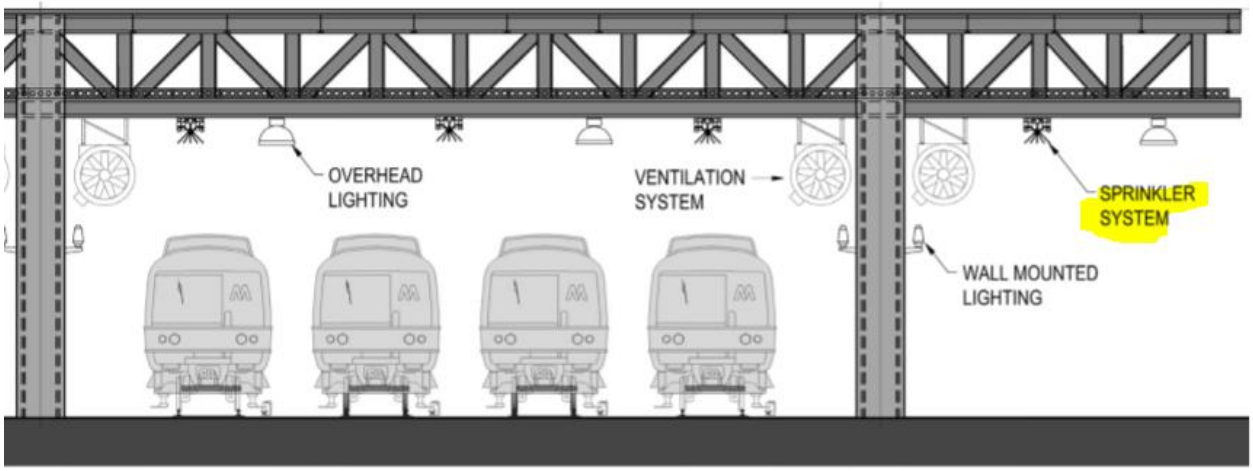


Figure 8: Sunny Side Yard Section View w/ Sprinklers

A standpipe system should be considered for firefighting in the enclosed railyard, and fire department connections (FDC) for the New York Fire Department provided on the surface. This should be provided where physical factors prevent or impede access to the water supply. The design of the standpipe system will be based on the availability of fire hydrants based on their proximity to the yard as well as available emergency access locations.

Further work will be needed to finalize the design for the fire suppression system to ensure the system is adequate for the fire load contained within the area covered by the deck. This will require ongoing Fire Life Safety coordination and concurrence will occur with the MTA, NYPD, FDNY and Amtrak beyond this Master Plan framework.

VI. **Summary**

Upon the launch of ESA service, MDSY will serve as a critical component for LIRR operations. While the SSY-MP design approach will not impact the yard's operational functions, design modifications and preliminary health and safety approaches are proposed to facilitate an overbuild:

- <u>Horizontal Clearances/Column Spacing</u>
    - Where practical and achievable, the deck design will meet or exceed the 12'-4 ¼"' minimal horizonal clearance requirement.
    - An absolute minimum 8'-6" clearance will be maintained for locations where the 12'-4 ¼" is not achievable, utilizing a 2'-8" column width in the cross-track direction
    - Dimensions of the column in the along-track direction will vary based on the layout of the massing above the deck.

- As the design is further developed, if there are instances in which the minimum clearance of 8'-6" cannot be met, a variance may be pursued through either the LIRR and/or NYSDOT, as appropriate. Currently, there are no instances of this scenario as part of the SSY-MP design.

- <u>Vertical Clearances</u>

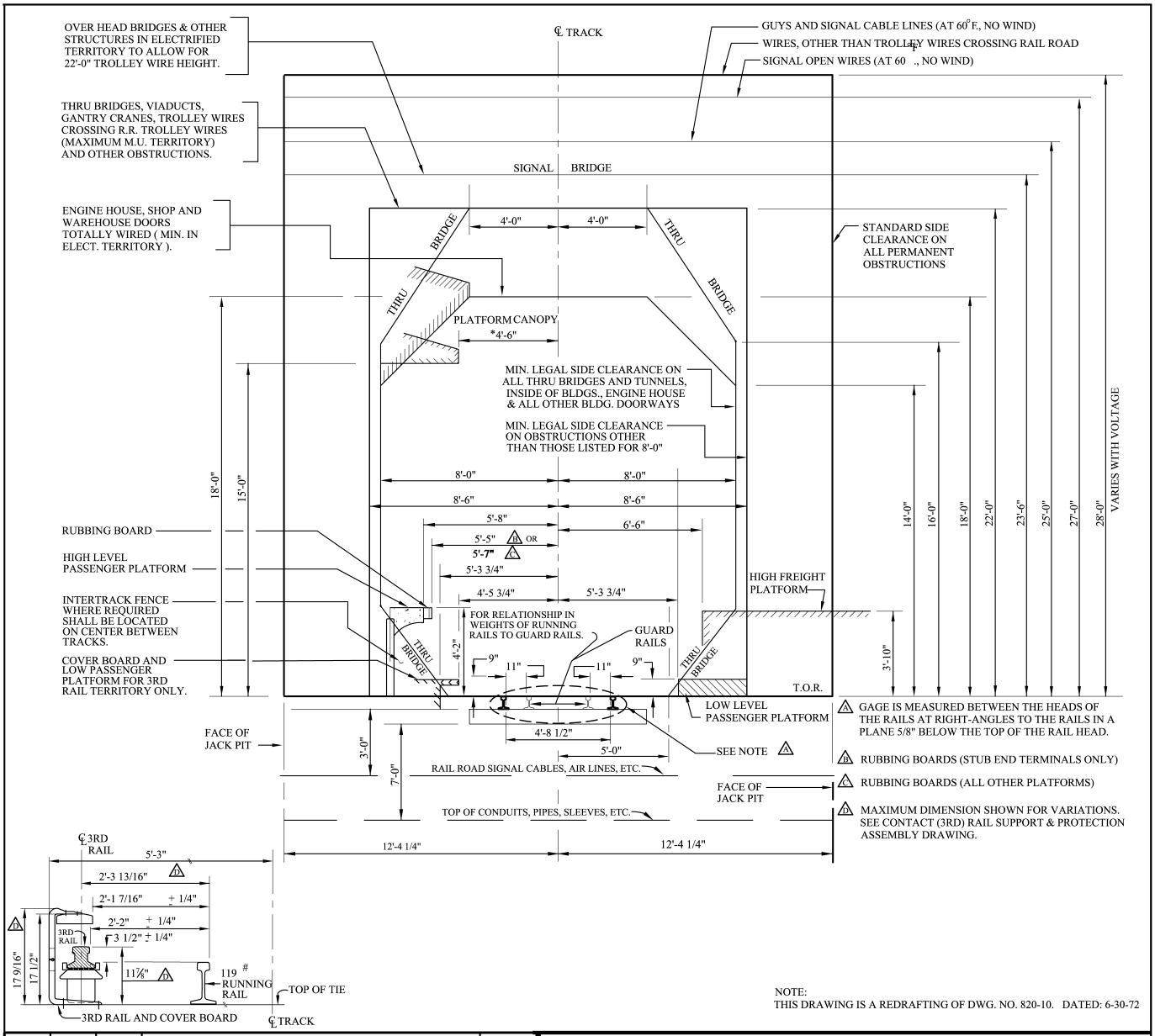
  - To achieve a smooth transition from the existing DOT bridges to the deck, a vertical clearance variance will be needed
  - To achieve the lowest possible deck elevation, based on vertical track clearance requirements, the SSY-MP design proposes lowering and mounting the lighting structures on the underside of the deck and integrating the footbridge into the construction of the deck.

- <u>Health and Safety</u>

  - Crash Protection will be provided in MDSY based on a LIRR twelve car Bi-Level trainset traveling at 5 mph
  - Ventilation
    - MTA's yard operations will require management interface with systems installed by others.
    - Existing MTA wayside structures will be modified to include code compliant stairways to provide egress from inside MDSY to the open air at the surface.
    - Existing MTA wayside structures will include design elements to mitigate additional acoustic and air quality demands created by enclosed space under the deck.
  - Fire and Life Safety
    - Current overbuild design follows the 2014 New York Building, and Fire Code. NFPA 130 as they are applicable to any area that includes passenger terminals and transit ways used for public occupied trains.
    - Fire Life Safety designed within the overbuild deck will need to be determined through coordination with MTA, FDNY and NYPD as present codes may not be adequate in providing the sufficient suppression abilities.
    -
    - Performance based code development would be required to demonstrate acceptable egress distances for stair locations within the rail yard area based on building code Industrial occupancy classification.
    - The overbuild will include openings that permit fire trucks and other emergency response vehicles to access fire hydrants, fire department connections and other equipment in track wayside areas.
    - Ongoing Fire Life Safety coordination and concurrence will occur with the MTA, NYPD, FDNY and Amtrak beyond this Master Plan framework.

APPENDIX A.4.A

LIRR CLEARANCE DIAGRAMS



Rev. No.	Drawn by	Chk by	Description	Date
6	BCF	RS/PH	REVISED TITLE BLOCK	1-26-10
5	UA	HN/PH	REVISED 3RD RAIL DIMENSIONS	12-18-08
5	ALV	HN/PH	REVISED PLATFORM CLEARANCE DIMENSION	1-22-08
4	RC	HN	ADDED RUBBING BOARDS	2-26-07
3	ALV	JS	REVISED DIMENSION AND DEFINED GAGE	
2	ALV	MP/VAM	REDRAFTED IN AUTOCAD FORMAT	1-26-99

project:

LONG ISLAND RAIL ROAD

Metropolitan Transportation Authority — Structures Department

THE LONG ISLAND RAIL ROAD — Office of the Chief Engineer — Jamaica NY 11435 — 718-990-7400

drawing title:

MINIMUM RAILWAY CLEARANCES

P.E.

designed by: SEE NOTE
drawn by: ALV
drawing no: 820-10
checked by: VAM/MP
scale: NONE
sheet no: CE-1
in charge: FJS
date: 1-26-99
branch: STANDARD

Long Island Rail Road
Minimum Railway Clearances Plan

NOTES:

THE MINIMUM CLEARANCE LIMITS PRESCRIBED BY THIS PLAN AND THESE DISTANCES SHOULD BE EXCEEDED WHERE POSSIBLE. STRUCTURES MUST NOT BE LOCATED NEARER TO TRACK THAN

MINIMUM CLEARANCES:

FOR TANGENT TRACK	SHALL BE SHOWN ON THIS PLAN.
FOR CURVED TRACK	ARE THE SAME AS SHOWN FOR TANGENT TRACK
ABOVE TOP OF RAIL	MEASURED VERTICALLY FROM TOP OF WHICH SHALL BE MEASURED FROM TOP OF NEAREST RAIL. OF HIGH RAIL. EXCEPT PASSENGER AND FREIGHT PLATFORMS. THE HEIGHT
SIDE CLEARANCE (MEASURED RADIALLY) — OUTSIDE:	ON THE OUTSIDE OF CURVED TRACK. SIDE CLEARANCES SHALL BE MEASURED HORIZONTALLY FROM THE GAGE OF NEAREST RAIL AND BE INCREASED BY 1 INCH PER DEGREE OF CURVATURE; OVER THAT SHOWN FOR TANGENT TRACK.
INSIDE:	ON THE INSIDE OF CURVED TRACK SIDE CLEARANCES SHALL BE MEASURED HORIZONTALLY FROM THE GAGE OF NEAREST RAIL AND BE INCREASED BY 1 INCH PER DEGREE OF CURVATURE, OVER THAT SHOWN FOR TANGENT TRACK TO WHICH MUST ALSO BE ADDED TO THE AMOUNT OF SUPER ELEVATION OF THE HIGH RAIL ABOVE THE LOW RAIL.

CLEARANCE REQUIREMENTS SET FORTH ON THIS PLAN SHALL APPLY ONLY TO NEW CONSTRUCTION OR RECONSTRUCTION. STRUCTURES AND TRACKS CONSTRUCTED PRIOR TO APRIL 1, 1961. MAY BE MAINTAINED AND EXTENDED AT THE EXISTING CLEARANCE. OF THE RAIL ROAD LAW EFFECTIVE APRIL 1, 1961. THE FOLLOWING SIDE CLEARANCE ARE INCLUDED IN SECTION 51-A

MIN. C TO C DISTANCE FOR PARALLEL MAIN TRACKS	13'-6"	C TO C
MIN. C TO C DISTANCE YARD AND SIDE TRACKS	13'-6"	C TO C
ALL TRACKS PARALLEL TO MAIN OR PASSING TRACKS	15'-0"	C TO C
LADDER TRACKS TO ADJACENT TRACKS	18'-0"	C TO C
PARALLEL LADDER TRACKS	19'-0"	C TO C
PARALLEL TEAM TRACKS AND HOUSE TRACKS	13'-6"	C TO C

PLATFORM CANOPY CLEARANCE OF 4'-6" MAY BE USED ONLY IF RESTRICTIONS AGAINST RIDING ON THE SIDE OR TOP OF CARS AT THE LOCATION OF THE CANOPY ARE LISTED IN THE CURRENT TIME-TABLE UNDER SPECIAL INSTRUCTIONS.

Rev. No.	Drawn by	Chk by	Description	Date

project: LONG ISLAND RAIL ROAD

Metropolitan Transportation Authority — Structures Department — MTA — THE LONG ISLAND RAIL ROAD — Office of the Chief Engineer — Jamaica NY 11435 718-990-7400

drawing title: MINIMUM RAILWAY CLEARANCES

P.E.

designed by: SEE NOTE | drawn by: ALV | drawing no: 820-10

checked by: VAM/MP | scale: NONE | sheet no: CE-1

in charge: FJS | date: 1-26-99

branch: STANDARD

APPENDIX A.4.B

COLUMN CLEARANCE ZONES

LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE
  3' CLEARANCE CUT AND COVER TUNNELS
  10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

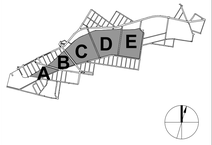
- COLUMN LINES
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date
1	DRAWINGS UPDATE	11/20/2018

Key Plan



Discipline:

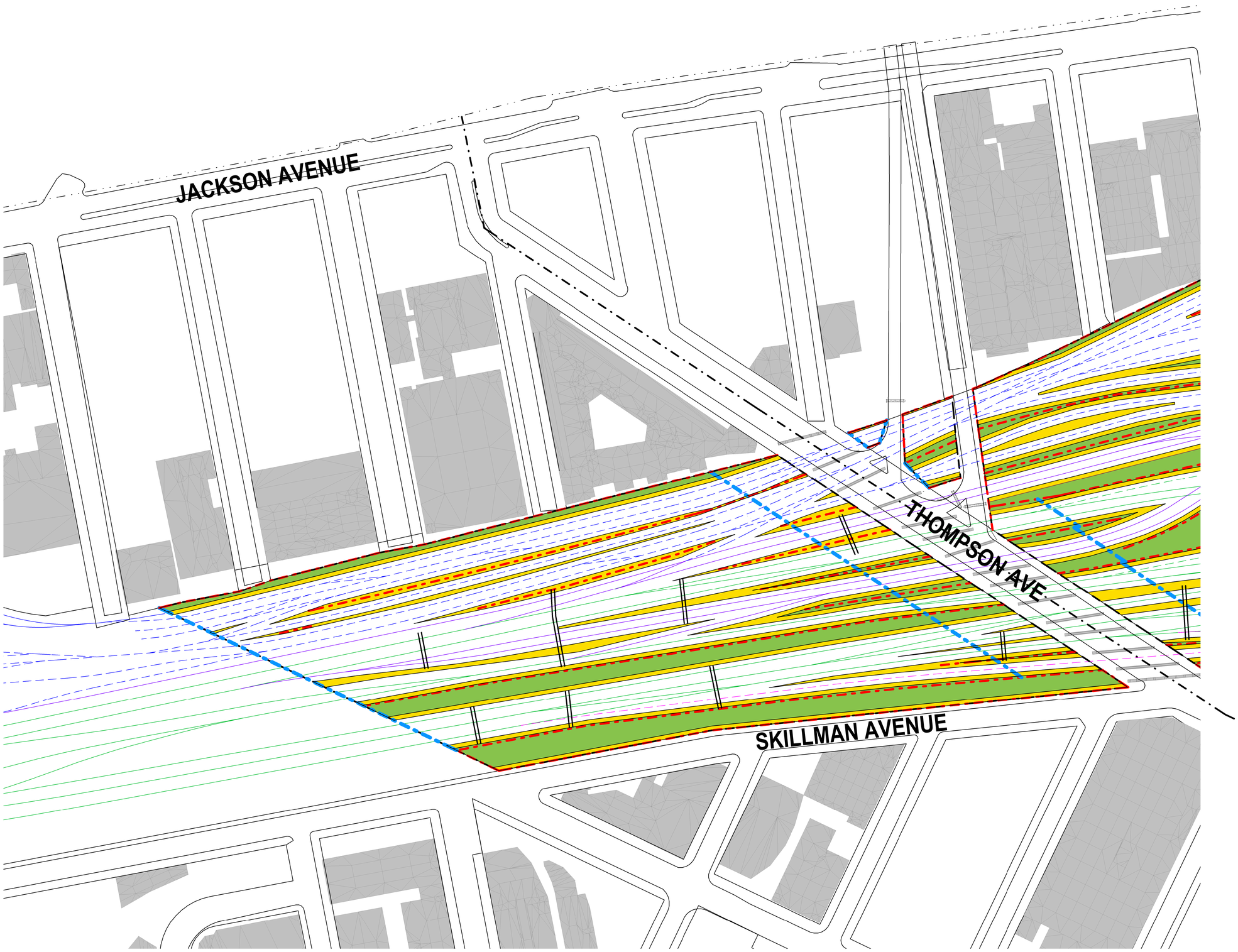
STRUCTURE

Title

OVERALL SITE PLAN - COLUMNS & HORIZONTAL CLEARANCES

Thornton Tomasetti

Designed by	CC
Drawn by	AP
Checked by	JB
Date	09/14/2018
Drawing Number	S-110.00



LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE
  3' CLEARANCE CUT AND COVER TUNNELS
  10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

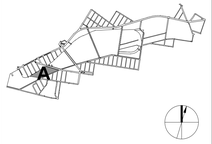
- COLUMN LINES
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date
1	DRAWINGS UPDATE	11/20/2018

Key Plan



Discipline:

STRUCTURE

Title

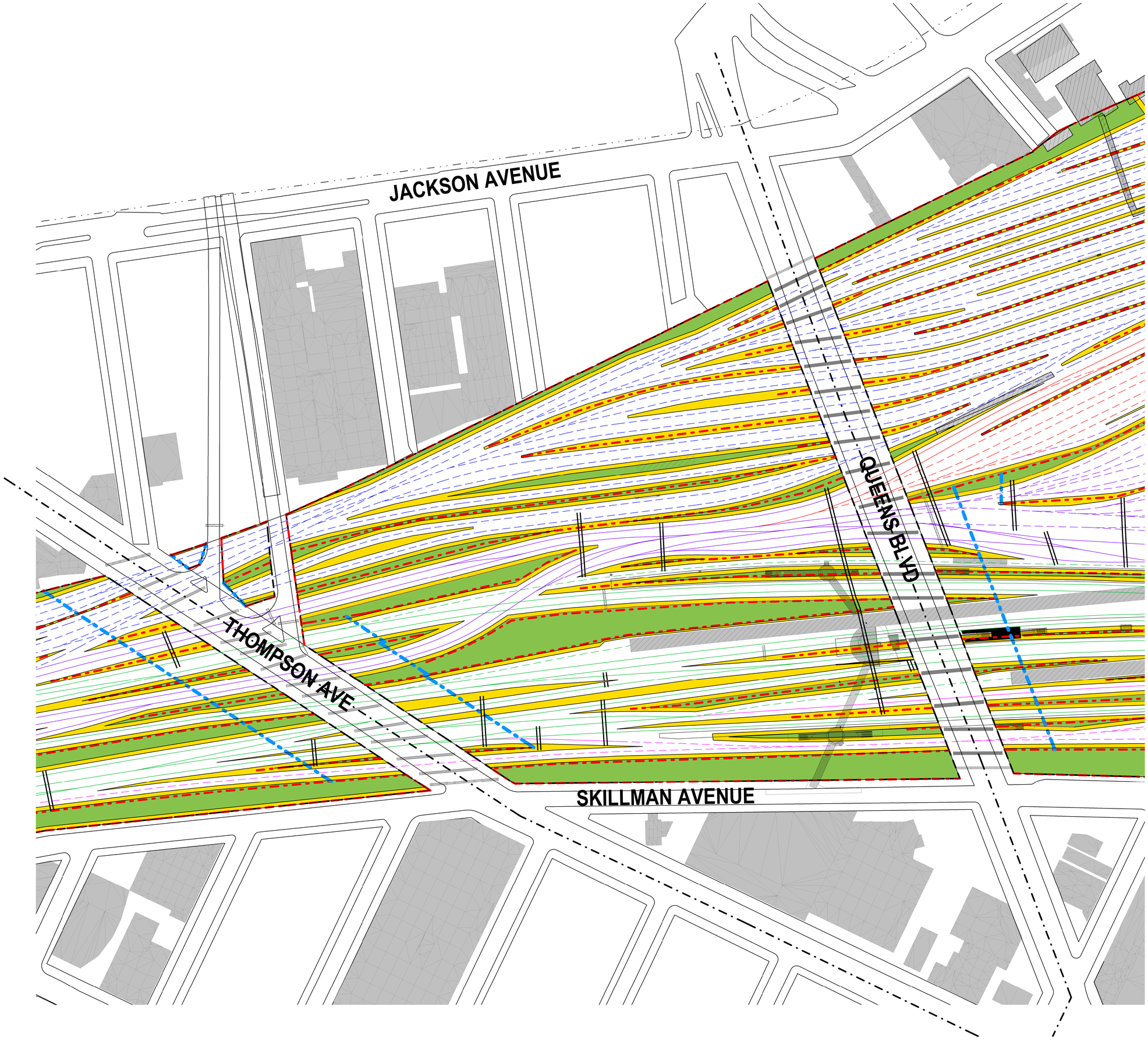
OVERALL SITE PLAN - COLUMNS & HORIZONTAL CLEARANCES - SECTOR A

Thornton Tomasetti

Designed by	CC
Drawn by	AP
Checked by	JB
Date	09/14/2018

Drawing Number

S-110A.00



LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE
  3' CLEARANCE CUT AND COVER TUNNELS
  10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

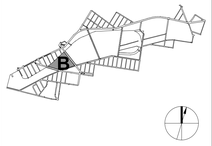
- COLUMN LINES
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date
1	DRAWINGS UPDATE	11/20/2018

Key Plan



Discipline:

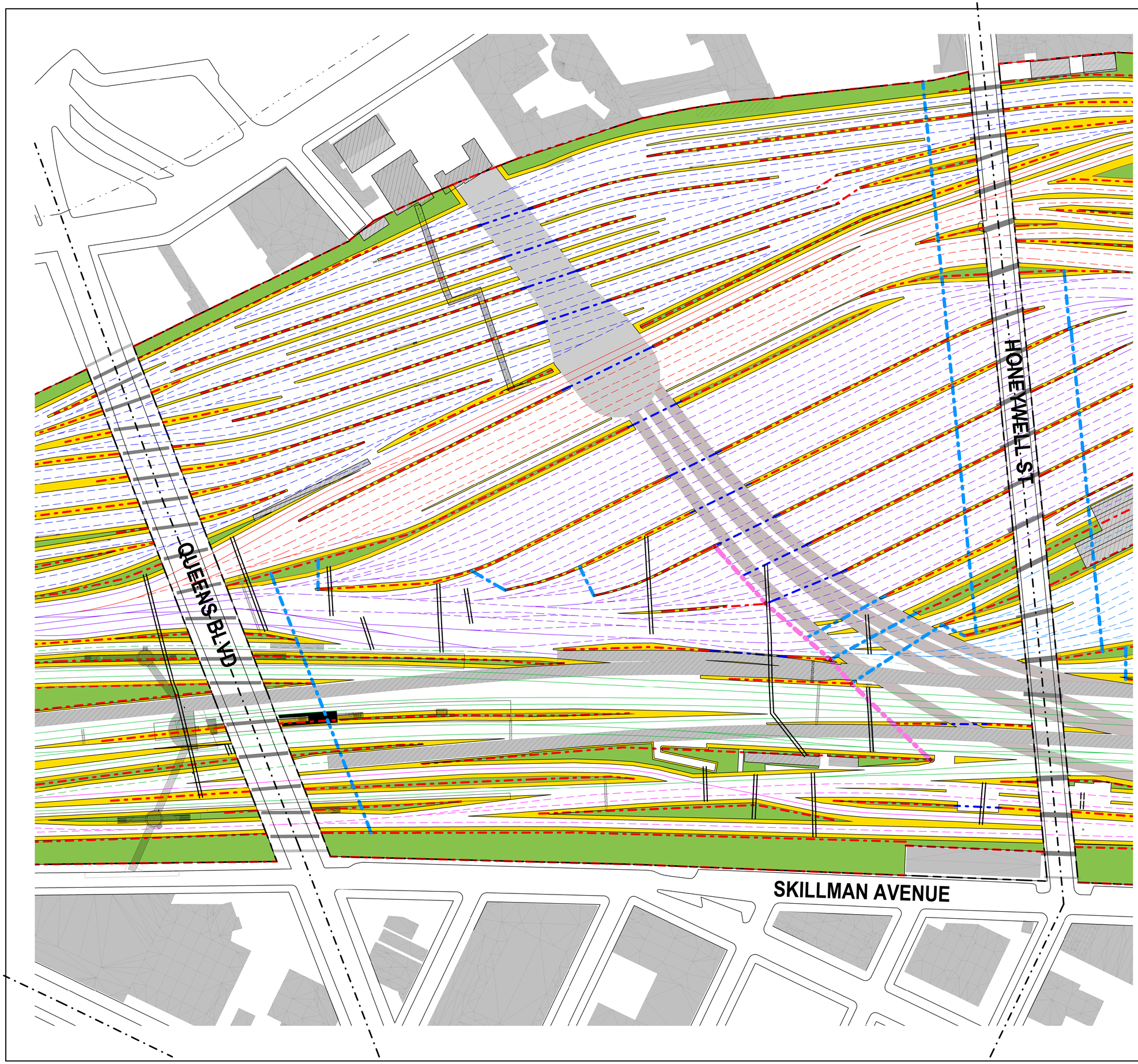
STRUCTURE

Title

OVERALL SITE PLAN - COLUMNS & HORIZONTAL CLEARANCES - SECTOR B

Thornton Tomasetti

Designed by	CC
Drawn by	AP
Checked by	JB
Date	09/14/2018
Drawing Number	S-110B.00



LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE
  3' CLEARANCE CUT AND COVER TUNNELS
  10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

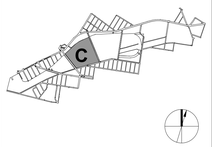
- COLUMN LINES
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date
1	DRAWINGS UPDATE	11/20/2018

Key Plan



Discipline:

STRUCTURE

Title

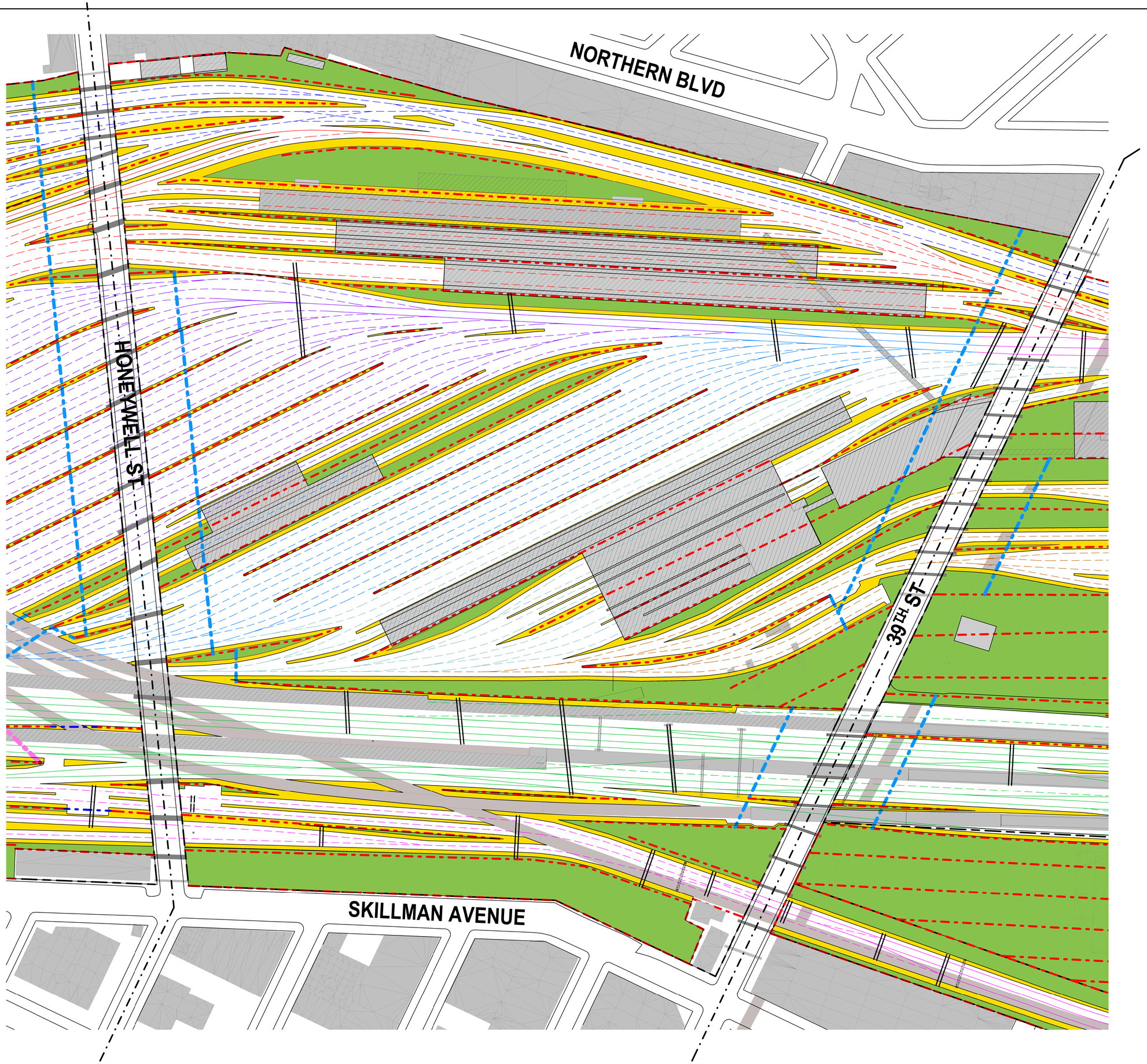
OVERALL SITE PLAN - COLUMNS & HORIZONTAL CLEARANCES - SECTOR C

Thornton Tomasetti

Designed by	CC
Drawn by	AP
Checked by	JB
Date	09/14/2018

Drawing Number

S-110C.00



LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE
  3' CLEARANCE CUT AND COVER TUNNELS
  10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

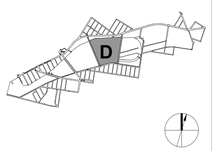
- COLUMN LINES
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date
1	DRAWINGS UPDATE	11/20/2018

Key Plan



Discipline:

STRUCTURE

Title

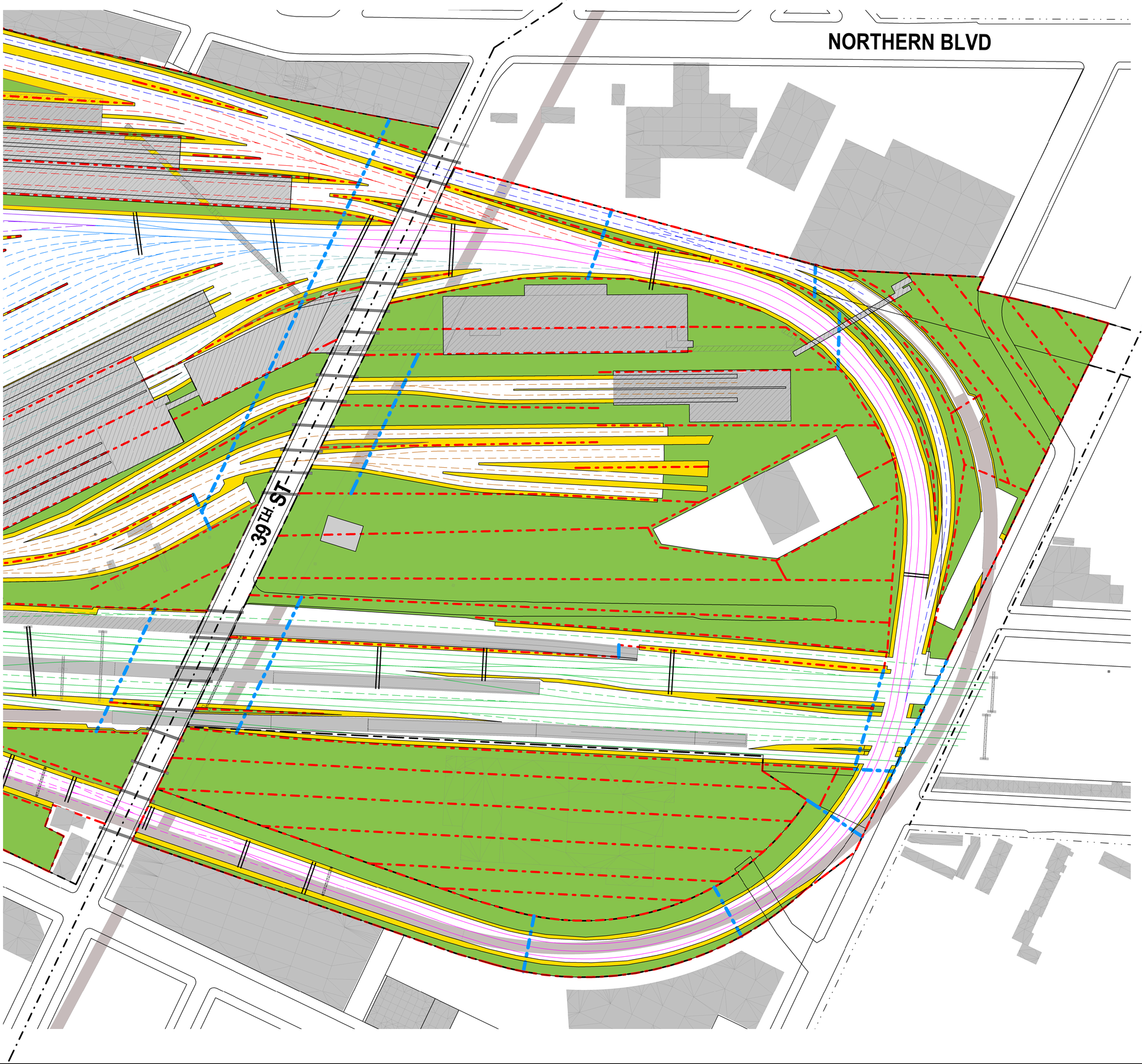
OVERALL SITE PLAN - COLUMNS & HORIZONTAL CLEARANCES - SECTOR D

Thornton Tomasetti

Designed by	CC
Drawn by	AP
Checked by	JB
Date	09/14/2018

Drawing Number

S-110D.00



LEGEND

HORIZONTAL CLEARANCE

- 8'-6" ABSOLUTE CLEARANCE LINE
  3' CLEARANCE CUT AND COVER TUNNELS
  10' CLEARANCE ESA TUNNELS
- 16'-0" FOULING LINE

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

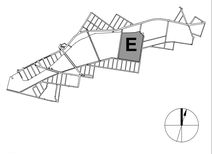
- COLUMN LINES
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date
1	DRAWINGS UPDATE	2/21/2018

Key Plan



Discipline:

STRUCTURE

Title

OVERALL SITE PLAN - COLUMNS & HORIZONTAL CLEARANCES - SECTOR E

Thornton Tomasetti

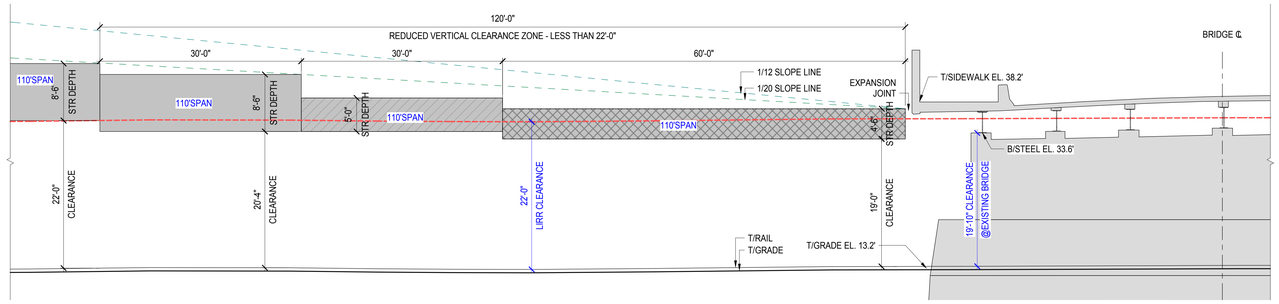
Designed by	CC
Drawn by	AP
Checked by	JB
Date	09/14/2018

Drawing Number

S-110E.00

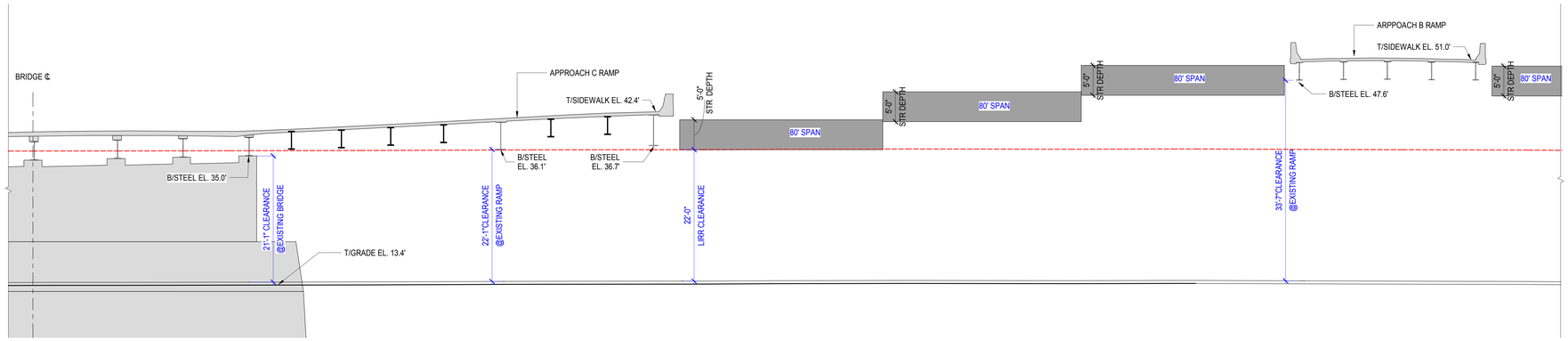
APPENDIX A.4.C

BRIDGE CROSS SECTIONS



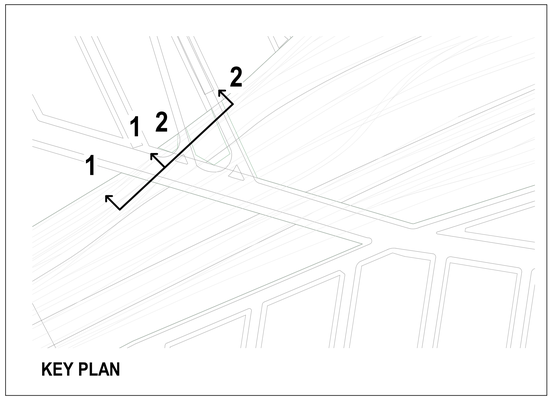
1 SECTION AT THOMSON AVENUE BRIDGE - MID-DAY STORAGE YARD - WEST

SCALE: 1/8" = 1'-0"



2 SECTION AT THOMSON AVENUE BRIDGE - MID-DAY STORAGE YARD - EAST

SCALE: 1/8" = 1'-0"



LEGEND

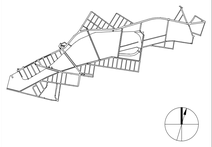
- TYPICAL LOADING
- TYPICAL LOADING + CLOSE SPACING
- REDUCED LOADING + CLOSE SPACING

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date
1	DRAWINGS UPDATE	11/20/2018

Key Plan



Discipline:

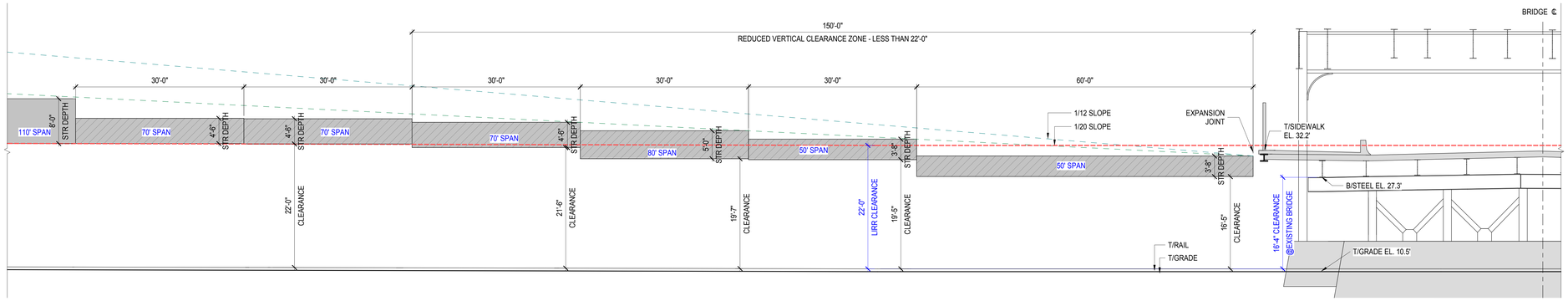
STRUCTURE

Title

THOMSON AVENUE BRIDGE SECTION - VARIANCE STUDY

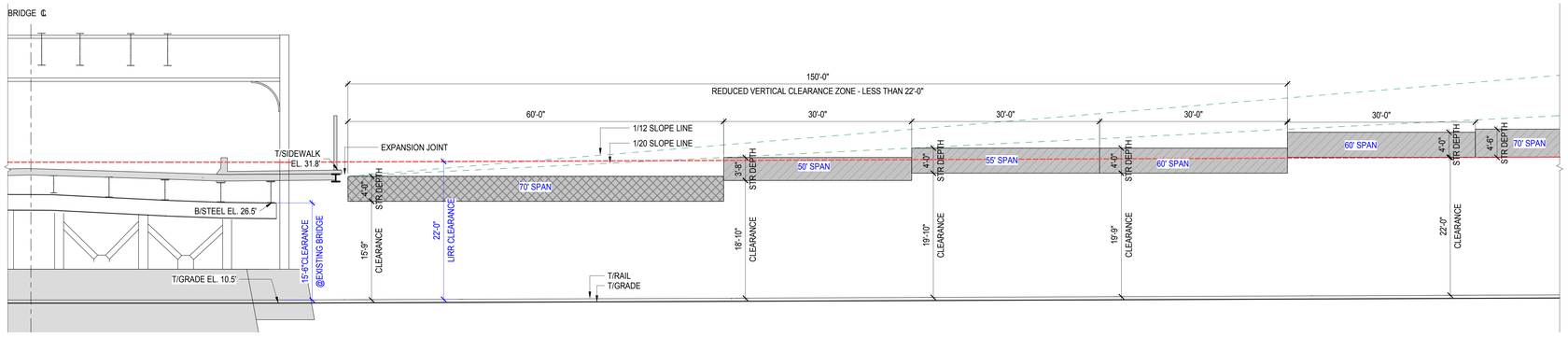
Thornton Tomasetti

Designed by	CCG
Drawn by	AP
Checked by	JB
Date	09/14/2018
Drawing Number	S-400.00



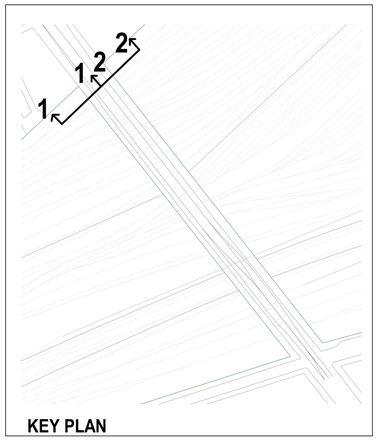
1 **SECTION AT QUEENS BOULEVARD BRIDGE - MID-DAY STORAGE YARD - WEST**

SCALE: 1/8" = 1'-0"



2 **SECTION AT QUEENS BOULEVARD BRIDGE -MID-DAY STORAGE YARD - EAST**

SCALE: 1/8" = 1'-0"



LEGEND

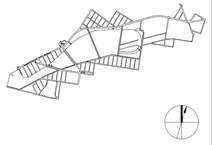
- TYPICAL LOADING
- TYPICAL LOADING + CLOSE SPACING
- REDUCED LOADING + CLOSE SPACING

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:

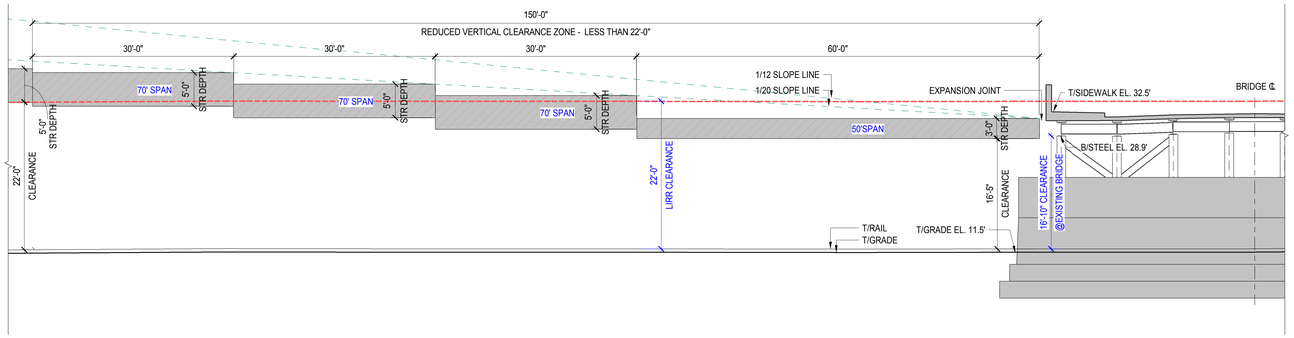
STRUCTURE

Title

QUEENS BOULEVARD BRIDGE SECTION - VARIANCE STUDY

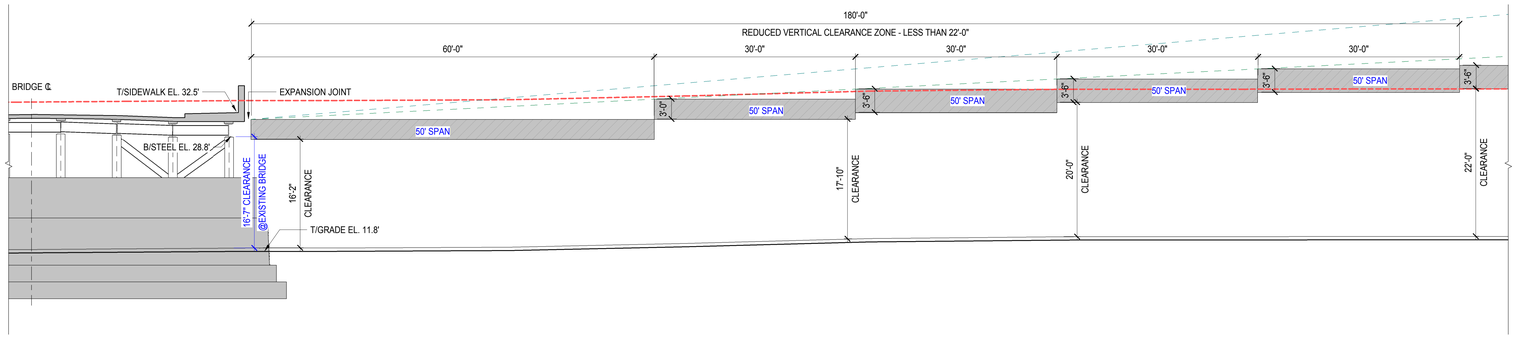
Thornton Tomasetti

Designed by	CCG
Drawn by	AP
Checked by	JB
Date	09/14/2018
Drawing Number	S-410.00



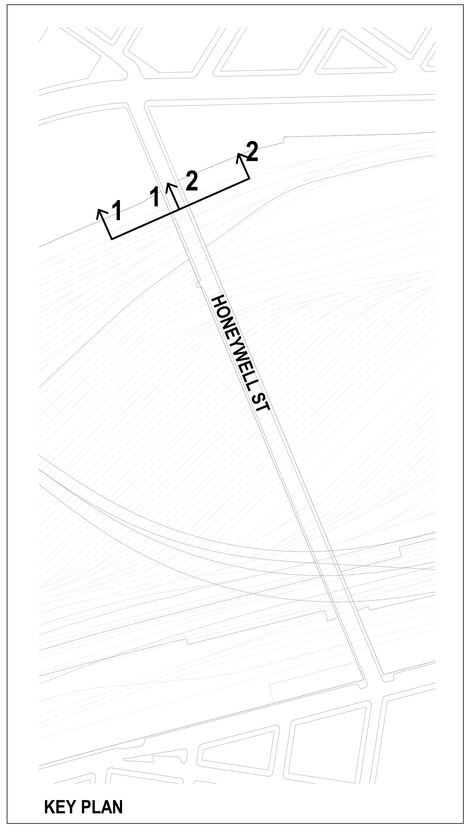
1 SECTION AT HONEYWELL ST BRIDGE - MID-DAY STORAGE YARD - WEST

SCALE: 1/8" = 1'-0"



2 SECTION AT HONEYWELL ST BRIDGE - MID-DAY STORAGE YARD - EAST

SCALE: 1/8" = 1'-0"



KEY PLAN

LEGEND

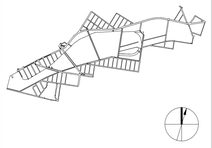
- TYPICAL LOADING
- TYPICAL LOADING + CLOSE SPACING
- REDUCED LOADING + CLOSE SPACING

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:

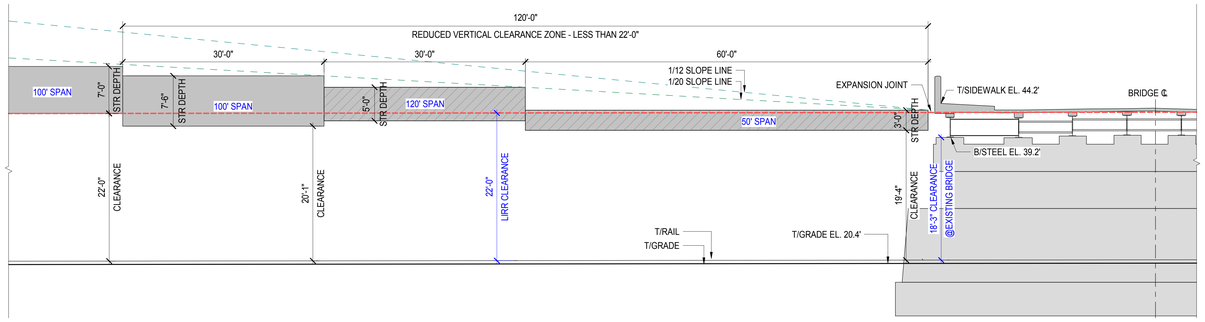
STRUCTURE

Title

HONEYWELL STREET BRIDGE SECTION - VARIANCE STUDY

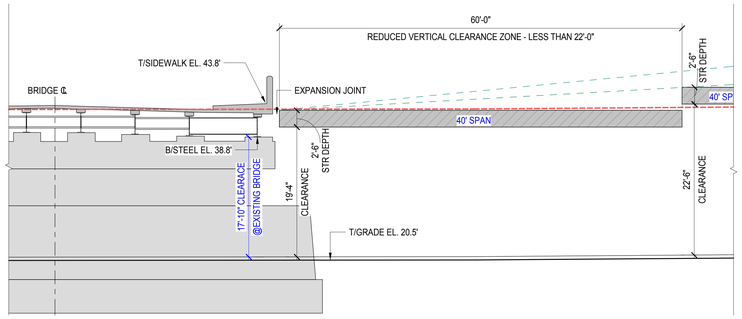
Thornton Tomasetti

Designed by	CCG
Drawn by	AP
Checked by	JB
Date	09/14/2018
Drawing Number	S-420.00



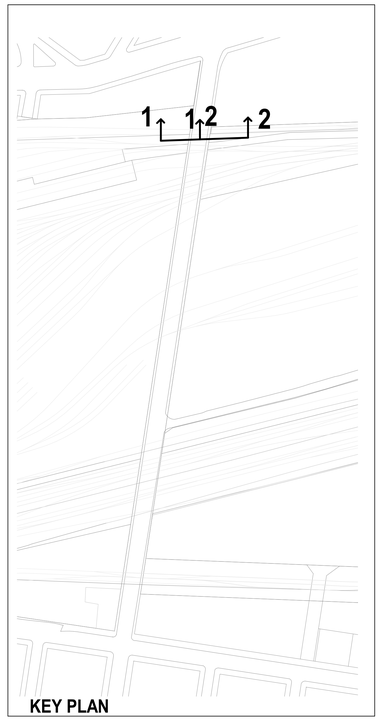
1 SECTION AT 39TH STREET BRIDGE - MID-DAY STORAGE YARD - WEST

SCALE: 1/8" = 1'-0"



2 SECTION AT 39TH STREET BRIDGE - MID-DAY STORAGE YARD - EAST

SCALE: 1/8" = 1'-0"



LEGEND

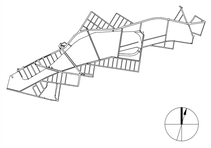
- TYPICAL LOADING
- TYPICAL LOADING + CLOSE SPACING
- REDUCED LOADING + CLOSE SPACING

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:

STRUCTURE

Title

39TH STREET BRIDGE SECTION - VARIANCE STUDY

Thornton Tomasetti

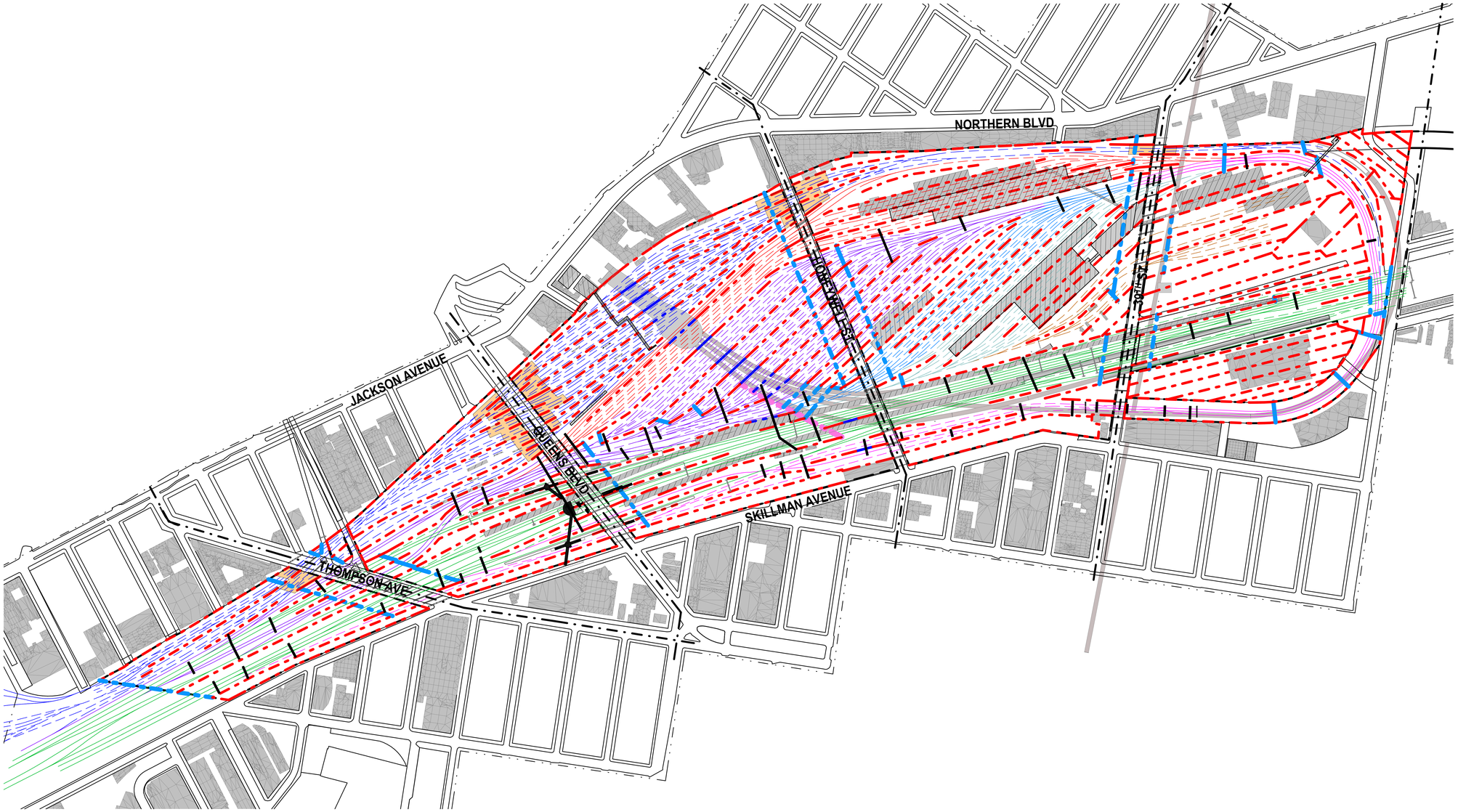
Designed by	CCG
Drawn by	AP
Checked by	JB
Date	09/14/2018

Drawing Number

S-430.00

APPENDIX A.4.D

VERTICAL CLEARANCE VARIANCE EXTENTS



LEGEND

VERTICAL CLEARANCE

- CLEARANCE LESS THAN LIRR = 22'-0"

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

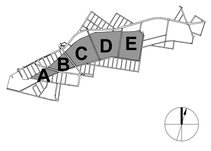
- COLUMN LINES
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:

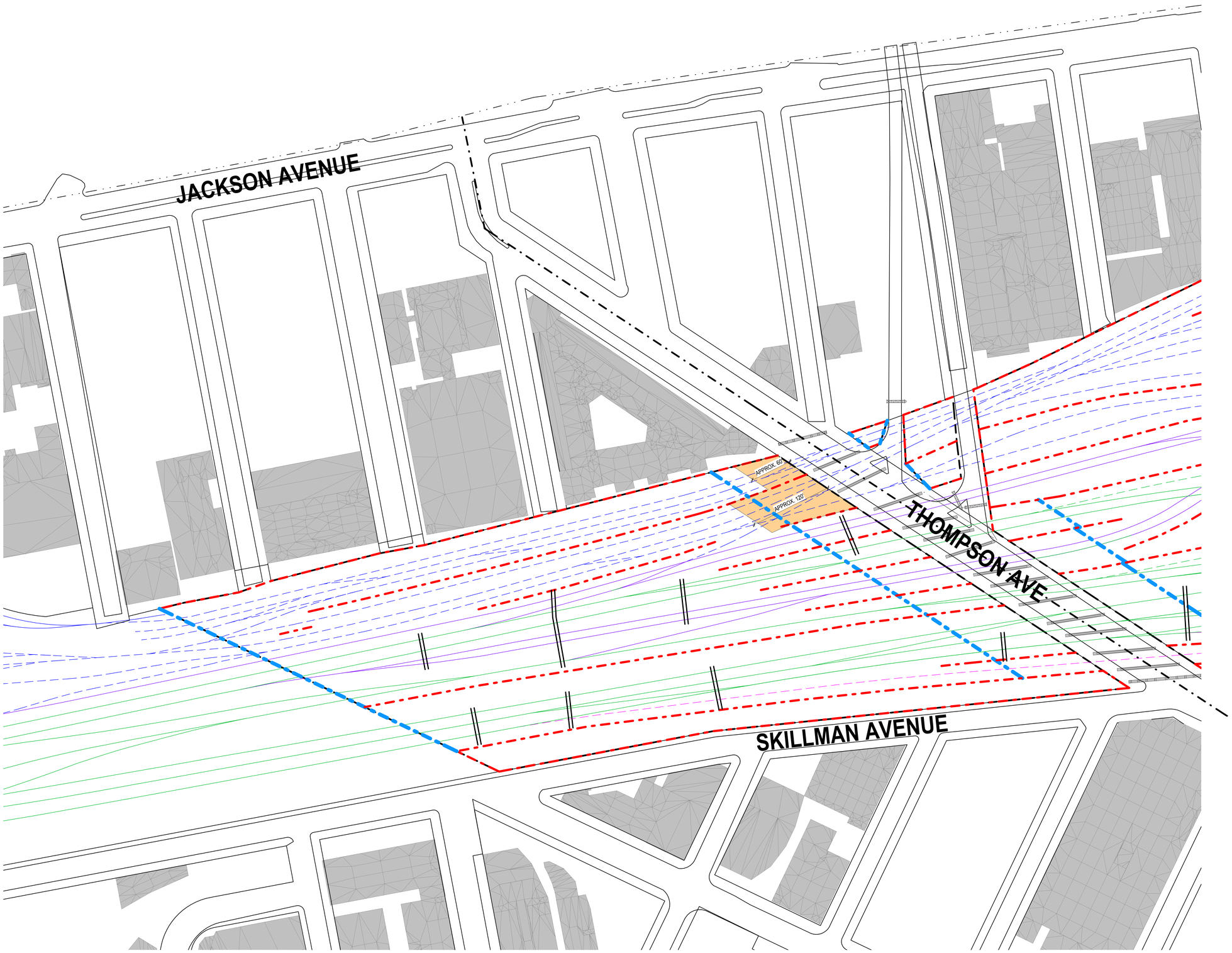
STRUCTURE

Title

OVERALL SITE PLAN - MID-DAY STORAGE YARD - VERTICAL CLEARANCE

Thornton Tomasetti

Designed by	CC
Drawn by	AP
Checked by	JB
Date	11/20/2018
Drawing Number	S-201.00



LEGEND

VERTICAL CLEARANCE

- CLEARANCE LESS THAN LIRR = 22'-0"

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

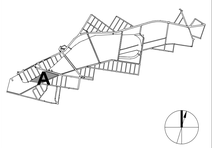
- COLUMN LINES
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:

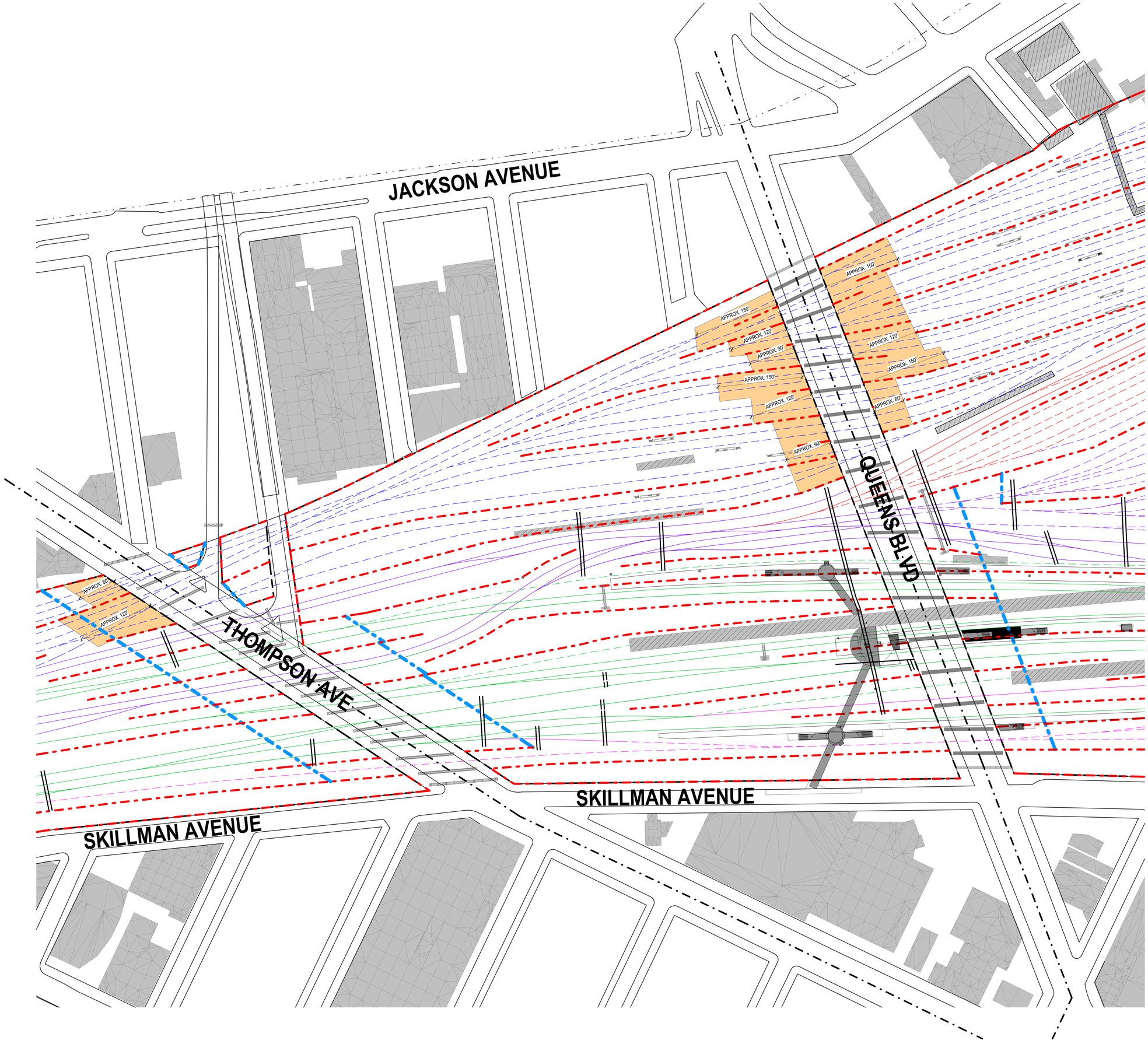
STRUCTURE

Title

OVERALL SITE PLAN - MID-DAY STORAGE YARD - VERTICAL CLEARANCE - SECTOR A

Thornton Tomasetti

Designed by	CC
Drawn by	AP
Checked by	JB
Date	11/20/2018
Drawing Number	S-201A.00



LEGEND

VERTICAL CLEARANCE

- CLEARANCE LESS THAN LIRR = 22'-0"

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

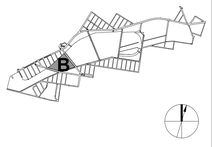
- COLUMN LINES
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:

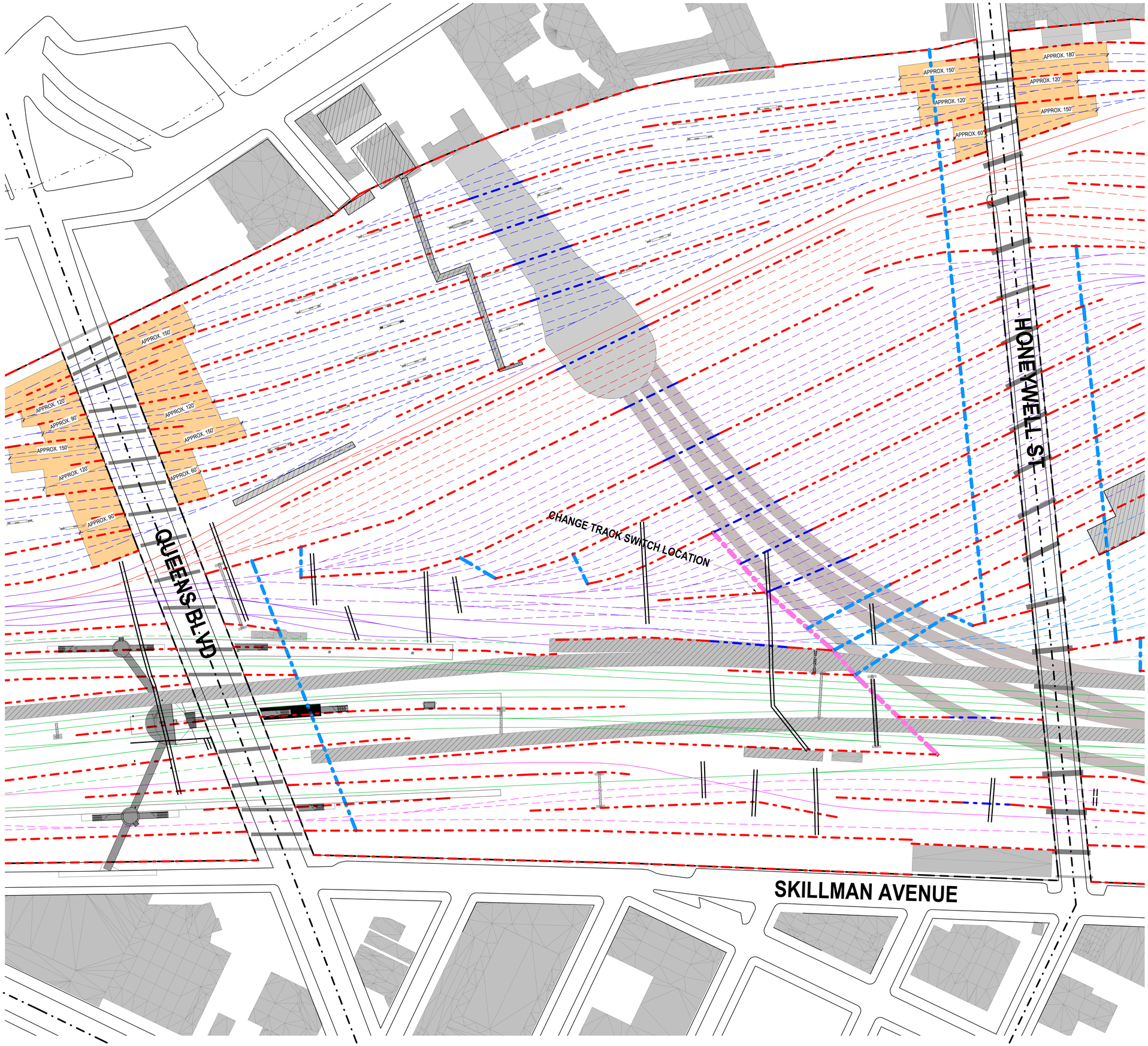
STRUCTURE

Title

OVERALL SITE PLAN - MID-DAY STORAGE YARD - VERTICAL CLEARANCE - SECTOR B

Thornton Tomasetti

Designed by	CC
Drawn by	AP
Checked by	JB
Date	11/20/2018
Drawing Number	S-201B.00



LEGEND

VERTICAL CLEARANCE

- CLEARANCE LESS THAN LIRR = 22'-0"

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

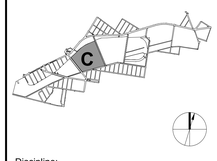
- COLUMN LINES
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:

STRUCTURE

Title

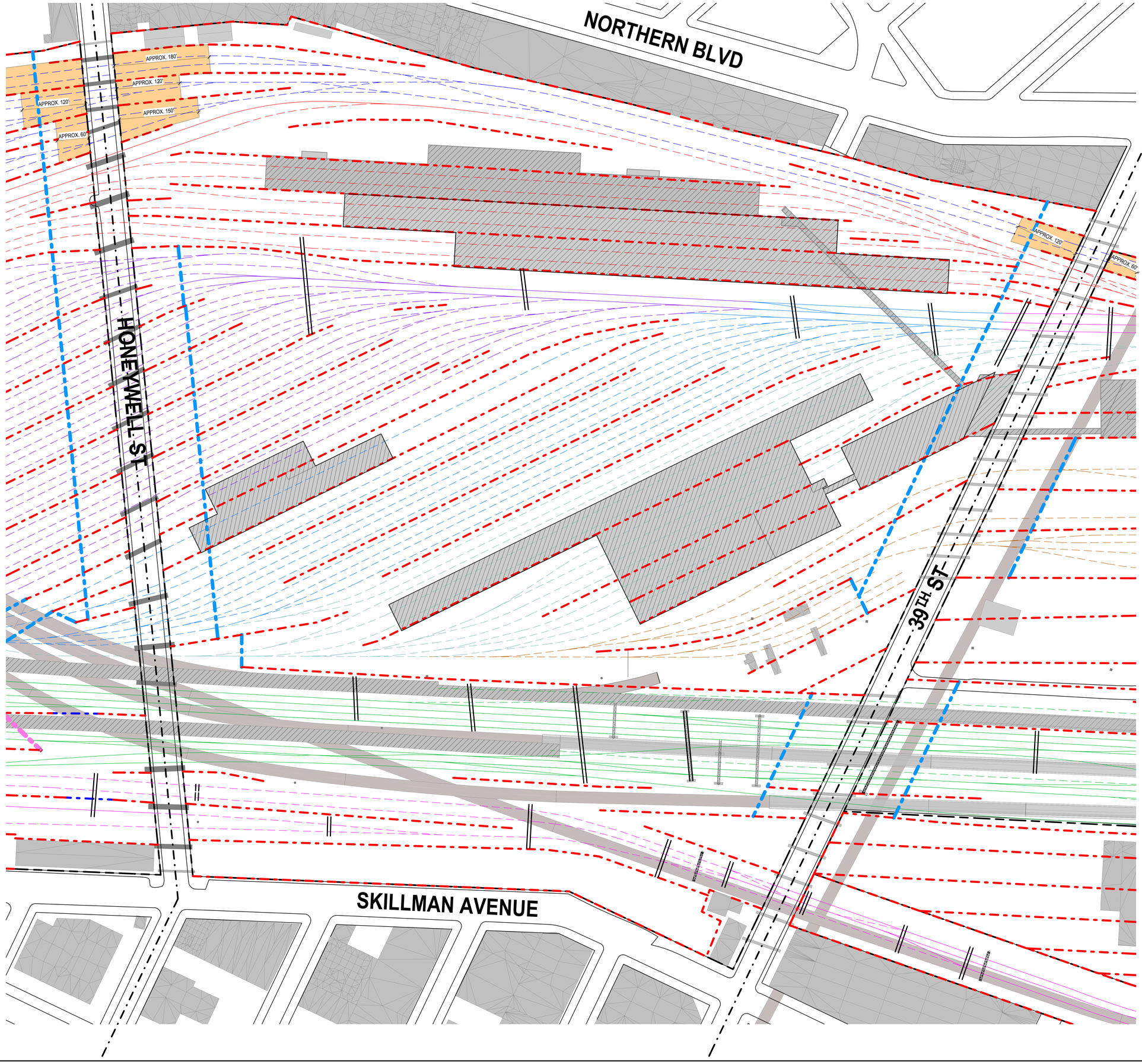
OVERALL SITE PLAN - MID-DAY STORAGE YARD - VERTICAL CLEARANCE - SECTOR C

Thornton Tomasetti

Designed by	CC
Drawn by	AP
Checked by	JB
Date	11/20/2018

Drawing Number

S-201C.00



LEGEND

VERTICAL CLEARANCE

- CLEARANCE LESS THAN LIRR = 22'-0"

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

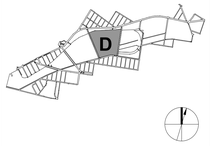
- COLUMN LINES
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:

STRUCTURE

Title

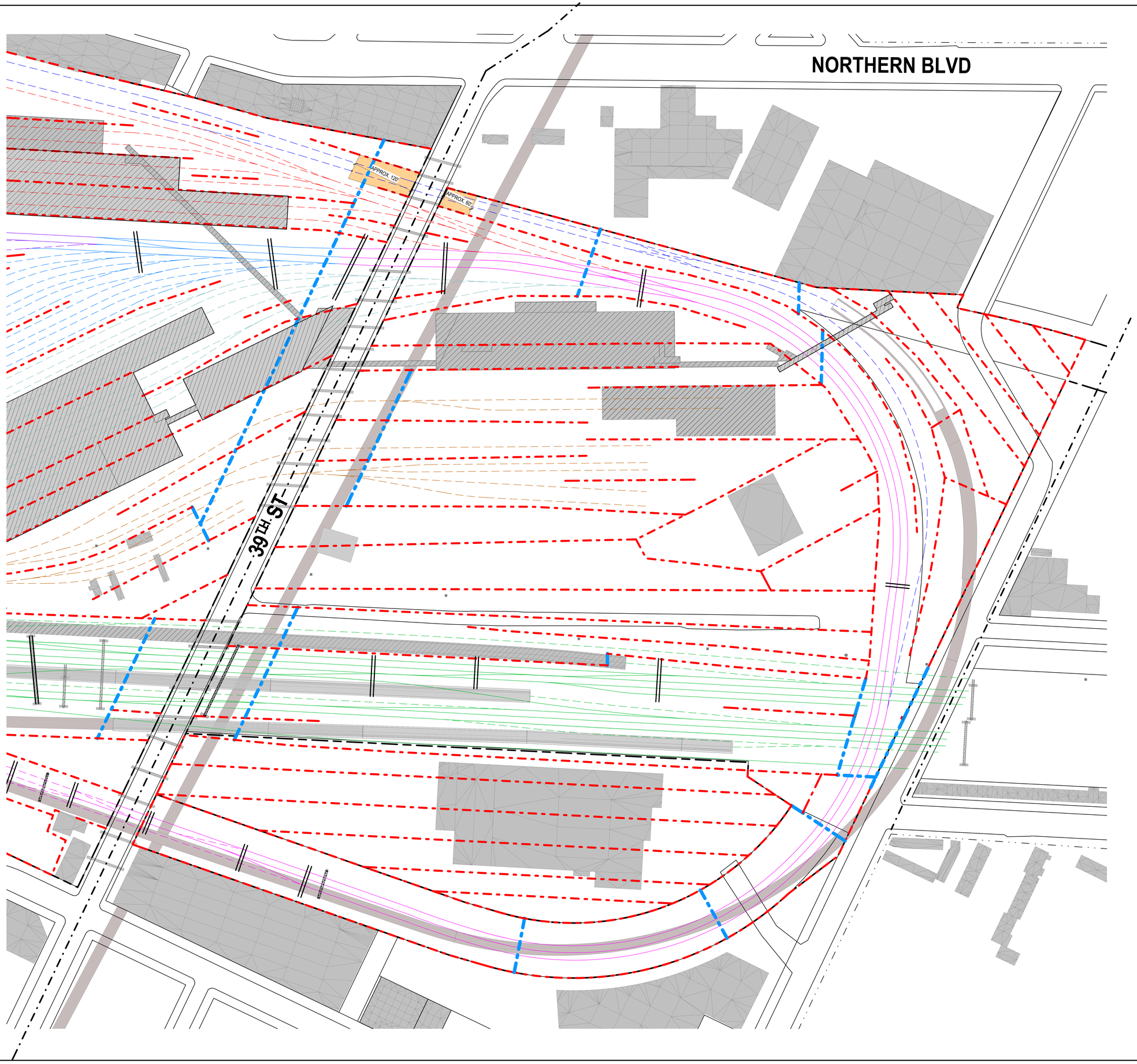
OVERALL SITE PLAN - MID-DAY STORAGE YARD - VERTICAL CLEARANCE - SECTOR D

Thornton Tomasetti

Designed by	CC
Drawn by	AP
Checked by	JB
Date	11/20/2018

Drawing Number

S-201D.00



LEGEND

VERTICAL CLEARANCE

- CLEARANCE LESS THAN LIRR = 22'-0"

TRACKS

- EXISTING TRACK
- PROPOSED TRACK
- CROSS TRACK FEEDER

TRACK ZONES

- TRACK ZONE 1
- TRACK ZONE 2
- TRACK ZONE 3
- TRACK ZONE 4
- TRACK ZONE 5
- TRACK ZONE 6
- TRACK ZONE 7
- TRACK ZONE 8

STRUCTURE

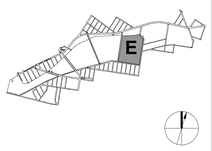
- COLUMN LINES
- TRUSSES PARALLEL TO TRACKS
- TRUSSES PERPENDICULAR TO TRACKS
- MEGATRUSS
- MEGACOLUMN
- EXISTING BUILDINGS
- PROPOSED BUILDINGS

NYCEDC

SUNNYSIDE YARDS MASTER PLAN

No.	Description	Date

Key Plan



Discipline:

STRUCTURE

Title

OVERALL SITE PLAN - MID-DAY STORAGE YARD - VERTICAL CLEARANCE - SECTOR E

Thornton Tomasetti

Designed by	CC
Drawn by	AP
Checked by	JB
Date	11/20/2018

Drawing Number

S-201E.00