FINAL REPORT

Imperial Avenue Division (IAD) ZEB Master Plan

MTS

San Diego, CA

Prepared by:

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CHAPTER 1 – INTRODUCTION

INTRODUCTION

BACKGROUND

On Friday, December 14, 2018, the California Air Resources Board (CARB) adopted the Innovative Clean Transit (ICT) regulation that has been in development for almost four years. The ICT requires California transit agencies to begin purchasing Zero Emission Buses (ZEBs) as early as 2023, with the goal of transitioning all transit buses to zero emission technology by 2040. Today, zero emission technology includes Battery Electric Buses (BEBs) and Fuel Cell Electric Buses (FCEBs). San Diego Metropolitan Transit Systems (MTS) has already started paving the way for this transition, due to its commitment to continue providing safe, reliable transit service while also striving to improve air quality in the region. MTS's Zero-Emissions Bus Pilot Program has already taken steps toward accomplishing the goals set forth in the ICT. Further, this Master Plan provides a template for charging 161 ZEBs to be purchased in accordance with CARB requirements at the Imperial Avenue Division (IAD) in San Diego, California, and to help MTS develop and implement a ZEB rollout plan (required by ICT), with MTS's next purchase of ZEBs. In addition, this project will continue the implementation of ZEB infrastructure set forth by the previous project at the South Bay Maintenance Facility and will continue with projects at MTS's other maintenance facilities at the Kearny Mesa Division (KMD), East County Bus Maintenance Facility (ECBMF) and Copley Park Maintenance Facility (CPMF).

For the IAD, MTS will have procured an initial 40-foot ZEB fleet of 30 buses by 2024. Beyond 2024, MTS will comply with state regulations requiring 25% ZEB purchases starting in 2026, transitioning to 50% at a later date.

MTS OBJECTIVE

The IAD ZEB Master Plan will provide a road map for charging infrastructure installation, timed to coincide with ZEB bus purchases, matching new charging technology with the new busses in a phased approach. The first 30 ZEB's fleet will be Phase 1 or the first implementation of the full IAD ZEB Master Plan. The ZEB Master Plan will develop an infrastructure and operational improvement and phasing plan that must:

- Be compatible with MTS's long-range ZEB vision.
- Confirm the fleet size and mix able to be parked and provided with electrified parking / charging capabilities at the IAD.
- Identify specific infrastructure needed to support the recommended 161 ZEB fleet mix.

Make recommendations that can be implemented within the constraints of available funding and site constraints.

PROJECT GOALS

The following goals were developed through discussions with key MTS staff.

1. The design must provide for implementation without disruptions with smooth yard operations and the ability to continue providing reliable revenue service.
2. The solution must be cost-efficient.
3. The project must meet project milestones and adhere to the Innovative Clean Transit regulation.
4. The solution must be scalable, modular, and flexible.
5. The solution must provide resiliency to fleet operations during utility power outages at all phases and redundancy to power losses once the ZEB fleet grows beyond 50% of the total on-site fleet.

PROJECT PARAMETERS

The following parameters were established for the project through discussions with MTS.

1. The project is to provide a total parking capacity of 172 buses, of which there are 136 charging positions.
2. The project must make the best use of the capital budget.
3. The project must consider only technology that is currently available.
4. The project is to continue to accommodate employee parking on-site
5. The project will continue to accommodate the existing CNG buses until those buses have been replaced with the ZEBs.
6. The existing maintenance and administration buildings are to remain

PRELIMINARY ENGINEERING METHODOLOGY

The first step was to collect and review existing documents provided by MTS that are pertinent to the project, including:

- Facility as-built drawings
- Facility's current bus parking layout
- Current circulation routes
- Historic electricity and gas usage information
- Existing fleet inventory

After the existing documentation was reviewed a ZEB checklist was developed to document key findings of both the existing facility and the proposed on-site operations. An in-person site tour was conducted to acquire missing data not ascertainable from the received existing condition documentation and previous operational discussions.

Upon reviewing the existing operational and facility information and with the documented understanding of MTS's preferred future ZEB operational needs and holding bi-weekly meetings and an in-person Concept Design Workshop with MTS, various master site layouts were developed around the preferred charging technology. The preferred technology selected for this project is the automatic overhead charging from a piston depot dispenser that is compatible with both the individual 180kW Heliox styled charging cabinets being installed at the MTS South Bay Maintenance Facility (SBMF) and the new to industry 'Big Box' medium voltage / transformer / switchboard / chargers all in a single container charger. Pros and Cons for these options are discussed in Chapter 4 along with the recommended infrastructure option. The pros and cons also included IAD specific tangibles such as a master plans ability to park the desired 161 ZEBs, phasability / constructability, physical space to accommodate the electrical service, and specific charging equipment needed to support the ZEB fleet. All the developed master plan concepts, including those that were unsuccessful in accommodating all the ZEB 's Master Plan Goals, are included in this report.

Once the Preferred Master site concept was selected by MTS, the Master Plan Concept Implementation plans were developed. The Preferred Master Plan Concept was subdivided into three district implementation 'Phases' needed to fully construct the master plan anticipated to span between 2022 through 2030 and beyond. Each of the three Master Plan Implementation phases were further divided into construction 'stages' or areas of defined limited construction to be completed and turned back for use by MTS prior to a contractor moving to the next construction stage portion of the IAD site. These construction stages are needed to accommodate buildout and construction of BEB charging infrastructure on the IAD site while maintaining on-site transit operations. Refer to Chapter 6 for phasing and staging details. The IAD ZEB Master Plan BEB Implementation Phase 1 location was chosen to minimize disruption to the current IAD operation, as well as limit the capital expenditure needed to support the near term 30 BEB IAD order. The phasing plan for the project identifies how to accommodate the first 30 40-foot ZEB's scheduled to arrive in the near term of March 2024, and then continues in subsequent infrastructure phases based on MTS's bus procurement schedule and the ability to allow for construction phasing / staging on site without reducing the number of buses being operated out of IAD or having detrimental impact on IAD on-site operations. Additional phases and stages are possible, and the developed master plan phase and stage concepts are only one of many possible construction and implementation options. For instance, if MTS had another facility able to accommodate, operated and / or maintain / service portions of IAD conventional CNG bus fleet, Phase 3 construction phases could be significantly reduced.

Existing Conditions Report

The Existing Conditions Report was previously submitted to MTS on January 7, 2022 and is attached to this ZEB Master Plan Report as Appendix A. The Existing Conditions Report examined and documented the existing IAD facility and the existing on-site operations to determine site specific limitations and opportunities to support a fully 100% ZEB fleet. Additionally, the report contains a glossary of terms and acronyms used within itself and applicable to this report and other previously issued memorandums as part of this IAD ZEB Master Plan project.

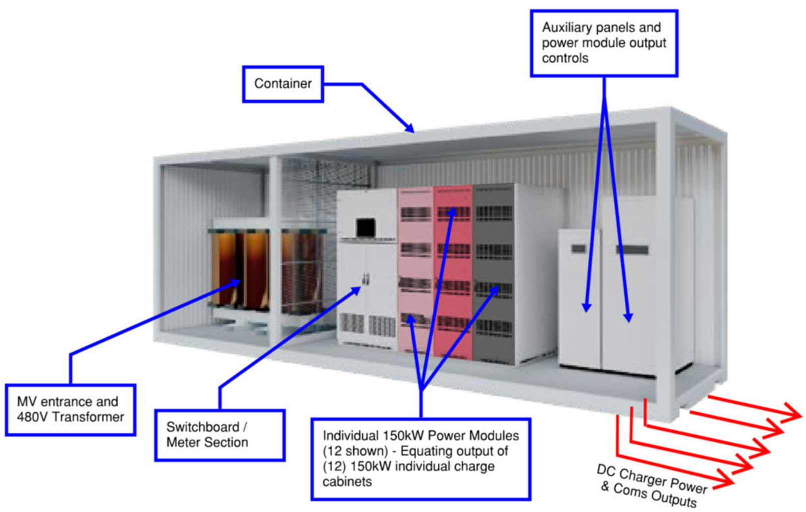
CHAPTER 3 – BEB CHARGING TECHNOLOGY

BEB Charging Technology

During the IAD ZEB project kickoff meeting and on subsequent workshops it was confirmed that the basis of design for BEB charging technology at IAD would be the on-going BEB charger and dispenser units being used at SBMF currently in the early stages of the Phase 1 construction. The SBMF Phase 1 BEB charging infrastructure is utilizing Heliox Flex180 charging cabinets paired with an overhead mounted Schunk SLS 301 depot charger piston dispensers in a 1:3 charging configuration [i.e., one (1) charging cabinet energizes three (3) depot piston dispenser]. Another SBMF BEB charging technology identified to use as basis of design was the medium voltage service entrance and medium voltage feeder lines being distributed across the site to medium voltage unit substations. As discussed in greater detail in Chapter 4 with the concept descriptions, this MV on-site power distribution/ charger / dispenser setup was the basis of all the developed concepts. A recently available charging technology that wasn't available during the design of the SBMF Phase 1 design, the "Big Box" charger, was also considered during conceptual design. Plugin and induction charging were not considered for IAD BEB charging technology.

Big box chargers are being offered now by various charger OEMs with the promise of a smaller charging system footprint with similar performance of the current individual nominal 150kW charging cabinets being utilized in multiple charger clusters similar to SBMF and the IAD concepts. Big box space savings occurs when the individual BEB charging infrastructure components including medium voltage (MV) feeder entrance, 480v transformer, switchboard, and individual charging cabinet are combined into a single container by a single OEM as a charging 'system'

Example 1.5MW 'Big Box' container section



CHAPTER 4 – ELECTRIC SERVICE APPROACH & CONCEPT PLAN OPTIONS

ELECTRICAL SERVICE APPROACH & CONCEPT PLAN OPTIONS

ELECTRICAL SERVICE APPROACH

GOALS

Fleet conversion to all-electric buses requires a great deal of power to charge the vehicles. The relationship between the transit agency and the utility will change because the utility becomes like a fuel provider. If they can't provide the fuel, the buses don't run the next day. Similarly, with electric buses, if there is a power outage, it could have a substantial impact on the next day's rollouts. This means that the power coming from the utility needs to be reliable and the grid needs to be able to support the increase in load that BEBs require. This section will discuss how the utility, SDG&E, can supply sufficient power reliably and discuss resiliency options if there is a power outage.

INDEX	MEASURE	UNITS
System Average Interruption Duration Index (SAIDI)	Average outage duration per customer	Minutes per outage (per customer)
Customer Average Interruption Duration Index (CAIDI)	Average outage duration if an outage is experienced, or average restoration time	Minutes Per Year (per customer)
System Average Interruption Frequency Index (SAIFI)	How often a customer can expect to experience an outage	Number of outages a year (average)
Momentary Average Interruption Frequency Index (MAIFI)	The frequency of momentary interruptions	Number of instantaneous outages (<5 minutes) per year (average)

UTILITY RELIABILITY

Table 1. Electric Power Distribution Reliability Indices

Source: SDG&E

1. REALIABILITY INDICES

Power reliability is an important factor when considering the transition to BEBs. Without an understanding of existing reliability or measures in place to mitigate the risks of an outage, any disruption in electrical flows can be devastating to SDMTS's service.
The California Public Utilities Commission (CPUC) monitors reliability for regulated, investor-owned utilities around the State to ensure that performance is upheld. WSP gathered information from the CPUC as it relates to San Diego Gas & Electric (SDG&E), the local distribution utility.

2. SDG&E RELIABILITY

Reliability metrics can vary from year to year based on large power outage events, such as, the Camp Fire in Paradise, California in 2018, or the Southwest Blackout of 2011. Therefore, CPUC generally uses 10-year rolling averages to show improvements over time. After Pacific Gas & Electric's transmission lines caused the deadliest fire in California history (the Camp Fire), the CPUC and regulated utilities began to implement public safety power shutoffs (PSPS) in 2019. In 2019, outage impacts from PSPS de-energization events in 2019 totaled 53.74 system SAIDI minutes. and 0.034 system SAIFI. In 2020, outage impacts from PSPS de-energization events in 2020 totaled 107.17 system SAIDI minutes and 0.068 system SAIFI. Despite the impacts, SDG&E is among the top 2 utilities in this region that show a consistent, high level of performance. For all four metrics Table 1, lower numbers indicate more reliability. For example, if an average outage duration (CAIDI) is experienced, the number represents the number of minutes of the outage, so an outage of only 10 minutes shows a more robust system then an average outage of 45 minutes.

Figure 1A and Figure 1B presents metrics for the San Diego Construction Metro district.

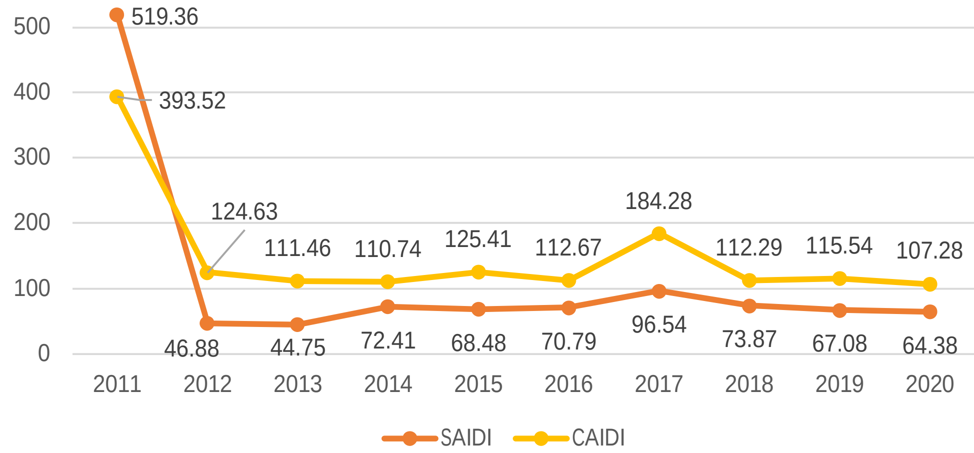


Figure 1A. Metro Division Metrics of SAIDI and CAIDI (2011-2020)

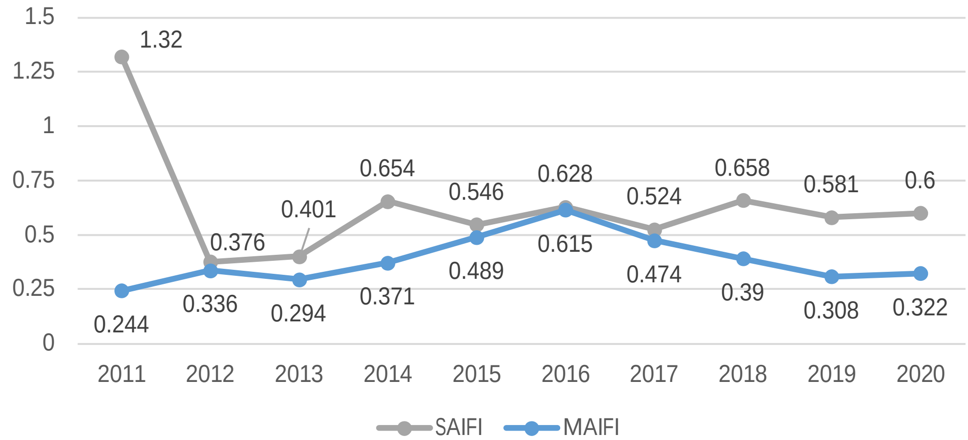


Figure 1B. Metro Division Metrics of SAIFI and MAIFI (2011-2020)

Source: SDG&E

The left side of each chart is the year 2011 when there was a regional power outage called the Southwest Blackout. The right side of each chart has 2020 data which is the latest available reliability numbers as of Jan 2022. Over the last 9 years, the average numbers for unplanned outages are presented below in Table X, including the 2011 anomaly.

SAIDI	CAIDI	SAIFI	MAIFI
112.5	149.8	0.629	0.384

Table 2: Metro Division Metrics of SAIDI and CAIDI (2011-2020)

Source: SDG&E

Each customer within SDG&E's Metro district can expect just over one power outage within two years, and it will probably last around 150 minutes. (By multiplying 0.629 average outages per year * 149.8 minutes per outage = 94.3 minutes of average outage minutes per year). Similarly, there are only 0.384 momentary outages per year, or less than one every other year.

ELECTRICAL SERVICE APPROACH & CONCEPT PLAN OPTIONS

RESILIENCY REQUIREMENTS

IAD RESILIENCY APPROACH

Similar to using SBMF detail design BEB charging technology as basis of design for IAD Master Plan Concepts, the final detailed design being implemented in the SBMF Phase 1 on-going construction power resiliency technology and approach is being used as basis of design at IAD. SBMF used a new MW feed that entered the site into a microgrid controllable service entrance feeding separate microgrid controllable unit stations spread across the site. Resilient provisions were made at SBMF for multiple potential redundant power sources including:

- Fixed Generation On-Site
- Portable Generation
    - At main MV entrance
    - At each MV substation
- On-Site Generated Photovoltaic (PV) power
- On-Site Battery Energy Storage System

Based on space limitation on IAD site, the reduced fleet size being operated from IAD as compared to the ultimate BEB capacity of SBMF, and the close proximity to high density multistory housing adjacent to the likely fixed emergency BEB generator(s) the fixed generation resiliency was not considered a viable technology for IAD. The other three resilient power sources are being accommodated in the IAD master plan concepts as described in detail later in this chapter.

DETERMINING RESILIENCY NEEDS

There are various methods to increase a site's resiliency to meet their fleet demands: solar panels, battery storage, backup generators, redundant power feeds, microgrids, etc. However, these methods can require more space, time, and money than the project budget allows. It is important to integrate resiliency needs into the overall resiliency effort and planning. The first stage of the project aims to support fully charging 30 BEBs to 100% state of charge (SOC) in the event of a power outage. For a full buildout beyond the first 30 buses, charging multiple BEBs to 100% SOC is a substantial cost, and further analyses can help determine the most cost-effective way of providing resiliency. There are two main aspects that adding these technologies can help with:

1) Reducing overall operational/electricity cost
2) Ensuring backup power can operate almost instantaneously in the event of an outage.

Both items require further analysis of the BEB network's power and energy demands, the resiliency of the utility, and the level of comfortability that the transit authority has for estimating those daily needs. The resiliency statistics in section 1 provide an initial step to determining the amount of backup power a depot needs. The project needs to consider backup plans in the event of an overnight outage causing all the chargers to go offline.

To determine this, modeling is required to estimate that amount of time the BEBs will need to charge versus the time buses stay at the depot. It is possible that some buses may pull into the depot close to empty, those requiring substantially more charge time, whereas some buses may pull in at 40% or more SOC. Therefore, it is important to measure the average time differential between the buses' idle period at the depot and its required charging time. With this information, the site can determine the amount of impact a power outage would cause to the fleet's charging operation.

For example, the SAIDI statistic, which is the average number of minutes the utility power is unavailable during an outage, can help determine the average outage time gap the resiliency plan needs to protect against. In the San Diego Metro district, the average outage is 150 minutes. When looking at fleet times, the fleet operators need to determine the percentage of buses that cannot complete their routes during an average or longer outage time period. In this scenario, if only 5% of buses could not fully charge when the power was out for over 2 hours, the average SDG&E outage might not be a concern and little to no resiliency may be required. However, if 50% of buses cannot complete their routes if the power was out for an hour, then resiliency is highly encouraged and would require a substantial investment in alternative generation and critical storage technologies.

Another option to offset electricity costs and increase resiliency is to use microgrid technologies that would allow some or all of the site to operate in an "islanded" mode for a period of time. The site can also use the microgrid to use power from the grid during times of low electricity rates and use onsite power when electricity costs are high. SDG&E has rates that change based on when the electricity is used, so if there are some buses that need to charge during peak times, using something like solar and battery storage to charge those buses could substantially decrease that operational cost. The microgrid can also smoothly transition the site from grid power to onsite power almost instantaneously when an incoming outage is sensed.

ELECTRICAL SERVICE APPROACH & CONCEPT PLAN OPTIONS

1. EXISTING INFRASTRUCTURE

The existing site electrical service is provided by SDG&E. There are five existing services provided by five utility-owned transformers associated with five utility meters. The repair and maintenance building, office annex, and administration building to the east receive power from two services entering the facility from 16th street with switchboards and two meters located in the repair and maintenance building. The three remaining service feeds that power the west side of the facility originate from L street, connected to three SDG&E-owned transformers located near the L-street fence.

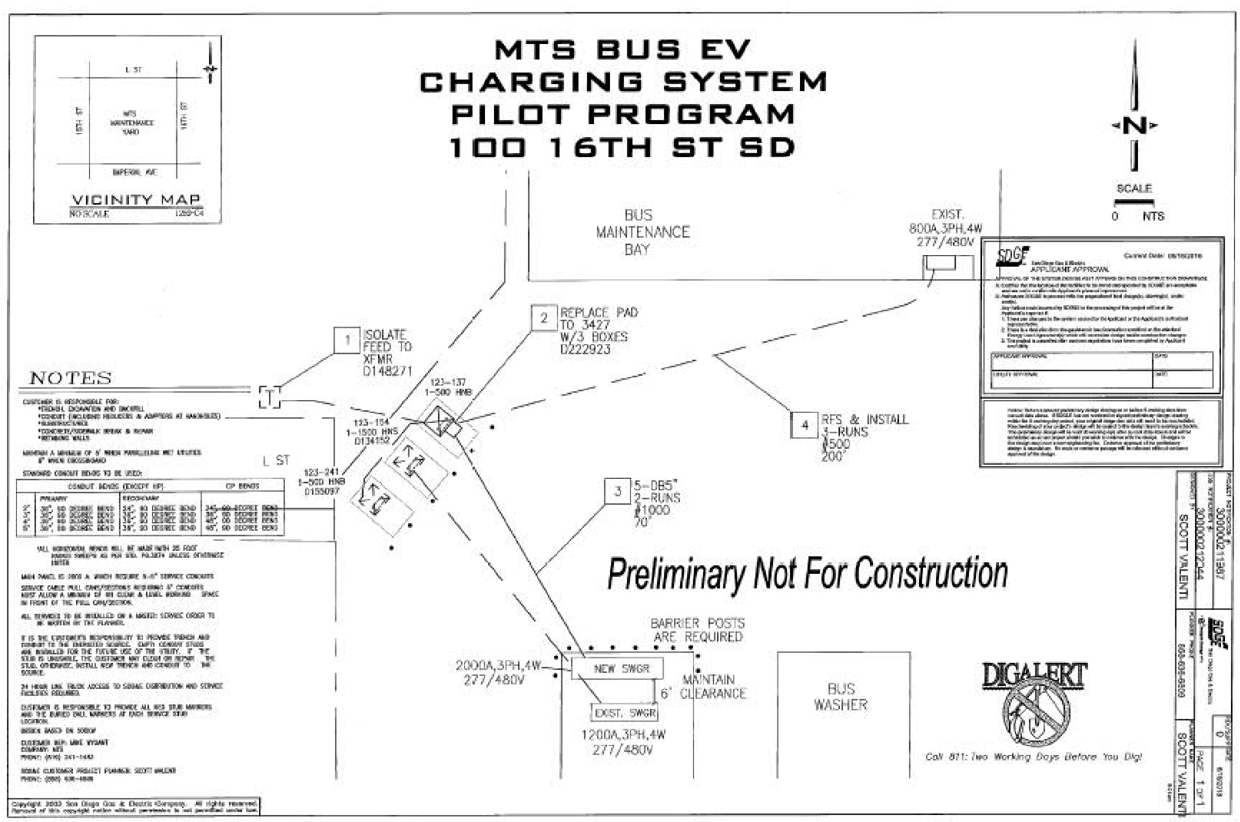


Figure 1C: Existing Electrical Site As-Built Layout

There are six (6) existing ChargePoint CP-250 BEB plug-in chargers fed by a separate 480 V three-phase SDG&E service connected to a dedicated utility meter and main switchboard with 2000A main bus with a main breaker set to trip at 600A. This is shown in Existing Conditions Report, Appendix A.

There are three onsite backup generators. The first generator is located near the fence on the east side of the site, supplying standby power to building loads. The second generator is 75kVA and is located near the maintenance building. The third generator is 150kVA and supplies standby power to the service bay. This is shown in Existing Conditions Report, Appendix A.

The existing infrastructure does not have enough capacity to support the new full BEB buildout and new Electrical infrastructure will be required. For a full fleet buildout, it is estimated at a 3:1 charging ratio that the EVSE could pull a maximum of 10 MW. While nighttime and off-peak charging will help regulate the cost of that much electricity, and charge management software can help reduce peaks and spread out the power needed, the infrastructure must be designed to support to full possible load, especially for emergency scenarios.

2. NEW INFRASTRUCTURE CONCEPTUAL DESIGN

One new 12 kV service line will be anticipated to supply power to 136 new charging positions – the anticipated total of new on-site charging positions being added to the IAD site in the Master Plan Ultimate Buildout. Total estimated maximum power required will be 10MW. Construction of the masterplan will be deployed in three phases. Phase 1 consists of the build out for the first 30 charging positions in the North lot. Phase 2 consists of the build out for the remaining 10 charging positions in the North lot and 50 charging positions in the South lot. Lastly, phase 3 consists of the building out for the remaining 40 charging positions located in South lot. For the phase 1 deployment, the new main service and the unit substation in the north lot will be required. The charging equipment operates at 480V. The existing service to the IAD, is expected to remain untouched. The new BEB service would be separately metered.

- New incoming service will be a 12kV service and feeds a new medium voltage switchgear.
- The new medium voltage switchgear capacity is sized to feed three new pad mounted unit substations located on elevated platforms over the bus parking north and south lots
  - One new pad mounted substation will be installed in Phase 1.
  - Two future pad mounted substations will be installed in later phases as needed
- Each unit substation will contain a 3750kVA 12.47kV-480/277V pad mounted transformer which will feed its switchboard rated for 6000A at 480/277V (3ph, 4W), 100kAIC.
- Each switchboard will be able to feed up to 20 DC charging cabinets (180kW) supporting sixty (60) BEB's at a 3:1 charging ratio
  - The switchboard will feed auxiliary loads, via a step-down transformer, for equipment monitoring, hoist motors, etc.
- Each switchboard will have a tap box section to facilitate connections from a portable trailer generator parked in close proximity to the substation
- Each switchboard will be provisioned to have solar power and BESS connection as alternatives

Equipment List Summary

- MV Switchgear – 600A, 15kV, 3ph, 3W, 65kAIC qty. one (1)
- Unit Substations
  - Transformers – 3750kVA 12.47kV – 480V/277V, pad-mounted qty. three (3)
  - Switchboards – 6000A, 480/277C, 3ph, 4W, 100kAIC qty. three (3)
- Auxiliary transformers – 15kVA 480V/277V – 120/208V, pad-mounted qty. three (3)
- Panelboards – 200A, 120/208V, 3ph, 3W, 22kAIC qty. three (3)

The first 30 charging positions will only need one unit substation consisting of transformer and one switchboard, and the additional 10 charging cabinets to be added in phase 2 will be served by the switchboard from phase 1. Additional transformers and switchboards will be added in the future in conjunction with the expanding BEB fleet. This modular approach allows for adaptability as the fleet expands from its initial 30 buses.

The chargers will be fed from the 480V switchboards but auxiliary devices including: 1) hoists for the charging cables from the power dispenser, 2) the auxiliary power for the power dispenser itself which plugs into the bus,

3) other communication devices which will be fed from 120/208V panelboards. Cable ladder tray and/or conduit will be used to route the cable from source to load.

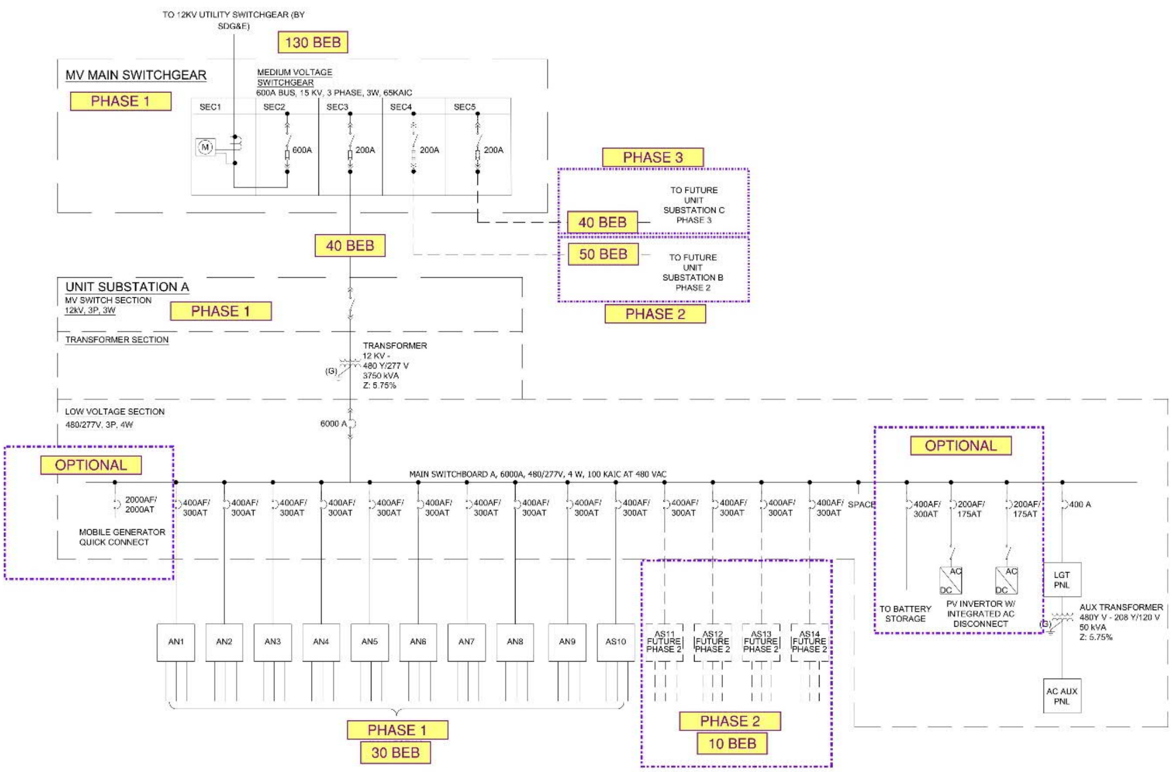
All devices will be properly grounded to the facility's existing ground system. The main MV service entrance switchgear will be grounded according to SDG&E's standards.

In the event of a utility outage, "microgrid ready" switchgear will continue to feed a portion of the fleet. This microgrid will have provisions within the switchgear, likely on the low voltage side, and at each of the Distributed Energy Resources (DERs) for intelligent monitoring of its loads and will be able to operate in an island mode and power some buses during an outage. Ideally, the charge management software that controls the EVSE would also be able to talk to the intelligent devices on the microgrid for better load management and determining which DERs to use at what time. The fleet will receive power via DER sources available:

- Solar power – photovoltaic cells are planned to be added on top of the new gantry system that will be installed to support overhead charging. The maximum total space available to install solar panels at both north and south lot is 75,000 sq-ft. The estimated peak power supplied by the fully built-out solar system is 1.15 MW. The solar power available can be used to assist with mid-day charging or charging a large stationary battery (BESS) to help shift loads depending on the time of day.
- BESS Battery power – Currently there is enough room for (2) 2 MWh battery that would fit in a 40' storage container on north and south platform each based on preliminary designs. Additional modeling, resiliency, and economic factors should be employed to "right size" the battery for the design.

The final choice of DERs must account for the duration of an anticipated outage (per the Resiliency section above) and the ability of the buses to still meet rollout schedules based on detailed modeling. This modeling should take into consideration overnight idle time versus how long each bus needs to charge overnight. Some buses may arrive at the depot with low power and require substantially longer charge times, and thus a power outage would more dramatically affect that bus's ability to meet rollout the next day. Some buses that do mid-day or on-route charging may come back to the depot with a much higher battery SOC % and may not need a full battery to make their rollouts the next day, and thus would be less susceptible to the effects of a power outage. Doing this detailed analysis and taking into consideration the probability of an outage and outage durations will allow the client to make better informed decisions on the type, size, and quantity of DERs from both a technical feasibility perspective and an economic perspective. The current conceptual design allows for the flexibility to integrate these DERs as needed based on that analysis.

SINGLE LINE DIAGRAM



ELECTRICAL SERVICE APPROACH & CONCEPT PLAN OPTIONS

CONCEPT PLAN OPTIONS

The design team worked with key project representatives from MTS to develop and test various alternate facility concept layouts based on the various charging technologies and how each charging technologies, once applied to the IAD facility, impacted the site's functional on-site vehicle and workflow and physical requirements such as accommodating the full anticipated fleet parking and space to accommodate new electrical charging service infrastructure. All developed concepts, including concepts tested that failed to produce a viable master plan, are described in this chapter. All the concepts discussed in this chapter assume the use of overhead piston dispensers. All concepts also assume that any existing BEB infrastructure can remain. An MTS preferred and selected IAD ZEB Master Plan Concept option was chosen which will form the basis of design of the preliminary design. This selected Master Plan Concept will be further discussed in Chapter 5.

The developed concepts took the following ZEB distribution schedule into consideration:

FISCAL YEAR	QUANTITY OF NEW ZEBs	RUNNING TOTAL
2025	10	10
2026	13	23
2030	33	56
2031	26	82
2034	37	119

Table 3: ZEB Distribution Schedule

To reduce the number redundant concepts to review and maximize the number of option configurations considered, the option variables were broken down into three main decision categories

1. New Medium Voltage Switchgear Location
2. Big Box Charger vs Individual Charger Cabinets
3. Charger Infrastructure Location

Each of the decision variables were shown as described below but not on every possible combination. If MTS selected a MV voltage switchgear location it would work with most of the other developed charger type and location scenarios. Configurations of concept variables not included on day 1 of the design charrette workshop but were discussed and wanting more discussion were developed for day 2 of the design charrette workshop and refined in the final selected master plan concept on day 3 of the design charrette workshop.

The following options were developed and presented to MTS:

Medium Voltage Switchgear Location Options

- Option 1 Location – Brewery: This location shows the new medium voltage service coming into the site adjacent to the existing BEB infrastructure. This option required the loss of several staff parking positions in order to provide adequate room for the new switchgear.
- Option 2 Location – Condo: This location shows the new medium voltage service coming into the north side of the site adjacent to the service gate in a underutilized site area. This option minimally impacts the site in terms of parking area and circulation. This is the preferred concept to be discussed further in chapter 5.

Charging Infrastructure Equipment

- Option 1 – 1.5 MW Big Box: This equipment option utilizes a large container that contains everything required to charge 20 positions at 75 kW concurrently, or up to 40 parking positions at 1:2 charging, including transformers, distribution panels, and charging cabinets. The container connects directly to the new medium voltage service, steps the medium voltage down to 480V, rectifies the AC power to DC power, and finally outputs DC power to numerous dispensers.
- Option 2 – Individual Cabinets: This equipment option utilizes individual nominal 150kW charging cabinets that connect back to a unit substation. The unit substation then connects back to the new medium voltage switchgear, where the new medium voltage service enters the site. The unit substation consists of a medium voltage to low voltage transformer and low voltage distribution panels, which then connect to the individual charging cabinets. This is the preferred concept to be discussed further in chapter 5.

- Note futureproofing. One of the advantages of the individual cabinet option is that the space needed to accommodate individual charging cabinets and unit will be large enough to accommodate a big box charger in the future if, as BEB charging technology if quickly developing, big box MV chargers were to replace the individual charges at the end of their lifecycle.

Charging Infrastructure Locations

- Option 1 – Ground Mounted Infrastructure: This option shows all of the necessary charging infrastructure after the medium voltage switchgear installed on an elevated curb at grade, occupying a whole parking track in both north lot and the south lot. This is the approach being installed now for charging infrastructure at SBMF BEB Phase 1.
- Option 2 – Platform Mounted Infrastructure: This option shows all the necessary charging infrastructure after the medium voltage switchgear installed on an elevated platform over the level of the buses. Minimal parking is occupied by new structural columns, and no equipment is installed at grade. Both lots in this option utilize steel framing with a concrete deck.
- Option 3 – Platform Mounted Infrastructure North Lot, Parking Deck Mounted Infrastructure South Lot: This option shows all the necessary charging infrastructure after the medium voltage switchgear mounted overhead over the level of parked buses. The north lot in this option utilizes steel framing with a concrete deck, and the south lot utilizes a new parking deck structure, with bus parking at grade, and additional staff parking on the new elevated parking deck. The parking deck also supports necessary charging infrastructure for the buses parked at grade. This is the preferred concept to be discussed further in chapter 5.

Note The resilient power options (PV, portable generation and BESS) were able to be incorporated into all charging infrastructure location concepts.

In all the options described above, minimal to no impact is expected for the underground storage tanks (USTs) adjacent to the fuel lanes. but once the overhead structure is installed, the tanks would be effectively impossible to remove. Prior to and separate from construction of Phase 1, MTS will remove the USTs and replace them with aboveground storage systems.

The following table provides a quick designated parking count summary comparing the Charging Infrastructure Location options for on-site parking. It is assumed that, for the overhead steel options in the south lot, a similar staff parking arrangement can be maintained as is currently being utilized (i.e. overnight for bus parking, day time for staff vehicle parking in the south lot). Numbers in brackets indicate difference between existing and master plan. Note that for staff parking, all options assume that the existing CNG yard and BEB infrastructure are removed in favor of staff parking.

OPTION	40' BUS PARKING	60' BUS PARKING	TOTAL CHARGING	STAFF PARKING	NRV PARKING
Existing	45 (North Lot) 53 (South Lot)	36 (South Lot)	6	172	38
Ovhd Steel Frame w Equipment on Ground	35 (North Lot) [-10] 46 (South Lot) [-7]	36 (South Lot) [0]	117 [+111]	152 [-20]*	38 [0]
Ovhd Steel Frame w Equipment Overhead	40 (North Lot) [-5] 46 (South Lot) [-7]	36 (South Lot) [0]	122 [+116]	172 [0]*	38 [0]
Ovhd Steel Frame and Parking Deck	40 (North Lot) [-5] 60 (South Lot) [+7]	36 (South Lot) [0]	136 [+130]	232 [+60]**	44 [+6]

* Staff parking in bus parking tracks
** No staff parking in bus parking tracks

Table 4: Parking Positions per Option

A bus operator survey was conducted by MTS to gauge the current amount of bus operators parking on-site vs off-site. The survey received a 90% response rate, so it is assumed that the remaining 10% of operators follow a similar on-site vs off-site distribution. Of the replies received, a maximum of 48 out of 243 drivers currently park off-site or do not drive themselves to work. It is assumed that the decision to not drive to work is influenced by the need to park off-site, or from being dissuaded from parking on-site. Taking this into account, as well as an additional 10% for those responses not received, an estimated 60 additional car parking spaces would be required to accommodate all bus operators on a given day. The "Overhead Steel Frame and Parking Deck" option accommodates an additional 65 staff and NRV parking positions, allowing those that park off-site or do not drive themselves to work due to lack of parking, to instead be able to park on-site.

In the case that the CNG yard is demolished, additional employee parking can be gained. If the existing BEB infrastructure is retained, up to 18 additional parking positions can be gained. If the existing BEB infrastructure is removed, up to 23 additional parking positions can be gained.

HYDROGEN

The concepts presented below do not have provisions for a hydrogen storage yard, but there are a number of things to consider when planning for the fueling of hydrogen buses. Setbacks to structures, property lines, and other facilities are required for both the storage system as well as the dispensing area. The setbacks for the hydrogen storage area are defined and quantified in "NFPA 2 – Hydrogen Technologies Code."

For the dispensing area, a certain minimum distance must be maintained from storage tanks as well as public sidewalks, depending on a number of factors. These requirements are found in a different section of the NFPA Code (NFPA 55).

For a given hydrogen storage system, there are 2 major components that have separate setback requirements:

1. The liquid hydrogen storage tank, and
2. The gaseous hydrogen storage tank

For each of these components, there are 3 groups of setback categories (referred to as "Exposures Groups"), listed below. For the liquid hydrogen storage tanks, the setbacks are determined by the overall volume of the tank. For the gaseous storage tanks, the setbacks are determined by the pressure of the tank, as well as the smallest pipe diameter.

- Exposures Group 1
    - Lot lines
    - Air intakes
    - Operable openings in buildings and other structures
    - Ignition sources (open flames, welding stations, etc)
- Exposures Group 2
    - Exposed persons (other than those servicing the system)
    - Parked cars
- Exposures Group 3
    - Buildings (combustible / non-combustible)
    - Flammable gas storage systems (above or below ground)
    - Hazardous materials storage (above or below ground)
    - Combustible materials (slow or fast burning)
    - Unopenable openings in buildings and other structures
    - Overhead utilities
    - Piping containing hazardous materials
    - Flammable gas metering

Other considerations for interior installations vs exterior installations of systems can be accounted for in NFPA 2, but for this project it is assumed that hydrogen systems are only under consideration for outdoor installation.

An example hydrogen storage yard for fueling 90 Hydrogen buses is shown in Figure 4.1, showing the overall setbacks for each of the exposures group. The example yard consists of an 18,000 gal liquid hydrogen storage tank, gaseous hydrogen storage vessel, pumps, chillers, etc. Assuming the daily use of hydrogen per bus is 30 kg and two hydrogen fueling lanes, the system is capable of fueling a fleet of 90 hydrogen buses in less than 7 hours. Additionally, this system would be required to have hydrogen delivered 4-5 times a week. Additional storage could be added to minimize the delivery requirements, but that would require additional space for the tanks, as well as space for the required setbacks. As this is an example, there may be various changes to the layout to better accommodate the tight fit of the site (fewer buses being hydrogen fueled requiring smaller storage tanks, as an example) that could reduce the overall setback requirements.

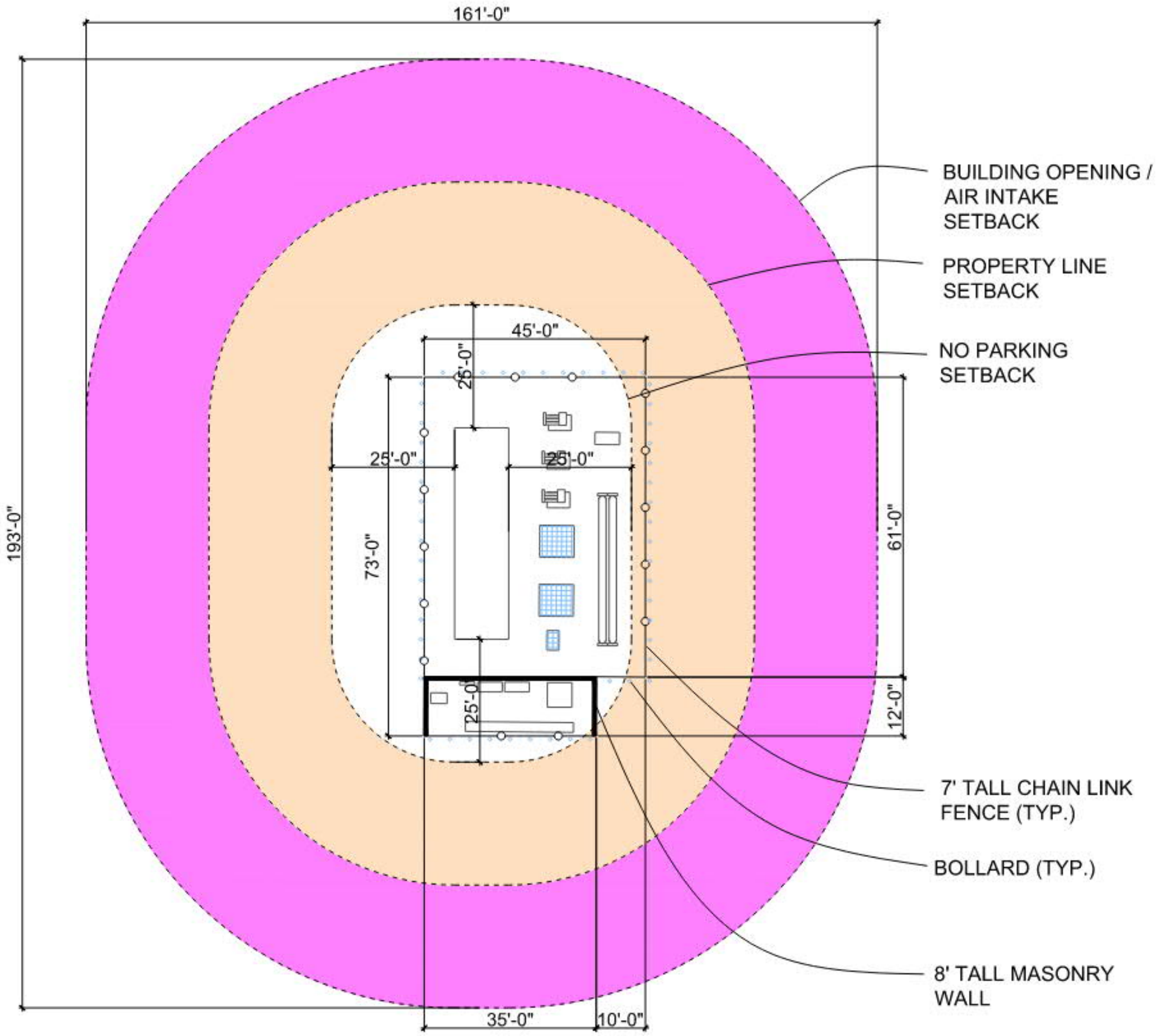


Figure 4.1: Example Hydrogen Storage Yard

New Medium Voltage Switchgear Option 1 – Brewery Location

In this option, it is proposed that the new medium voltage switchgear, which is the new entry point for medium voltage service, be installed adjacent to the existing BEB infrastructure at the western edge of the site, at the end of L Street.

Figures 4.3 "Ground Mounted Cabinet Equipment" and 4.4 "Platform Cabinet Equipment" show both proposed switchgear location options on the western side of the site.

Pros:	Cons:
• Installation adjacent to existing BEB infrastructure, and other SDG&E MTS transformers, minimal separation of service.	• The new required medium voltage switchgear occupies staff parking spaces. • Getting power from the medium voltage switchgear to the new unit substations requires working with and around many existing utilities.

This option was discarded due to the amount of existing utility interaction that would be required, in addition to loss of staff parking.

New Medium Voltage Switchgear Option 2 – Condo Location (SELECTED)

In this option, it is proposed that the new medium voltage switchgear, which is the new entry point for the new medium voltage service, be installed near the service gate at the north side of the site, adjacent to K Street.

Figures 4.3 "Ground Mounted Cabinet Equipment" and 4.4 "Platform Cabinet Equipment" show both proposed switchgear location options on the western side of the site.

Pros:	Cons:
• No loss of parking, or interruption of circulation.	• Distant from existing BEB infrastructure • Will require new SDG&E MV entrance to be coordinated with existing fire line and backflow preventer at northwest corner of the IAD site along K Street. • Will required contractor to build new underground service feeders across the active three service lanes.

This option was selected due to minimal existing utility interaction, as well as minimal impact to existing parking and circulation.

A preliminary design has been provided by SDGE that shows a potential path for power to enter the site. Power would enter the site from north, at the gate across the street from 15th street, cross the site along the employee parking between the two gates at the northern boundary of the site and enter this selected New Medium Voltage Switchgear Location option. Refer to Appendix C for the base drawing.

New Charging Infrastructure Equipment Option 1 – 1.5 MW Big Box

In this option, it is proposed that a large, containerized solution be used to charge up to 40 positions. The necessary infrastructure is to be provided entirely within the footprint of the large container, and includes medium to low voltage transformers, necessary distribution, and charging cabinets. This solution can be utilized on an elevated curb, or on an overhead structure.

Refer to Figure 4.2 "Charger Layout Options" for difference in required infrastructure and space between the proposed charging equipment options.

Pros:	Cons:
• Reduces footprint required to charge 40 positions significantly. • All in one solution in a single container by a single OEM	• Newer developing technology. While initial units are commercially available and pilot installation area beginning to be installed in North America, no long-term data of reliability or utilization issues. • Unit contains multiple removable 'power modules' that energize the overhead dispensers. If a power modules maintenance needs to be performed, this likely will result in a shutdown of the entire unit, resulting in loss of charging for any positions connected to the unit. • Alternatively, the big box can be temporarily de-energized, individual power module(s) remove for maintenance and the big box re-energized with the remaining attached power modules energizing their respective dispensers.

This option was also discarded due to the fact it is new yet unproven technology. Additionally, in a scenario where the multi-MW big box was designed around but individual charging cabinets were ultimately selected or tried to replace the big box chargers in the future, there would not be enough room on the platforms to support the alternate individual charging cabinet and unit substation infrastructure.

New Charging Infrastructure Equipment Option 2 – Individual Cabinets (SELECTED)

In this option, it is proposed that the charging positions be electrified through the use of several individual charging cabinets. The infrastructure required for this option is a unit substation, which consists of a medium to low voltage transformer and low voltage distribution panels, as well as several individual charging cabinets.

Refer to Figure 4.2 “Charger Layout Options” for difference in required infrastructure and space between the proposed charging equipment options.

Pros:	Cons:
• If maintenance needs to be performed on a cabinet, the individual cabinet can be shut off, only affecting 3 charging positions instead of many more charging positions. • Established charging technology across the transit industry and currently being installed at SBMF BEB Master Plan Phase 1 • Elevated decking and curb islands sized to support individual unit substations and individual charging cabinets can be retrofitted at a later future date with a big box type charger.	• More space required than the 1.5 MW box option. • More individual parts and pieces from separate OEMs

This option was selected over the 1.5 MW box, due to being able to maintain cabinets individually while only shutting down 3 charging positions per cabinet instead of many more and for the preference to utilizing more established BEB charging technology without limiting the ability to use a future big box charging system in the future.

Support for New Charging Infrastructure Option 1 – Equipment Installed on Elevated Curb in North Lot and South Lot

In this option, it is proposed that the selected infrastructure be installed on an elevated curb at grade. In order to accommodate the necessary electrical infrastructure, at least one parking track per lot must be utilized for the charging infrastructure. This ground mounted charging equipment by repurposing a bus parking lane was the selected solution at the SBMF Phase 1. Due to the length of the parking tracks removed, both individual cabinets and unit substations, or the large 1.5 MW boxes are proposed to be installed on the same size elevated curb. Minimal overhead structure is proposed to be installed over the north lot and the south lot sized only to hold overhead power distribution, overhead piston dispenser and PV panels. No equipment overhead concrete deck with this option.

Trenching is required from the medium voltage switchgear to the elevated curb, along the entire length of the elevated curb, and down to the south lot elevated curb, and finally along the length of that entire curb.

Along with the necessary charging infrastructure, there is potential for PV panels to be installed on the new overhead steel structure.

Refer to Figure 4.3 “Ground Mounted Cabinet Equipment”, for a representation of this yard layout option. Note that the graphic shown indicates an individual charging cabinets layout.

Pros:	Cons:
• Minimal structure required overhead, only need to support pantographs and necessary cables and distribution. • Charging equipment and infrastructure at grade for ease of maintenance and service access • Matched approach utilized at Phase 1 SBMF	• Lose at least one parking track in both the north and the south lot. • Requires more trenching and ground disturbance in both lots. • Past on-site excavation uncovered a significant amount of hence forth unknown debris and un-marked active and abandoned underground utilities

This option was discarded in favor of retaining as much parking as possible.

Support for New Charging Infrastructure Option 2 – Equipment Installed on New Overhead Steel Frame in North Lot and South Lot

In this option, it is proposed that all necessary charging infrastructure after the medium voltage switchgear be installed over the level of the buses, thereby maximizing the amount of ground space available for parking. Overhead steel structure is proposed to be installed over both the north lot and the south lot, with a concrete deck cast overhead to support the necessary charging infrastructure. Both the charging cabinets and the unit substations, or the large 1.5 MW boxes are proposed to be installed on this overhead structure.

The trenching required for this option is from the medium voltage switchgear to one of the columns of the new proposed structure in the north lot. Additional trenching may be required to get power to the south lot overhead platform, or an "AC Power Bridge" could be constructed to avoid additional trenching.

Along with the necessary charging infrastructure, there is potential for PV panels to be installed on the new overhead steel structure.

Refer to Figure 4.4 "Platform Mounted Cabinet Equipment" for a representation of this yard layout option. Note that the graphic shown indicates an individual charging cabinets layout.

Pros:	Cons:
• Minimize required trenching • Maximize ground space for bus parking • Reduce quantity of obstacles at grade.	• A more significant structure is required compared to the "equipment installed on elevated curb" option in order to support the necessary charging infrastructure. • Charging infrastructure is on elevated platforms not at grade Note fixed deck access stairs not service ladders will mitigate access issues to elevated charging equipment but charging equipment will still be largely out of casual visual inspection

This option was discarded in favor of the similar parking deck option, as the parking deck option afforded more staff and MTS non-revenue (NRV) car parking space.

Support for New Charging Infrastructure Option 3 – Equipment Installed on New Overhead Steel Frame in North Lot, Elevated Parking Deck in South Lot (SELECTED)

In this option, it is proposed that a steel overhead frame be installed in the north lot in order to support the overhead mounted charging infrastructure, thereby maximizing the amount of ground space available for bus parking. In the south lot, a new parking structure is proposed to be built, with bus parking at grade, and staff parking and charging infrastructure on the upper level of the deck. Again, by installing the necessary charging infrastructure overhead, the maximum amount of ground space becomes available for bus parking. Both the individual cabinets and unit substations, or the large 1.5 MW boxes are proposed to be installed on both the concrete platform above the north lot, as well as on a portion of the new elevated parking deck on level with the car parking.

The overall clearance under the parking deck will be less than what can be achieved with the overhead steel structure in the North Lot. This is primarily due to the desire to keep the top of the parking deck at the same level as the second floor of the administration building. This results in approximately 15.5' clear for pantographs to be mounted. Assuming a bus height of 11'-4", this allows approximately 4' of clearance between the roof of the bus and the high points of the underside of the structure available for pantographs. This is enough space to allow both a piston pantograph dispenser and an arm pantograph to be utilized.

The trenching required for this option is from the medium voltage switchgear to one of the columns of the new proposed structure in the north lot. Additional trenching may be required to get power to the south lot parking deck, or an "AC Power Bridge" could be constructed to avoid additional trenching.

Along with the necessary charging infrastructure, there is potential for PV panels to be installed on the new overhead steel structure in the north lot. Additional PV can be installed on the parking deck as well, with additional light steel framing required to mount the PV panels over the level of the car parking / charging infrastructure.

Refer to Figure 4.5 "Platform and Parking Deck Mounted Cabinet Equipment" for a representation of this yard layout option. Note that the graphic shown indicates an individual charging cabinets layout.

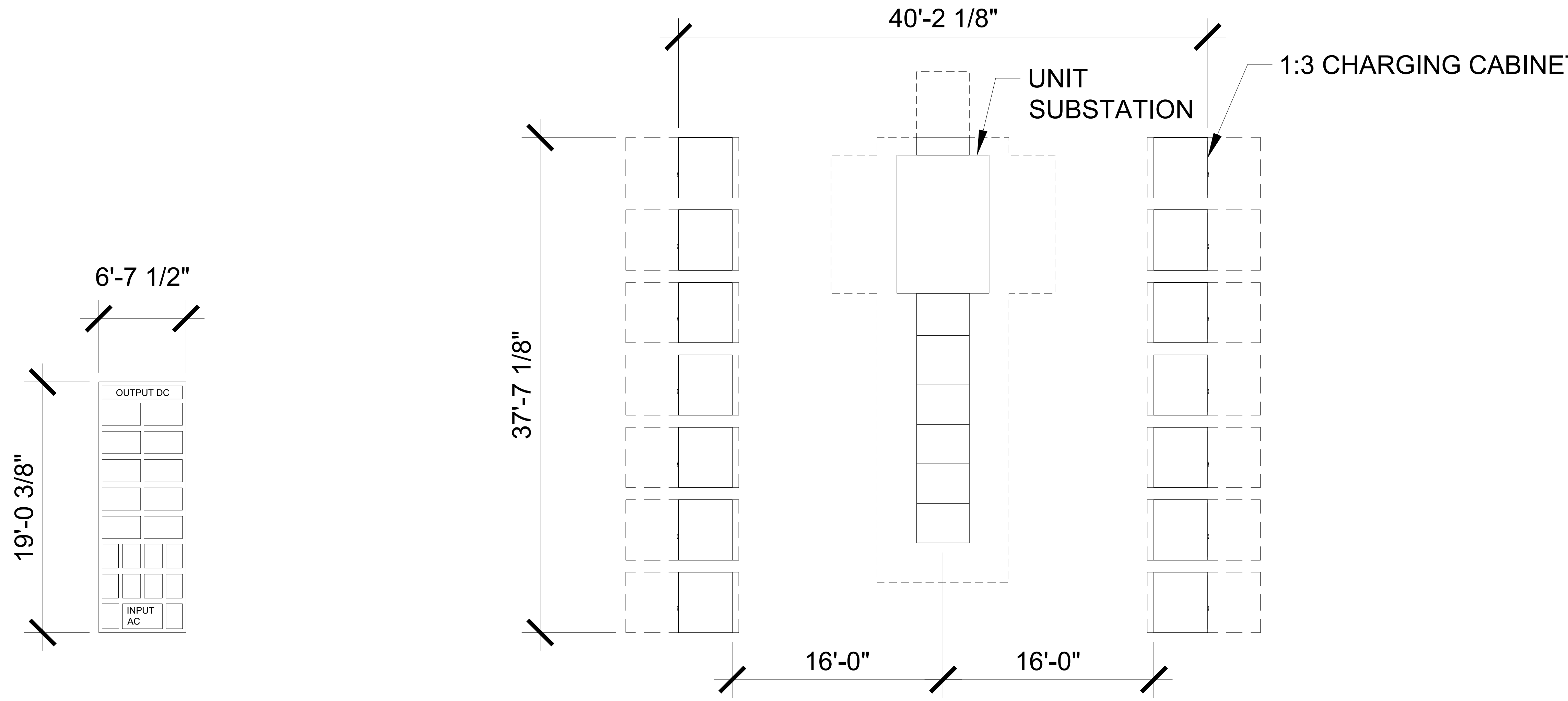
Pros:	Cons:
• Minimize required trenching • Maximize ground space bus parking • Increases potential for bus parking as relocated at grade car parking frees up grade level space for bus parking • Maximizes and increases car parking on site with utilization of the elevated car parking deck • Reduce number of private car circulating and parking at grade and in doing so reduces the potential interaction of private cars and bus traffic at grade • Proposed direct access to second floor of the administration and operation building from the new parking area on the parking deck.	• A more significant structure is required compared to the "equipment installed on elevated curb" option in order to support the necessary charging infrastructure in the north lot • Costs associated with constructing a parking deck in the south lot. • Multiple construction stages will be needed to construct parking deck with all IAD MTS vehicles operating on site. Likely staff cars and NRVs would be temporarily moved offsite to allow for garage construction • Phasing in piers will impact parking, as pier locations will have rebar poking out of the ground. Note construction stages could be reduced if MTS had another property to temporarily relocate a portion of the IAD bus, staff and NRV cars during construction.

This option was selected ultimately due to the increase in bus parking capacity, increase of staff and NRV parking, as well as improving site circulation by reducing the number of staff cars co-mingling with bus circulation at grade.

ELECTRICAL SERVICE APPROACH & CONCEPT PLAN OPTIONS

The overall cost for constructing a parking deck is roughly $13.6 million. The overall cost for constructing a steel frame is roughly $3.3 million. The major difference between the parking deck and the light steel frame (barring cost) is the quantity of parking positions for staff. Refer to Table 4 for parking counts.

Figure 4.1 - Charging Equipment Options



BIG BOX CONFIGURATION

20 POSITIONS CONCURRENT
@ 75 kW OR 40 POSITIONS AT 1:2 CHARGING

UNIT SUBSTATION WITH CHARGING
CABINET CONFIGURATION

1 SUBSTATION AND 14 CHARGE CABINETS
WITH 42 POSITIONS AT 1:3 CHARGING

PROJECT NO.	12127D
DRAWN BY	RR
DATE	02/03/2022
SCALE	11x17: 1" = 10'-0"

PROJECT TITLE
IAD ELECTRIC BUS
CONCEPT LAYOUTS

WSP USA Inc.
16200 PARK ROW
SUITE 200
HOUSTON, TEXAS 77084
TEL: (281) 589-5900
FAX: (281) 759-5164

DRAWING TITLE
CHARGING
EQUIPMENT
OPTIONS

DRAWING NUMBER
IAD
MP.CG1

Figure 4.2 -Ground Mounted Cabinet Equipment

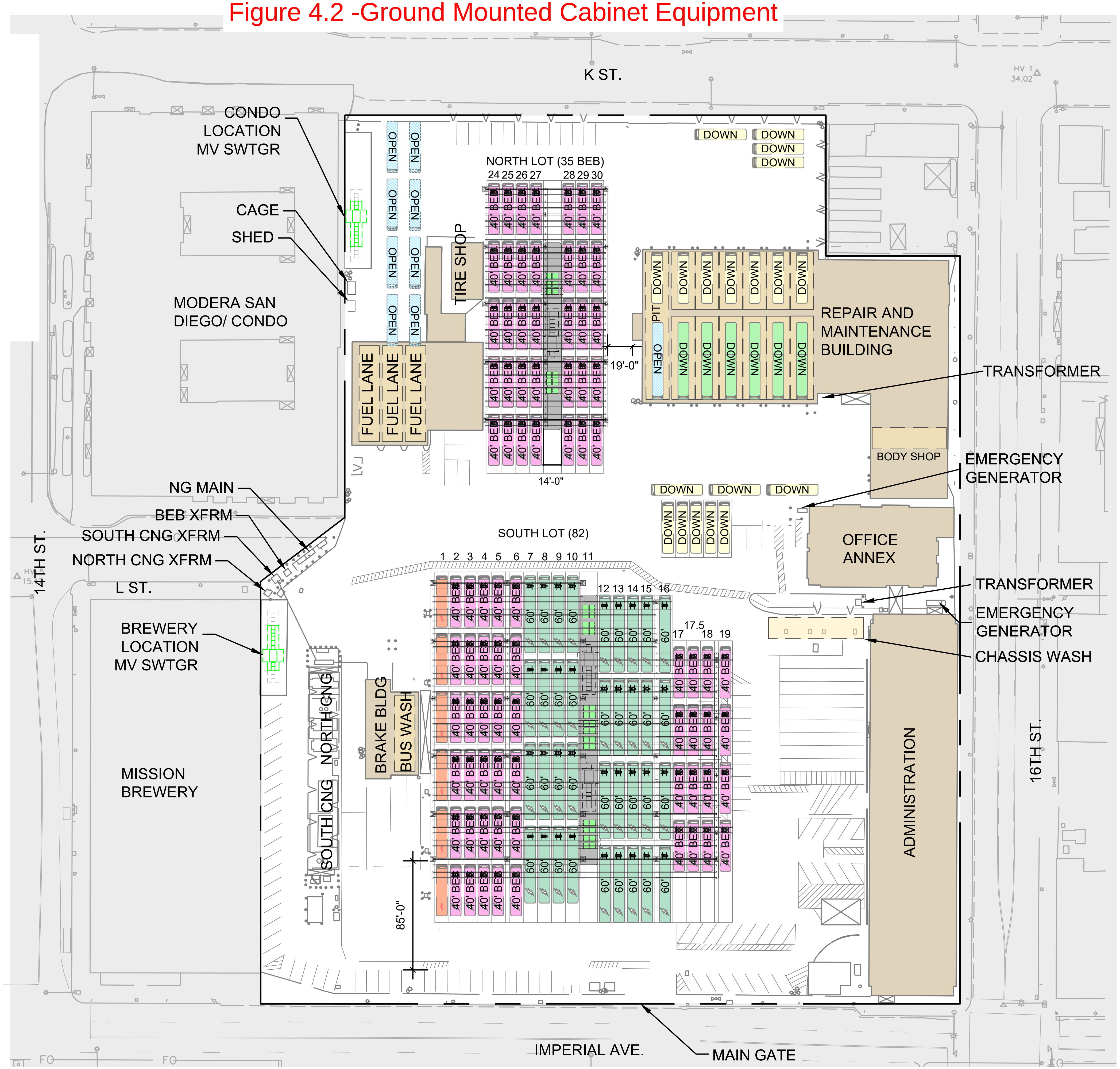
STATISTICS
Based on IAD Layout Option:

Assigned Buses:

40' BEB (Pantograph)	40' BEB	81
40' BUS- DOWN	DOWN	19
40' BEB (Plug-in)		6
60' BUS	60'	36
60' BUS- DOWN	DOWN	6
TOTAL		148

Open Buses:

40' OPEN	OPEN	8
60' BUS- OPEN	OPEN	1



PROJECT NO.	12127D
DRAWN BY	GA
DATE	12/20/2021
SCALE	11x17: 1" = 80'-0"

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DOKKEN ENGINEERING

WSP USA Inc.
16200 PARK ROW
SUITE 200
HOUSTON, TEXAS 77084
TEL: (281) 589-5900
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DRAWING TITLE
GROUND MTD CABINET EQUIPMENT

DRAWING NUMBER
IAD
MP.1

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Figure 4.3 -Ground Mounted Cabinet Equipment

STATISTICS
Based on IAD Layout Option:

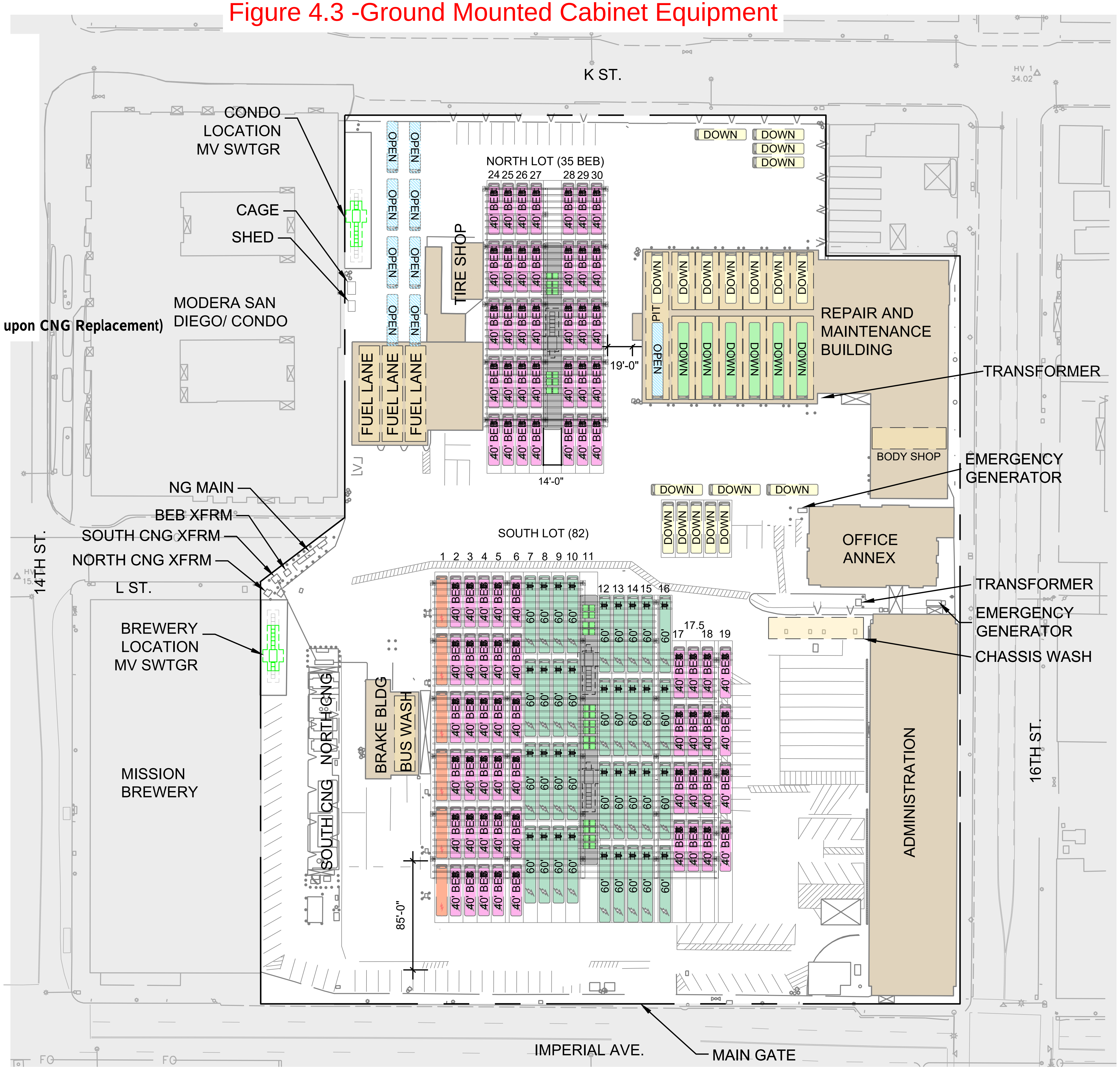
Assigned Buses:

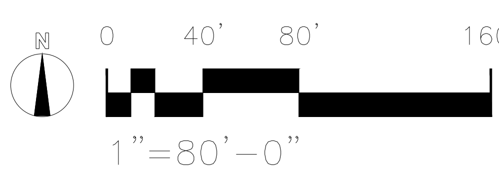
40' BEB (Pantograph)	40' BEB	81
40' BUS- DOWN	DOWN	19
40' BEB (Plug-in)		6
60' BUS	60'	36
60' BUS- DOWN	DOWN	6
TOTAL		148

Open Buses:

40' OPEN	OPEN	8
60' BUS- OPEN	OPEN	1

Staff Parking 129 (add 23 upon CNG Replacement)
NRV Parking 38





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PROJECT NO. 12127D
DRAWN BY GA
DATE 12/20/2021
SCALE 11x17: 1" = 80'-0"

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP USA Inc.
16200 PARK ROW
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HOUSTON, TEXAS 77084
TEL: (281) 589-5900
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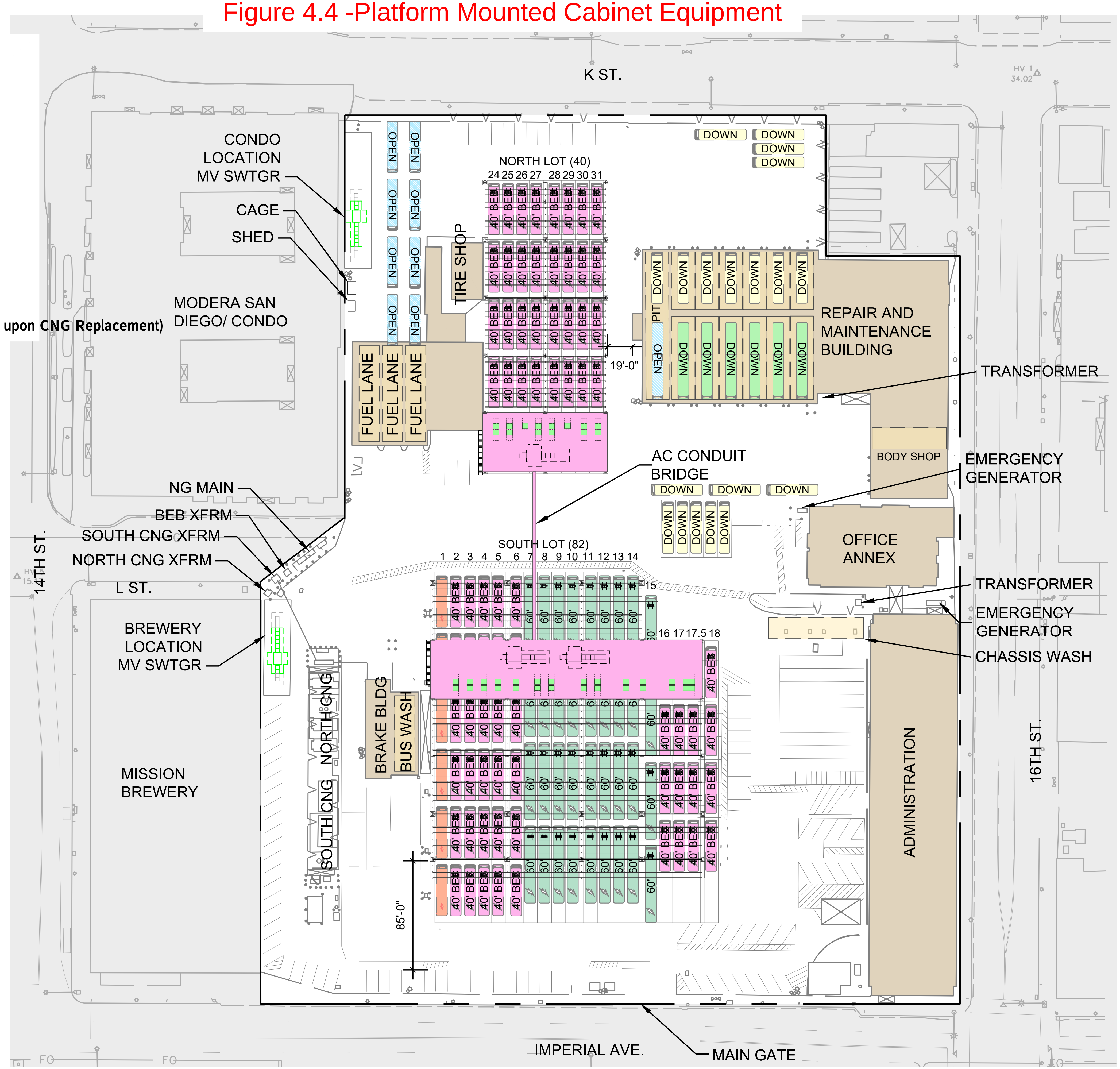
DRAWING TITLE
GROUND MTD CABINET EQUIPMENT

DRAWING NUMBER
IAD
MP.1

STATISTICS
Based on IAD Layout Option:

Assigned Buses:		
40' BEB (Pantograph)	40' BEB	86
40' BUS- DOWN	DOWN	19
40' BEB (Plug-in)		6
60' BUS	60'	36
60' BUS- DOWN	DOWN	6
TOTAL		153
Open Buses:		
40' OPEN	OPEN	8
60' BUS- OPEN	OPEN	1
Staff Parking		**149 (add 23 upon CNG Replacement)**
NRV Parking		**38**

Figure 4.4 -Platform Mounted Cabinet Equipment



PROJECT NO. 12127D
DRAWN BY GA
DATE 12/20/2021
SCALE 11x17: 1" = 80'-0"

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
PLATFORM MTD CABINET EQUIPMENT

DRAWING NUMBER
IAD
MP.3

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SELECTED MASTER PLAN

The MTS selected master plan design concept outlined in this chapter is based on the following criteria:

- Maximize and increase the amount of available ground space for bus parking
- Minimize the loss of staff and non-revenue vehicle (NRV) parking and / or increase private and NRV parking space count
- Utilize overhead piston dispensers
- Utilize DC charging cabinets in a 1:3 charging ratio.
- Minimize disturbance of existing utility infrastructure
- Minimize ground disturbance
- Maintain existing BEB infrastructure throughout phasing.
- Maintain existing bus site circulation
- Improve operations site flow by allowing bus operators to drive up to the second level and walk directly into MTS Operations for morning check-in / evening check-out with limited need to cross onsite bud circulation traffic

The site plan developed was based on three items of which MTS needed to make a choice of options presented. The items presented were (1) Two options for the location of the Medium Voltage Switchgear, (2) Two options for the Charging Infrastructure Equipment and (3) Three options for the location of the Charging infrastructure Equipment. Chapter 4 provides a discussion, in detail, of all options.

MTS has selected the following options:

- Medium Voltage Switchgear Option 2 – Condo Location: The selected option was to install the new Medium Voltage Switchgear near the service gate because it minimized interaction with existing utilities, as well as minimized the impact on staff parking and vehicle circulation.
- Charging Infrastructure Equipment Option 2 – Individual Cabinets: The selected charging infrastructure equipment was individual charging cabinets and unit substations. This selected option allows flexibility to install either option should a decision be made later to install the other option. The unit substations serve as the connection point between the charging cabinets and the Medium Voltage Switchgear. The unit substation consists of a medium to low voltage transformer, as well as low voltage distribution panels. The charging cabinets connect to the low voltage distribution panels, convert the power from AC to DC, and output the DC power to the dispensers. Each cabinet can connect to up to three dispensers.
- Charging Infrastructure Location Option 3 – Platform Mounted Infrastructure North Lot, Parking Deck Mounted Infrastructure South Lot: The selected charging infrastructure after the new Medium Voltage Switchgear was proposed to be installed on three different structural options. The option selected was to install an overhead steel support frame over the north lot to hold the selected charging infrastructure and construct a new parking deck over the south lot, providing space for the selected charging infrastructure, as well as staff vehicle parking on the upper level of the deck, with bus parking kept at grade.

  With MTS providing their preferred and selected options, the development of the master plan exhibits, and estimate are simply referred to as <u>the</u> IAD ZEB Master Plan.

The combination of the selected criteria can be seen on Figure 4.5 "Platform and Parking Deck Cabinet Equipment," as well as in more detail in Appendix B. The track widths in the master plan are nominally the same width as the existing parking tracks, with the exception of providing adequate space for structural columns.

The selected criteria allow for the continued use of the fuel lanes and wash lane, as well the existing maintenance building. Upon full electrification, it is proposed that the existing fuel lanes become repurposed to be service lanes.

The overall site flow is designed to be unchanged, except for subtle differences of actions along the site flow based on vehicle fuel type. BEBs follow the same path (staging, service crew moving through service lanes, wash, park) as CNG buses. While BEBs are parked at the service / fuel lanes, they will not be connected to a charger. When parked after nightly service, BEBs under piston dispensers will have their parking brakes set to initiate the charging buses, whereas CNG buses are simply parked. Other non-fueling services normally performed during fueling, such as vaulting, collection of bad order tickets, tire pressure check, and interior bus clean, can still be performed for all bus types. All buses regardless of fuel type will enter and exit the same gates at the same times of day. Staff will no longer have to hot park (cars and buses utilizing the same site area for parking at different times of day) in bus parking tracks, as additional car parking is to be provided on the top of the new parking deck.

Solar power is an option to be explored, as the steel structure over the north lot can support solar panels. Additional structure would be required over the parking deck, but solar power could also be utilized in the south lot.

The existing CNG yard can also be removed upon full electrification, in favor of more charging positions for buses, vehicle parking for staff / NRV, battery storage, etc.

CHAPTER 6 – IMPLEMENTATION SCHEDULING & PHASING

IMPLEMENTATION SCHEDULE & PHASING

INTRODUCTION

There are several different methods for achieving 100% electrification utilizing the selected master plan concept. This chapter will discuss a method that doesn't require a full shut-down of the yard while 100% BEB IAD Master Plan Concept is being implemented, with minimal vehicle displacement to other available on IAD site areas. The criteria for implementation phases are as follows:

- Yard to retain functionality during construction.
- Fuel, wash, maintenance, and pull-in / pull-out should be minimally impacted during construction.
- Minimize the number of displaced buses during construction.
- Maintain the existing charging infrastructure and usage during the construction of Phase 1, for a majority of Phase 2 construction, and potentially the construction of Phase 3.

During the construction of the parking deck, any bus displacement will be coordinated with the Shakeup Schedule.

The following sections provide a detailed description of each of the identified IAD ZEB Master Plan Implementation Phases, as well as the individual steps, or construction Stages, required to complete each master plan implementation phase.

Refer to Figure 6.1 "Overall Phasing Plan" for illustration of proposed phases. Refer to Appendix B for conceptual step-by-step illustrations of Phase 1 and 2 construction staging.

Table 5 below shows the total bus and staff parking with gains / losses shown in [brackets] when compared to the previous phase (all of Phase 1 in comparison to Existing, all of Phase 2 in comparison to Phase 1.F, etc.). In "Phase X.Y," "X" represents a given phase, and "Y" represents a given stage, or step in construction. Each stage is described in more detail in the following sections. Note that charging positions are included in the net bus parking columns totals. Stages in bold indicate completion of a given phase.

Phase	NET 40' Bus Parking	40' Charging	NET 60' Bus Parking	60' Charging	Staff Parking	NRV Parking
Existing	98	6	36	0	172	38
Phase 1.A-B	73 [-25]	6	36	0	172	38
Phase 1.C	98	6	36	0	172	38
Phase 1.D-E	73 [-25]	6	36	0	172	38
Phase 1.F	98	36 [+30]	36	0	172	38
Phase 2.A-B	88 [-10]	36	36	0	172	38
Phase 2.C	98	46 [+10]	36	0	172	38
Phase 2.D-E	98	46 [+10]	36	0	101 [-71]	38
Phase 2.F	110 [+12]	46 [+10]	36	0	151 [-21]	44 [+6]
Phase 2.G-H	95 [-3]	46 [+10]	20 [-16]	0	120 [-52]	44 [+6]
Phase 2.I	107 [+9]	70 [+34]	32 [-4]	0	160 [-12]	44 [+6]
Phase 2.J-K	94 [-4]	70 [+34]	8 [-28]	0	129 [-43]	44 [+6]
Phase 2.L	100 [+2]	70 [+34]	36	26 [+26]	167 [-5]	44 [+6]
Phase 2.M-N	64 [-34]	54 [+28]	32 [-4]	26 [+26]	167 [-5]	44 [+6]
Phase 2.O	100 [+2]	70 [+34]	36	26 [+26]	209 [+35]	44 [+6]
Phase 3.A-B	100	70	24 [-12]	24 [-2]	209	44
Phase 3.C	100	70	36	36 [+10]	209	44
Phase 3.D-E	82 [-18]	70	36	36 [+10]	209	44
Phase 3.F	100	88 [+18]	36	36 [+10]	209	44
Phase 3.G-H	88 [-12]	88 [+18]	36	36 [+10]	209	44
Phase 3.I	100	100 [+30]	36	36 [+10]	209	44
CNG Removed, Parking Added	100	100	36	36	232 [+25]	44
Final vs Existing	100 [+2]	100 [+94]	36 [0]	36 [+36]	232 [+60]	44 [+6]

Table 5: Parking per Stage

PHASE 1

Upon completion of Phase 1, there shall be charging infrastructure in order to provide charging for up to 30 bus parking positions. The overall structure shall be completed over the entire North Lot covering forty (40) bus parking spaces, but overhead dispensers and quantity of charging cabinets will be limited to what is needed to support the initial Phase 1 thirty (30) incoming BEB fleet. The remaining ten (10) non-electric bus north parking positions will not be capable of charging until the requisite pantographs and charging cabinets are installed. At the completion of Phase 1 there will be a total of thirty (30) 40-foot BEB charging positions at the north lot, as well as the existing six charging positions being retained at the south lot.
The new infrastructure provided in Phase 1 is as follows:

- New SDG&E Medium Voltage Service Entrance. This new MV service entrance switchgear shall be sized to accommodate the ultimate full charging infrastructure needed for Phase 1, 2 and 3.
- Necessary trenching from the medium voltage switchgear to the new overhead steel structure. The trench shall be sized appropriately for the charging infrastructure to be provided in Phase 2 and Phase 3 plus additional spare conduits.
- New overhead steel support structure over North Lot. The structure shall be sized to support a new unit substation, as well as at least 14 individual charging cabinets which utilize as 3:1 chargers will support. The structure shall also be sized to accommodate a Battery Energy Storage System (BESS). Accommodations for PV panels shall also be made.
- New unit substation. The substation shall be sized for 14 individual charging cabinets capable of energizing forty (40) overhead piston dispensers.
- New charging cabinets. At the completion of phase 1, there shall be ten (10) charging cabinets providing power for thirty (30) overhead piston dispensers.
- New overhead piston dispensers. At the completion of Phase 1, there shall be thirty (30) piston dispensers.

The proposed steps required to complete implementation of Phase 1 are listed below. Refer to Figure 6.2 "North Lot Phase 1 Staging" for a visual representation of the anticipated conceptual construction staging needed to construct Phase 1 and maintain on-site transit operations.

- Stage A: Remove striping of the tracks on the east side of the north lot, and displace 25 bus parking positions. Affected buses can stay on site in crush parking or be temporarily relocated off-site to a secondary location TBD during detailed design.
- Stage B: Construction of the eastern half of the overhead platform. Upon completion of this stage, there will be no charging positions available, as the necessary charging infrastructure is proposed to be on the west side. The new medium voltage switchgear is proposed to be installed in this stage as well. The necessary trenching can also be completed but will not connect to the new structure at the completion of this stage.
- Stage C: Construction contractor vacates the Stage B construction area; the newly vacated former Stage B area is available for MTS possession and the former displaced CNG buses are re-parked in the former Stage B site area. The site can be used normally at the completion of this stage with CNG buses parked under installed but not yet energized overhead piston dispensers.
- Stage D: Remove striping of the existing tracks on the west side of the north lot and displace 25 bus parking positions. Affected buses can stay on site in crush parking or be sent to a secondary location.
- Stage E: Construction of the western half of the overhead platform, as well as installation of necessary charging infrastructure. Upon completion of this stage, all 30 proposed charging positions can begin charging vehicles.
- Stage F: Repark displaced buses. The site can be used normally at the end of this stage. Existing vehicles can also begin to be replaced with new BEBs and charged in the North Lot parking spaces upon completion of Phase 1. Completion of this stage marks the completion of Master Plan Implementation Phase 1.

PHASE 2

Upon completion of Phase 2, there shall be an additional ten (10) charging positions in the north lot, as well as fifty (50) new charging positions in the south lot. No additional structure is proposed to be added in the north lot, only the addition of the necessary charging infrastructure items. The south lot will have the entire parking structure built, but at the completion of Phase 2, only the necessary infrastructure for fifty (50) charging positions will be added. The total number of charging positions available will be ninety (90) charging positions, as well as the existing six charging positions.

During the construction of the parking deck, any bus displacement will be coordinated with the Shakeup Schedule.

The new infrastructure to be added in Phase 2 for the North Lot is as follows:

- New charging cabinets. At the completion of Phase 2, there shall be an additional 4 charging cabinets installed on the now existing overhead concrete deck that was completed in Phase 1. These new charging cabinets will be connected to the existing unit substation that was installed in Phase 1, and will provide power to ten (10) new charging positions.
- New dispensers. An additional ten (10) overhead piston dispensers will be added at the completion of phase 2. These new dispensers will be installed on the existing overhead structure.

The new infrastructure to be added in Phase 2 for the South Lot is as follows:

- Necessary trenching to connect the medium voltage switchgear to the new unit substation.
- New parking deck. At the completion of Phase 2, there will be a new parking deck constructed, that will provide covered parking for buses as well as an overhead structure to mount dispensers from. The top of the deck shall allow for car parking and support the necessary unit substations, BESS equipment, and charging cabinets
- New Unit Substation. The substation will be sized for 17 individual charging cabinets.
- New Charging Cabinets. During the construction of Phase 2, an additional 17 charging cabinets shall be installed on the new parking deck. These 17 cabinets will provide power to 50 dispensers to be installed in phase 2, as well as a final dispenser in Phase 3.
- New Dispensers. An additional fifty (50) dispensers will be added by the completion of Phase 2. These new dispensers will be installed on the new parking deck structure.

The proposed steps to complete this phase are listed below. Refer to Figures 6.3 “North Lot Additional 10 BEB Staging,” and 6.4 “South Lot Phase 2 Parking Deck Staging“ for visual representations of the staging for Phase 2.

- Stage A: Displace ten (10) bus parking positions. Affected buses can remain on site in crush parking or can be sent to a secondary location.
- Stage B: Installation of new charging infrastructure, charging cabinets and overhead piston dispensers. Tie add equipment to existing unit substation at elevated North Lot deck. Upon completion of this stage, there shall be ten (10) new charging positions ready to charge vehicles.
- Stage C: Reoccupy area.
- Stage D: Vacate area. This area is used primarily for staff parking, however it occasionally is used as a staging area for buses.
- Stage E: Drill new piers and erect a portion of the parking deck in the newly vacated area. Upon completion, structure is fully usable during any subsequent construction.
- Stage F: Reoccupy area.
- Stage G: Vacate area. Displace 31 bus parking positions and related staff parking. Affected buses can be kept on site in crush parking or be sent a secondary location.
- Stage H: Drill new piers and erect an additional portion of the parking deck in the newly vacated area. Upon completion, entire structure is usable during any subsequent construction. Previously installed piston pantographs can now be electrified.
- Stage I: Reoccupy area.
- Stage J: Vacate area. Displace 39 bus parking and related staff parking. Affected buses can be kept on site in crush parking or be sent to a secondary location.
- Stage K: Drill new piers and erect an additional portion of the parking deck in the newly vacated area. Upon completion, entire structure is usable during any subsequent construction.
- Stage L: Reoccupy area.
- Stage M: Vacate area. Displace 40 bus parking. Affected buses can be kept on site in crush parking or be sent to a secondary location.
- Stage N: Drill new piers and erect an additional portion of the parking deck in the newly vacated area. Upon completion, entire structure is usable during any subsequent construction.
- Stage O: Reoccupy area.

PHASE 3

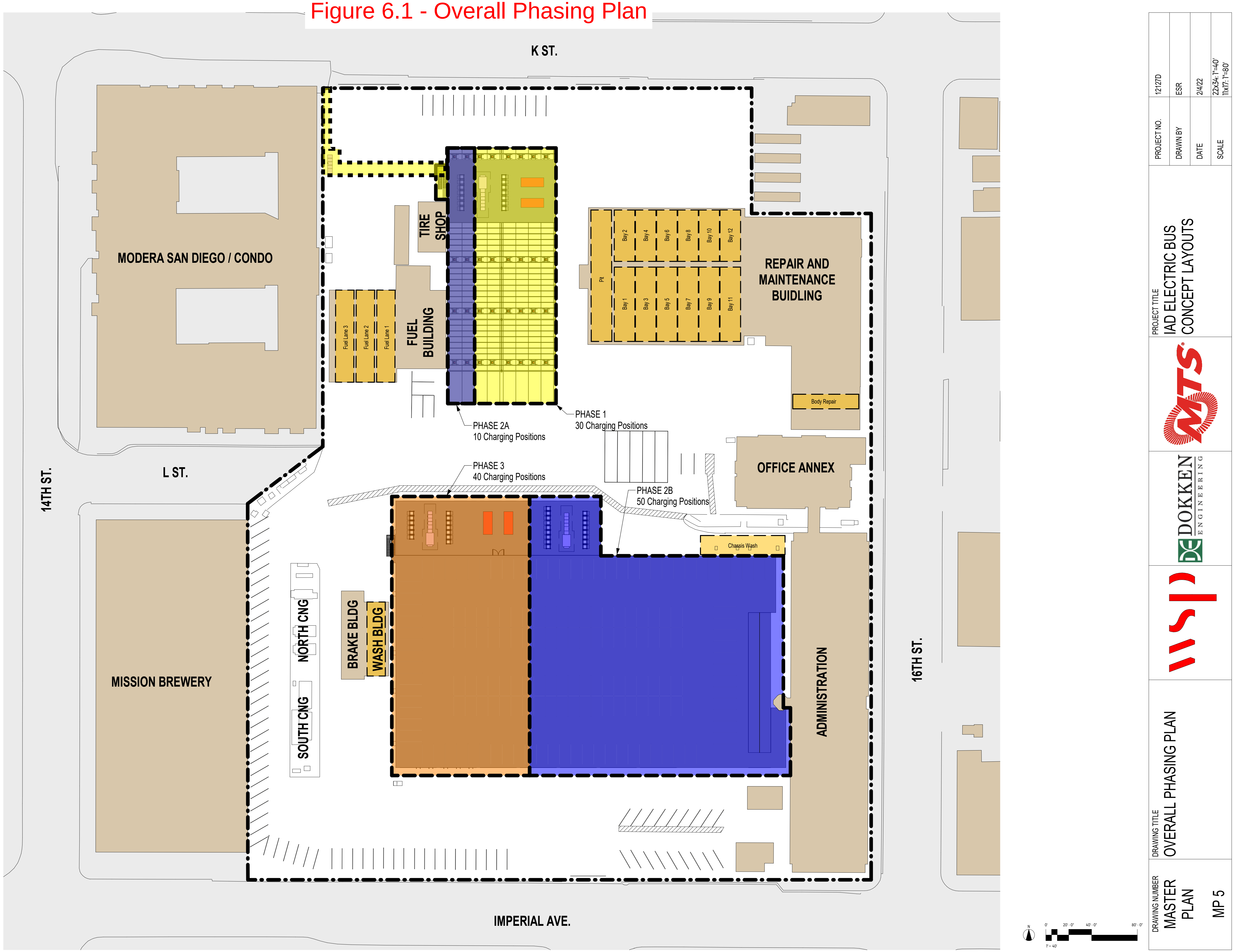
Upon completion of Phase 3, there shall be an additional ninety (90) charging positions, as well as a new parking deck providing additional bus parking at grade and additional vehicle parking on the upper level. The total number of charging positions will be 130, as well as the existing 6 charging positions.
The new infrastructure to be added in Phase 3 is as follows:

- New Unit Substation. The substation will be sized for thirteen (13) individual charging cabinets.
- New charging cabinets. At the completion of Phase 3, there will be thirteen (13) new charging cabinets providing power to thirty-nine (39) charging positions.
- New dispensers. An additional forty (40) dispensers will be added at the completion of Phase 3.

The proposed steps to complete this phase are listed below. Refer to Figure 6.5 “South Lot Phase 3 Staging” for a visual representation of the staging for Phase 3.

- Stage A: Vacate area. Displace 12 bus parking. Affected buses can be kept on site in crush parking or be sent to a secondary location.
- Stage B: Install unit substation, charging cabinets, and piston dispensers. An additional 10 charging positions can be added, bringing the number of charging positions on the site to 100.
- Stage C: Reoccupy area. Additional CNG buses can be replaced with BEBs at the completion of this stage.
- Stage D: Vacate area. Displace 18 bus parking. Affected buses can be kept on site in crush parking or sent to a secondary location.
- Stage E: Install charging cabinets and piston dispensers. An additional 18 charging positions can be added, bring the total number of charging positions on the site to 118.
- Stage F: Reoccupy area. Additional CNG buses can be replaced with BEBs at the completion of this stage.
- Stage G: Vacate area. Displace 12 bus parking. Affected buses can be kept on site in crush parking or be sent to a secondary location.
- Stage H: Install charging cabinets and piston dispensers. An additional 12 charging positions can be added, bringing the total number of charging positions on the site to 130.
- Stage I: Reoccupy area. Upon completion of this stage, all remaining existing CNG vehicles can be replaced with new BEBs. Completion of this stage marks the completion of Phase 3, as well as the completion of the electrification of IAD. The CNG yard in the southwest corner of the site can be removed once all CNG buses have been decommissioned. Refer to Figure 4.5 “Platform and Parking Deck Cabinet Equipment” for a potential use of the reclaimed area, as well as Appendix B for alternate layouts.

Figure 6.1 - Overall Phasing Plan



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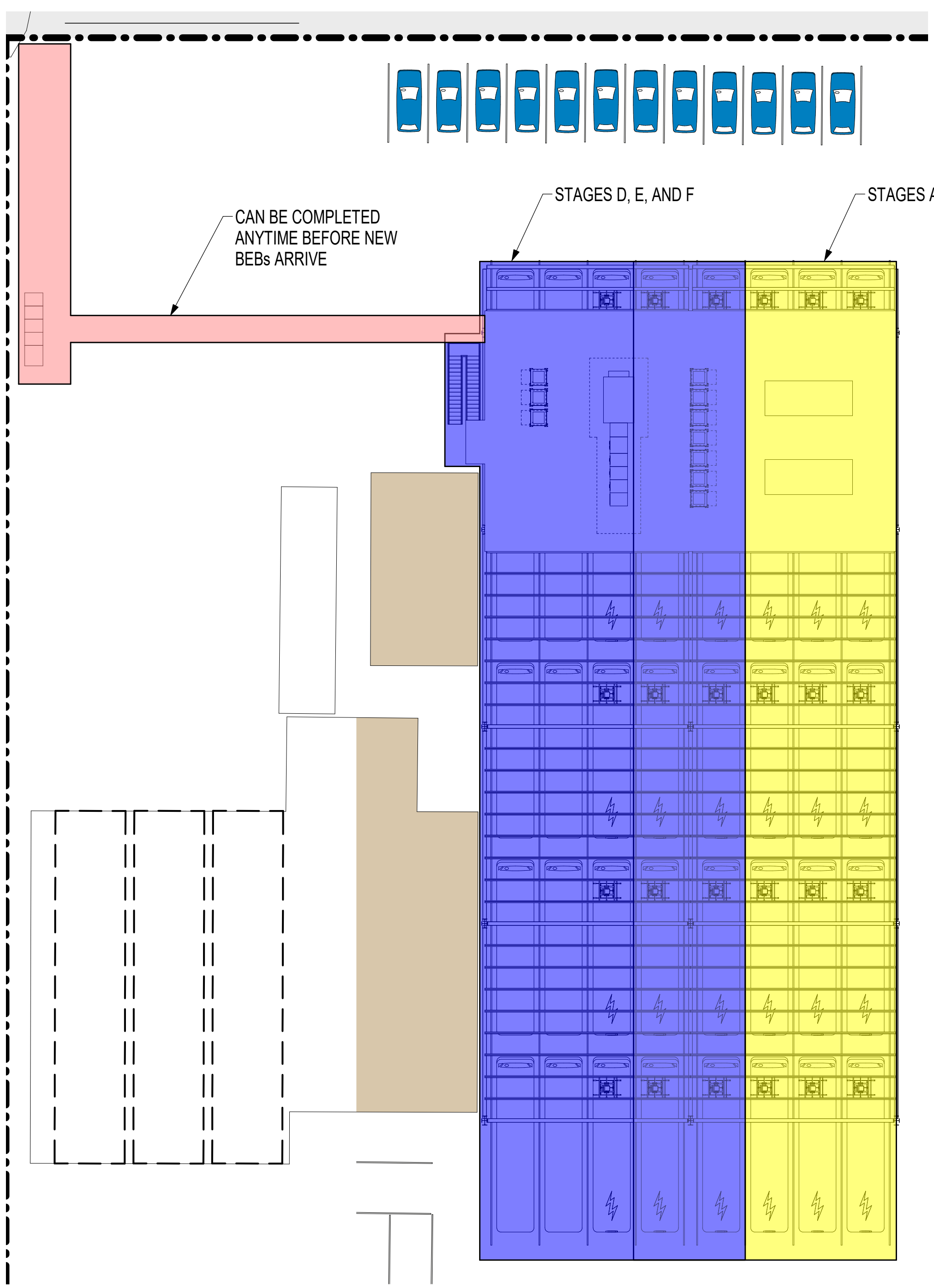
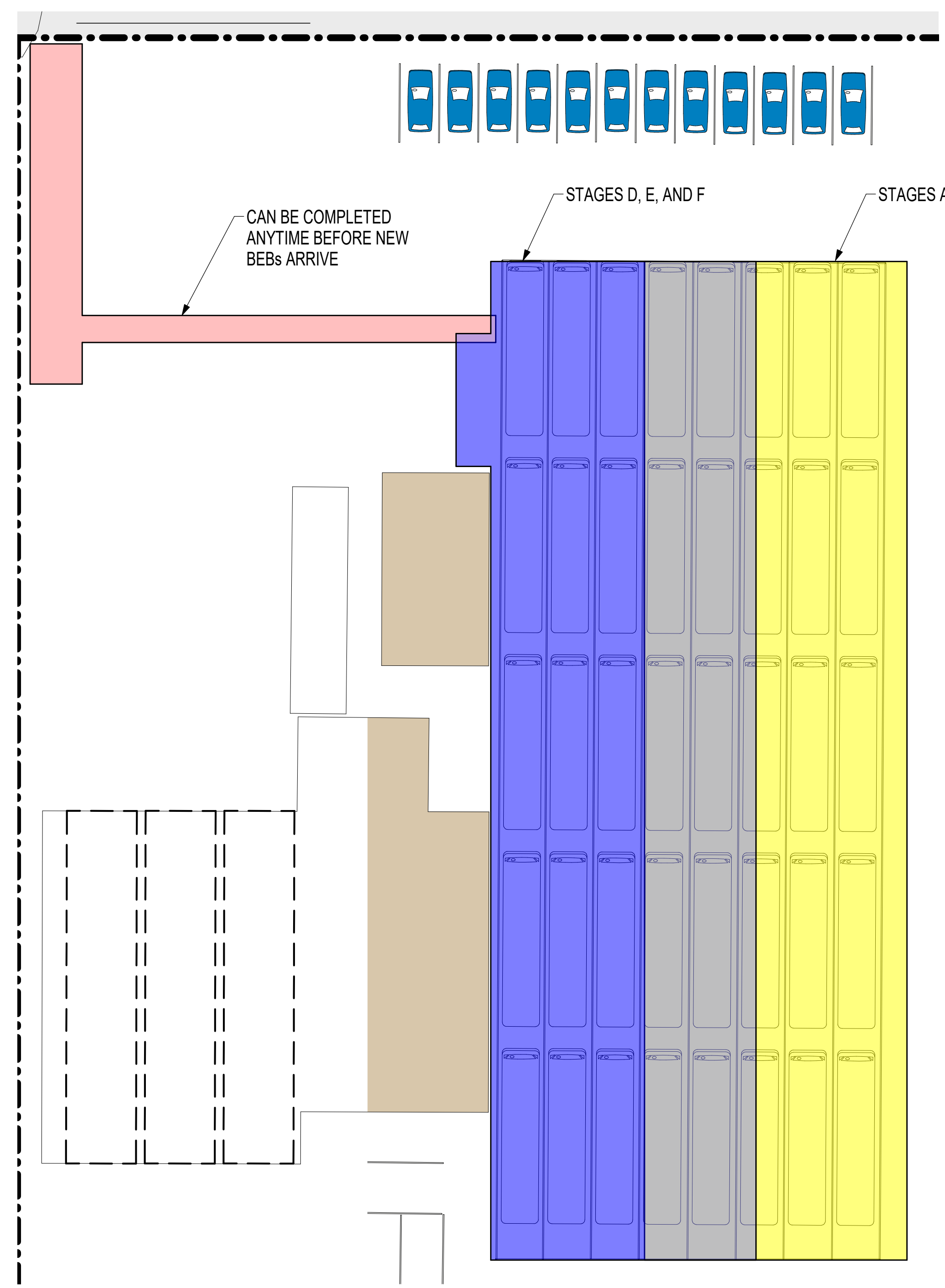
Category: REPORT - Set: MASTER PLAN

Figure 6.2 - North Lot Phase 1 Staging



2 PHASE 1 STAGING - PHASE 1 COMPLETE
1" = 20'-0"



1 PHASE 1 STAGING - EXISTING
1" = 20'-0"

PROJECT NO. 12127D
DRAWN BY ESR
DATE 2/4/22
SCALE 22x34: 1"=20' 11x17: 1"=40'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
NORTH LOT PHASE 1 STAGING

DRAWING NUMBER
PHASE 1
PH 1.3

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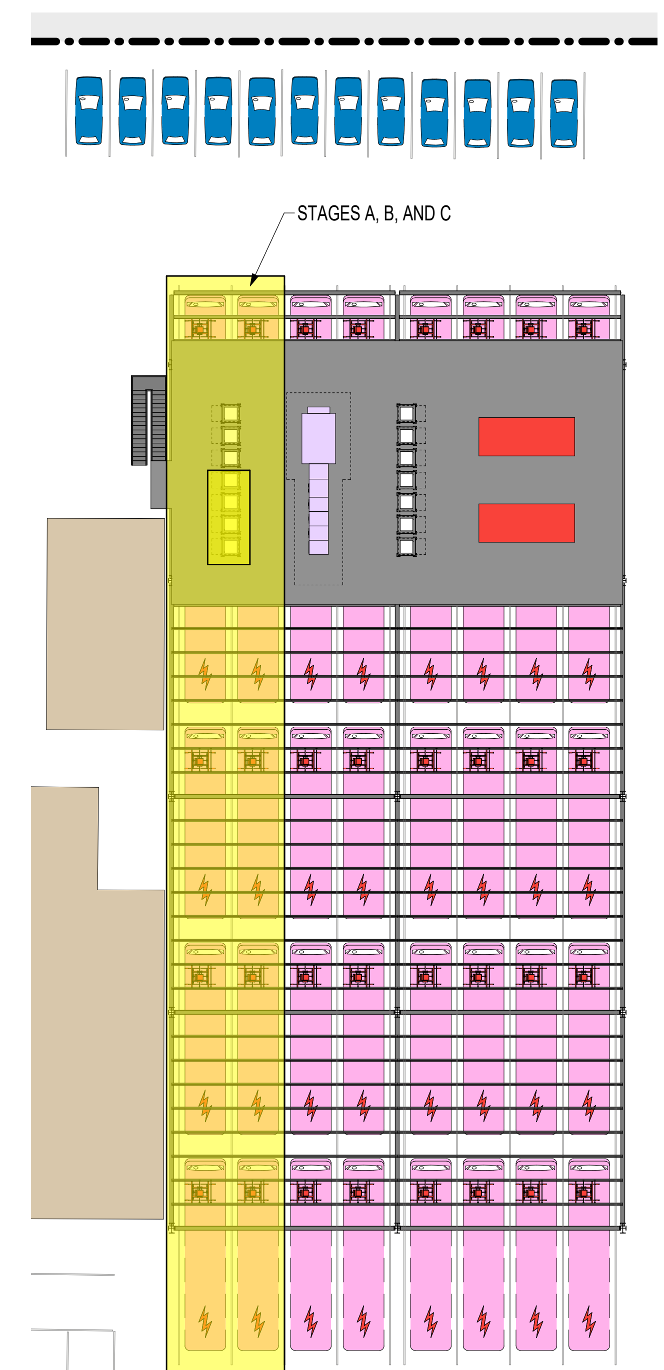
Category: REPORT - Set: PHASE 1

Figure 6.3 - North Lot Phase 2 Staging



2 NORTH LOT - PHASE 2 STAGING - PHASE 2 COMPLETE
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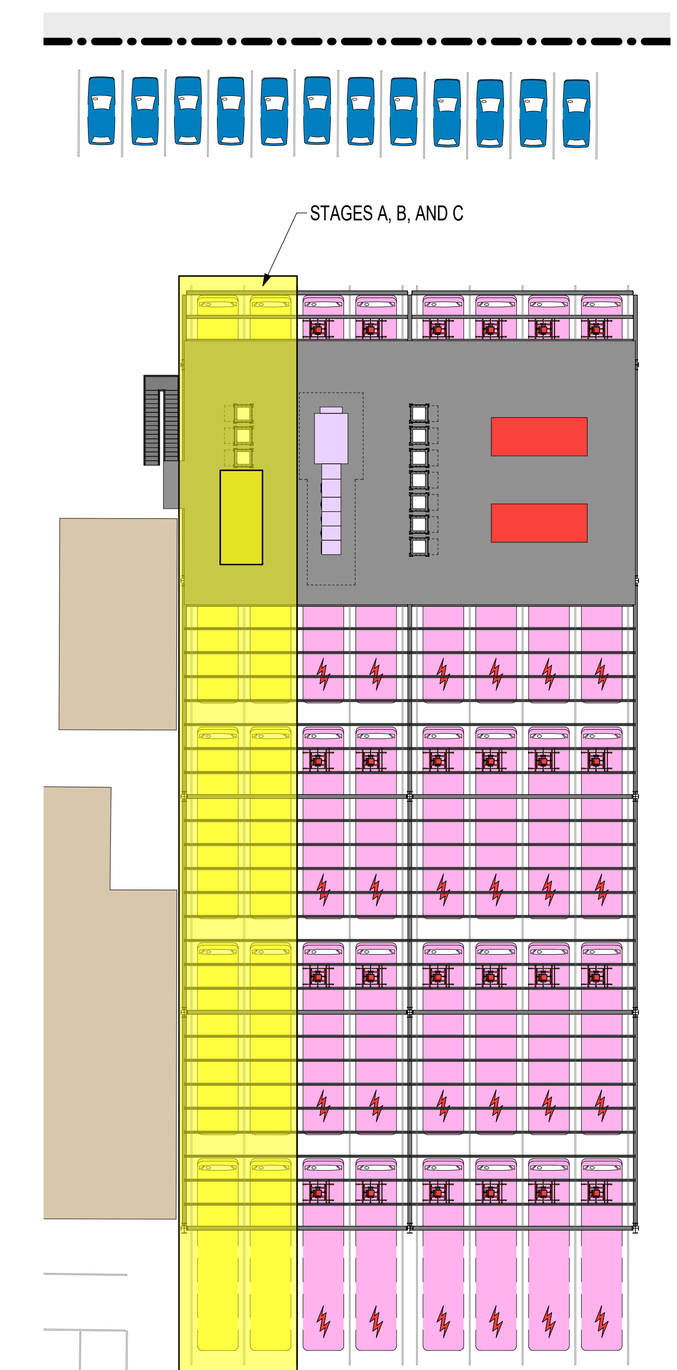

1 NORTH LOT - PHASE 2 STAGING - PHASE 1 COMPLETE
1" = 20'-0"

PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
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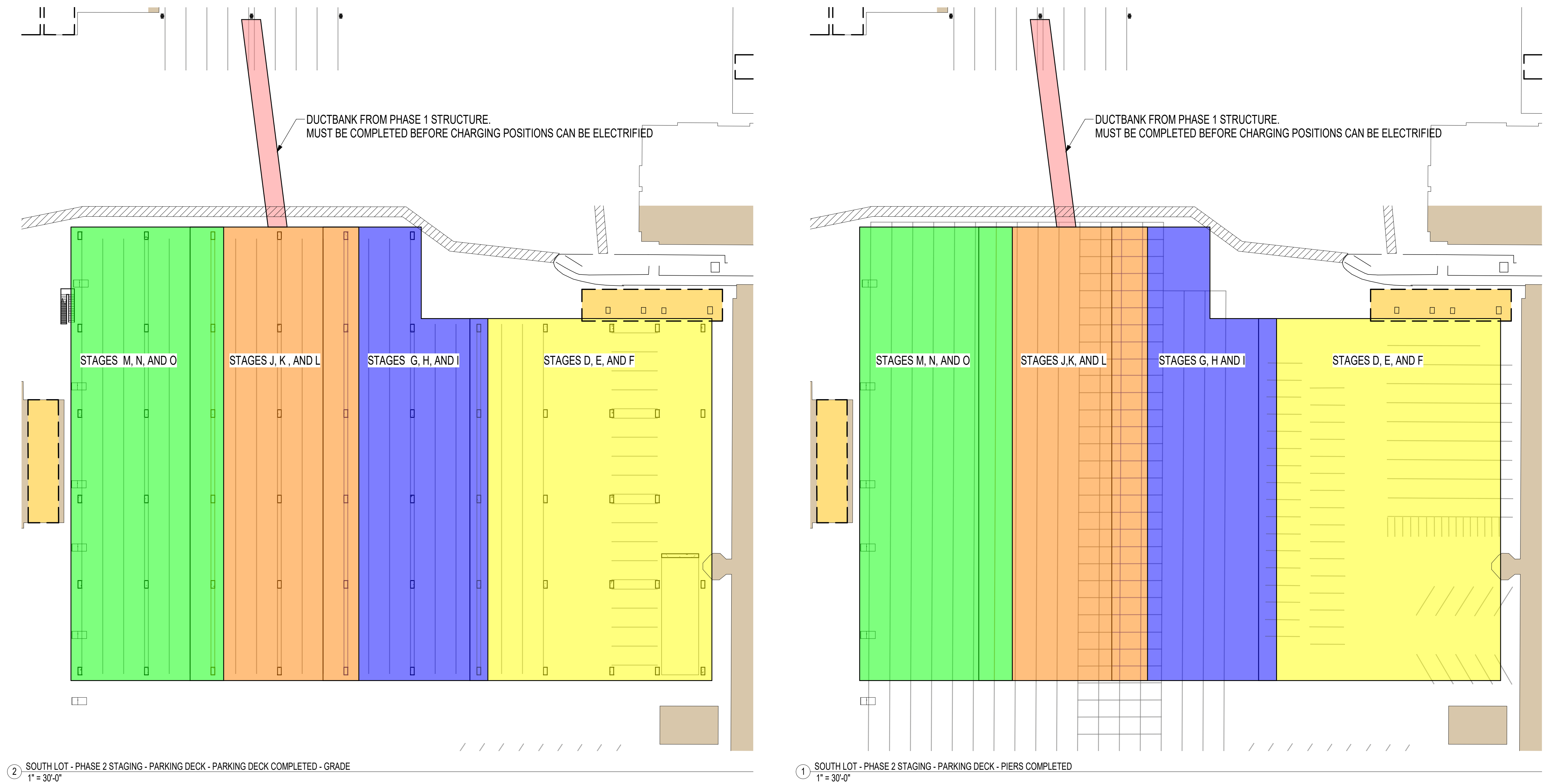
PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
NORTH LOT PHASE 2 STAGING

DRAWING NUMBER
PHASE 2
PH 2.3

3/24/2022 9:15:42 AM

Figure 6.4 - South Lot Phase 2 Parking Deck Staging



PROJECT NO. 12127D
DRAWN BY ESR
DATE 2/4/22
SCALE 22x34: 1"=30' 11x17: 1"=60'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
SOUTH LOT PHASE 2 STAGING PARKING DECK

DRAWING NUMBER
PHASE 2
PH 2.9

8/5/2022 6:42:32 PM

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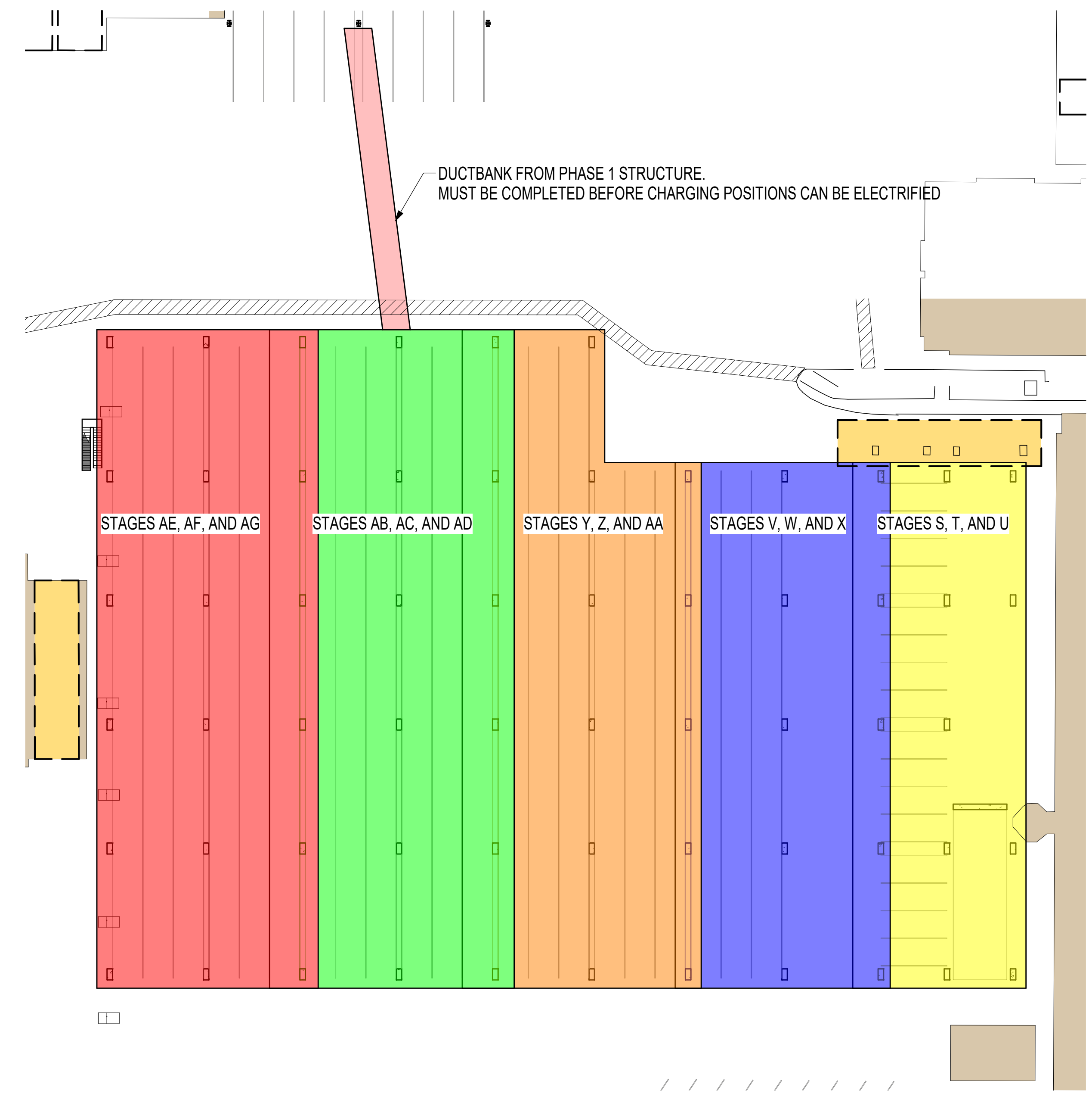
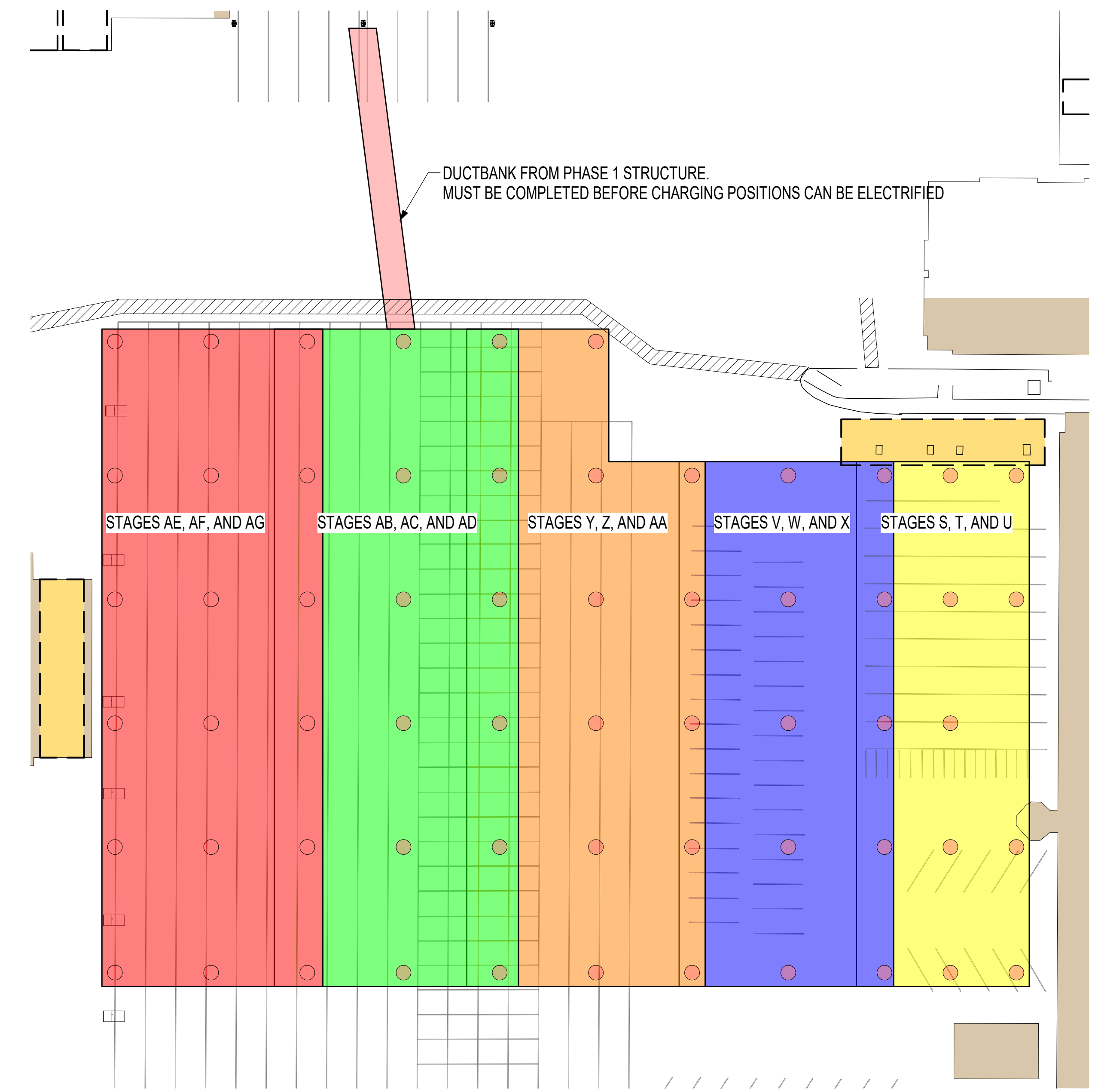
Category: REPORT - Set: PHASE 2

Figure 6.5 - South Lot Phase 2 Parking Deck Staging



2 SOUTH LOT - PHASE 2 STAGING - PARKING DECK - PARKING DECK COMPLETED - GRADE
1" = 30'-0"



1 SOUTH LOT - PHASE 2 STAGING - PARKING DECK - PIERS COMPLETED
1" = 30'-0"

PROJECT NO. 12127D
DRAWN BY ESR
DATE 2/4/22
SCALE 22x34: 1"=30' 11x17: 1"=60'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DOKKEN ENGINEERING

DRAWING TITLE
SOUTH LOT PHASE 2 STAGING PARKING DECK

DRAWING NUMBER
PHASE 2
PH 2.10

3/24/2022 9:16:14 AM

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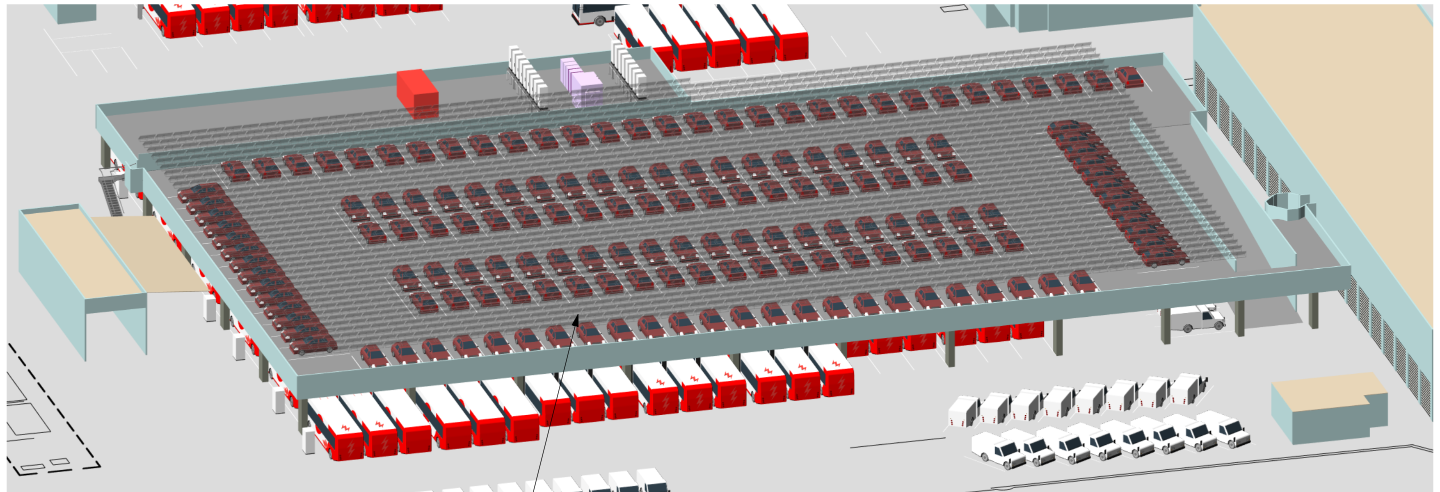
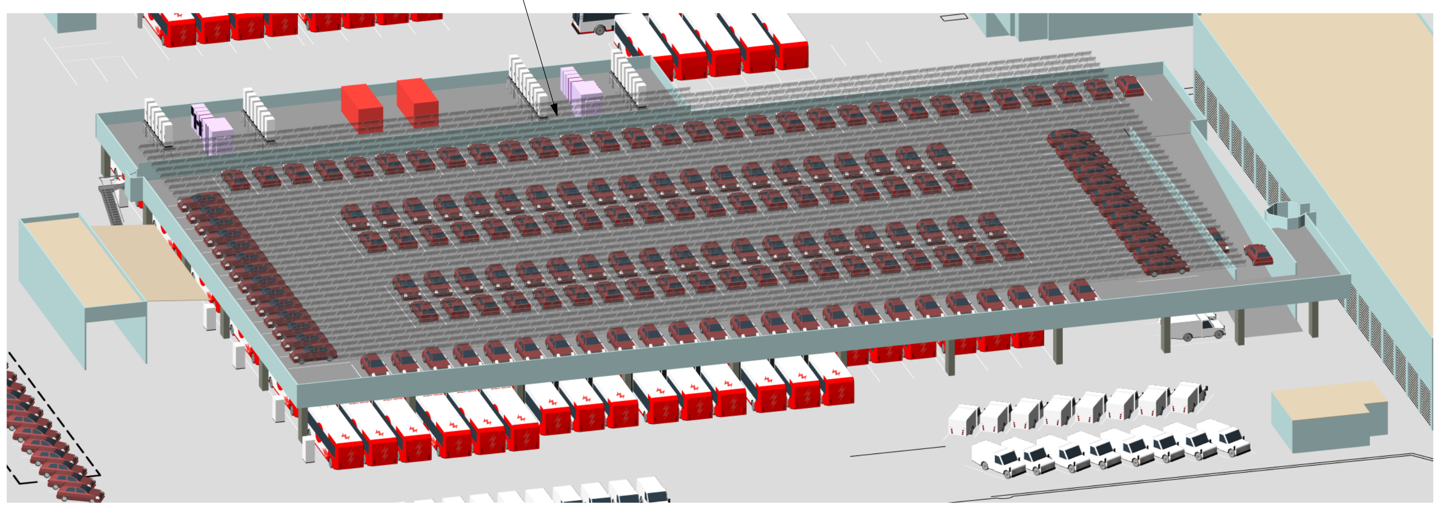
Category: REPORT - Set: PHASE 2

Figure 6.5 - South Lot Phase 3 Staging

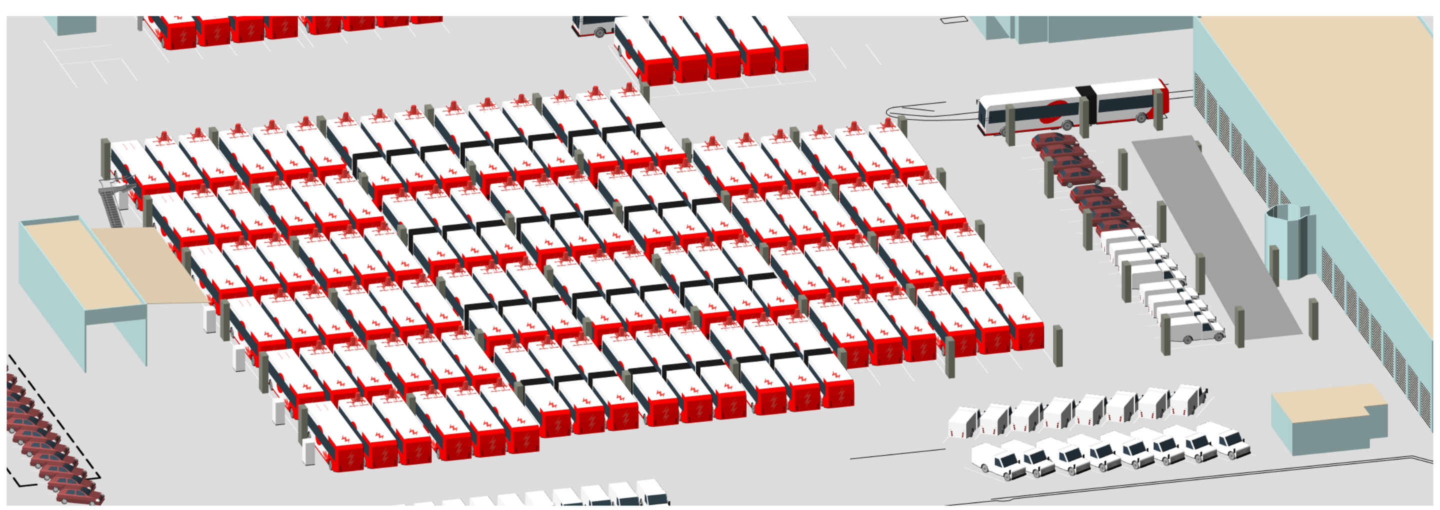


3 SOUTH LOT - PHASE 2 COMPLETION

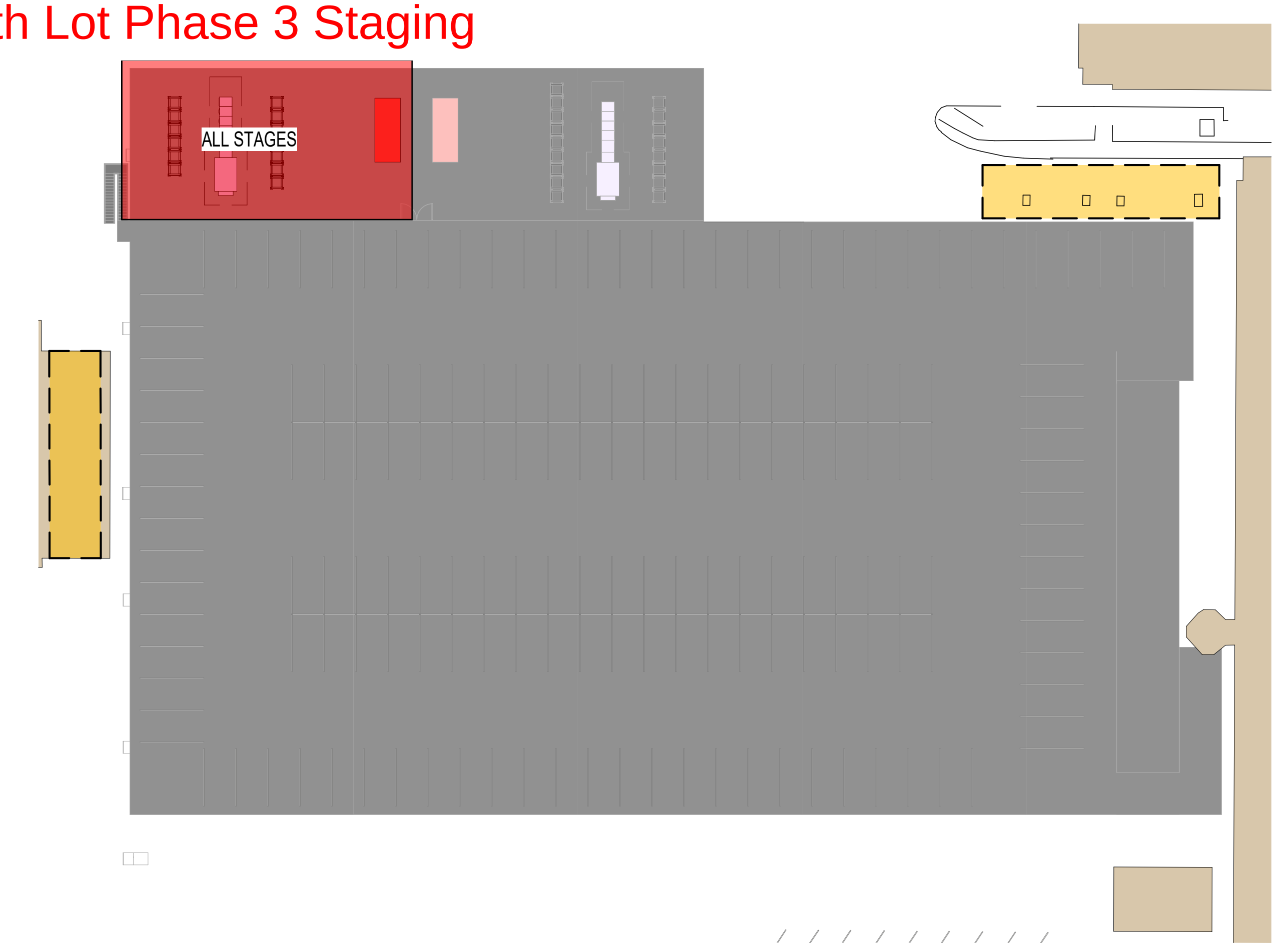
SOLAR PANELS TRANSPARENT FOR CLARITY



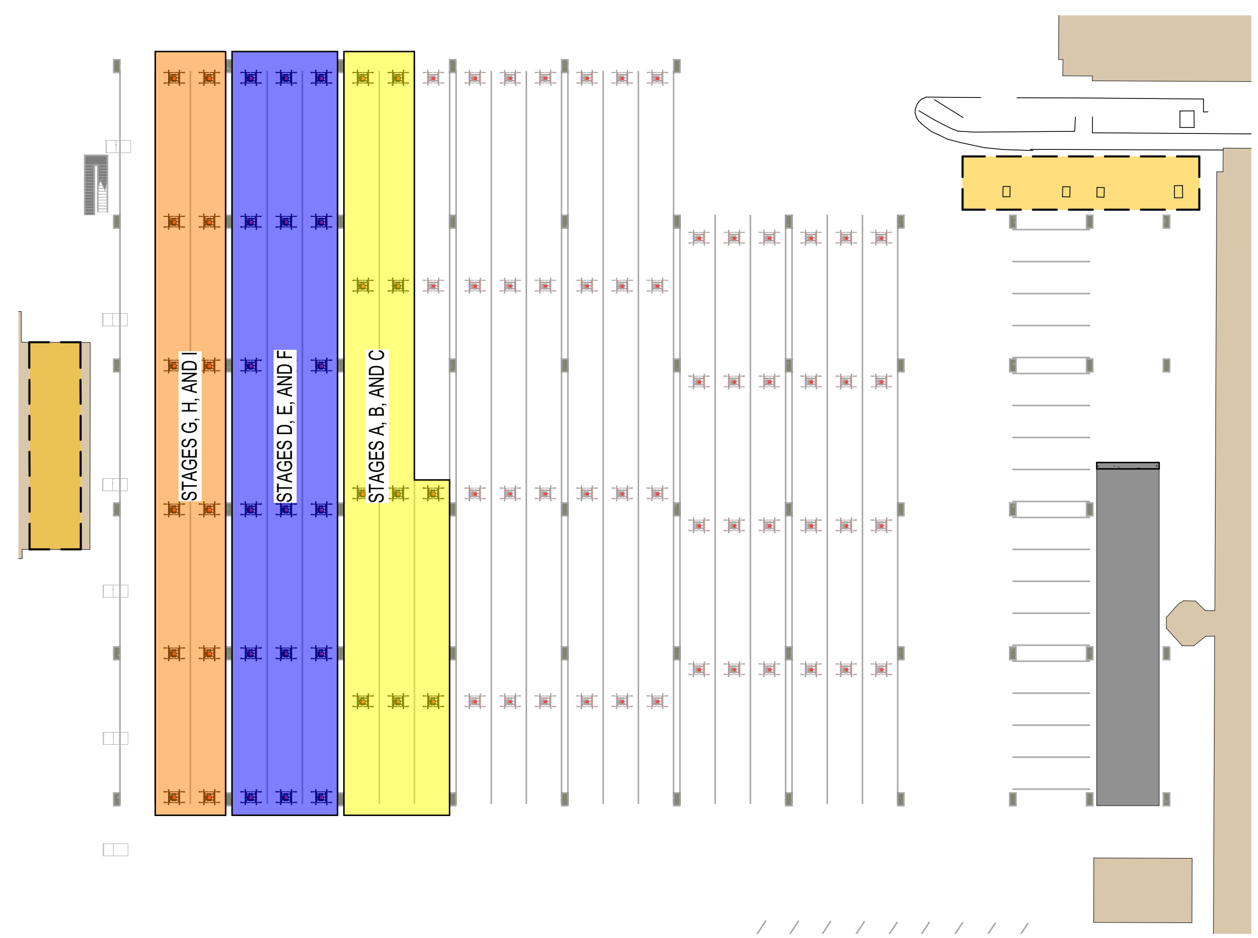
4 SOUTH LOT - PHASE 3 - ABOVE DECK



5 SOUTH LOT - PHASE 3 - BELOW DECK



1 PHASE 3 STAGING - PARKING DECK - TOP OF DECK
1" = 30'-0"



2 PHASE 3 STAGING - PARKING DECK - GRADE
1" = 30'-0"

PROJECT NO.	12127D
DRAWN BY	ESR
DATE	03/25/2022
SCALE	22x34; 1"=30' 11x17; 1"=60'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
SOUTH LOT PHASE 3 STAGING

DRAWING NUMBER
PH 3.5

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COST ESTIMATE

INTRODUCTION

A rough order of magnitude (ROM) cost estimate was developed based on the Conceptual Site Design for the infrastructure to support the battery electric bus master plan (IAD ZEB Master Plan) presented in Chapter 5. Costs were developed for the following options:

- New Medium Voltage Switchgear – Option 2: Condo Location
- Charging Infrastructure Equipment – Option 2: Individual Cabinets
- Charging Infrastructure Locations – Option 3: Equipment installed on new overhead steel frame in north parking lot and elevated deck in south lot.
- A brief analysis of the Charging Infrastructure Locations Option 2, to compare the Parking Deck to a Light Steel Frame. All Grand Totals in the Executive Summary of the estimate assume the parking deck is built, as opposed to the steel frame.

The general scope of work includes:

- Costs by phase
- BEB Infrastructure (including electrical components and bus charging)
- Structures to support BEB infrastructure

EXCLUSIONS

The estimate for design and construction specifically excludes:

- SDG&E Infrastructure Cost and fees
- Environmental permitting
- Additional cost associated with each phasing stage
- Off-site improvements (assumed none would be required)
- Hazardous material investigation and abatement, if any
- Operations and maintenance costs
- Cost for the buses
- Annual energy cost
- Annual staffing cost
- Annual maintenance cost
- One-time training cost

COST ESTIMATE

ASSUMPTIONS AND QUALIFICATIONS

1. The work will be done under one general contract during normal working hours.
2. The work will be phased to keep the IAD operational throughout construction.
3. The estimate is based on prices used for the South Bay Maintenance Facility ZEB project with the values escalated to fourth quarter of 2021.
4. The estimate reflects probable construction costs obtainable in the project locality on the date of this estimate. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors and general contractors, with a minimum of four (4) bidders for all major subcontracted work and four (4) to five (5) general contractor bids.
5. Experience shows fewer bids may result in higher bids, and conversely more bidders may result in lower bids. Therefore, it is important to obtain as many bids as possible.
6. The following is a list of items that may affect the cost estimate:
   a. Modifications to the scope of work or assumptions included in this estimate.
   b. Restrictive technical specifications or excessive contract conditions.
   c. Any specified item of equipment, material, or product that cannot be obtained from at least three different sources.
   d. Any other non-competitive bid situations.
   e. This cost estimate may be subject to increase costs because of the disruption of labor and/or supply chain issues due to the ongoing Covid Pandemic. The pricing has incorporated impact due to covid through December 2021.
7. Unit costs include cost for materials, labor and equipment, sales tax, and installing contractor's (trade contractor's) mark-up.
8. The estimate is intended to be a determination of fair market value for the project construction. It I not a prediction of low bid. Since the team has no control over market conditions and other factors which may affect bid prices, this estimate cannot and does not warrant or guarantee that bids or ultimate construction cost will not vary from the cost estimate. There are no other warranties, expressed or implied, and the team is not responsible for the interpretation by others of the contents herein the cost estimate.
9. It should be noted that the cost estimate is a "snapshot in time" and that the reliability of this opinion of probable construction cost will inherently degrade over time.
10. This estimate has been prepared based on the conceptual design and should be updated when more detailed project information is available

FACTORS APPLIED

The following factors have been applied:

- Design Contingency (25%) that reflects the preliminary nature of the design. This factor should be reduced as the detailed design progresses.
- General Contractor's General Conditions (12%)
- Insurance (0.75%)
- Bond (1.5%)
- Overhead and Profit (12.5%)
- Escalation to December 2023 (3 %)
- Pre- and Post-Construction Expenses ("Soft Costs") (1.7%)
- Design Costs (design fees, construction management) (29.5%)

MTS IAD
San Diego, CA
ROM Estimate
August 8, 2022

BATTERY ELECTRIC BUS EQUIPMENT - MASTER PLAN
INCLUDING PHASES 1, 2, and 3

MTS IAD
San Diego, CA
ROM Estimate
August 2022

EXECUTIVE SUMMARY

	PHASE 1 TOTAL	
1	Phase 1	$ 12,973,081
2	Phase 1 + Add Alt 1	$ 15,302,514
3	Phase 1 + Add Alt 1, 2	$ 15,751,867
4	Phase 1 + Add Alt 1, 2, 3	$ 15,804,747
	PHASE 2 TOTAL	
1	Phase 2	$ 33,479,714
2	Phase 2 + Add Alt 1	$ 34,645,780
3	Phase 2 + Add Alt 1, 2	$ 37,789,514
4	Phase 2 + Add Alt 1, 2, 3	$ 38,001,035
	PHASE 3 TOTAL	
1	Phase 3	$ 6,478,879
2	Phase 3 + Add Alt 1	$ 7,644,944
3	Phase 3 + Add Alt 1, 2	$ 7,644,944
4	Phase 3 + Add Alt 1, 2, 3	$ 7,644,944
	GRAND TOTALS (PHASES 1, 2, AND 3)	
1	TOTAL	**$ 52,931,673**
2	TOTAL + Add Alt 1	**$ 57,593,239**
3	TOTAL + Add Alt 1, 2	**$ 61,186,325**
4	TOTAL + Add Alt 1, 2, 3	**$ 61,450,727**

MTS IAD
San Diego, CA
ROM Estimate
August 2022

PHASE 1 SUMMARY

					TOTAL
A	**Charging Equipment (OFCI)**			$	2,291,518
B	**Charging Infrastructure Support**			$	3,089,634
C	**Support Frame**			$	1,895,000
D	**Civil**			$	465,451
			Sub-Total	**$**	**7,741,602**
		Design Contingency	**25.00%**	$	1,935,401
			Sub-Total + Design Contingency	**$**	**9,677,003**
	Markups				
	General Conditions and Requirements		12.00%	$	1,161,240
	Insurance		0.75%	$	72,578
	Bond		1.50%	$	145,155
	Overhead and Profit		12.50%	$	1,209,625
			Estimated Current Construction Cost Q12022	**$**	**12,265,601**
	Escalation to Q42023 (Mid-point of Construction)		4.00%	$	490,624
			Estimated Contract Award, Q42022	**$**	**12,756,225**
	Pre- and Post-Construction Expenses ("Soft Costs")		1.70%	$	216,856
			TOTAL CONSTRUCTION ESTIMATE	**$**	**12,973,081**

MTS IAD
San Diego, CA
ROM Estimate
August 2022

PHASE 1 SUMMARY

			TOTAL
Add Alternative 1 - Battery Storage		$	1,737,593
Markups	26.75%	$	464,806
RUNNING TOTAL		**$**	**2,202,399**
Escalation to Q42023 (Mid-point of Construction)	4.00%	$	88,096
RUNNING TOTAL		**$**	**2,290,495**
Pre & Post-Construction Expenses	1.70%	$	38,938
ADD ALT 1 TOTAL		**$**	**2,329,433**
Add Alternative 2 - Photovoltaic System		$	335,185
Markups	26.75%	$	89,662
RUNNING TOTAL		**$**	**424,848**
Escalation to Q42023 (Mid-point of Construction)	4.00%	$	16,994
RUNNING TOTAL		**$**	**441,841**
Pre & Post-Construction Expenses	1.70%	$	7,511
ADD ALT 2 TOTAL		**$**	**449,353**
Add Alternative 3 - Earthwork - Non-Hazardous Waste		$	39,445
Markups	26.75%	$	10,552
RUNNING TOTAL		**$**	**49,997**
Escalation to Q42023 (Mid-point of Construction)	4.00%	$	2,000
RUNNING TOTAL		**$**	**51,996**
Pre & Post-Construction Expenses	1.70%	$	884
ADD ALT 3 TOTAL		**$**	**52,880**
TOTAL CONSTRUCTION ESTIMATE + ADD ALT 1		**$**	**15,302,514**
TOTAL CONSTRUCTION ESTIMATE + ADD ALT 1, 2		**$**	**15,751,867**
TOTAL CONSTRUCTION ESTIMATE + ADD ALT 1, 2, 3		**$**	**15,804,747**

MTS IAD
San Diego, CA
ROM Estimate
August 2022

PHASE 1 CHARGING EQUIPMENT

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
CHARGING EQUIPMENT					
DC Charging Cabinets and Pantographs					
DC Charging Cabinet - 180 kW	10	EA	$ 70,755	$ 79,741	$ 797,409
Pantograph (includes outlet box)	30	EA	$ 32,860	$ 37,033	$ 1,110,997
Installation					
Equipment Install (20% of Equipment Cost)	1		$ 381,681		$ 381,681
Site Acceptance Test - Depot (One and Done)	1		$ 1,270	$ 1,431	$ 1,431
CALeVIP FUNDING, HVIP FUNDING, OTHER REBATES					
HVIP Funding per Bus	-	EA	($40,000.00)		$0
CALeVIP Funding (Quantity is total number of charging cabinets)	-	EA	($42,000.00)		$0
SDG&E Charge Ready per Bus	-	EA	($25,000.00)		$0
				TO PHASE 1 SUMMARY	**$ 2,291,518**

MTS IAD
San Diego, CA
ROM Estimate
August 2022

PHASE 1 CHARGING INFRASTRUCTURE SUPPORT

LOCATION	QUANTITY	UOM		RATE*		SD Index		ADD
						113%		
DIVISION 03 - CONCRETE								
033000 Cast-In-Place Concrete (GC)								
Field surveys and verification	16	HRS	$	102.98	$	116.06	$	1,857
033053 Miscellaneous Cast-In-Place Concrete								
CIP Concrete housekeeping pad								
at utility switch	2	CY	$	253.89	$	286.13	$	635
at MAIN SWITCHGEAR	3	CY	$	278.88	$	314.30	$	943
at bus parking	67	CY	$	278.88	$	314.30	$	20,964
DIVISION 26 - ELECTRICAL								
260513 Medium Voltage Cables								
AC Power Cable, 15kV, 3-conductor, with shield, MAIN to SBSN A	525	LF	$	13.14	$	14.80	$	7,772
260519 Low Voltage Electrical Power Conductors and Cables								
Substation to Cabinet								
AC Power Cable, 1/C, 350 KCMIL XHHW-2, SUBSTATION A to EV Charging Cabinets, includes 3 phase conductor	3,168	LF	$	11.04	$	12.44	$	39,417
1/C, grounding cable	528	LF	$	11.04	$	12.44	$	6,569
Cabinet to Dispenser, DC								
DC Power Cable, 1/C, 250 KCMIL XHHW-2, rated for 1000V, from Charging Cabinets to Pantographs, (SUB A)	6,624	LF	$	8.79	$	9.91	$	65,620
#2 AWG, grounding cable (SUB A)	3,312	LF	$	2.36	$	2.66	$	8,809
Cabinet to Dispenser, Misc								
Category 7 & 4x2x22 AWG (SF/FTP) Ethernet, Shielded and Foiled with Foiled Twisted Pairs, CMX Rated for Outdoor Use	3,312	LF	$	0.79	$	0.89	$	2,949
LAPP, Unitronix, CAN BUS, Burial or Equivalent	3,312	LF	$	2.25	$	2.54	$	8,398
7/C 16 AWG, Shielded, 600V, Type TC Control Cable, Outdoor Rated for Wet Locations	3,312	LF	$	2.66	$	3.00	$	9,929
Coax Cable BELDEN TYPE 1694SB OR EQUIVALENT	3,312	LF	$	3.38	$	3.81	$	12,616
Coax Cable LMR 240 N-Type F/Reverse Pol SMA M	3,312	LF	$	3.38	$	3.81	$	12,616
4/C 12 AWG, 600V Type TC Control cable, Outdoor Rated for Wet Locations	3,312	LF	$	1.13	$	1.27	$	4,218
260539 Underground raceways for Electrical Systems								
4" SCHEDULE 40 PVC CONDUIT DUCT BANK: including spacers from MAIN SWITCHGEAR to transition vault A	440	LF	$	50.89	$	57.35	$	25,235
1 1/2" innerduct for fiber-optic cable, run within duct bank from MAIN SWITCHGEAR to transition vault A	110	LF	$	25.44	$	28.68	$	3,154
260533 Wireways & Associated Parts								
4" rigid metal conduit, with fittings, elbows, and attachments: from transition vault A to Substation A	63	LF	$	61.91	$	69.77	$	4,396
1 1/2" rigid metal conduit, with fittings, elbows, and attachments: from transition vault A to Substation A	63	LF	$	30.95	$	34.89	$	2,198
Cable ladder, 36", with attachments (EV charging cabinets to 28 pantographs)	530	LF	$	61.91	$	69.77	$	36,978
Cable ladder, 18", with attachments (EV charging cabinets to 28 pantographs)	530	LF	$	30.95	$	34.89	$	18,489

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PHASE 1 CHARGING INFRASTRUCTURE SUPPORT

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
Unit Substations					
MAIN SWITCHGEAR					
Medium-voltage switchgear with main fused switch, utility meter section, three distribution fused switches	1	EA	$ 214,702.00	$ 241,969.15	$ 241,969
Add Installation and Commissioning		LS	$ 72,590.75		$ 72,591
UNIT SUBSTATION A					
Medium-voltage switchgear, 12.47kV/480V Transformer - 3750kVA, 480V switchboard & breakers, Aux transformer, panel & breakers (480-277/120V)	1	EA	$ 317,968.49	$ 358,350.49	$ 358,350
Add Installation and Commissioning		LS	$ 107,505.15		$ 107,505
Exterior Lighting					
Lighting, includes LED luminaires, LED floodlights, NEMA 3R control panel, digital timer, switch, conductor, conduit & installation	167,934	SF	$ 10.13	$ 11.42	$ 1,917,296
Other Electrical					
Mobile Generator Quick Connect / Tap box, 3-phase, 4-wire, 480V, 2000 KVA, 2400A continuous rating.	1	EA	$ 50,652.00	$ 57,084.80	$ 57,085
Ground mat, including ground rods, for MAIN SWITCHGEAR	1	EA	$ 15,000.00	$ 16,905.00	$ 16,905
Steel Grate Grounding Mat, including ground rods, for Substation	1	EA	$ 10,000.00	$ 11,270.00	$ 11,270
DIVISION 27 - COMMUNICATIONS					
271323 Communications Optical Fiber Backbone Cabling					
Fiber optic cable, multimode, in duct bank from Main MV Switchgear to Unit Substation A	175	LF	$ 12.99	$ 14.64	$ 2,562
DIVISION 33 - EXTERIOR IMPROVEMENTS					
337119 Electrical Underground Ducts and Manholes					
Vault, pre-cast concrete, 4'X4'X4'6" with cover	2	EA	$ 4,586.82	$ 5,169.35	$ 10,339
				TO PHASE 1 SUMMARY	**$ 3,089,634**

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PHASE 1 SUPPORT FRAME AND GARAGE

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
DIVISION 03 - CONCRETE					
033053 Miscellaneous Cast-In-Place Concrete					
Regular concrete (4000 psi), 6" slab	5,170	SF	$ 5.63	$ 6.34	$ 32,786.45
Drilled piers & caps	288	CY	$ 925.50	$ 1,043.04	$ 300,395.09
Grade beams & Tie beams	100	CY	$ 617.00	$ 695.36	$ 69,535.90
DIVISION 05 - METALS					
050001 Miscellaneous and Ornamental Iron					
4" sch 40 pipe bollards	60	EA	$ 443.80	$ 500.16	$ 30,009.76
051200 Structural Steel					
Conduit / Cable tray support rack; galvanized	2,961	LF	$ 19.02	$ 21.44	$ 63,460.77
Columns:					
W12X190 (20' columns)	300	LF	$ 240.92	$ 271.52	$ 81,455.05
2" Steel Plate	60	SF	$ 415.90	$ 468.72	$ 28,123.43
1-1/2" Dia. 30" long steel ancor rods	375	LF	$ 101.44	$ 114.32	$ 42,871.08
Support Beams:					
W33X120 (Edge girders under platform)	130	LF	$ 494.52	$ 557.32	$ 72,452.13
W40X215 (Center girder under platform)	65	LF	$ 886.02	$ 998.54	$ 64,905.03
W24X62 (Edge girders & Moment frame beams open framing)	646	LF	$ 255.50	$ 287.95	$ 186,016.19
W27X84 (Edge girder open framing)	135	LF	$ 346.16	$ 390.13	$ 52,667.12
W36X150 (Moment frame beams under platform)	188	LF	$ 618.15	$ 696.66	$ 130,971.15
W24X76 (Beams under platform)	1,034	LF	$ 313.20	$ 352.97	$ 364,972.94
24K10 (Bar joists open framing)	2,162	LF	$ 44.38	$ 50.02	$ 108,135.15
HSS6X6X1/2 (K Bracing)	240	LF	$ 82.42	$ 92.89	$ 22,292.96
053113 Steel Floor Decking					
1.5" Steel Decking, 16 ga.	5,170	SF	$ 6.66	$ 7.50	$ 38,787.61
DIVISION 09 - FINISHES					
090007 Painting					
Prep columns & framing	18,863	SF	$ 5.71	$ 6.43	$ 121,301.58
DIVISION 31 - EARTHWORK					
316326 Drilled Caissons					
Fixed end caisson pile, open, machine drilled, in stable ground, no casings or ground water, 36" diameter	450	LF	$ 165.36	$ 186.36	$ 83,860.30
				TO PHASE 1 SUMMARY	**$ 1,894,999.68**

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PHASE 1 CIVIL

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
DIVISION 01 - GENERAL REQUIREMENTS					
01 71 23 - Construction Staking and Survey		LS	$ 20,000.00	$ 22,540.00	$ 22,540.00
01 57 23 - Temporary Storm Water Pollution Control		LS	$ 25,000.00	$ 28,175.00	$ 28,175.00
DIVISION 03 - CONCRETE					
03 30 00 - Cast-in-Place Concrete (Minor Concrete)	50	CY	$ 800.00	$ 901.60	$ 45,080.00
DIVISION 31 - EARTHWORK					
31 20 00 - Excavation	100	CY	$ 100.00	$ 112.70	$ 11,270.00
31 20 00 - 1-Sack Slurry	75	CY	$ 200.00	$ 225.40	$ 16,905.00
31 20 00 - Potholing		LS	$ 25,000.00	$ 28,175.00	$ 28,175.00
DIVISION 32 - EXTERIOR IMPROVEMENTS					
32 11 23 - Class 2 Aggregate Base	200	CY	$ 70.00	$ 78.89	$ 15,778.00
32 12 16 - Asphalt Concrete	300	TON	$ 180.00	$ 202.86	$ 60,858.00
32 17 23 - Parking Lot Striping		LS	$ 10,000.00	$ 11,270.00	$ 11,270.00
32 31 13 - Fixed Bollard	30	EA	$ 2,000.00	$ 2,254.00	$ 67,620.00
DIVISION 33 - UTILITIES					
33 00 00 - Various Utility Relocations		LS	$ 50,000.00	$ 56,350.00	$ 56,350.00
33 00 00 - Fire Line & Back Flow Preventer Relocation		LS	$ 35,000.00	$ 39,445.00	$ 39,445.00
33 40 00 - On-Site Storm Drain System		LS	$ 35,000.00	$ 39,445.00	$ 39,445.00
33 40 00 - Stormwater BMPs		LS	$ 20,000.00	$ 22,540.00	$ 22,540.00
				TO PHASE 1 SUMMARY	**$ 465,451.00**

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PHASE 1 ADD ALTERNATES

LOCATION	QUANTITY	UOM	RATE*		SD Index		ADD	
					113%			
ADD ALT 1								
Battery Storage								
Battery Storage	2	EA	$	700,000.00	$	788,900.00	$	1,577,800.00
Substation A additional components (transformer and LV switchboards) per vendor quote	1	EA		$17,861.00		$20,129	$	20,129.35
Add Installation and Commissioning (10%)		LS	$	159,792.93			$	159,792.93
ADD ALT 2								
Photovoltaic System								
PV Panels	207	EA	$	387.50	$	436.71	$	90,399.49
DC Optimizer	140	EA	$	108.75	$	122.56	$	17,158.58
PV Wiring		LS	$	95,761.72	$	107,923.46	$	107,923.46
PV Grounding		LS	$	1,500.00	$	1,690.50	$	1,690.50
PV Support Rails		LS	$	87,214.68	$	98,290.95	$	98,290.95
PV Inverters	1	EA	$	11,500.00	$	12,960.50	$	12,960.50
PV Signage and Commissioning		LS	$	6,000.00	$	6,762.00	$	6,762.00
PV Structural Steel Framing	-	TONS	$	6,500.00	$	7,325.50	$	-
ADD ALT 3								
Earthwork - Non-hazardous waste								
LOADING, HAULING, AND DISPOSING NON-HAZARDOUS WASTE (MANIFEST REQUIRED) - ADD ALT - hauling to a local landfill.	100	CY	$	350.00	$	394.45	$	39,445.00
LOADING, HAULING, AND DISPOSING NON-HAZARDOUS WASTE (MANIFEST REQUIRED) - ADD ALT - hauling to a California Hazarous approved site	-	CY	$	100.00	$	112.70	$	-
					ADD ALT 1 TO PHASE 1 SUMMARY		**$**	**1,737,592.93**
					ADD ALT 2 TO PHASE 1 SUMMARY		**$**	**335,185.47**
					ADD ALT 3 TO PHASE 1 SUMMARY		**$**	**39,445.00**

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PHASE 2 SUMMARY

					TOTAL
A	**Charging Equipment (OFCI)**			$	4,675,862
B	**Charging Infrastructure Support**			$	1,087,676
C	**Parking Garage**			$	13,702,480
D	**Civil**			$	512,785
		Sub-Total		**$**	**19,978,803**
		Design Contingency	**25.00%**	$	4,994,701
		Sub-Total + Design Contingency		**$**	**24,973,504**
	Markups				
	General Conditions and Requirements		12.00%	$	2,996,820
	Insurance		0.75%	$	187,301
	Bond		1.50%	$	374,603
	Overhead and Profit		12.50%	$	3,121,688
		Estimated Current Construction Cost Q12022		**$**	**31,653,916**
	Escalation to Q42023 (Mid-point of Construction)		4.00%	$	1,266,157
		Estimated Contract Award, Q42022		**$**	**32,920,073**
	Pre- and Post-Construction Expenses ("Soft Costs")		1.70%	$	559,641
		TOTAL CONSTRUCTION ESTIMATE		**$**	**33,479,714**

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PHASE 2 SUMMARY

			TOTAL
Add Alternative 1 - Battery Storage		$	869,803
Markups	26.75%	$	232,672
RUNNING TOTAL		**$**	**1,102,475**
Escalation to Q42023 (Mid-point of Construction)	4.00%	$	44,099
RUNNING TOTAL		**$**	**1,146,574**
Pre & Post-Construction Expenses	1.70%	$	19,492
ADD ALT 1 TOTAL		**$**	**1,166,066**
Add Alternative 2 - Photovoltaic System		$	2,345,004
Markups	26.75%	$	627,288
RUNNING TOTAL		**$**	**2,972,292**
Escalation to Q42023 (Mid-point of Construction)	4.00%	$	118,892
RUNNING TOTAL		**$**	**3,091,184**
Pre & Post-Construction Expenses	1.70%	$	52,550
ADD ALT 2 TOTAL		**$**	**3,143,734**
Add Alternative 3 - Earthwork - Non-Hazardous Waste		$	157,780
Markups	26.75%	$	42,206
RUNNING TOTAL		**$**	**199,986**
Escalation to Q42023 (Mid-point of Construction)	4.00%	$	7,999
RUNNING TOTAL		**$**	**207,986**
Pre & Post-Construction Expenses	1.70%	$	3,536
ADD ALT 3 TOTAL		**$**	**211,521**
TOTAL CONSTRUCTION ESTIMATE + ADD ALT 1		**$**	**34,645,780**
TOTAL CONSTRUCTION ESTIMATE + ADD ALT 1, 2		**$**	**37,789,514**
TOTAL CONSTRUCTION ESTIMATE + ADD ALT 1, 2, 3		**$**	**38,001,035**

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PHASE 2 CHARGING EQUIPMENT

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
CHARGING EQUIPMENT					
DC Charging Cabinets and Pantographs					
DC Charging Cabinet - 180 kW	21	EA	$ 70,755	$ 79,741	$ 1,674,559
Pantograph (includes outlet box)	60	EA	$ 32,860	$ 37,033	$ 2,221,993
Installation					
Equipment Install (20% of Equipment Cost)		LS	$ 779,310		$ 779,310
CALeVIP FUNDING, HVIP FUNDING, OTHER REBATES					
HVIP Funding per Bus	-	EA	($40,000.00)		$0
CALeVIP Funding (Quantity is total number of charging cabinets)	-	EA	($42,000.00)		$0
SDG&E Charge Ready per Bus	-	EA	($25,000.00)		$0
				TO PHASE 2 SUMMARY	**$ 4,675,862**

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PHASE 2 CHARGING INFRASTRUCTURE SUPPORT

LOCATION	QUANTITY	UOM	RATE*		SD Index		ADD
					113%		
DIVISION 26 - ELECTRICAL							
260513 Medium Voltage Cables							
AC Power Cable, 15kV, 3-conductor, with shield, MAIN to SBSN B	1,614	LF	$	13.14	$	14.80	$ 23,889
260519 Low Voltage Electrical Power Conductors and Cables							
Substation to Cabinet							
North Lot							
AC Power Cable, 1/C, 350 KCMIL XHHW-2, SUBSTATION A to EV Charging Cabinets, includes 3 phase conductor	1,038	LF	$	11.04	$	12.44	$ 12,915
1/C, grounding cable	173	LF	$	11.04	$	12.44	$ 2,152
South Lot							
AC Power Cable, 1/C, 350 KCMIL XHHW-2, SUBSTATION B to EV Charging Cabinets, includes 3 phase conductor	4,692	LF	$	11.04	$	12.44	$ 58,378
1/C, grounding cable	782	LF	$	11.04	$	12.44	$ 9,730
Cabinet to Dispenser, DC							
North Lot							
DC Power Cable, 1/C, 250 KCMIL XHHW-2, rated for 1000V, from Charging Cabinets to Pantographs	1,990	LF	$	8.79	$	9.91	$ 19,714
#2 AWG, grounding cable	995	LF	$	2.36	$	2.66	$ 2,646
South Lot							
DC Power Cable, 1/C, 250 KCMIL XHHW-2, rated for 1000V, from Charging Cabinets to Pantographs	15,342	LF	$	8.79	$	9.91	$ 151,983
#2 AWG, grounding cable	7,671	LF	$	2.36	$	2.66	$ 20,403
Cabinet to Dispenser, Misc							
North Lot							
Category 7 & 4x2x22 AWG (SF/FTP) Ethernet, Shielded and Foiled with Foiled Twisted Pairs, CMX Rated for Outdoor Use	995	LF	$	0.79	$	0.89	$ 886
LAPP, Unitronix, CAN BUS, Burial or Equivalent	995	LF	$	2.25	$	2.54	$ 2,523
7/C 16 AWG, Shielded, 600V, Type TC Control Cable, Outdoor Rated for Wet Locations	995	LF	$	2.66	$	3.00	$ 2,983
Coax Cable BELDEN TYPE 1694SB OR EQUIVALENT	995	LF	$	3.38	$	3.81	$ 3,790
Coax Cable LMR 240 N-Type F/Reverse Pol SMA M	995	LF	$	3.38	$	3.81	$ 3,790
4/C 12 AWG, 600V Type TC Control cable, Outdoor Rated for Wet Locations	995	LF	$	1.13	$	1.27	$ 1,267
South Lot							
Category 7 & 4x2x22 AWG (SF/FTP) Ethernet, Shielded and Foiled with Foiled Twisted Pairs, CMX Rated for Outdoor Use	7,671	LF	$	0.79	$	0.89	$ 6,830
LAPP, Unitronix, CAN BUS, Burial or Equivalent	7,671	LF	$	2.25	$	2.54	$ 19,452
7/C 16 AWG, Shielded, 600V, Type TC Control Cable, Outdoor Rated for Wet Locations	7,671	LF	$	2.66	$	3.00	$ 22,996
Coax Cable BELDEN TYPE 1694SB OR EQUIVALENT	7,671	LF	$	3.38	$	3.81	$ 29,221
Coax Cable LMR 240 N-Type F/Reverse Pol SMA M	7,671	LF	$	3.38	$	3.81	$ 29,221
4/C 12 AWG, 600V Type TC Control cable, Outdoor Rated for Wet Locations	7,671	LF	$	1.13	$	1.27	$ 9,769
260539 Underground raceways for Electrical Systems							
4" SCHEDULE 40 PVC CONDUIT DUCT BANK: including spacers from transition vault B to transition vault C	510	LF	$	50.89	$	57.35	$ 29,272
1 1/2" innerduct for fiber-optic cable, run within duct bank from transition vault B to transition vault C	128	LF	$	25.44	$	28.68	$ 3,659

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PHASE 2 CHARGING INFRASTRUCTURE SUPPORT

LOCATION	QUANTITY	UOM		RATE*		SD Index		ADD
						113%		
260533 Wireways & Associated Parts								
North lot to South Lot								
4" rigid metal conduit, with fittings, elbows, and attachments: above ground underframe from transition A to transition B	229	LF	$	61.91	$	69.77	$	15,963
1 1/2" rigid conduit, with fittings, elbows, and attachments: above ground underframe from transition A to transition B	229	LF	$	30.95	$	34.89	$	7,982
Substation B								
4" rigid metal conduit, with fittings, elbows, and attachments: from transition vault A to Substation A	96	LF	$	61.91	$	69.77	$	6,677
1 1/2" rigid metal conduit, with fittings, elbows, and attachments: from transition vault A to Substation A	96	LF	$	30.95	$	34.89	$	3,339
Cable ladder, 36", with attachments (EV charging cabinets to 28 pantographs)	918	LF	$	61.91	$	69.77	$	64,049
Cable ladder, 18", with attachments (EV charging cabinets to 28 pantographs)	918	LF	$	30.95	$	34.89	$	32,025
Unit Substations								
UNIT SUBSTATION B								
Medium-voltage switchgear, 12.47kV/480V Transformer - 3750kVA, 480V switchboard & breakers, Aux transformer, panel & breakers (480-277/120V)	1	EA	$	317,968.49	$	358,350.49	$	358,350
Add Installation and Commissioning		LS	$	107,505.15			$	107,505
Other Electrical								
Steel Grate Grounding Mat, including ground rods, for Substation	1	EA	$	10,000.00	$	11,270.00	$	11,270
DIVISION 27 - COMMUNICATIONS								
271323 Communications Optical Fiber Backbone Cabling								
Fiber optic cable, multimode, in duct bank from Main MV Switchgear to Unit Substation A	538	LF	$	12.99	$	14.64	$	7,877
DIVISION 33 - EXTERIOR IMPROVEMENTS								
337119 Electrical Underground Ducts and Manholes								
Vault, pre-cast concrete, 4'X4'X4'6" with cover	1	EA	$	4,586.82	$	5,169.35	$	5,169
						TO PHASE 2 SUMMARY	**$**	**1,087,676**

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PHASE 2 SUPPORT FRAME AND GARAGE

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
PARKING DECK					
DIVISION 03 - CONCRETE					
033053 Miscellaneous Cast-In-Place Concrete					
Drilled piers & caps (all have been added to phase 1)	-	CY	$ 925.50	$ 1,043.04	$ -
Grade beams & Tie beams	85	CY	$ 617.00	$ 695.36	$ 59,105.52
034113 Precast Structural Pretensioned					
Precast Concrete Garage	150,074	SF	$ 80.21	$ 90.40	$ 13,566,189.85
DIVISION 31 - EARTHWORK					
316326 Drilled Caissons					
Grade beams and Tie beams	111	CY	$ 617.00	$ 695.36	$ 77,184.85
				TO PHASE 2 SUMMARY	**$ 13,702,480.22**
STEEL STRUCTURE ALT					
CHARGING EQUIPMENT					
DC Charging Cabinets and Pantographs					
DC Charging Cabinet - 180 kW	-2	EA	$ 70,755	$ 79,741	$ (159,482)
Pantograph (includes outlet box)	-8	EA	$ 32,860	$ 37,033	$ (296,266)
Installation					
Equipment Install (20% of Equipment Cost)		LS	$ (91,150)		$ (91,150)
DIVISION 03 - CONCRETE					
033053 Miscellaneous Cast-In-Place Concrete					
Regular concrete (4000 psi), 6" slab	9,495	SF	$ 5.63	$ 6.34	$ 60,214.20
Drilled piers & caps	245	CY	$ 925.50	$ 1,043.04	$ 255,544.43
Grade beams & Tie beams	220	CY	$ 617.00	$ 695.36	$ 152,978.98
DIVISION 05 - METALS					
050001 Miscellaneous and Ornamental Iron					
4" sch 40 pipe bollards	116	EA	$ 443.80	$ 500.16	$ 58,018.86
051200 Structural Steel					
Conduit / Cable tray support rack; galvanized	5,625	LF	$ 19.02	$ 21.44	$ 120,575.47
Columns:					
W12X190 (20' columns)	480	LF	$ 240.92	$ 271.52	$ 130,328.08
2" Steel Plate	96	SF	$ 415.90	$ 468.72	$ 44,997.49
1-1/2" Dia. 30" long steel ancor rods	600	LF	$ 101.44	$ 114.32	$ 68,593.73
Support Beams:					
W33X120 (Edge girders under platform)	90	LF	$ 494.52	$ 557.32	$ 50,159.16
W40X215 (Center girder under platform)	135	LF	$ 886.02	$ 998.54	$ 134,802.75
W24X62 (Edge girders & Moment frame beams open framing)	1,349	LF	$ 255.50	$ 287.95	$ 388,445.57
W27X84 (Edge girder open framing)	510	LF	$ 346.16	$ 390.13	$ 198,964.68
W36X150 (Moment frame beams under platform)	410	LF	$ 618.15	$ 696.66	$ 285,628.57
W24X76 (Beams under platform)	1,640	LF	$ 313.20	$ 352.97	$ 578,873.90
24K10 (Bar joists open framing)	6,192	LF	$ 44.38	$ 50.02	$ 309,700.68
HSS6X6X1/2 (K Bracing)	480	LF	$ 82.42	$ 92.89	$ 44,585.92

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PHASE 2 SUPPORT FRAME AND GARAGE

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
053113 Steel Floor Decking					
1.5" Steel Decking, 16 ga.	9,495	SF	$ 6.66	$ 7.50	$ 71,235.66
DIVISION 09 - FINISHES					
090007 Painting					
Prep columns & framing	35,840	SF	$ 5.71	$ 6.43	$ 230,473.00
DIVISION 31 - EARTHWORK					
316326 Drilled Caissons					
Fixed end caisson pile, open, machine drilled, in stable ground, no casings or ground water, 36" diameter	720	LF	$ 165.36	$ 186.36	$ 134,176.47
				SOUTH LOT ALT TO SUMMARY	**$ 2,771,400.57**

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PHASE 2 CIVIL

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
DIVISION 01 - GENERAL REQUIREMENTS					
01 71 23 - Construction Staking and Survey		LS	$ 20,000.00	$ 22,540.00	$ 22,540.00
01 57 23 - Temporary Storm Water Pollution Control		LS	$ 25,000.00	$ 28,175.00	$ 28,175.00
DIVISION 31 - EARTHWORK					
31 20 00 - Excavation	400	CY	$ 100.00	$ 112.70	$ 45,080.00
31 20 00 - 1-Sack Slurry	225	CY	$ 200.00	$ 225.40	$ 50,715.00
31 20 00 - Potholing		LS	$ 50,000.00	$ 56,350.00	$ 56,350.00
DIVISION 32 - EXTERIOR IMPROVEMENTS					
32 17 23 - Parking Lot Striping		LS	$ 20,000.00	$ 22,540.00	$ 22,540.00
32 31 13 - Fixed Bollard	20	EA	$ 2,000.00	$ 2,254.00	$ 45,080.00
DIVISION 33 - UTILITIES					
33 00 00 - VariousUtility Relocations		LS	$ 150,000.00	$ 169,050.00	$ 169,050.00
33 40 00 - On-Site Storm Drain System		LS	$ 35,000.00	$ 39,445.00	$ 39,445.00
33 40 00 - Stormwater BMPs		LS	$ 30,000.00	$ 33,810.00	$ 33,810.00
				TO PHASE 2 SUMMARY	**$ 512,785.00**

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PHASE 2 ADD ALTERNATES

LOCATION	QUANTITY	UOM		RATE*		SD Index		ADD
						113%		
ADD ALT 1								
Battery Storage								
Battery Storage	1	EA	$	700,000.00	$	788,900.00	$	788,900.00
Substation B additional components (transformer and LV switchboards) per vendor quote	1	EA		$17,861.00		$20,129	$	20,129.35
Add Installation and Commissioning (10%)		LS	$	80,902.93			$	80,902.93
ADD ALT 2								
Photovoltaic System								
PV Panels	380	EA	$	387.50	$	436.71	$	165,950.75
DC Optimizer	140	EA	$	108.75	$	122.56	$	17,158.58
PV Wiring		LS	$	41,488.28	$	46,757.29	$	46,757.29
PV Grounding		LS	$	1,500.00	$	1,690.50	$	1,690.50
PV Support Rails		LS	$	37,785.32	$	42,584.05	$	42,584.05
PV Inverters	1	EA	$	11,500.00	$	12,960.50	$	12,960.50
PV Signage and Commissioning		LS	$	6,000.00	$	6,762.00	$	6,762.00
PV Structural Steel Framing	280	TONS	$	6,500.00	$	7,325.50	$	2,051,140.00
ADD ALT 3								
Earthwork - Non-hazardous waste								
LOADING, HAULING, AND DISPOSING NON-HAZARDOUS WASTE (MANIFEST REQUIRED) - ADD ALT - hauling to a local landfill.	400	CY	$	350.00	$	394.45	$	157,780.00
LOADING, HAULING, AND DISPOSING NON-HAZARDOUS WASTE (MANIFEST REQUIRED) - ADD ALT - hauling to a California Hazarous approved site	-	CY	$	100.00	$	112.70	$	-
						ADD ALT 1 TO PHASE 2 SUMMARY	**$**	**869,802.93**
						ADD ALT 2 TO PHASE 2 SUMMARY	**$**	**2,345,003.67**
						ADD ALT 3 TO PHASE 2 SUMMARY	**$**	**157,780.00**

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PHASE 3 SUMMARY

					TOTAL
A	**Charging Equipment (OFCI)**			$	3,021,552
B	**Charging Infrastructure Support**			$	844,677
C	**Support Frame & Parking Garage**			$	-
D	**Civil**			$	-
		Sub-Total		**$**	**3,866,229**
		Design Contingency	**25.00%**	$	966,557
		Sub-Total + Design Contingency		**$**	**4,832,786**
	Markups				
	General Conditions and Requirements		12.00%	$	579,934
	Insurance		0.75%	$	36,246
	Bond		1.50%	$	72,492
	Overhead and Profit		12.50%	$	604,098
		Estimated Current Construction Cost Q12022		**$**	**6,125,556**
	Escalation to Q42023 (Mid-point of Construction)		4.00%	$	245,022
		Estimated Contract Award, Q42022		**$**	**6,370,579**
	Pre- and Post-Construction Expenses ("Soft Costs")		1.70%	$	108,300
		TOTAL CONSTRUCTION ESTIMATE		**$**	**6,478,879**
	Add Alternative 1 - Battery Storage			$	869,803
	Markups		26.75%	$	232,672
		RUNNING TOTAL		**$**	**1,102,475**
	Escalation to Q42023 (Mid-point of Construction)		4.00%	$	44,099
		RUNNING TOTAL		**$**	**1,146,574**
	Pre & Post-Construction Expenses		1.70%	$	19,492
		ADD ALT 1 TOTAL		**$**	**1,166,066**
		TOTAL CONSTRUCTION ESTIMATE + ADD ALT 1		**$**	**7,644,944**

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PHASE 3 CHARGING EQUIPMENT

LOCATION	QUANTITY	UOM		RATE*		SD Index		ADD
						113%		
CHARGING EQUIPMENT								
DC Charging Cabinets and Pantographs								
DC Charging Cabinet - 180 kW	13	EA	$	70,755	$	79,741	$	1,036,632
Pantograph (includes outlet box)	40	EA	$	32,860	$	37,033	$	1,481,329
Installation								
Equipment Install (20% of Equipment Cost)	1		$	503,592			$	503,592
CALeVIP FUNDING, HVIP FUNDING, OTHER REBATES								
HVIP Funding per Bus	-	EA		($40,000.00)				$0
CALeVIP Funding (Quantity is total number of charging cabinets)	-	EA		($42,000.00)				$0
SDG&E Charge Ready per Bus	-	EA		($25,000.00)				$0
				TO PHASE 3 SUMMARY			**$**	**3,021,552**

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PHASE 3 CHARGING INFRASTRUCTURE SUPPORT

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
DIVISION 26 - ELECTRICAL					
260513 Medium Voltage Cables					
AC Power Cable, 15kV, 3-conductor, with shield, MAIN to SBSN C	1,647	LF	$ 13.14	$ 14.80	$ 24,378
260519 Low Voltage Electrical Power Conductors and Cables					
Substation to Cabinet					
AC Power Cable, 1/C, 350 KCMIL XHHW-2, SUBSTATION C to EV Charging Cabinets, includes 3 phase conductor	3,546	LF	$ 11.04	$ 12.44	$ 44,120
1/C, grounding cable	591	LF	$ 11.04	$ 12.44	$ 7,353
Cabinet to Dispenser, DC					
DC Power Cable, 1/C, 250 KCMIL XHHW-2, rated for 1000V, from Charging Cabinets to Pantographs, (SUB A)	7,652	LF	$ 8.79	$ 9.91	$ 75,803
#2 AWG, grounding cable (SUB A)	3,826	LF	$ 2.36	$ 2.66	$ 10,176
Cabinet to Dispenser, Misc					
Category 7 & 4x2x22 AWG (SF/FTP) Ethernet, Shielded and Foiled with Foiled Twisted Pairs, CMX Rated for Outdoor Use	3,826	LF	$ 0.79	$ 0.89	$ 3,406
LAPP, Unitronix, CAN BUS, Burial or Equivalent	3,826	LF	$ 2.25	$ 2.54	$ 9,702
7/C 16 AWG, Shielded, 600V, Type TC Control Cable, Outdoor Rated for Wet Locations	3,826	LF	$ 2.66	$ 3.00	$ 11,470
Coax Cable BELDEN TYPE 1694SB OR EQUIVALENT	3,826	LF	$ 3.38	$ 3.81	$ 14,574
Coax Cable LMR 240 N-Type F/Reverse Pol SMA M	3,826	LF	$ 3.38	$ 3.81	$ 14,574
4/C 12 AWG, 600V Type TC Control cable, Outdoor Rated for Wet Locations	3,826	LF	$ 1.13	$ 1.27	$ 4,872
260533 Wireways & Associated Parts					
4" rigid metal conduit, with fittings, elbows, and attachments: from transition vault A to Substation A	107	LF	$ 61.91	$ 69.77	$ 7,465
1 1/2" rigid metal conduit, with fittings, elbows, and attachments: from transition vault A to Substation A	107	LF	$ 30.95	$ 34.89	$ 3,733
Cable ladder, 36", with attachments (EV charging cabinets to 28 pantographs)	676	LF	$ 61.91	$ 69.77	$ 47,165
Cable ladder, 18", with attachments (EV charging cabinets to 28 pantographs)	676	LF	$ 30.95	$ 34.89	$ 23,582
Cable Cleats, for bundling and attaching (2) 250kcmil XHHW-2 DC cables to cable ladder approximately every 4 feet	957	EA	$ 5.63	$ 6.34	$ 6,067
1" SCHEDULE 40 PVC CONDUIT, including all fittings and attachments, for coupler power and comm circuits in lower cable ladder	7,902	LF	$ 5.63	$ 6.34	$ 50,120
Junction Box on cable ladder from RMC conduit riser	3	EA	$ 281.40	$ 317.14	$ 951
Unit Substations					
UNIT SUBSTATION C					
Medium-voltage switchgear, 12.47kV/480V Transformer - 3750kVA, 480V switchboard & breakers, Aux transformer, panel & breakers (480-277/120V)	1	EA	$ 317,968.49	$ 358,350.49	$ 358,350
Add Installation and Commissioning		LS	$ 107,505.15		$ 107,505
Other Electrical					
Steel Grate Grounding Mat, including ground rods, for Substation	1	EA	$ 10,000.00	$ 11,270.00	$ 11,270

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PHASE 3 CHARGING INFRASTRUCTURE SUPPORT

LOCATION	QUANTITY	UOM	RATE*		SD Index		ADD
					113%		
DIVISION 27 - COMMUNICATIONS							
271323 Communications Optical Fiber Backbone Cabling							
Fiber optic cable, multimode, in duct bank from Main MV Switchgear to Unit Substation A	549	LF	$	12.99	$	14.64	$ 8,038
						TO PHASE 3 SUMMARY	**$ 844,677**

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PHASE 3 ADD ALTERNATES

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
ADD ALT 1					
Battery Storage					
Battery Storage	1	EA	$ 700,000.00	$ 788,900.00	$ 788,900.00
Substation C additional components (transformer and LV switchboards) per vendor quote	1	EA	$17,861.00	$20,129	$ 20,129.35
Add Installation and Commissioning (10%)		LS	$ 80,902.93		$ 80,902.93
			ADD ALT 1 TO PHASE 3 SUMMARY		**$ 869,802.93**

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OVERALL SUMMARY

				TOTAL
A	**Charging Equipment (OFCI)**			$ 9,988,932
B	**Charging Infrastructure Support**			$ 5,021,986
C	**Support Frame & Parking Garage**			$ 15,538,374
D	**Civil**			$ 978,236
		Sub-Total		**$ 31,527,529**
		Design Contingency	**25.00%**	$ 7,881,882
		Sub-Total + Design Contingency		**$ 39,409,411**
	Markups			
	General Conditions and Requirements		12.00%	$ 4,729,129
	Insurance		0.75%	$ 295,571
	Bond		1.50%	$ 591,141
	Overhead and Profit		12.50%	$ 4,926,176
		Estimated Current Construction Cost Q12022		**$ 49,951,428**
	Escalation to May 2023 (Mid-point of Construction)		4.00%	$ 1,998,057
		Estimated Contract Award, Dec 2022		**$ 51,949,485**
	Pre- and Post-Construction Expenses ("Soft Costs")		1.70%	$ 883,141
		TOTAL CONSTRUCTION ESTIMATE		**$ 52,832,626**

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OVERALL SUMMARY

			TOTAL
Add Alternative 1 - Battery Storage		$	3,477,199
Markups	26.75%	$	930,151
RUNNING TOTAL		**$**	**4,407,349**
Escalation to Q42023 (Mid-point of Construction)	4.00%	$	176,294
RUNNING TOTAL		**$**	**4,583,643**
Pre & Post-Construction Expenses	1.70%	$	77,922
ADD ALT 1 TOTAL		**$**	**4,661,565**
Add Alternative 2 - Photovoltaic System		$	2,680,189
Markups	26.75%	$	716,951
RUNNING TOTAL		**$**	**3,397,140**
Escalation to Q42023 (Mid-point of Construction)	4.00%	$	135,886
RUNNING TOTAL		**$**	**3,533,025**
Pre & Post-Construction Expenses	1.70%	$	60,061
ADD ALT 2 TOTAL		**$**	**3,593,087**
Add Alternative 3 - Earthwork - Non-Hazardous Waste		$	197,225
Markups	26.75%	$	52,758
RUNNING TOTAL		**$**	**249,983**
Escalation to Q42023 (Mid-point of Construction)	4.00%	$	9,999
RUNNING TOTAL		**$**	**259,982**
Pre & Post-Construction Expenses	1.70%	$	4,420
ADD ALT 3 TOTAL		**$**	**264,402**
TOTAL CONSTRUCTION ESTIMATE + ADD ALT 1		**$**	**57,494,192**
TOTAL CONSTRUCTION ESTIMATE + ADD ALT 1, 2		**$**	**61,087,279**
TOTAL CONSTRUCTION ESTIMATE + ADD ALT 1, 2, 3		**$**	**61,351,680**

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OVERALL CHARGING EQUIPMENT

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
CHARGING EQUIPMENT					
DC Charging Cabinets and Pantographs					
DC Charging Cabinet - 180 kW	44	EA	$ 70,755	$ 79,741	$ 3,508,599
Pantograph (includes outlet box)	130	EA	$ 32,860	$ 37,033	$ 4,814,319
Installation					
Equipment Install (20% of Equipment Cost)		LS	$ 1,664,584		$ 1,664,584
Site Acceptance Test - Depot (One and Done)	1	EA	$ 1,270	$ 1,431	$ 1,431
CALeVIP FUNDING, HVIP FUNDING, OTHER REBATES					
HVIP Funding per Bus	-	EA	($40,000.00)		$0
CALeVIP Funding (Quantity is total number of charging cabinets)	-	EA	($42,000.00)		$0
SDG&E Charge Ready per Bus	-	EA	($25,000.00)		$0
				TO PHASE 1 SUMMARY	**$ 9,988,932**

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OVERALL CHARGING INFRASTRUCTURE SUPPORT

LOCATION	QUANTITY	UOM		RATE*		SD Index		ADD
						113%		
DIVISION 03 - CONCRETE								
033000 Cast-In-Place Concrete (GC)								
Field surveys and verification	16	HRS	$	102.98	$	116.06	$	1,857
033053 Miscellaneous Cast-In-Place Concrete								
CIP Concrete housekeeping pad								
at utility switch	2	CY	$	253.89	$	286.13	$	635
at MAIN SWITCHGEAR	3	CY	$	278.88	$	314.30	$	943
at bus parking	67	CY	$	278.88	$	314.30	$	20,964
DIVISION 26 - ELECTRICAL								
260513 Medium Voltage Cables								
AC Power Cable, 15kV, 3-conductor, with shield, MAIN to SBSN A, B, C	3,785	LF	$	13.14	$	14.80	$	56,039
260519 Low Voltage Electrical Power Conductors and Cables								
Substation to Cabinet								
AC Power Cable, 1/C, 350 KCMIL XHHW-2, SUBSTATION A, B, C to EV Charging Cabinets, includes 3 phase conductor	12,444	LF	$	11.04	$	12.44	$	154,829
1/C, grounding cable	2,074	LF	$	11.04	$	12.44	$	25,805
Cabinet to Dispenser, DC								
DC Power Cable, 1/C, 250 KCMIL XHHW-2, rated for 1000V, from Charging Cabinets to Pantographs, (SUB A, B, C)	31,608	LF	$	8.79	$	9.91	$	313,119
#2 AWG, grounding cable (SUB A, B, C)	15,804	LF	$	2.36	$	2.66	$	42,034
Cabinet to Dispenser, Misc								
Category 7 & 4x2x22 AWG (SF/FTP) Ethernet, Shielded and Foiled with Foiled Twisted Pairs, CMX Rated for Outdoor Use	15,804	LF	$	0.79	$	0.89	$	14,071
LAPP, Unitronix, CAN BUS, Burial or Equivalent	15,804	LF	$	2.25	$	2.54	$	40,075
7/C 16 AWG, Shielded, 600V, Type TC Control Cable, Outdoor Rated for Wet Locations	15,804	LF	$	2.66	$	3.00	$	47,378
Coax Cable BELDEN TYPE 1694SB OR EQUIVALENT	15,804	LF	$	3.38	$	3.81	$	60,202
Coax Cable LMR 240 N-Type F/Reverse Pol SMA M	15,804	LF	$	3.38	$	3.81	$	60,202
4/C 12 AWG, 600V Type TC Control cable, Outdoor Rated for Wet Locations	15,804	LF	$	1.13	$	1.27	$	20,127
260539 Underground raceways for Electrical Systems								
4" SCHEDULE 40 PVC CONDUIT DUCT BANK: including spacers	950	LF	$	50.89	$	57.35	$	54,507
1 1/2" innerduct for fiber-optic cable, run within duct bank	238	LF	$	25.44	$	28.68	$	6,813
260533 Wireways & Associated Parts								
4" rigid metal conduit, with fittings, elbows, and attachments	495	LF	$	61.91	$	69.77	$	34,501
1 1/2" rigid metal conduit, with fittings, elbows, and attachments	495	LF	$	30.95	$	34.89	$	17,251
Cable ladder, 36", with attachments	2,124	LF	$	61.91	$	69.77	$	148,192
Cable ladder, 18", with attachments	2,124	LF	$	30.95	$	34.89	$	74,096
Cable Cleats, for bundling and attaching (2) 250kcmil XHHW-2 DC cables to cable ladder approximately every 4 feet	957	EA	$	5.63	$	6.34	$	6,067
1" SCHEDULE 40 PVC CONDUIT, including all fittings and attachments, for coupler power and comm circuits in lower cable ladder	7,902	LF	$	5.63	$	6.34	$	50,120
Junction Box on cable ladder from RMC conduit riser	3	EA	$	281.40	$	317.14	$	951

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OVERALL CHARGING INFRASTRUCTURE SUPPORT

LOCATION	QUANTITY	UOM		RATE*		SD Index		ADD
						113%		
Unit Substations								
MAIN SWITCHGEAR								
Medium-voltage switchgear with main fused switch, utility meter section, three distribution fused switches	1	EA	$	214,702.00	$	241,969.15	$	241,969
Add Installation and Commissioning		LS	$	72,590.75			$	72,591
UNIT SUBSTATION A, B, C								
Medium-voltage switchgear, 12.47kV/480V Transformer - 3750kVA, 480V switchboard & breakers, Aux transformer, panel & breakers (480-277/120V)	3	EA	$	317,968.49	$	358,350.49	$	1,075,051
Add Installation and Commissioning		LS	$	322,515.44			$	322,515
Exterior Lighting								
Lighting, includes LED luminaires, LED floodlights, NEMA 3R control panel, digital timer, switch, conductor, conduit & installation	167,934	SF	$	10.13	$	11.42	$	1,917,296
Other Electrical								
Mobile Generator Quick Connect / Tap box, 3-phase, 4-wire, 480V, 2000 KVA, 2400A continuous rating.	1	EA	$	50,652.00	$	57,084.80	$	57,085
Ground mat, including ground rods, for MAIN SWITCHGEAR	1	EA	$	15,000.00	$	16,905.00	$	16,905
Steel Grate Grounding Mat, including ground rods, for Substation	3	EA	$	10,000.00	$	11,270.00	$	33,810
DIVISION 27 - COMMUNICATIONS								
271323 Communications Optical Fiber Backbone Cabling								
Fiber optic cable, multimode, in duct bank from Main MV Switchgear to Unit Substation A	1,262	LF	$	12.99	$	14.64	$	18,478
DIVISION 33 - EXTERIOR IMPROVEMENTS								
337119 Electrical Underground Ducts and Manholes								
Vault, pre-cast concrete, 4'X4'X4'6" with cover	3	EA	$	4,586.82	$	5,169.35	$	15,508
						TO PHASE 1 SUMMARY	**$**	**5,021,986**

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OVERALL SUPPORT FRAME AND GARAGE

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
NORTH LOT STEEL STRUCTURE					
DIVISION 03 - CONCRETE					
033053 Miscellaneous Cast-In-Place Concrete					
Regular concrete (4000 psi), 6" slab	5,170	SF	$ 5.63	$ 6.34	$ 32,786.45
Drilled piers & caps	288	CY	$ 925.50	$ 1,043.04	$ 300,395.09
Grade beams & Tie beams	100	CY	$ 617.00	$ 695.36	$ 69,535.90
DIVISION 05 - METALS					
050001 Miscellaneous and Ornamental Iron					
4" sch 40 pipe bollards	60	EA	$ 443.80	$ 500.16	$ 30,009.76
051200 Structural Steel					
Conduit / Cable tray support rack; galvanized	2,961	LF	$ 19.02	$ 21.44	$ 63,460.77
Columns:					
W12X190 (20' columns)	300	LF	$ 240.92	$ 271.52	$ 81,455.05
2" Steel Plate	60	SF	$ 415.90	$ 468.72	$ 28,123.43
1-1/2" Dia. 30" long steel ancor rods	375	LF	$ 101.44	$ 114.32	$ 42,871.08
Support Beams:					
W33X120 (Edge girders under platform)	130	LF	$ 494.52	$ 557.32	$ 72,452.13
W40X215 (Center girder under platform)	65	LF	$ 886.02	$ 998.54	$ 64,905.03
W24X62 (Edge girders & Moment frame beams open framing)	646	LF	$ 255.50	$ 287.95	$ 186,016.19
W27X84 (Edge girder open framing)	135	LF	$ 346.16	$ 390.13	$ 52,667.12
W36X150 (Moment frame beams under platform)	188	LF	$ 618.15	$ 696.66	$ 130,971.15
W24X76 (Beams under platform)	1,034	LF	$ 313.20	$ 352.97	$ 364,972.94
24K10 (Bar joists open framing)	2,162	LF	$ 44.38	$ 50.02	$ 108,135.15
HSS6X6X1/2 (K Bracing)	240	LF	$ 82.42	$ 92.89	$ 22,292.96
053113 Steel Floor Decking					
1.5" Steel Decking, 16 ga.	5,170	SF	$ 6.66	$ 7.50	$ 38,787.61
DIVISION 09 - FINISHES					
090007 Painting					
Prep columns & framing	18,863	SF	$ 5.71	$ 6.43	$ 121,301.58
DIVISION 31 - EARTHWORK					
316326 Drilled Caissons					
Fixed end caisson pile, open, machine drilled, in stable ground, no casings or ground water, 36" diameter	450	LF	$ 165.36	$ 186.36	$ 83,860.30
				NORTH LOT STEEL STRUCTURE	**$ 1,894,999.68**

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OVERALL SUPPORT FRAME AND GARAGE

LOCATION	QUANTITY	UOM	RATE*		SD Index		ADD
					113%		
SOUTH LOT PARKING DECK							
DIVISION 03 - CONCRETE							
033053 Miscellaneous Cast-In-Place Concrete							
Drilled piers & caps	-	CY	$	925.50	$ 1,043.04	$	-
Grade beams & Tie beams	85	CY	$	617.00	$ 695.36	$	59,105.52
034113 Precast Structural Pretensioned							
Precast Concrete Garage	150,074	SF	$	80.21	$ 90.40	$	13,566,189.85
DIVISION 31 - EARTHWORK							
316326 Drilled Caissons							
Grade beams and Tie beams	111	CY	$	617.00	$ 695.36	$	77,184.85
					SOUTH LOT PARKING DECK	**$**	**13,643,374.70**
					TO OVERALL SUMMARY	**$**	**15,538,374.38**
SOUTH LOT ALT STEEL STRUCTURE							
CHARGING EQUIPMENT							
DC Charging Cabinets and Pantographs							
DC Charging Cabinet - 180 kW	(2)	EA	$	70,755	$ 79,741	$	(159,482)
Pantograph (includes outlet box)	(8)	EA	$	32,860	$ 37,033	$	(296,266)
Installation							
Equipment Install (20% of Equipment Cost)		LS	$	(91,150)		$	(91,150)
DIVISION 03 - CONCRETE							
033053 Miscellaneous Cast-In-Place Concrete							
Regular concrete (4000 psi), 6" slab	9,495	SF	$	5.63	$ 6.34	$	60,214.20
Drilled piers & caps	245	CY	$	925.50	$ 1,043.04	$	255,544.43
Grade beams & Tie beams	220	CY	$	617.00	$ 695.36	$	152,978.98
DIVISION 05 - METALS							
050001 Miscellaneous and Ornamental Iron							
4" sch 40 pipe bollards	116	EA	$	443.80	$ 500.16	$	58,018.86
051200 Structural Steel							
Conduit / Cable tray support rack; galvanized	5,625	LF	$	19.02	$ 21.44	$	120,575.47
Columns:							
W12X190 (20' columns)	480	LF	$	240.92	$ 271.52	$	130,328.08
2" Steel Plate	96	SF	$	415.90	$ 468.72	$	44,997.49
1-1/2" Dia. 30" long steel ancor rods	600	LF	$	101.44	$ 114.32	$	68,593.73
Support Beams:							
W33X120 (Edge girders under platform)	90	LF	$	494.52	$ 557.32	$	50,159.16
W40X215 (Center girder under platform)	135	LF	$	886.02	$ 998.54	$	134,802.75
W24X62 (Edge girders & Moment frame beams open framing)	1,349	LF	$	255.50	$ 287.95	$	388,445.57
W27X84 (Edge girder open framing)	510	LF	$	346.16	$ 390.13	$	198,964.68
W36X150 (Moment frame beams under platform)	410	LF	$	618.15	$ 696.66	$	285,628.57
W24X76 (Beams under platform)	1,640	LF	$	313.20	$ 352.97	$	578,873.90
24K10 (Bar joists open framing)	6,192	LF	$	44.38	$ 50.02	$	309,700.68
HSS6X6X1/2 (K Bracing)	480	LF	$	82.42	$ 92.89	$	44,585.92

MTS IAD
San Diego, CA
ROM Estimate
August 2022

OVERALL SUPPORT FRAME AND GARAGE

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
053113 Steel Floor Decking					
1.5" Steel Decking, 16 ga.	9,495	SF	$ 6.66	$ 7.50	$ 71,235.66
DIVISION 09 - FINISHES					
090007 Painting					
Prep columns & framing	35,840	SF	$ 5.71	$ 6.43	$ 230,473.00
DIVISION 31 - EARTHWORK					
316326 Drilled Caissons					
Fixed end caisson pile, open, machine drilled, in stable ground, no casings or ground water, 36" diameter	720	LF	$ 165.36	$ 186.36	$ 134,176.47
				SOUTH LOT ALT	**$ 2,771,400.57**
				ALTERNATE TOTAL	**$ 4,666,400.25**

MTS IAD
San Diego, CA
ROM Estimate
August 2022

OVERALL CIVIL

LOCATION	QUANTITY	UOM	RATE*	SD Index	ADD
				113%	
DIVISION 01 - GENERAL REQUIREMENTS					
01 71 23 - Construction Staking and Survey		LS	$ 40,000.00	$ 45,080.00	$ 45,080.00
01 57 23 - Temporary Storm Water Pollution Control		LS	$ 50,000.00	$ 56,350.00	$ 56,350.00
DIVISION 03 - CONCRETE					
03 30 00 - Cast-in-Place Concrete (Minor Concrete)	50	CY	$ 800.00	$ 901.60	$ 45,080.00
DIVISION 31 - EARTHWORK					
31 20 00 - Excavation	500	CY	$ 100.00	$ 112.70	$ 56,350.00
31 20 00 - 1-Sack Slurry	300	CY	$ 200.00	$ 225.40	$ 67,620.00
31 20 00 - Potholing		LS	$ 75,000.00	$ 84,525.00	$ 84,525.00
DIVISION 32 - EXTERIOR IMPROVEMENTS					
32 11 23 - Class 2 Aggregate Base	200	CY	$ 70.00	$ 78.89	$ 15,778.00
32 12 16 - Asphalt Concrete	300	TON	$ 180.00	$ 202.86	$ 60,858.00
32 17 23 - Parking Lot Striping		LS	$ 30,000.00	$ 33,810.00	$ 33,810.00
32 31 13 - Fixed Bollard	50	EA	$ 2,000.00	$ 2,254.00	$ 112,700.00
DIVISION 33 - UTILITIES					
33 00 00 - Various Utility Relocations		LS	$ 200,000.00	$ 225,400.00	$ 225,400.00
33 00 00 - Fire Line & Back Flow Preventer Relocation		LS	$ 35,000.00	$ 39,445.00	$ 39,445.00
33 40 00 - On-Site Storm Drain System		LS	$ 70,000.00	$ 78,890.00	$ 78,890.00
33 40 00 - Stormwater BMPs		LS	$ 50,000.00	$ 56,350.00	$ 56,350.00
				TO PHASE 1 SUMMARY	**$ 978,236.00**

MTS IAD
San Diego, CA
ROM Estimate
August 2022

OVERALL ADD ALTERNATES

LOCATION	QUANTITY	UOM		RATE*		SD Index		ADD
						113%		
ADD ALT 1								
Battery Storage								
Battery Storage	4	EA	$	700,000.00	$	788,900.00	$	3,155,600.00
Substation additional components (transformer and LV switchboards) per vendor quote	3	EA		$17,861.00		$20,129	$	60,388.04
Add Installation and Commissioning (10%)		LS	$	321,598.80			$	321,598.80
ADD ALT 2								
Photovoltaic System								
PV Panels	587	EA	$	387.50	$	436.71	$	256,350.24
DC Optimizer	280	EA	$	108.75	$	122.56	$	34,317.15
PV Wiring		LS	$	137,250.00	$	154,680.75	$	154,680.75
PV Grounding		LS	$	3,000.00	$	3,381.00	$	3,381.00
PV Support Rails		LS	$	125,000.00	$	140,875.00	$	140,875.00
PV Inverters	2	EA	$	11,500.00	$	12,960.50	$	25,921.00
PV Signage and Commissioning		LS	$	12,000.00	$	13,524.00	$	13,524.00
PV Structural Steel Framing	280	TONS	$	6,500.00	$	7,325.50	$	2,051,140.00
ADD ALT 3								
Earthwork - Non-hazardous waste								
LOADING, HAULING, AND DISPOSING NON-HAZARDOUS WASTE (MANIFEST REQUIRED) - ADD ALT - hauling to a local landfill.	500	CY	$	350.00	$	394.45	$	197,225.00
LOADING, HAULING, AND DISPOSING NON-HAZARDOUS WASTE (MANIFEST REQUIRED) - ADD ALT - hauling to a California Hazarous approved site	-	CY	$	100.00	$	112.70	$	-
						ADD ALT 1 TO TOTAL SUMMARY	**$**	**3,477,198.80**
						ADD ALT 2 TO TOTAL SUMMARY	**$**	**2,680,189.14**
						ADD ALT 3 TO TOTAL SUMMARY	**$**	**197,225.00**

APPENDIX A – EXISTING CONDITIONS REPORT

IMPERIAL AVENUE DIVISION BATTERY ELECTRIC BUS CONCEPT LAYOUT

Final Existing Facility Conditions Report

MTS Metropolitan Transit System

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Final

Existing Conditions Report

Prepared for:

Metropolitan Transit System

Prepared by:

Dokken Engineering & WSP

January 7, 2022

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APPENDICES

GLOSSARY OF TERMS AND ACRONYMS

AC	Alternating Current – multi-directional current flow, good for distributing power over long distances.
ATS	Automatic Transfer Switch
Amp	Ampere – a unit of electrical current
BEB	Battery-Electric Bus – a type of bus that produces no emissions.
CNG	Compressed Natural Gas – a fuel type that produces fewer emissions than diesel.
DC	Direct Current – One-way current flow, used to charge batteries, less efficient over long distances.
Diesel	A fuel type for buses. This fuel type results in more emissions than hybrid or CNG buses.
Hostler	Staff member of the nightly service crew who move the buses through the nightly fare collection / fuel / interior clean / exterior wash / park cycle.
Hot Parking	Where a space is designated for agency vehicle use (bus or NRV) is utilized by a private vehicle while the agency vehicle is off site during normal working hours.
hp	Horsepower – Unit of power equivalent to 0.7457 kW.
kW	Kilo-Watt – A unit of power, which is the rate at which energy is transferred
kWh	Kilo-Watt-Hour – A unit of energy.
kVA	Kilo-Volt Amps
kVARH	Kilo-Volt Amps Reactive Hours
MW	Mega-Watt – A unit of power equal to 1000 kW
MWh	Mega-Watt-Hour – A unit of energy equal to 1000 kWh
MTS	San Diego Metropolitan Transit System
Nightly Service	The process of a bus returning to a bus garage and being serviced (fares collected, interior cleaned, fueled/charged) to be ready for AM pull out the next day.
NRV	Non-Revenue Vehicle
PCC	Portland Concrete Cement
Tracks	A long open parking aisle in which buses are parked facing the same direction in a stacked row nose-to-tail (front of one bus pointed at the rear of another bus).
ZEB	Zero Emission Bus – Vehicle which uses electricity to power its motor.

1 INTRODUCTION

1.1 Report Purpose and Structure

This report documents the existing site and utility conditions present at the San Diego Metropolitan Transit System's (MTS) Imperial Avenue Division (IAD). The information outlined in this report establishes a baseline for the decisions made in subsequent tasks and will ultimately inform MTS on how to gradually implement a scalable and modular zero emission bus charging system at the IAD.

The goals of this Existing Conditions Report are to:

1. Develop an understanding of the existing Compressed Natural Gas (CNG) and battery-electric bus (BEB) fleet and maintenance facilities, parking configurations, and site flow at the IAD.
2. Identify physical and infrastructure constraints associated with the implementation of 100 percent Zero Emission Buses (ZEBs) and near-term Phase 1 buildout of the Master Plan.
3. Analyze existing facilities to determine the need for infrastructure upgrades and modifications required to existing vehicle maintenance and vehicle support facilities to support full-fleet ZEBs.
4. Identify existing utility capacities, limitations, and availability as a baseline prior to the implementation of the Phase 1 ZEB Master Plan.
5. Provide a basis for selecting charging infrastructure technology types that can be feasibly installed and phased into the IAD.

This report examines the existing facilities and electrical service at the IAD and recommends the improvements needed to implement a scalable and modular bus charging system. This document also assesses the existing utility services to determine how the existing electrical infrastructure will need to be improved to meet the additional power demand of a BEB operation.

This report is organized into the following sections:

- Section 2: Existing Conditions
- Section 3: Findings & Next Steps

1.2 Background and Approach

The project team began the site assessment process with a kickoff meeting with MTS staff to discuss the proposed methodology, schedule, and goals. A check list of existing pertinent data was assembled and reviewed with MTS key ZEB and IAD operations staff. The check list was completed based on received as-builts and operational data provided by MTS. Data not able to be confirmed by information contained in the as-builts was collected during an in-person site tour. This report details the findings of both the as-built existing data review and the on-site Site Assessment.

On November 18, 2021, the project team performed a field site assessment, met with key operations staff to discuss the existing facilities, and document the existing conditions of the IAD. The site assessment observations and supporting data provided by MTS are provided in Section 2 of this report.

The MTS bus fleet contains over 700 vehicles, which consists of standard 40-foot buses, articulated 60-foot buses, and >25-foot minibuses. MTS currently operates and maintains 155 compressed natural gas (CNG) and BEB buses of various sizes at the IAD. The IAD fleet operates throughout the San Diego region, primarily servicing the central San Diego area.

1.3 Summary of Documents Referenced

In order to develop an understanding of the IAD's bus operations and existing infrastructure, the project team worked with MTS staff to gather information relating to the layout, condition, power consumption, and use of existing facilities. The following documents were provided by MTS for review:

1. As-built construction drawings of existing facilities addressed by this report:
   - Imperial Avenue Division As-Builts – Central Operating Facility – Dated February 1971
   - Imperial Avenue Division As-Builts – Contract Bus 013 – Dated August 1993
   - Imperial Avenue Division As-Builts – Contract Bus 418A – Underground Storage Tank Removal and Upgrades – Dated April 1999
   - Imperial Avenue Division As-Builts – Contract Bus 443B – Bus Maintenance Facility – Dated January 2001
   - Imperial Avenue Division As-Builts – Contract Bus 10958-A – Underground Storage Tanks Repairs – Dated August 2005
   - Imperial Avenue Division As-Builts – Contract 1112900 – Steam Rack Upgrade – Dated August 2006
   - IAD Industrial SWPPP Site Map – Dated September 2006
   - Imperial Avenue Division As-Builts – Contract 1105700 – Pavement Rehabilitation and Fire Sprinkler Installation – Dated September 2008
   - E1, E2, E3 Sheets of Existing MTS IAD Administration and Repair and Maintenance Building – Dated April 2014
   - Imperial Avenue Division As-Builts – Zero Emission Bus Charger Project – Dated November 2018
   - Imperial Avenue Division As-Builts – Parking Lot Lighting Diagram
   - SDG&E MTS Bus EV Charging Pilot Program 100 16th St SD – Dated June 2018
   - MTS IAD Zero Emissions Bus Charger Project – Dated November 2018
   - MTS IAD Zero Emissions Bus Charger Project with Hand Marked Comments – Dated September 2019
   - IAD Parking Lot Assignment Map (Excel .xlsx)

2. Full Site CAD Drawings of existing facilities:
   - Imperial Avenue Division – Existing Electrical Site Plan
   - Imperial Avenue Division – Existing Site Utility Plan
   - Imperial Avenue Division – Existing Site Topography
   - Imperial Avenue Division – Survey Points

3. Historic electric-utility and gas-utility usage information provided by SDG&E (PENDING)

Furthermore, previous Geotechnical Investigation Reports dated 2015 and 2017 were obtained from the adjacent Modera Development as well as Soils Reports from 1985 and 1986 for the project site itself. This information is very limited and does not provide conclusive evidence of the underlying soils conditions for the proposed work area; meaning that additional geotechnical testing and reporting will be necessary prior to final design and plan development.

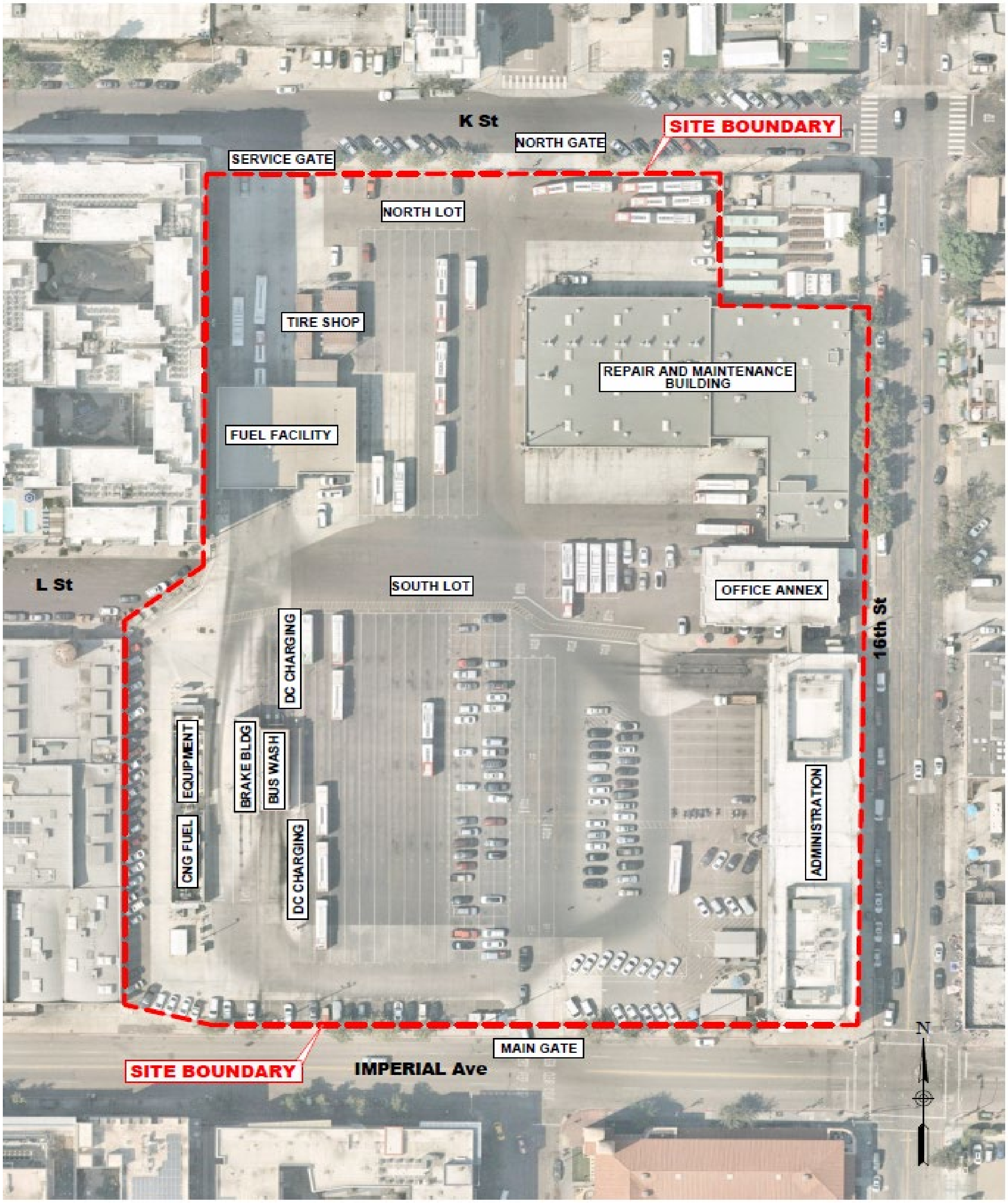
2 Existing Conditions

This section provides an understanding of the existing conditions at the IAD. The following topics are covered in this report: fleet parking, operations, facilities, siting, planned improvements, power conditions and consumption, site circulation, and fleet utilization.

2.1 Site Location

The IAD is located at 100 16th St., in the City of San Diego (Figure 2-1). According to the California Environmental Protection Agency (CalEPA), the IAD is located within a state-designated disadvantaged community[1].

Figure 2-1. IAD Aerial View



[1] Disadvantaged communities are defined as the top 25 percent scoring census tracts using results of the California Communities Environmental Health Screening Tool (CalEnviroScreen) along with other areas with high amounts of pollution and low population.

2.2 Fleet Parking, Operations, and Existing Facilities

The following structures are present at the IAD: A two-story administration building (Administration Building), one-story office annex building (Office Annex), one-story maintenance building (Repair and Maintenance Building – RAM Building), tire shop (Tire Shop), stand-alone bus wash and brake inspection building, stand-alone CNG fueling stations (Fuel Facility), six direct current (DC) charging stations, and an approximately 3,300-square-foot CNG compressor yard. Table 2-1 and Figure 2-1 provide an overview of the existing site facilities and parking lot designations.

Buses enter and exit the site from Imperial Avenue via the Main Gate and proceed to the fuel staging lanes located adjacent to the tire shop. Following fuel, wash, and interior cleaning, buses are returned to the bus parking area. Buses remain parked until the following business day unless maintenance is required. Buses are dispatched from the site via the North Gate located along K Street.

Bus parking is provided on-site in the North Lot and South Lot. The North Lot accommodates 40-foot buses while the South Lot accommodates both 60-foot articulated transit buses and 40-foot buses. During daytime operations, the 60-foot articulated buses are typically parked in the North Lot, while the South Lot is occupied by employee vehicles. In the evening, the 60-foot buses are parked in the South Lot and the North Lot houses the 40-foot buses. Buses are generally parked nose-to-tail in numbered lanes. Additional parking for down fleet vehicles is provided adjacent to the Repair and Maintenance Building in striped spaces, stack parked adjacent to the north fence within the circulation pavement / apron north of the RAM building in unstriped areas, and within the RAM building itself. Additional parking for staff and non-revenue vehicles (NRV) is provided on-site adjacent to the Administration Building and along the southern and western perimeter of the site as well as within the bus parking yard co-mingled with the South Lot bus parking. Parking spaces designated by signage along the fence line, paralleling Imperial Avenue, are also used as “hot parking” spaces by MTS staff utilizing the MTS NRV vehicles. As buses in the South Lot are dispatched from their parking tracks (tracks 11-17.5) arriving staff and visitors “hot park” perpendicular facing east/west in painted striped that overlay the north/south bus parking track striping. Refer to Section 2.6 for an on-site parking narrative and Appendix C for annotated Site Circulation Exhibits.

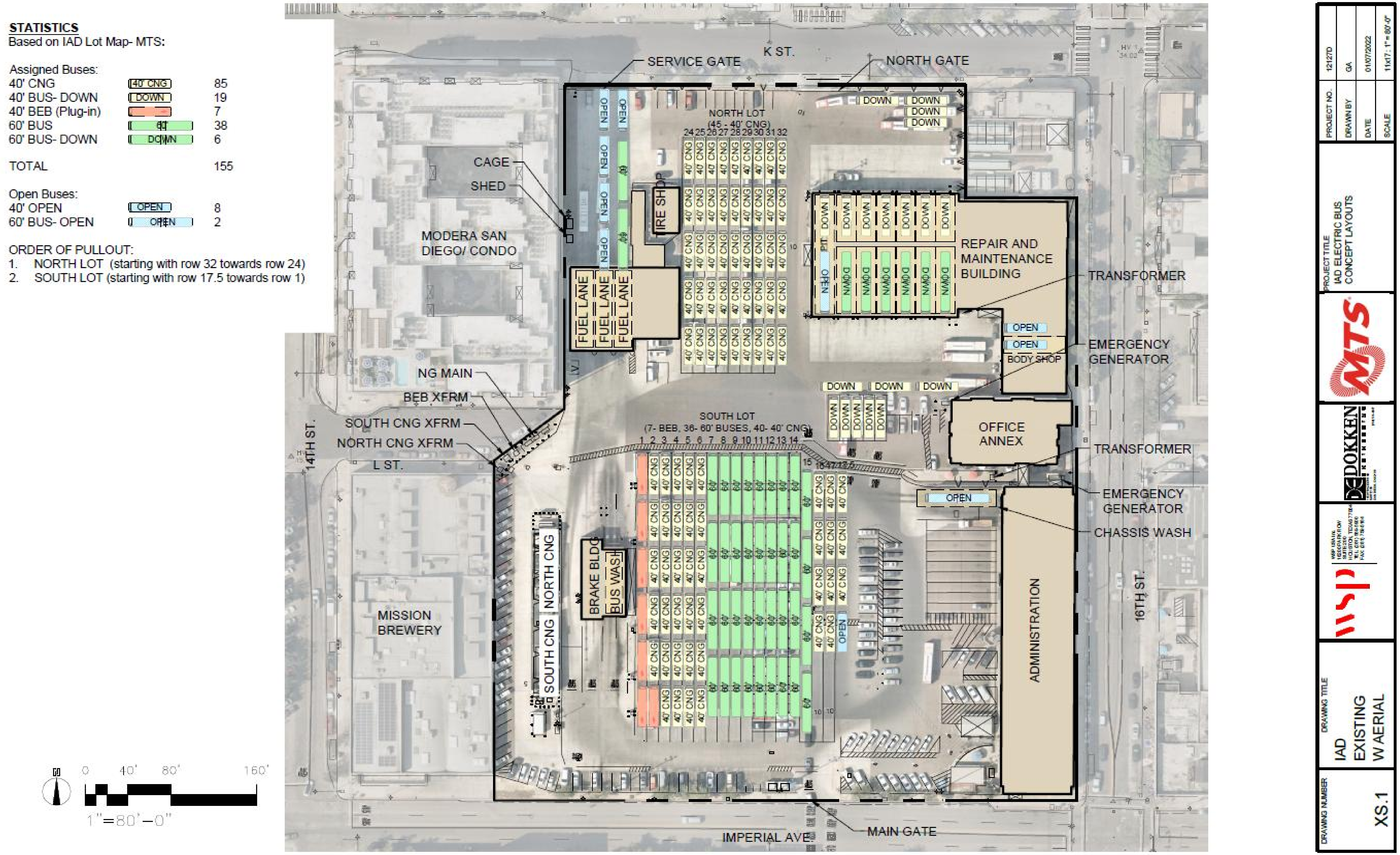
The existing Portland Concrete Cement (PCC) and Asphalt Concrete (AC) paving on site are in satisfactory condition. No drainage issues were identified during the site assessment. Generally, the site drains from the high side at the northeast corner diagonally across the site to be collected and leaves the site from within an underground storm water vault located at the southwest corner of the site.

The Repair and Maintenance Building appears to have adequate clearances, above 17’-0” clear, to accommodate future BEBs for both ground mounted chargers and overhead chargers. The existing flooring is epoxy-coated concrete and is in good condition.

Table 2-1. Existing CNG Fleet and Facilities Inventory

CNG Fleet Overview	
Buses and Service Type	
40' BEB	**7**
40' CNG	**104**
60'CNG (Artic Transit)	**44**
Total	**155**
Facilities	
Total Maintenance Bays	12
DC Charging Positions	6
CNG Fueling Positions	3
CNG Compressor Yards	1
Body shops	1
Bus Wash Lanes	1
Chassis Wash Bays (Exterior in Yard)	1

Figure 2-2. Existing Site Plan with Aerial



2.3 Siting

The IAD is bounded by commercial businesses and residential units to the north, south, east, and west. Electrical service enters the site via L St adjacent to the CNG yard. There are no known on-site easements constraining the site. MTS does not own or have information on any adjacent land available for site expansion. The existing site is very constrained with no adequate space available for future ground level electric bus charging equipment.

2.4 Characteristics and Planned Improvements

No major capital improvement projects or planned renovations are programmed for the IAD at this time. In 2018, six DC chargers were installed adjacent to the bus wash facility.

2.5 Existing Power Conditions and Usage

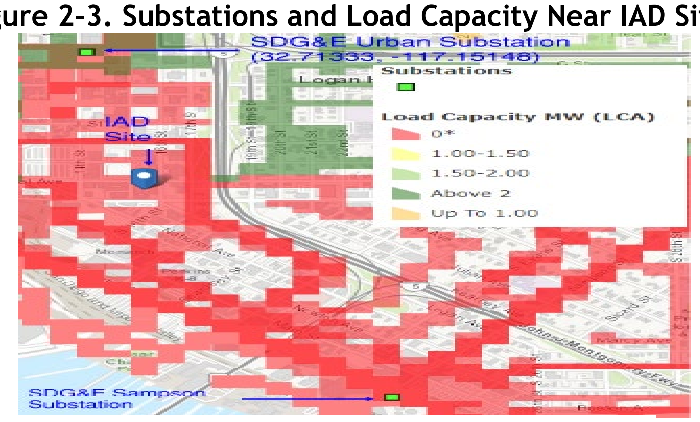
Building and CNG Electrical Facilities

The site is served by five existing electrical service feeds with five associated utility meters, all provided by SDG&E. There are five existing utility-owned transformers. The RAM Building, Office Annex, and Administration Building to the east receive power from two services entering the facility from 16th Street with switchboards and two meters located in the RAM Building. The three remaining service feeds that power the west side of the facility originate from L Street, connected to three SDG&E owned transformers located near the L Street fence. Given the site layout, it is assumed any new BEB charging facilities will be supplied by a utility feed originating from the west side of the facility on L Street. The CNG fuel equipment and bus wash are fed by SDG&E transformer D134152 located near the L Street fence to a meter and service panel near the bus wash. The service bay loads are fed by a 480V three-phase service tapped from SDG&E transformer D129760 located near the L Street fence to a utility meter and 800A main service switchboard (labels as MSB on the drawings) located near building 4. This transformer is also connected to the existing BEB charging facilities discussed below. There is a third SDG&E owned transformer near the L Street fence labeled D155097, but it is unclear what it is supplying.

Utility Feeders & Substations

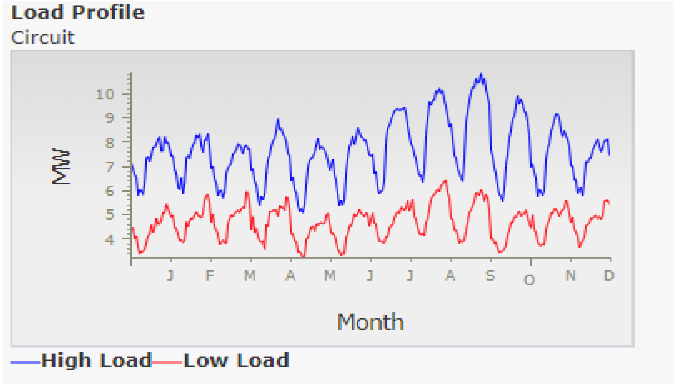
All of the IAD utility service transformers are fed by the 12 kV SDG&E Circuit # 123. SDG&E circuit #123 connects to the Sampson substation, approximately 1.1 miles away and located at 1304 Sampson St. According to the SDG&E ICA map shown below, circuit 123 is classified as "red" which signifies little or no additional load capacity. The annual load profile is shown below, with a summer peak of approximately 11 kW. The specific spare capacity of this circuit is unknown, but given that the IAD project (full build-out) will easily double the peak demand on this circuit, it is reasonable to assume that SDG&E will need to perform significant upgrades to Circuit 123 prior to replacing all existing buses with BEBs. The next closest substation is the SDG&E Urban substation, located approximately 0.6 miles away (32.71333, -117.15148) at the southeast corner of 14th street and F street. For additional resiliency it may be worth discussing with SDG&E if a redundant 12 kV service feed from the Urban substation could be brought to the IAD site.

Figure 2-3. Substations and Load Capacity Near IAD Site



Source: SDG&E ICA Map

Figure 2-4. SDG&E Circuit 123 Load Profile



Source: SDG&E ICA Map

Existing BEB Charging Facilities

The existing ChargePoint CP-250 BEB plug-in chargers are fed by a separate 480V three-phase SDG&E service connected to a dedicated utility meter and main switchboard (SWBD-ZEB on the single-line diagram) with 2000A main bus with a main breaker set to trip at 600A. This service is fed by SDG&E transformer D129760, which also feeds the service bay loads discussed above. The meter and switchboard are located to the northwest of the bus wash. Conduit for the ChargePoint charging stations runs from SWBD-ZEB underground to a junction box on the northwest wall of the bus wash. Conduit exits the junction box vertically and crosses the bus wash roof before transitioning underground on the southeast wall of the bus wash and proceeding underground to each ChargePoint charging station pad.

Figure 2-5. Key Electrical Infrastructure

Starting from left to right: SDG&E Transformer D129760 Supplying Existing ChargePoint BEB Charging Stations; Utility Meter for Service Feeding ChargePoint BEB Equipment

Backup Generation

There are three on-site backup generators. The first is a Kohler generator located on the east side of the site near the fence, supplying standby power to building loads. The second is 75kVA Onon genset unit also near the Repair and Maintenance Building. The third is a 150 kVA unit supplying standby power to the service bay via switchboard MSB. Switchboard MSB is fed from the same utility transformer as the ChargePoint BEB charging stations as discussed above.

Figure 2-6. Site Backup Generators

Starting from left to right: Generator 1 Near East Fence; Generator 2 – 75 kVA Near Maintenance and Repair Building; Generator 3 – 150 kVA – Connected to Existing Main Service Switchboard (MSB)

Table 2-2. Historical IAD Power Consumption

SEE APPENDIX A-1

2.6 Site Circulation

The description below coupled with the IAD Existing Site Circulation Exhibits (Appendix C) provide a general overview of current site circulation and daily operations at the IAD:

1. Bus operator arrives on site via the Main Gate and parks in the designated on-site employee parking lot.
2. Operator clocks-in at the Administration Building and obtains vehicle and route assignment.
3. Operator retrieves vehicle and performs a pre-trip inspection prior to parking pullout.
4. Upon successful completion of the pre-trip inspection buses exit the site to K Street via the North Gate. (Note: Main Gate is closed 2:00 AM - 6:30 AM daily, so all vehicles enter/exit the site via the North Gate during that time period).
5. Buses that do not pass pre-trip inspection are parked in the down fleet area for maintenance.
6. Following peak morning service, a portion of the buses return to the site in the early afternoon through the Main Gate (Note: North Gate is closed following AM pull out).
7. As peak PM service is ramping up buses are inspected and discharged from the facility.
8. Upon completion of daily service, buses return to the site for nightly service through the Main Gate and stage at the Service Gate that opens at approximately 6:00 PM, nightly.
    - 8.1. Parking Lane 24 is left open for buses staged in the South Lot to access the Fuel Facility.
    - 8.2. No incoming PM staged buses are parked in the Row A position of lanes 24-32.
    - 8.3. Prior to circulating buses from the North Lot staging lanes through the fuel lanes, all private and NRV vehicles parked on the inside of the North Gate are moved to allow buses to complete their turn from Row B into the fueling lanes.
9. Operator clocks-out and exits the site via the Main Gate.
10. Hostler pulls all bus types (CNG and BEB) to be serviced and proceeds to the CNG fuel lanes. Fare vaults are pulled, and the interior of all bus fuel types is cleaned while waiting for fueling to complete.
11. After fueling, buses are taken through the bus wash area for exterior cleaning.
12. Buses requiring servicing are parked in the down fleet area until retrieved by maintenance for service.
    - 12.1. After nightly service cycle is complete the Service Gate is closed and is not reopened until the next day at approximately 6:00 PM.
13. If no issues are reported then buses are returned to the designated parking areas facing nose-to-tail and staged for efficient morning discharge.

The Existing Site Circulation Exhibits are defined and separated by morning (AM), midday, and evening (PM) bus circulation periods of operation. The exhibits also differentiate Staff and NRV circulation from that of the buses during the midday timeframe. The exhibits note the following:

- The morning (AM) period of operation notes buses exiting out the North Gate onto K Street in an orderly fashion with minimal conflicts with private cars and NRVs entering and exiting the Main Gate.
- The midday operation period notes buses entering and existing the Main Gate located on Imperial Avenue with several turning concerns in and around the South Lot as well as potential conflicts with Staff/NRV circulation entering and exiting the same Main Gate.
- The evening (PM) period of operation notes buses entering from the Main Gate on Imperial Avenue as well as staging outside and entering the Service Gate with several turning concerns in and around both the North Lot and South Lot as well as refueling and washing of the buses.

In conclusion, the biggest concerns appear to be midday circulation conflicts with Staff/NRV vehicles as well as PM circulation conflicts with regards to bus refueling/washing in conjunction with orderly positioning of bus parking in the adjacent lots.

2.7 Fleet Utilization

The IAD begins dispatching buses for revenue service between 4:05 AM and 7:30 AM. During peak AM service there are approximately 127 buses in circulation. Approximately 38% of AM dispatched buses (48 buses) return to the IAD site from entering the site from the Main Gate at Driveway 1. During peak PM service there are approximately 120 buses in circulation. Following PM peak service, buses begin to return to the yard at 6:00 PM with most buses returning between 7:00 PM and 8:00 PM.

MTS maintains 155 buses at the IAD facility. MTS has indicated that 5 of these buses will be relocated to the South Bay Maintenance Facility and the IAD fleet size will be reduced to 150 buses. The IAD also maintains parking spaces for 39 NRVs on site. MTS has indicated that these vehicles will not be upgraded to electric vehicles in the near term and are therefore not analyzed as part of this report.

3 Findings and Next Steps

This section provides a summary of the existing conditions analyzed in this report and the recommended action required to implement a scalable BEB operation concluding into a full BEB fleet operating from IAD.

3.1 Findings

The existing IAD facility has adequate power to electrify the current on-site operations, equipment and buildings, and the electrical system, although varied in age, is in good working order. However, there is not enough spare capacity to support either initial near-term ZEB battery electric bus pilot of (31) thirty-one BEBS charging with 150kW chargers or future full fleet BEBs. It is anticipated that new electrical service will be needed to support both the near term BEB pilot and the future full fleet BEB.

3.2 Next Steps

After MTS has reviewed, confirmed, and accepted the findings contained in this Existing Facility Condition Report, the project team will form a set of parameters and assumptions with MTS to generate multiple conceptual solutions for both near term limited BEBs and full fleet BEB. All of these conceptual solutions will be analyzed for operational efficiency, ability to be constructed and operated on site while traditional fueled CNG transit buses and transit operations are on-site and on-going. Analysis will drive the selection of the technologies and phasing options to be conceptually studied and tested in subsequent tasks. These concept BEB operations plans will be graded on:

- Efficiency of BEB on-site circulation
- Comparison of BEB on-site circulation in conjunction with on-going traditional CNG transit operations
- Cost of improvements
- Ability to support / maintain identified full fleet count and break down as provided by MTS.
- Goal of not reducing the amount of bus parking from the amounts parked now.
- Ability to phase construct in the MTS future BEB Master Plan.
- Goal of eliminating current sharing of pavement between buses and NRVs / private automobiles.

These are just examples of the items that will be discussed and analyzed in subsequent tasks of the IAD Electric Bus Concept Layout project.

3.3 Conclusion and Recommendations

Upon review of all available existing data and information, there are some unknowns that would be beneficial to clarify after the BEB charging Master Plan is selected but prior to proceeding to final design and plan development. They include the following measures:

- Perform geotechnical investigation and reporting that focuses on the anticipated project impact area(s) as well as testing specifically related to the design parameters of the BEB charging concepts.
- Perform Subsurface Utility Engineering within the anticipated project footprint as to properly locate/define any possible utility conflicts and minimize project risk. Electromagnetic locators and ground penetrating radar services are viable techniques which could obtain the appropriate level of accuracy. This recommendation is based on information discussed during the site walk where it was noted that there were 'substantial' amounts of debris and non-soils found during the installation of the original six (6) BEB charging stations. Items discovered during construction include previously unknown vaults and scrap metals used to fill previous excavations.
- Perform a supplemental ground survey on the anticipated project impact area(s) as to appropriately design site grading/drainage and all tie-in locations during final design.

APPENDIX A

Final Facility Tour Checklist for Imperial Avenue Division Program Master Plan

IMPERIAL AVEUE DIVISION

FACILITY TOUR CHECKLIST FOR (ZEB) PROGRAM MASTER PLAN

Color Legend

Gray Text – Check list Item

Blue Text – Noted condition from received as-builts or MTS discussions, or WSP assumptions. MTS to review and comment if documented check list item needs revision.

Red Text – Open check list item that needs a response from MTS or design team on-site review.

OPERATIONS

Current Fleet Size – 155 buses – mix CNG and BEB

Current Fleet Makeup

(7) 40' BEB – Plug In charging only

(104) 40' transit CNG

(44) 60' artic transit CNG

Or

(25) Spare / Down Line

- In downline parking or in Maintenance Bays
- as 60ft buses are roughly 25% of 152 bus fleet, assume 25% of downline are 60fts = (6) 60ft buses)rq
- (19) 40fts + (6) 60fts = (25) down line

(130) Ready Line

- (92) 40ft
  - (7) BEBs
  - (85) 40fts
- (38) 60ft

Are there any sub-fleets to be parked together? N0

Near term fleet size / capacity to plan around. 155

Anticipated maximum fleet size at facility – TBD by master plan. Goal to maximize fleet count possible, ideal more than 152 in the current fleet size mix.

Anticipated Fleet Makeup (40's, 45' artics, double deckers, cutaways, etc…) to plan for within the IAD BEB Phase 1

(7) 40' BEB – Plug In charging only, existing Pilot

(23) 40' BEB – charging to be determined

(8) 60' BEB – charging to be determined

(32) 60' artic transit CNG

(82) 40' transit CNG

Parking – Interior / Exterior, Tracks / Stacks / Dedicated Positions

- Active Fleet – quantity and location – As shown on IAD lot map.xlsx as received 11/20/21 from MTS.
- Identify any sub-fleets we need to distinguish in existing conditions or BEB concepts – none.
- Down Fleet – 11 total including stacked parking (approx. 15% of 152 bus fleet)

  (6) 40' Downline spaces along northern fence parallel to the maintenance bays

  (5) 60' Downline spaces at south end of concrete Maintenance apron

  (14) Maintenance bays

- What is the spare / down bus ratio to plan for and is any particular track designated as downline? none
    - § Confirm no charging at downline parking spaces - confirmed
- Size of existing spaces / tracks 11'-0" wide

Diagram existing site flow of:

Three points of site entry.

Service Lane Gate - driveway off of K street into Fuel Canopy.

North Gate - driveway off of K street

Main Gate - South driveway off of Imperial.

Buses parked for morning pull out from North driveway. Midday buses enter site via main gate and exist North Gate. Service gate remain locked until evening pull in when all buses enter via Service Lane Gate while buses remain exiting site from North Gate.

- Daily morning rush pull out of buses.
    - o How buses are dispatched (software name, paper, combination, etc….) Hastus
    - o Order from which tracks, if routine, are buses dispatched. First buses dispatch from tracks 1-17.5 to create larger center aisle then buses parked in Service Lane then as needed.
    - o Hours of morning rush pull out 4:05 am – 7:00 am
    - o Pre-trip checks are done in bus parking space with ADA ramp check by pulling forward till side clearance available if needed.
    - o Maximum number of buses during Peak Service is 117

- How are buses monitored on route - SAP and Hastus

- Daily mid-day returns, if any, to site
  - Hours of occurrence & approximate quantities / percentage of fleet, 48 buses = 38% of 127 ready line buses return to site during mid day lull. Start returning to site after AM pull out around 9:00 a.m.
  - Area of mid-day parked buses tripper first back 8:15, stage in tracks 1-12
  - Confirm if any service (fuel, wash, vaulting, etc…) occur during mid-day return none
- Daily evening pull-in of buses
  - Hours of first bus & quantities / percentage of fleet – Service Lane Gate opens and inbound buses start queuing up 5:00 – 5:15 p.m. Service starts at 6:00 p.m.
  - Hours of last bus & quantities – 95% / 121 buses of 127 Ready Line buses in by 10 - 11 p.m. Last bus pull-in is at 2:32 a.m. to IAD; although this yard may have 24 hour service at some point.
- Nightly service cycle (vaulting / fueling/ interior clean / washing)
  - Hours of servicing 6 pm – 2:30 a.m.
- On-Site Vehicle Maintenance
  - First shift hours – 6:00 a.m. to 3:00 p.m.
    - Staff Quantity – use existing onsite parking space count as equivalent need.
  - Second shift hours – 2:30 p.m. to 11:30 p.m.
    - Staff Quantity – use existing onsite parking space count as equivalent need.
  - Third shift hours - 11:00 p.m. to 6:30 a.m.
    - 52 Maintenance and Service Lane staff on site by 6:00 p.m., gone by 2:30 a.m.
- Third Party Vendors
  - Tires
  - Fares and secure delivery
  - Lubricant delivery
  - Parts delivery
  - Trash

Location of staff parking

- Parking type

Staff and visitors around perimeter of bus parking lot but inside fence and private cars share Main Gate south driveway entrance with buses. – 172 Private Vehicles striped parking spots. Note does not include motorcycle count.

Staff hot parking in bus parking lot.

On street parking off of 16th

No accommodation for private and non-revenue vehicle EV charging

NRV Parking

- Quantity of NRV's to accommodate on site. - 32
- Will NRV parking positions be electrified for charging? Yes to charging - 32

Location of existing fueling system Fuel tanks per 2005 received As-Bults

UST 5 (Unleaded) located east of existing Fuel Canopy

UST 6,7,8 (Diesel) located east of existing Fuel Canopy

UST 1,2,3,4 (Coolant, ATF, EO1, EO2) located east of existing Fuel Canopy

Note other underground supply / lubricant tanks and associated piping at west side of Administration building removed by previous improvements

Large storm vault at SW corner of site.

- Fuel dispensers – under fuel canopy. O.k. to consider relocating if needed in master plan
- Underground fuel piping to be shown on survey and civil plans for coordination with any future BEB improvements.

Document type of fuel management system

- How tracked - Fleetwatch
- Where collected data is stored & reviewed – onsite server
- Is fueling centrally monitored by system wide monitoring or only managed locally at the facility? - Local

Agency's perception of the facility (is it at capacity, growing, have excess capacity, can expand, old, new, long term facility, short term / to be replaced, etc…) At capacity now unless overhead parking deck introduced.

CIVIL

Surrounding street names – Imperial, 14^{th}, K Street, 16^{th}

Confirm property lines and available land for development – to be confirmed by new site survey.

- Confirm if any available adjacent or nearby property available for potential facility use either temporary (phased construction) or permanent. None
- Any on-site existing structures able to be removed / relocated off site - None
- Confirm setbacks and easements – to be confirmed by new site survey.

Confirm pavement types in bus parking area – Mix of asphalt and concrete – to be confirmed by new site survey.

- Condition of pavement (i.e good condition, ready for replacement) both asphalt and concrete pavement in good condition

Location of any existing on-site storm water detention / retention – Storm Water vault at SW corner, others to be confirmed by new site survey.

- If any existing pervious areas are converted to impervious to accommodate BEB fleet and equipment, will existing on-site storm water system be adequate or will new storm water storage be required? None

Location of existing on-site storm water system

- Site drains – to be confirmed by new site survey.
- Main truck lines – to be confirmed by new site survey.

- Tie-in location(s) to city storm water system – to be confirmed by new site survey.

Location of existing on-site sanitary water system

- On-site buildings and areas sanitary exit to site system points – to be confirmed by new site survey.
- Main truck lines – to be confirmed by new site survey.
- Tie-in location(s) to city sanitary water system – to be confirmed by new site survey.

Location of existing on-site domestic / fire water system

- Site entry point(s) – to be confirmed by new site survey.
- Main site truck / distribution lines – to be confirmed by new site survey.
- On-site buildings and areas tie-in points – to be confirmed by new site survey.

Location of existing on-site natural gas

- Site entry point(s) – to be confirmed by new site survey.
- Main site trunk / distribution lines – to be confirmed by new site survey.
- On-site buildings and areas tie-in points – to be confirmed by new site survey.

Document from discussions with agency if any site areas have issues with flooding / retaining water currently or unusual subsidence or seismic issues. – drains well

Approximate elevation of property from sea level or standard flood plain. , not in flood plain

Confirm if any seismic issues are on-site greater than the San Diego Building Codes that need to be addressed / accommodated for in any planned improvements. – none

ELECTRICAL - SITE

Location of existing electrical service entry to site - – to be confirmed by new site survey.

(3) transformers on west side of site at termination of L street and west property line

(1) transformer in eastern edge of yard on island near chassis wash

(1) at south of Maint Bldg

Refer to electrical writeup in Existing Conditions Report for existing electrical system description and capacities

- Electrical utility provider(s) SDG&E
- Size of service - re: Section 2.5 of Existing Conditions Report
- Service entry type – (overhead, undergrounds, etc…) Underground
- Voltage of service - re: Section 2.5 of Existing Conditions Report
- Transformer size - re: Section 2.5 of Existing Conditions Report

1. Spare capacity of on-site service - - re: Section 2.5 of Existing Conditions Report.

- Main switchgear
    - Spare capacity - re: Section 2.5 of Existing Conditions Report.

- Meter location
    - Meter type - - re: Section 2.5 of Existing Conditions Report.
    - Remote metered / How or If tracked - - re: Section 2.5 of Existing Conditions Report.

Mark location of existing site electrical distribution equipment, if any. - re: Section 2.5 of Existing Conditions Report

Mark on site plan route of electrical:

- Entry - re: Section 2.5 of Existing Conditions Report.
- Site gear - re: Section 2.5 of Existing Conditions Report
- Distribution to on-site buildings - re: Section 2.5 of Existing Conditions Report.

Location of existing backup generator

- Physical size and capacity of generator - re: Section 2.5 of Existing Conditions Report.
    - Fuel source - - re: Section 2.5 of Existing Conditions Report
    - Diagram route to existing gear and on-site buildings / areas - re: Section 2.5 of Existing Conditions Report.
    - What does generator backup (equipment, spaces, panels) - - re: Section 2.5 of Existing Conditions Report.

Locate site lighting

- Method (perimeter poles, yard poles) perimeter poles
- Light type – cutsheet of existing fixture provided to design team by MTS
- Approximate lighting level – to be done but separate night time photometric study / site visit to capture existing conditions potentially during detail design

ELECTRICAL – BUS PARKING & MAINTENANCE BUILDING

Location of existing electrical service entry into buildings

- Type of entry (underground, overhead) - - re: Section 2.5 of Existing Conditions Report.
- Size of main switch board - - re: Section 2.5 of Existing Conditions Report
- Confirm if building is sub-metered - - re: Section 2.5 of Existing Conditions Report.

Location of agency communication connection

- Type of connection (copper, fiber) if any - - re: Section 2.5 of Existing Conditions Report.
- Document agency’s opinion of communications capacity / reliability - - re: Section 2.5 of Existing Conditions Report
- Where does local facility communication tie-back too for agency central coms system? - re: Section 2.5 of Existing Conditions Report

ELECTRICAL SERVICE

Document electrical service type (local utility provider(s) and if location of feeding substation / feeder

- Capacity. Establish available medium voltage circuit(s) feeding facility and estimated available capacity. To be determined by on-going utility query
- Available Voltages in adjacent and surrounding circuits To be determined by on-going utility query
- Reliability (i.e. frequency and hours down in the last 5-7 years) – to be confirmed by new site survey and service interruption report requested from SDG&E.

BUILDING STRUCTURE

Below bus parking buildings / canopies and within maintenance bays confirm existing

- Clear height – Fuel Canopy to be determined during site walk. Maint building per received as-builts
- Roof structure type – Fuel Canopy to be determined during site walk. Maint building per received as-builts
- Fuel Canopy and Maintenance Roof structure's ability to hold pantographs / remote dispensers and cord retractors / distributed bus bars / conduit runs / roof mounted switchgear, DC charging cabinets and transformers dispensers and distributed power only, no gear or chargers.
- Overhead door bus entry / exit opening clear height & width - Maint building per received as-builts.
- Flooring type – not applicable, no interior parking
- Flooring condition – not applicable, no interior parking

Document from discussions with agency if buildings / areas have any known structural issues currently. None but subsurface conditions have shown ample debris under pavement.

BEB FEASIBILITY / LOOKING FOR

Open space land for expanded / new electrical service - NRV parking adjacent to Brewery and along shared property line at fueling and condo. None available based on past MTS discissions.

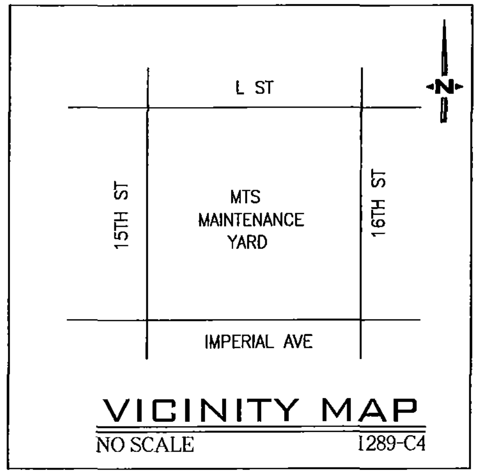
Available space to add charging stations to bus parking area

- Plug-in stations - (6) existing ChargePoint CP250
- Overhead frames to support overhead plug-in dispensers - none.
- Overhead pantographs (clear height) supports none
- Induction equipment (Primary Power Modules / Cooling) - none

APPENDIX B

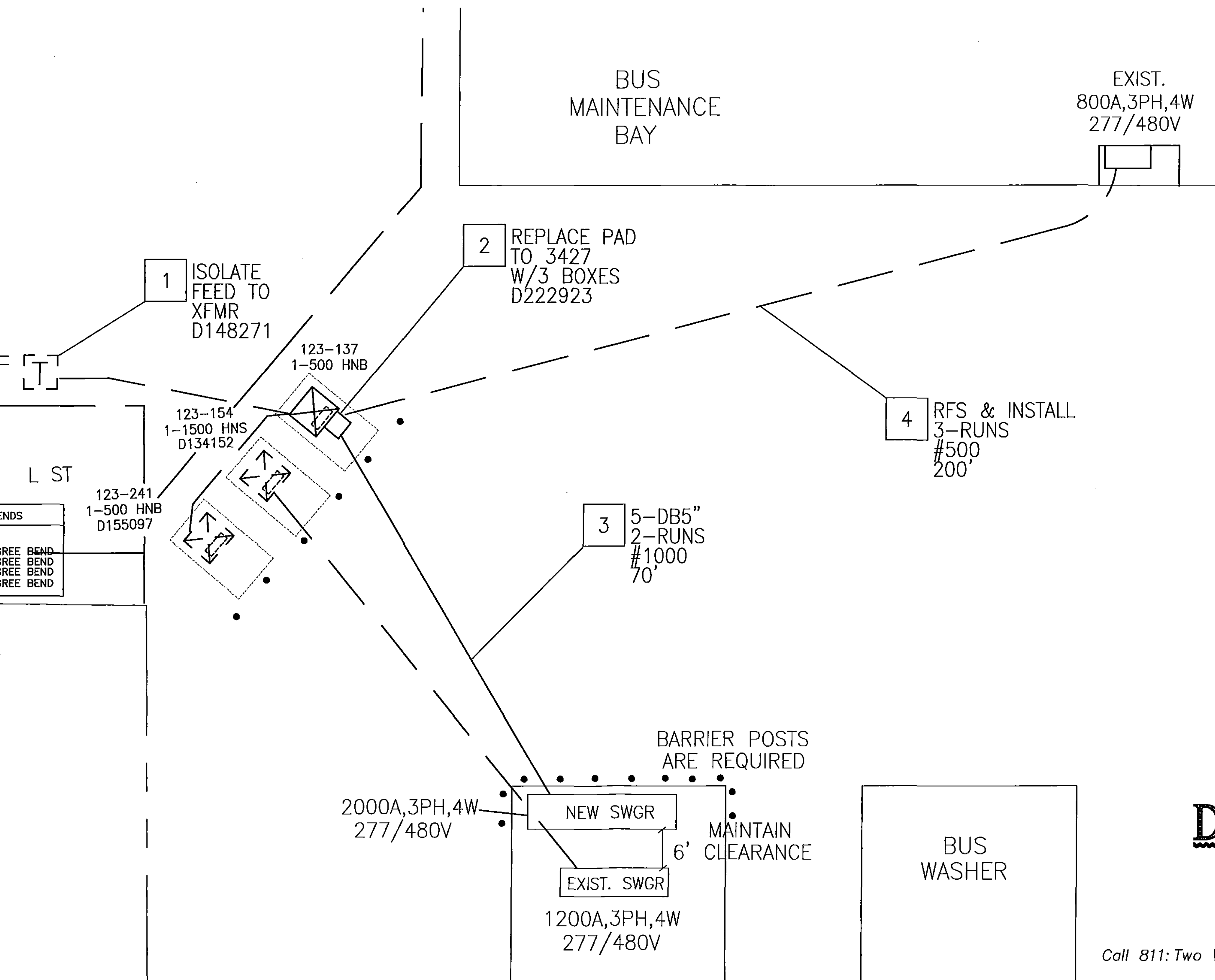
Existing Electrical Site Plans and Single Line Diagrams

MTS BUS EV CHARGING SYSTEM PILOT PROGRAM 100 16TH ST SD



VICINITY MAP

NO SCALE 1289-C4



N

SCALE

0 NTS

NOTES

CUSTOMER IS RESPONSIBLE FOR:
- *TRENCH, EXCAVATION AND BACKFILL
- *CONDUIT (INCLUDING REDUCERS & ADAPTERS AT HANDHOLES)
- *SUBSTRUCTURES
- *CONCRETE/SIDEWALK BREAK & REPAIR
- *RETAINING WALLS

MAINTAIN A MINIMUM OF 5' WHEN PARALLELING WET UTILITIES 6" WHEN CROSSINGAND

STANDARD CONDUIT BENDS TO BE USED:

	CONDUIT BENDS (EXCEPT CP)		CP BENDS
	PRIMARY	SECONDARY	
2"	36", 90 DEGREE BEND	24", 90 DEGREE BEND	~~24", 90 DEGREE BEND~~
3"	36", 90 DEGREE BEND	36", 90 DEGREE BEND	36", 90 DEGREE BEND
4"	36", 90 DEGREE BEND	36", 90 DEGREE BEND	48", 90 DEGREE BEND
5"	36", 90 DEGREE BEND	36", 90 DEGREE BEND	48", 90 DEGREE BEND

*ALL HORIZONTAL BENDS WILL BE MADE WITH 25 FOOT RADIUS SWEEPS AS PER STD. PG.3374 UNLESS OTHERWISE NOTED

MAIN PANEL IS 2000 A. WHICH REQUIRE 5-5" SERVICE CONDUITS

SERVICE CABLE PULL CANS/SECTIONS REQUIRING 5" CONDUITS MUST ALLOW A MINIMUM OF 6ft CLEAR & LEVEL WORKING SPACE IN FRONT OF THE PULL CAN/SECTION.

ALL SERVICES TO BE INSTALLED ON A MASTER SERVICE ORDER TO BE WRITTEN BY THE PLANNER.

IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRENCH AND CONDUIT TO THE ENERGIZED SOURCE. EMPTY CONDUIT STUBS ARE INSTALLED FOR THE FUTURE USE OF THE UTILITY. IF THE STUB IS UNUSABLE, THE CUSTOMER MAY CLEAN OR REPAIR THE STUB, OTHERWISE, INSTALL NEW TRENCH AND CONDUIT TO THE SOURCE.

24 HOUR LINE TRUCK ACCESS TO SDG&E DISTRIBUTION AND SERVICE FACILITIES REQUIRED.

CUSTOMER IS RESPONSIBLE TO PROVIDE ALL RED STUB MARKERS AND THE BURIED BALL MARKERS AT EACH SERVICE STUB LOCATION.

DESIGN BASED ON 500KW

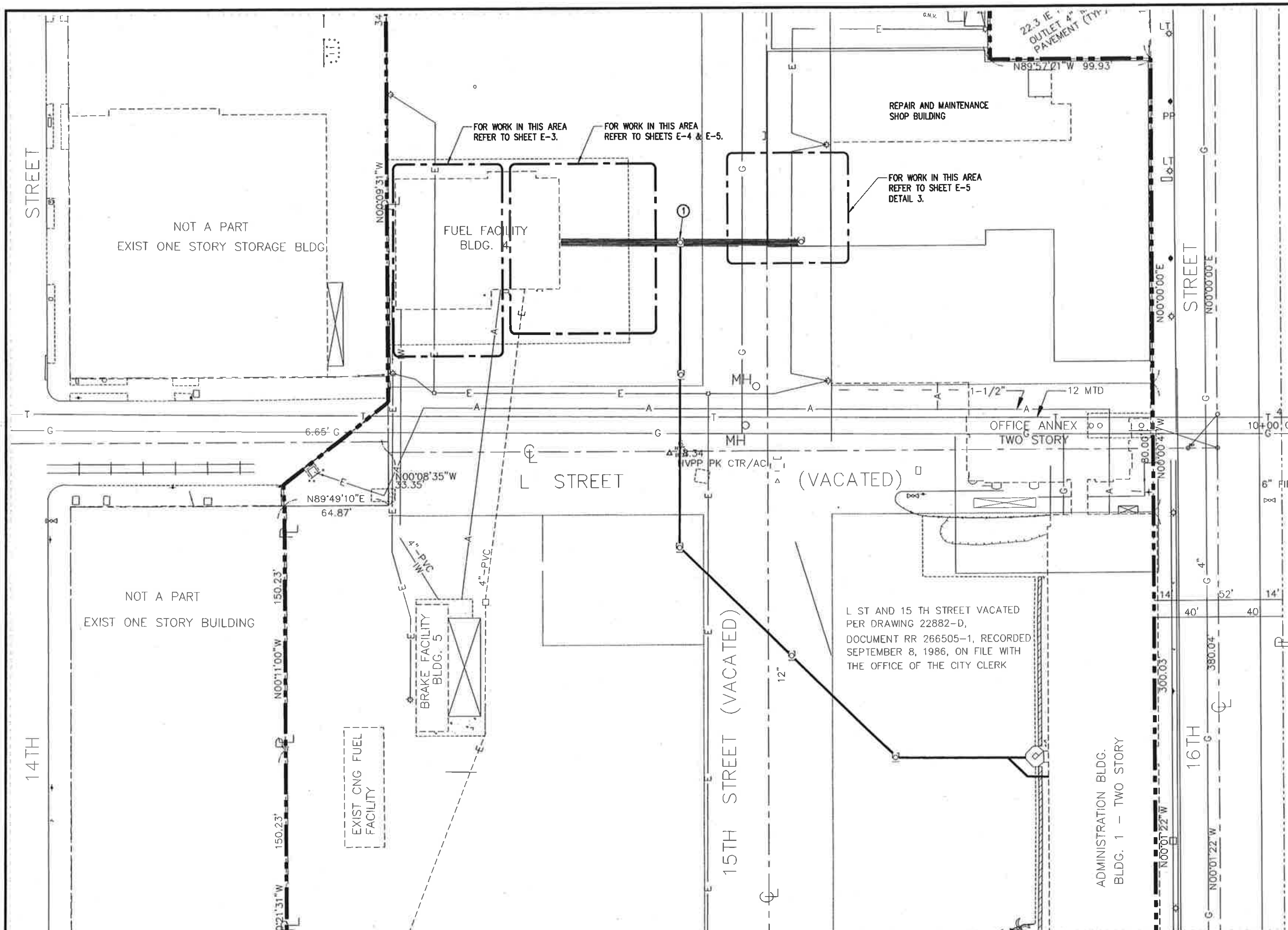
CUSTOMER REP: MIKE WYGANT
COMPANY: MTS
PHONE: (619) 241-1483

SDG&E CUSTOMER PROJECT PLANNER: SCOTT VALENTI
PHONE: (858) 636-6809

DIGALERT

Call 811: Two Working Days Before You Dig!

PROJECT NOTIFICATION #: 300000211987
Job NOTIFICATION #: 300000212044
DESIGNED BY SCOTT VALENTI
SDGE San Diego Gas & Electric — A Sempra Energy utility
PLANNER PHONE 858-636-6809
REV/SUPP 0
DATE 6/18/2018
PAGE 1 OF 1
PLANNER NAME SCOTT VALENTI
9:01am



NOTES

1. EXISTING SUMP (L-26) IS TO BE REPAIRED/REFURBISHED/REPLACED. CONTRACTOR SHALL DISCONNECT/REMOVE EXISTING SENSORS. UPON COMPLETION OF SUMP REPAIR, CONTRACTOR SHALL PROVIDE NEW THREADED METALLIC CONDUITS (PVC COATED RIGID), FITTINGS, ACCESSORIES, SEALS AND NEW CONDUCTORS TO CONNECT NEW SUMP SENSORS TO EXISTING CONNECTIONS.

NO.	DATE	REVISIONS	BY	CHK	APRV
	8/18/05	CONFORMED	DR		

Berryman & Henigar — 11590 W. Bernardo Ct. Suite 100, San Diego, CA 92127, TEL: (858)451-6100 FAX: (858)451-2846

RANDALL LAMB — Engineers - Mechanical, Electrical, Communications, Lighting Design — SAN DIEGO-SAN FRANCISCO — 600 West Broadway * Suite 500, San Diego California 92101 — (619) 814-4000, Fax * (619) 814-4010

		DATE
DESIGNED BY	dlb	09/04
DRAWN BY	MJM	09/04
CHECKED BY	RAF	09/04
PRJ. ENG.	RAF	09/04

SANDAG — San Diego's Regional Planning Agency

UNDERGROUND STORAGE TANKS REPAIRS AT IAD

ELECTRICAL SITE PLAN

SCALE 1"=30'-0"
SANDAG CONTRACT NO. 5000-408
DRAWING NO. 12 | SHEET NO. E-2

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

08/18/2005 RL #S003752.00

CONSTRUCTION NOTES:

- (3) SAWCUT EXISTING PAVEMENT
- (6) CONCRETE PAVEMENT SEE DETAIL DWG. No. C04
- (7) ASPHALT PAVEMENT SEE DETAIL DWG. No. C04
- (8) INSTALL CONDUIT, SEE ELECTRICAL SHEET, DWG. No. E01 FOR SIZE AND LAYOUT.
- (9) PROTECT EXISTING UTILITY, CONTRACTOR TO POTHOLE AND VERIFY EXACT LOCATION.
- (10) TRENCH PER DUCT BANK DETAILS, SEE SHEET C04
- (12) INSTALL STRIPING TO MATCH EXISTING.

CROSSING UTILITY TABLE

⬡	NORTHING	EASTING	UTILITY DESCRIPTION	UTILITY DEPTH	UTILITY LOCATE
1	1838299.25	6284435.89	CA&V	UNKNOWN	BUS-10845
2	1838288.85	6284441.06	STREE LITE	2'-1"	* NO AS-BUILTS AVAILABLE
3	1838287.79	6284441.59	1-1/2" HP GAS	3'-9"	* BUS-10845
4	1838259.96	6284472.91	4" GAS LINE	2'-3"	BUS-10845
5	1838259.96	6284477.73	GAS LINE	UNKNOWN	
6	1838259.96	6284480.63	ELECTRIC LINE	2'-8"	* PIPING PLAN SHOWS 3 CS COATED PIPE AND 1 - 4" SCHED 80 CS PIPE AT 17' FROM EDGE OF CNG BUILDING @ 18" MIN BELOW FINISH GRADE
7	1838259.96	6284484.38	STREET LITE	2'-1"	NO AS-BUILTS AVAILABLE
8	1838249.64	6284487.38	ELECTRIC LINE	UNKNOWN	NO AS-BUILTS AVAILABLE
9	1838147.88	6284536.06	3" WATER (PVC)	UNKNOWN	NO AS-BUILTS AVAILABLE
10	1838148.47	6284534.06	4" PVC (ELECTRIC)	2'	BUS-013

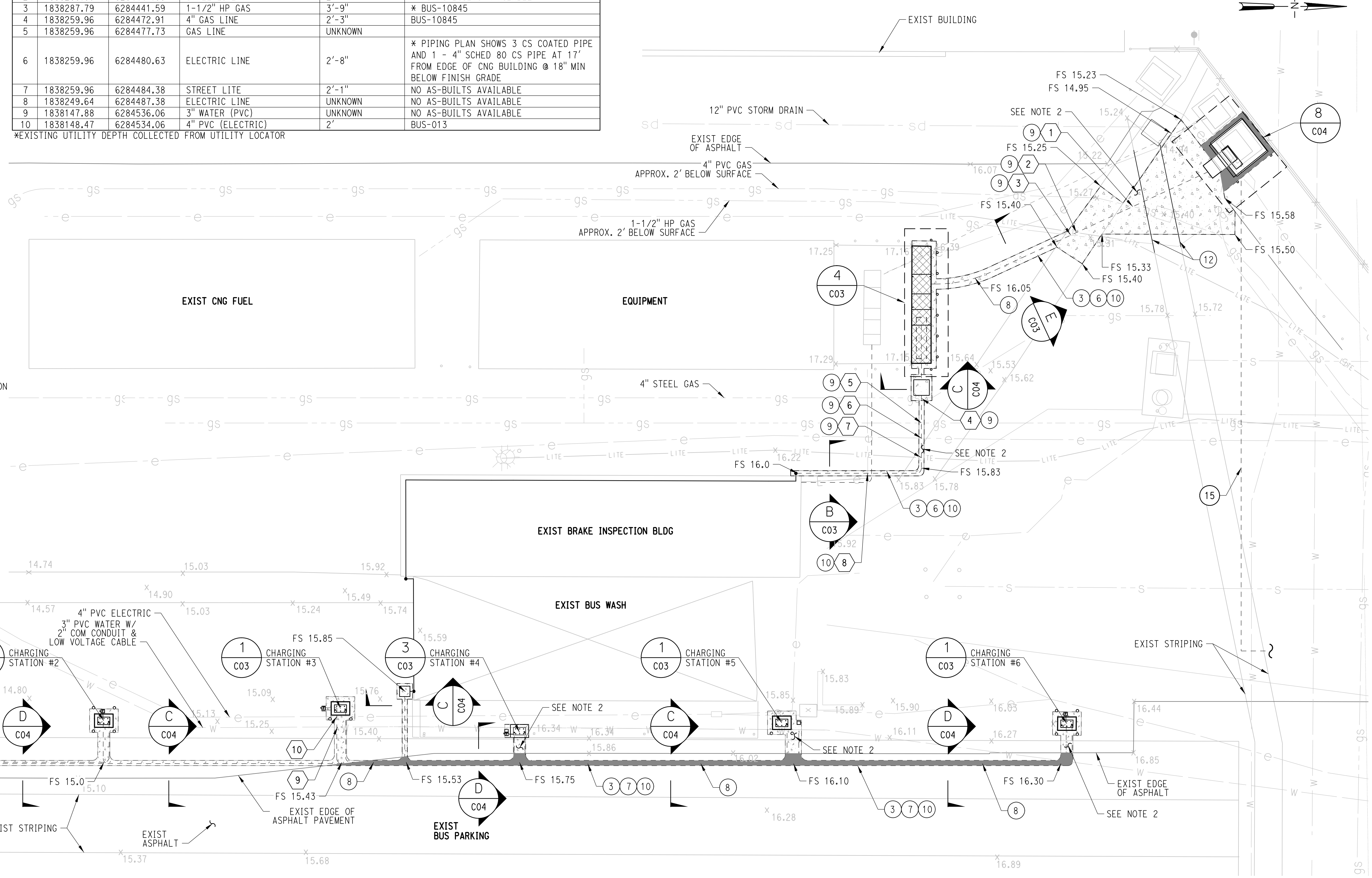
*EXISTING UTILITY DEPTH COLLECTED FROM UTILITY LOCATOR

NOTES:

1. SHALLOW UTILITIES LOCATED ONSITE, CONTRACTOR TO VERIFY LOCATION AND DEPTH OF EXISTING UTILITIES PRIOR TO EXCAVATION
2. SLOPE CONCRETE IN EXISTING SWALE AREAS TO MATCH EXISTING ELEVATIONS

CHARGING STATION DATA

	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	1838067.52	6284534.77	15.1	STATION #1
2	1838103.01	6284534.88	15.3	STATION #2
3	1838148.44	6284532.52	15.9	STATION #3
4	1838182.81	6284537.11	16.7	STATION #4
5	1838234.15	6284535.59	15.9	STATION #5
6	1838287.88	6284535.44	16.7	STATION #6



NO.	DATE	REVISIONS	BY	CHK	APRV

HDR

REGISTERED PROFESSIONAL ENGINEER LEONARDO HERNANDEZ No. C67141 Exp. 09/30/20 CIVIL STATE OF CALIFORNIA

DESIGNED BY	M.R. GRANADO	11/18
DRAWN BY	M.R. GRANADO	11/18
CHECKED BY	R. BOLEY	11/18
PRJ. ENG.	M. IPPOLITI	11/18

MTS Metropolitan Transit System

ZERO EMISSION BUS CHARGER PROJECT

SITE PLAN

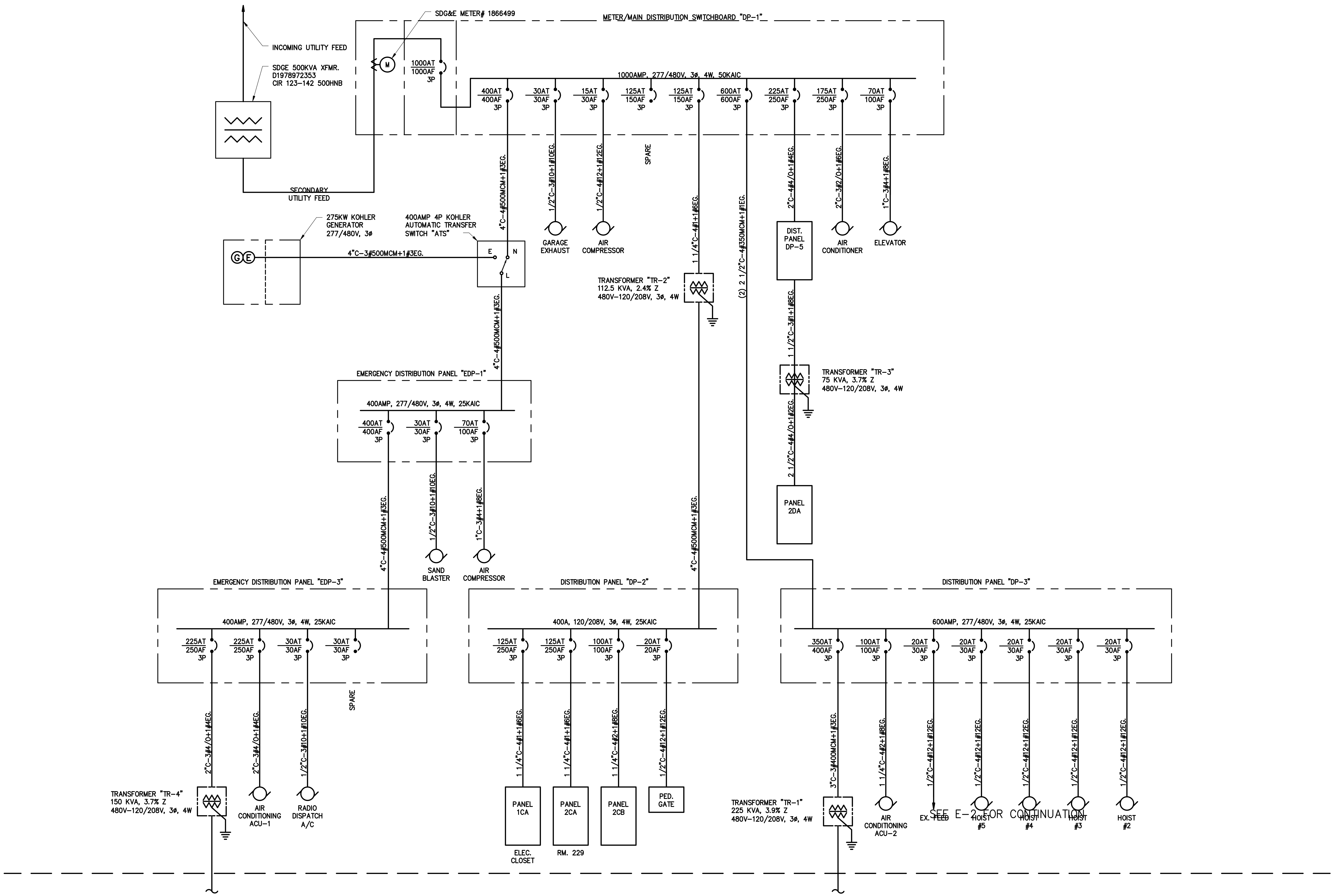
SCALE 1" = 10'

CONTRACT NO. G1947.01

DRAWING NO. C02

SHEET NO.

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3



ODYSSEY POWER

990 PARK CENTER DRIVE,
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GOMEZ ENGINEERING GROUP

805 BOWSPRIT ROAD
CHULA VISTA, CA 91914
PHONE (619) 871-1300
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GOMEZENGINEERINGGROUP.COM

Facility Name:
METROPOLITAN TRANSIT SYSTEM
100 16TH STREET
SAN DIEGO, CA 92101
(619) 238-0100

Project Name:
METROPOLITAN TRANSIT SYSTEM ADMIN & RAM BUILDINGS

Number	Date	Description
1		

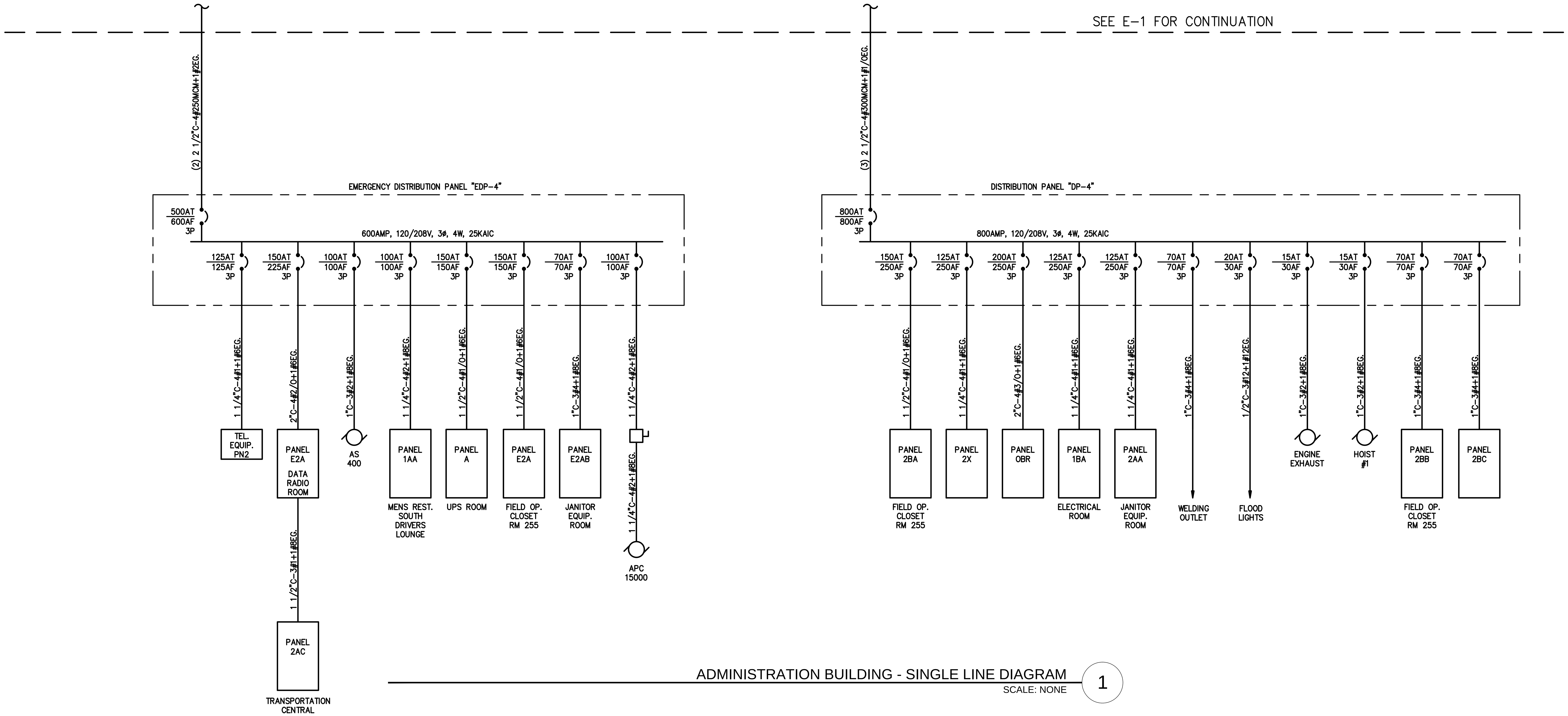
Submittal:

Date: APRIL 7, 2014

GEG project number: 14-04-112

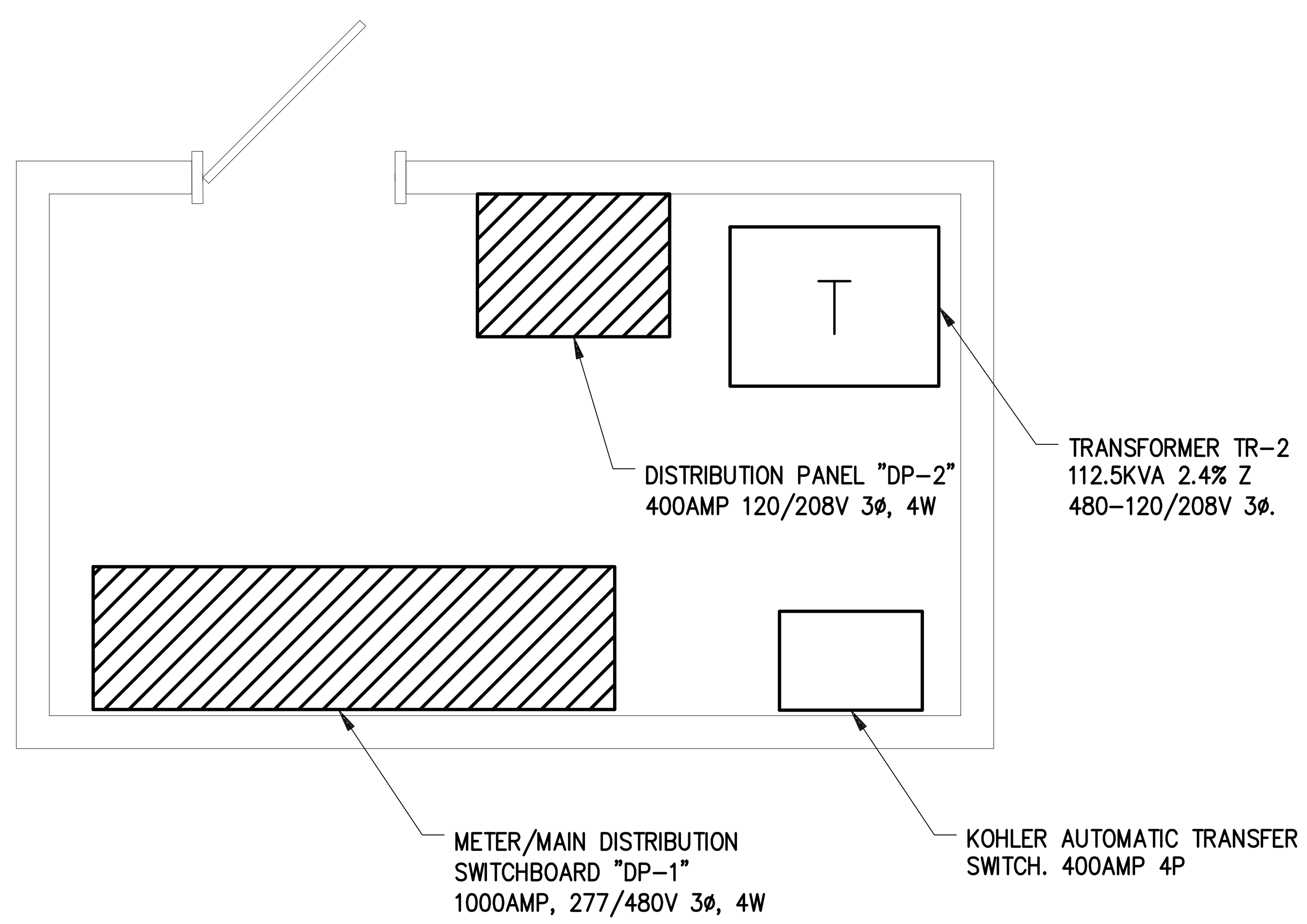
Sheet Name:
ADMINISTRATION BUILDING SINGLE LINE DIAGRAM

E1



ADMINISTRATION BUILDING - SINGLE LINE DIAGRAM (1)

SCALE: NONE



ENLARGED ELECTRICAL ROOM - ADMINISTRATION BUILDING (2)

SCALE: 1/2" = 1'-0"

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SAN DIEGO, CA 92101
(619) 238-0100

Project Name:
METROPOLITAN TRANSIT SYSTEM ADMIN & RAM BUILDINGS

Number	Date	Description
1		.

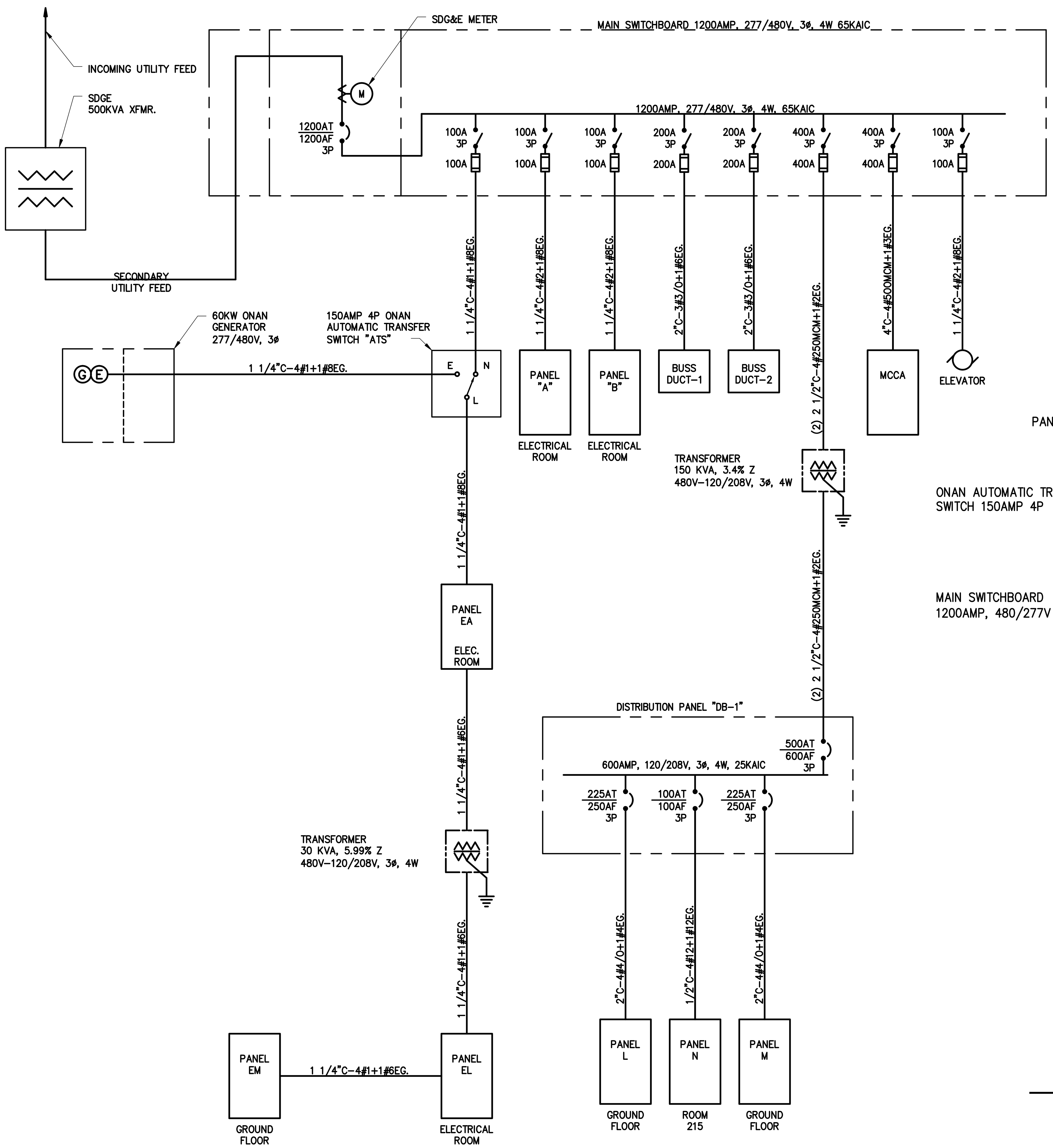
Submittal:

Date: APRIL 7, 2014

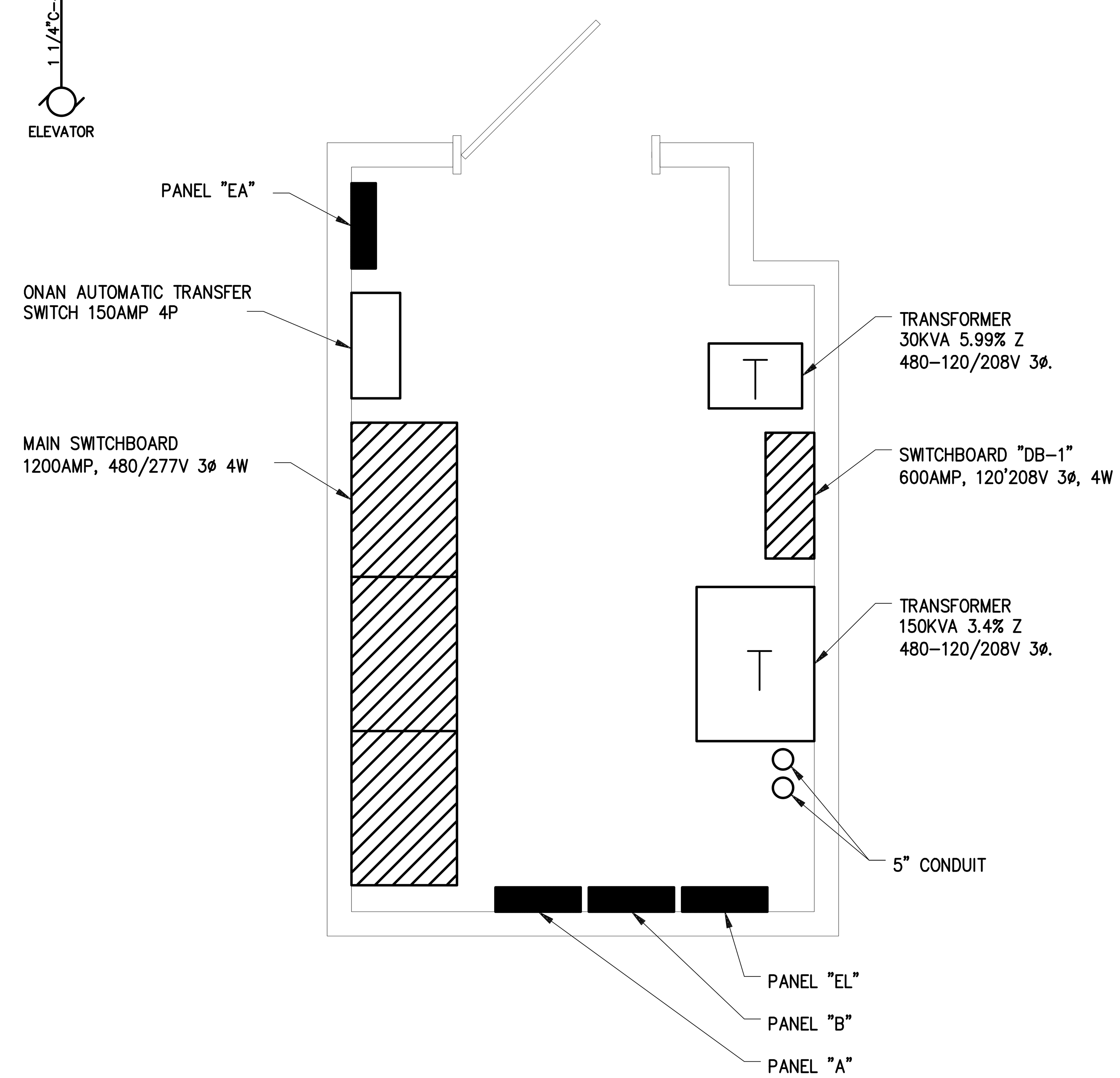
GEG project number: 14-04-112

Sheet Name:
ADMINISTRATION BUILDING SINGLE LINE DIAGRAM

E2



RAM BUILDING - SINGLE LINE DIAGRAM
SCALE: NONE
1



ENLARGED ELECTRICAL ROOM - RAM BUILDING
SCALE: 1/2" = 1'-0"
2

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GOMEZENGINEERINGGROUP.COM

Facility Name:
METROPOLITAN TRANSIT
SYSTEM
100 16TH STREET
SAN DIEGO, CA 92101
(619) 238-0100

Project Name:
METROPOLITAN TRANSIT SYSTEM ADMIN & RAM BUILDINGS

Number	Date	Description
1		

Submittal:

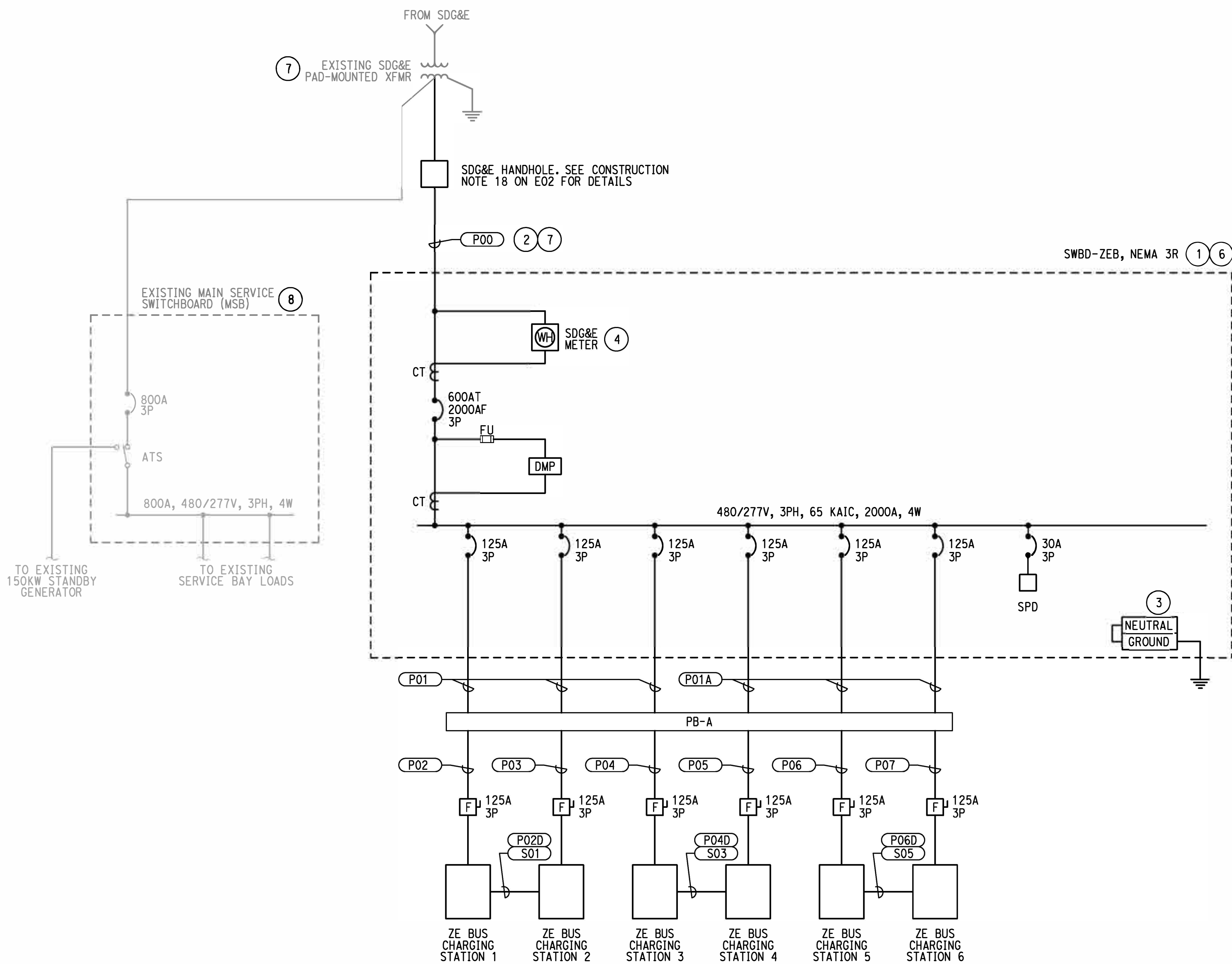
Date: APRIL 7, 2014

GEG project number: 14-04-112

Sheet Name:

RAM BUILDING
SINGLE LINE DIAGRAM

E3



SINGLE LINE DIAGRAM

SCALE: NTS

(1)

SWBD-ZEB								
	CURRENT				FUTURE			
	CONNECTED		DEMAND		CONNECTED		DEMAND	
EQUIPMENT	**FLA**	**KVA**	**FLA**	**KVA**	**FLA**	**KVA**	**FLA**	**KVA**
ZE BUS CHARGING STATION 1	81.0	67.3	81.0	67.3	81.0	67.3	81.0	67.3
ZE BUS CHARGING STATION 2	81.0	67.3	81.0	67.3	81.0	67.3	81.0	67.3
ZE BUS CHARGING STATION 3	81.0	67.3	81.0	67.3	81.0	67.3	81.0	67.3
ZE BUS CHARGING STATION 4	81.0	67.3	81.0	67.3	81.0	67.3	81.0	67.3
ZE BUS CHARGING STATION 5	81.0	67.3	81.0	67.3	81.0	67.3	81.0	67.3
ZE BUS CHARGING STATION 6	81.0	67.3	81.0	67.3	81.0	67.3	81.0	67.3
ADDITIONAL 13 CHARGING STATIONS FOR FUTURE	0.0	0.0	0.0	0.0	1053.0	874.4	1053.0	874.4
25% LONG CONTINUOUS LOAD (LCL) PER NEC 210.20(A)	121.5	100.9	121.5	100.9	384.8	319.5	384.8	319.5
TOTAL LOAD	607.5	504.5	606.8	504.5	1923.8	1597.5	1923.8	1597.5
MCB MINIMUM SIZE BREAKER	600A				2000A			

FEEDER SCHEDULE									
CONDUIT									
TAG	QTY	SIZE	POWER	SIGNAL	VOLTAGE	CURRENT	PHASE	LENGTH	VOLTAGE DROP
P00*	5	5"	PULLROPE		480	AC	3	80'	0.06%
P01	1	3"	9#2/0, 3#4(G)		480	AC	3	225'	0.64%
P01A	1	3"	9#2/0, 3#4(G)		480	AC	3	225'	0.64%
P02	1	1-1/2"	3#1/0, 1#6(G)		480	AC	3	115'	0.41%
P02D	1	3"	4#250kcmil, 1#4(G)		200-1000	DC		60'	
S01	1	1"		(1) CAT 6				60'	
P03	1	1-1/2"	3#1/0, 1#6(G)		480	AC	3	80'	0.28%
P04	1	1-1/2"	3#1/0, 1#6(G)		480	AC	3	35'	0.12%
P04D	1	3"	4#250kcmil, 1#4(G)		200-1000	DC		60'	
S03	1	1"		(1) CAT 6				60'	
P05	1	1-1/2"	3#1/0, 1#6(G)		480	AC	3	40'	0.14%
P06	1	1-1/2"	3#1/0, 1#6(G)		480	AC	3	95'	0.34%
P06D	1	3"	2#250kcmil, 1#4(G)		200-1000	DC		75'	
S05	1	1"		(1) CAT 6				75'	
P07	1	1-1/2"	3#1/0, 1#6(G)		480	AC	3	150'	0.53%

* CONTRACTOR SHALL COORDINATE WITH SDG&E FOR THE INSPECTION AND INSTALLATION OF CONDUCTORS.

CONSTRUCTION NOTES:

1. SWITCHBOARD IS SIZED FOR UP TO (19) ZERO EMISSION BUS CHARGING STATIONS AT INPUT POWER OF 81A, 480VAC, 3PH FOR EACH STATION.
2. CONTRACTOR TO INSTALL (QTY:5)-5" CONDUITS WITH PULLROPE FROM SDG&E TRANSFORMER HANDHOLE TO SWBD-ZEB. SEE E03 FOR DETAILS.
3. CONTRACTOR TO PROVIDE AND INSTALL 3/4" DIA. COPPER-CLAD STEEL GROUND ROD, 10'-0" LONG. GROUND ROD TO BE INSTALLED IN SOIL BENEATH PULL SECTION OF SWBD-ZEB BENEATH CONCRETE EQUIPMENT PAD. CONTRACTOR TO BOND NEUTRAL AND GROUND OF SWBD-ZEB TO GROUND ROD USING 10' OF #4/0 BARE COPPER WIRE WITH A CADWELL BOND AT EACH CONNECTION POINT.
4. PRIOR TO INSTALLATION OF SDG&E EQUIPMENT, COORDINATE/VERIFY WITH SDG&E FOR EXACT POINT OF CONNECTION AND INSTALLATION REQUIREMENTS. CONTRACTOR TO COMPLY WITH SDG&E REQUIREMENTS.
5. LETTER STATING SHORT CIRCUIT CURRENT VALUE FROM SDG&E SHALL BE AVAILABLE AT THE JOB SITE FOR INSPECTION. SHORT CIRCUIT CURRENT VALUE SHALL MEET SG 006.1 TABLE 2.
6. PROVIDE ARC FLASH LABELS AS REQUIRED BY NFPA 70E AND CALCULATED PER IEEE1584.
7. REFER TO DRAWING E05 FOR SDG&E DESIGN DRAWING.
8. CONTRACTOR TO PROVIDE TEMPORARY POWER FOR SERVICE BAY PER SPECIFICATION 01 00 00.
9. SWITCHBOARD SHALL HAVE LUGS SIZED FOR TERMINATION OF 1000KCMIL UTILITY CONDUCTORS FROM SDG&E.

NO.	DATE	REVISIONS	BY	CHK	APRV

HDR

DESIGNED BY	J. LEE	DATE 11/18
DRAWN BY	M. YANG	11/18
CHECKED BY	A. NICHOLS	11/18
PRJ. ENG.	M. IPPOLITI	11/18

MTS Metropolitan Transit System

ZERO EMISSION BUS CHARGER PROJECT

ELECTRICAL SINGLE LINE DIAGRAM

SCALE: NTS

CONTRACT NO.: G1947.01

DRAWING NO.: E01

SHEET NO.:

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES 0 1 2 3

Friday, November 30, 2018 07:17:31 PM

APPENDIX C

Site Circulation Exhibits

STATISTICS
Based on IAD Lot Map- MTS:

Assigned Buses:

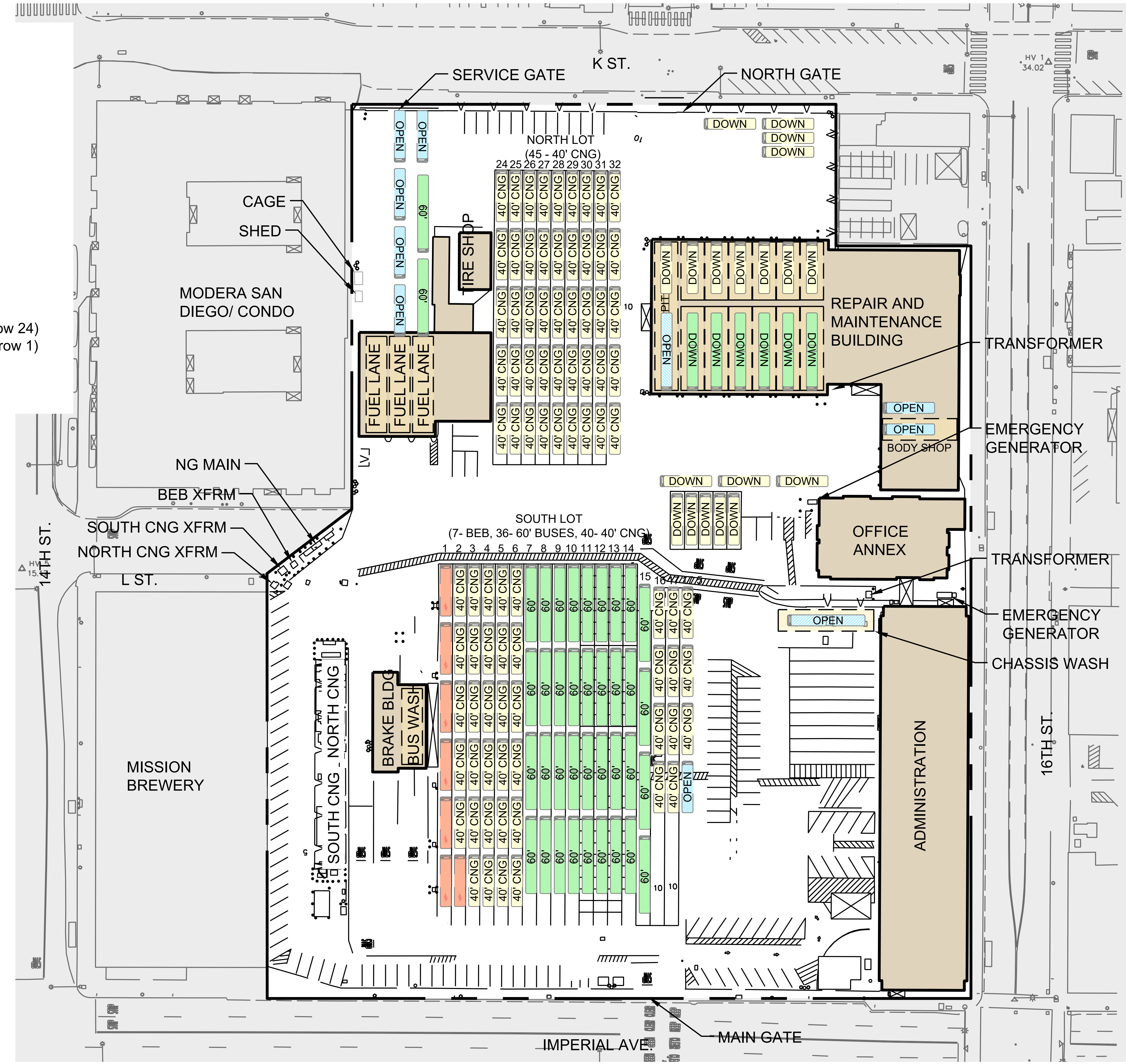
40' CNG	40' CNG	85
40' BUS- DOWN	DOWN	19
40' BEB (Plug-in)		7
60' BUS	60'	38
60' BUS- DOWN	DOWN	6
TOTAL		155

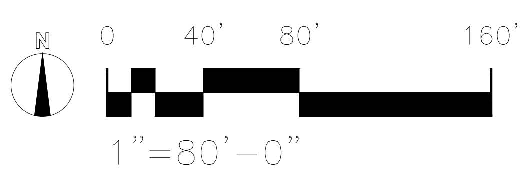
Open Buses:

40' OPEN	OPEN	8
60' BUS- OPEN	OPEN	2

ORDER OF PULLOUT:

1. NORTH LOT (starting with row 32 towards row 24)
2. SOUTH LOT (starting with row 17.5 towards row 1)





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PROJECT NO.	12127D
DRAWN BY	GA
DATE	01/07/2022
SCALE	11x17: 1" = 80'-0"

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP USA Inc.
16200 PARK ROW
SUITE 200
HOUSTON, TEXAS 77084
TEL: (281) 589-5900
FAX: (281) 759-5164

DRAWING TITLE
IAD
EXISTING

DRAWING NUMBER
XS.2

STATISTICS
Based on IAD Lot Map- MTS:

Assigned Buses:

40' CNG	40' CNG	85
40' BUS- DOWN	DOWN	19
40' BEB (Plug-in)		7
60' BUS	60'	38
60' BUS- DOWN	DOWN	6
TOTAL		155

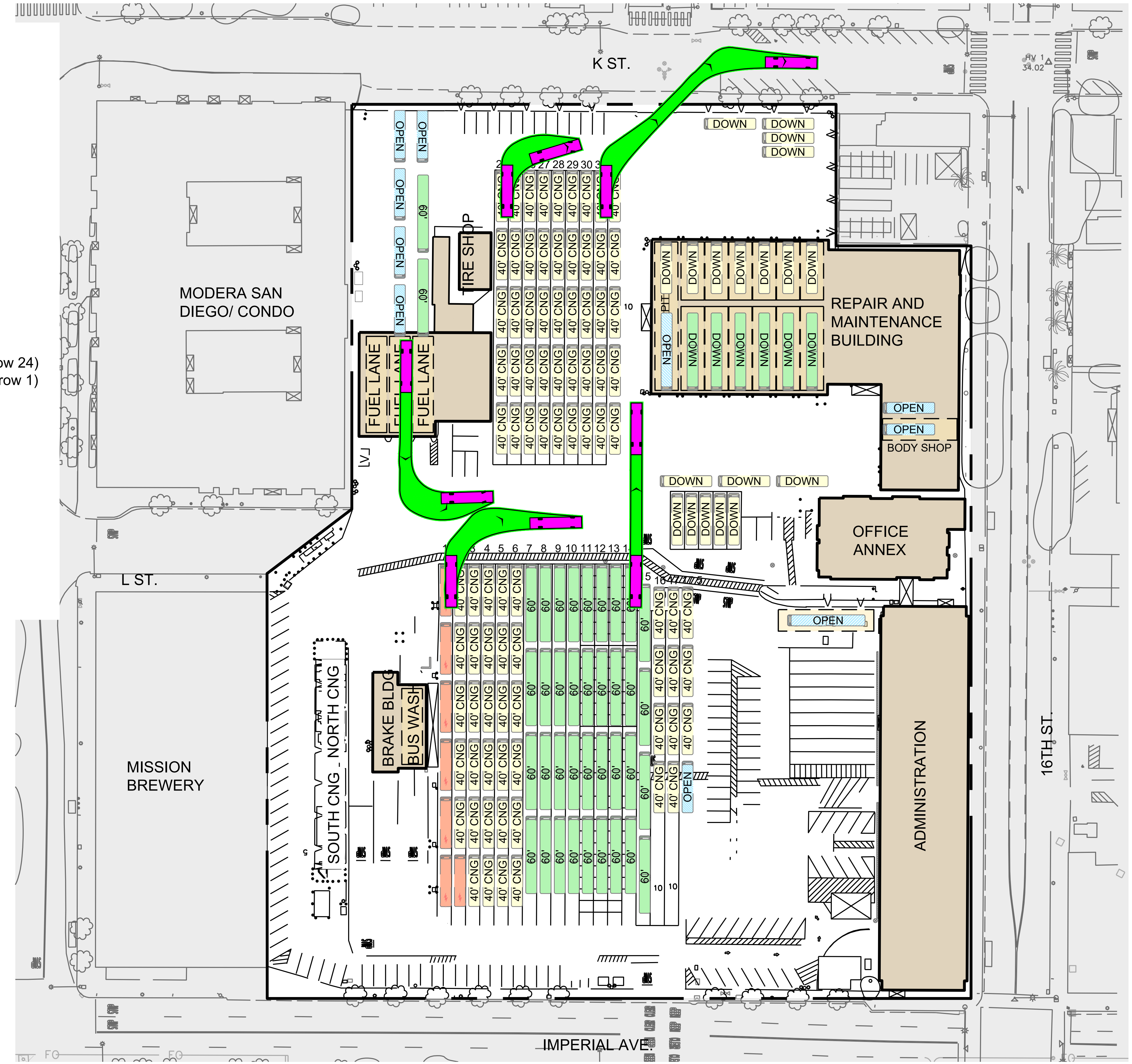
Open Buses:

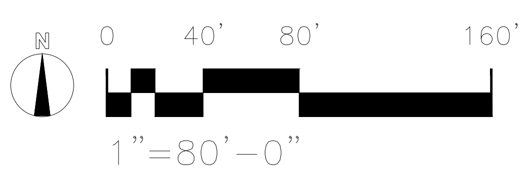
40' OPEN	OPEN	8
60' BUS- OPEN	OPEN	2

ORDER OF PULLOUT:
1. NORTH LOT (starting with row 32 towards row 24)
2. SOUTH LOT (starting with row 17.5 towards row 1)

CIRCULATION:

INBOUND
INTERNAL
OUTBOUND





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PROJECT NO. 12127D
DRAWN BY GA
DATE 01/07/2022
SCALE 11x17: 1" = 80'-0"

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP USA Inc.
16200 PARK ROW
SUITE 200
HOUSTON, TEXAS 77084
TEL: (281) 589-5900
FAX: (281) 759-5164

DRAWING TITLE
IAD EXISTING AM CIRC

DRAWING NUMBER
XS.4

STATISTICS
Based on IAD Lot Map- MTS:

Assigned Buses:

40' CNG	40' CNG	85
40' BUS- DOWN	DOWN	19
40' BEB (Plug-in)		7
60' BUS	60'	38
60' BUS- DOWN	DOWN	6
TOTAL		155

Open Buses:

40' OPEN	OPEN	8
60' BUS- OPEN	OPEN	2

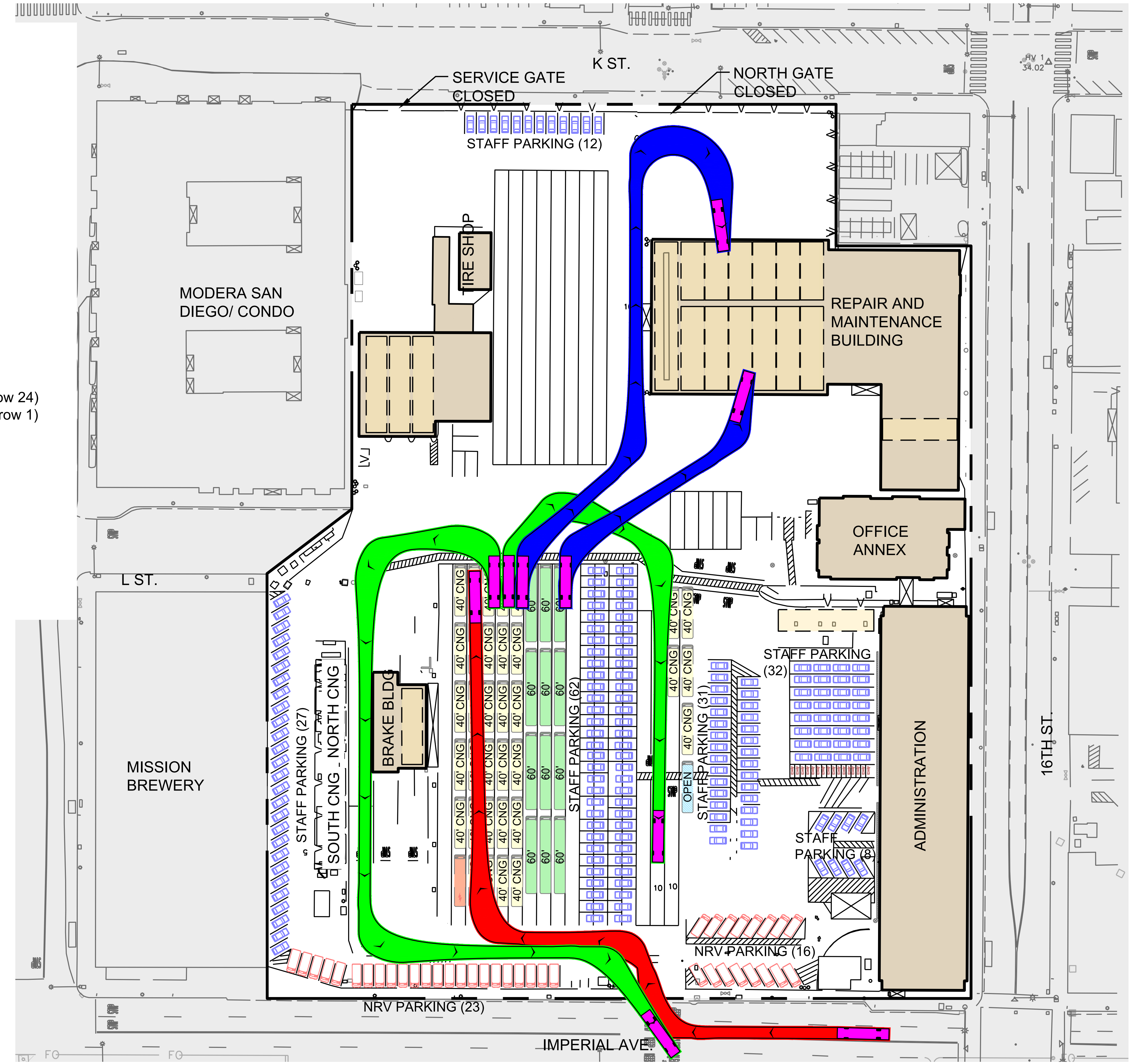
Parking:

NRV	39
Private Cars	172

ORDER OF PULLOUT:
1. NORTH LOT (starting with row 32 towards row 24)
2. SOUTH LOT (starting with row 17.5 towards row 1)

CIRCULATION:

INBOUND
INTERNAL
OUTBOUND



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1"=80'-0"

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PROJECT NO.	12127D
DRAWN BY	GA
DATE	01/07/2022
SCALE	11x17: 1" = 80'-0"

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP

DRAWING TITLE
IAD EXISTING MID NRV & PRIVATE CIRC

DRAWING NUMBER
XS.5

STATISTICS
Based on IAD Lot Map- MTS:

Assigned Buses:

40' CNG	40' CNG	85
40' BUS- DOWN	DOWN	19
40' BEB (Plug-in)		7
60' BUS	60'	38
60' BUS- DOWN	DOWN	6
TOTAL		155

Open Buses:

40' OPEN	OPEN	8
60' BUS- OPEN	OPEN	2

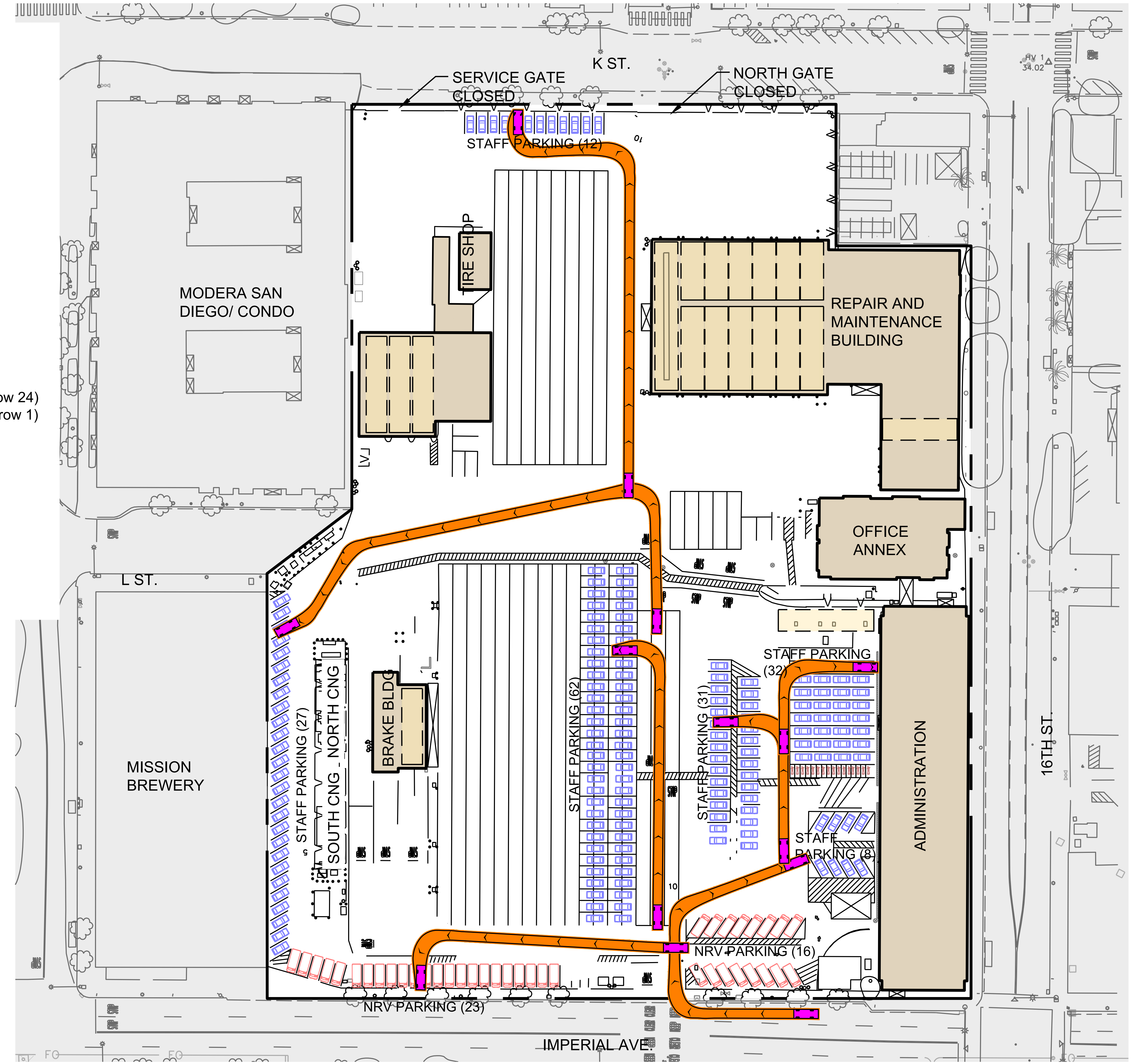
Parking:

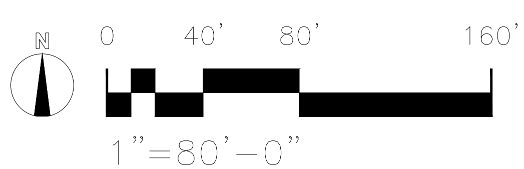
NRV	39
Private Cars	172

ORDER OF PULLOUT:
1. NORTH LOT (starting with row 32 towards row 24)
2. SOUTH LOT (starting with row 17.5 towards row 1)

CIRCULATION:

NRV & PRIVATE CAR PARKING





PROJECT NO.	12127D
DRAWN BY	GA
DATE	01/07/2022
SCALE	11x17: 1" = 80'-0"

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DOKKEN ENGINEERING
1450 FRAZEE ROAD SUITE 100 SAN DIEGO, CA 92108 (858) 514-8377

WSP USA Inc.
16200 PARK ROW
SUITE 200
HOUSTON, TEXAS 77084
TEL: (281) 589-5900
FAX: (281) 759-5164

DRAWING TITLE
IAD EXISTING MID NRV & PRIVATE CIRC

DRAWING NUMBER
XS.6

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STATISTICS
Based on IAD Lot Map- MTS:

Assigned Buses:

40' CNG	40' CNG	85
40' BUS- DOWN	DOWN	19
40' BEB (Plug-in)		7
60' BUS	60'	38
60' BUS- DOWN	DOWN	6
TOTAL		155

Open Buses:

40' OPEN	OPEN	8
60' BUS- OPEN	OPEN	2

Parking:

NRV	39
Private Cars	172

ORDER OF PULLOUT:
1. NORTH LOT (starting with row 32 towards row 24)
2. SOUTH LOT (starting with row 17.5 towards row 1)

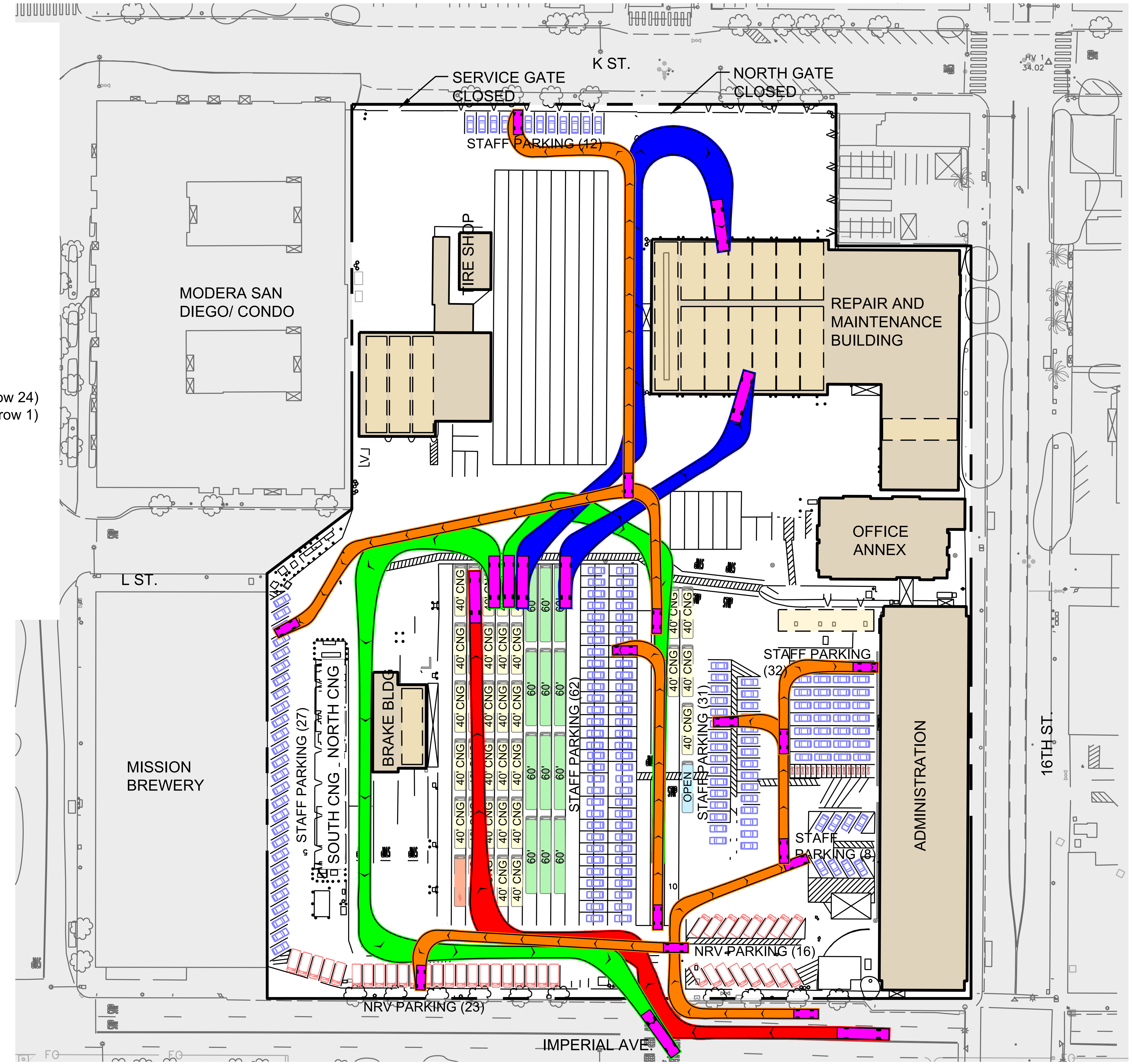
CIRCULATION:

INBOUND (red)

INTERNAL (blue)

OUTBOUND (green)

NRV & PRIVATE CAR PARKING (orange)



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1"=80'-0"

PROJECT NO. 12127D
DRAWN BY GA
DATE 01/07/2022
SCALE 11x17: 1" = 80'-0"

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP USA Inc.
16200 PARK ROW
SUITE 200
HOUSTON, TEXAS 77084
TEL: (281) 589-5900
FAX: (281) 759-5164

DRAWING TITLE
IAD EXISTING
MID DAY ALL
CIRC OVERALL

DRAWING NUMBER
XS.7

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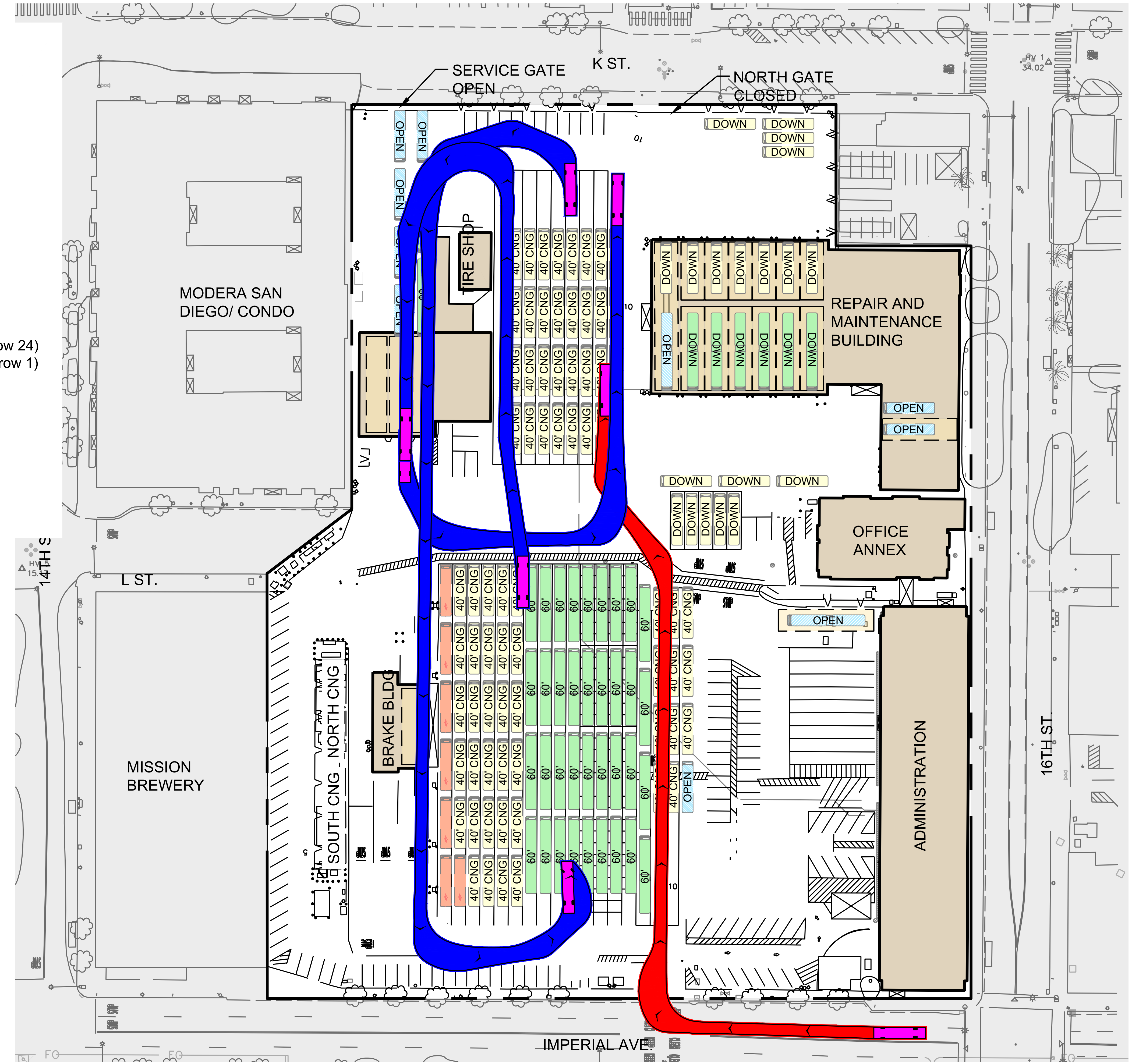
STATISTICS
Based on IAD Lot Map- MTS:

Assigned Buses:		
40' CNG	40' CNG	85
40' BUS- DOWN	DOWN	19
40' BEB (Plug-in)		7
60' BUS	60'	38
60' BUS- DOWN	DOWN	6
TOTAL		155
Open Buses:		
40' OPEN	OPEN	8
60' BUS- OPEN	OPEN	2

ORDER OF PULLOUT:
1. NORTH LOT (starting with row 32 towards row 24)
2. SOUTH LOT (starting with row 17.5 towards row 1)

CIRCULATION:

INBOUND
INTERNAL
OUTBOUND



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PROJECT NO. 12127D
DRAWN BY GA
DATE 01/07/2022
SCALE 11x17: 1" = 80'-0"

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP USA Inc.
16200 PARK ROW
SUITE 200
HOUSTON, TEXAS 77084
TEL: (281) 589-5900
FAX: (281) 759-5164

DRAWING TITLE
IAD EXISTING PM CIRC

DRAWING NUMBER
XS.8

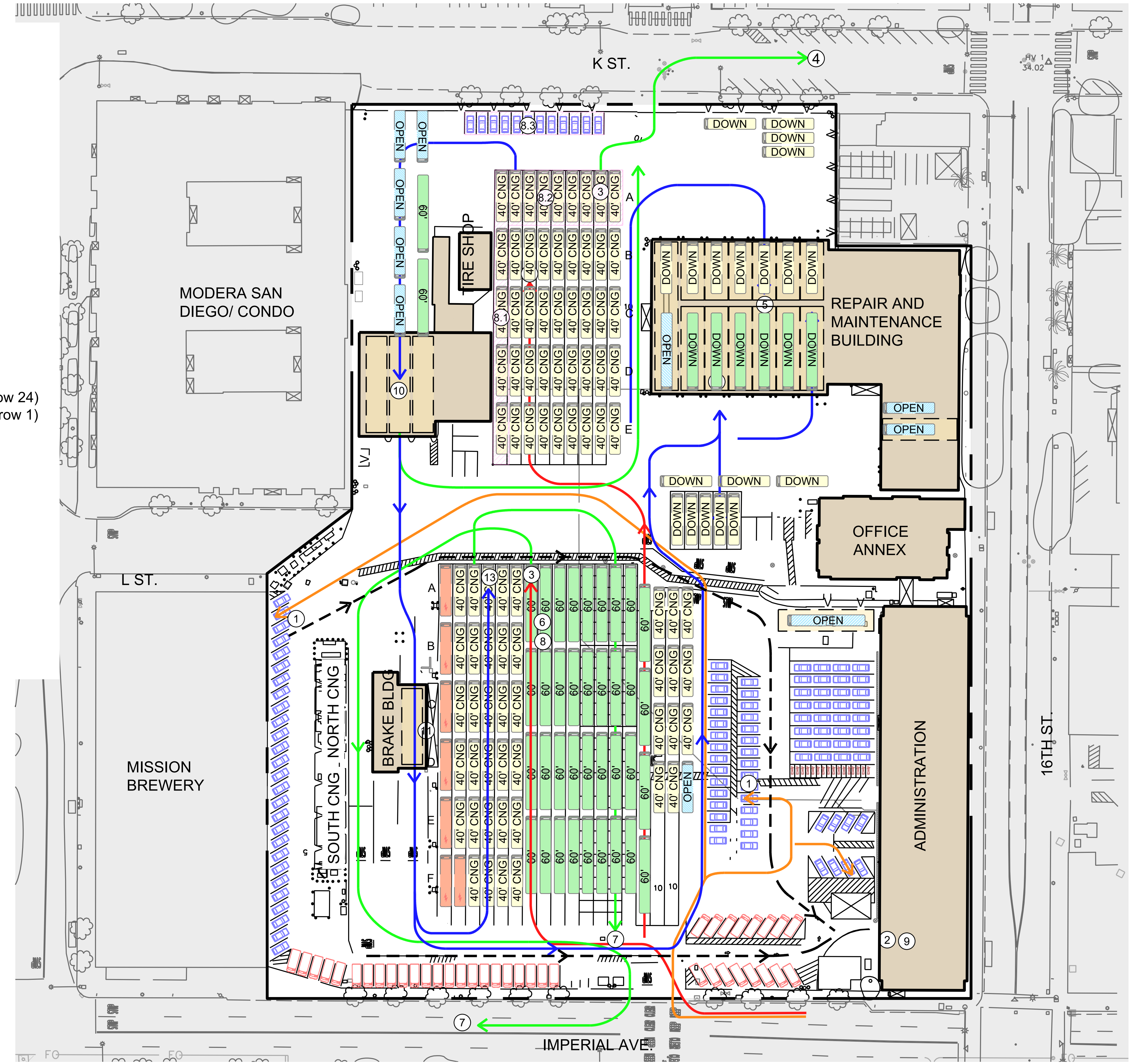
STATISTICS
Based on IAD Lot Map- MTS:

Assigned Buses:		
40' CNG	40' CNG	85
40' BUS- DOWN	DOWN	19
40' BEB (Plug-in)		7
60' BUS	60'	38
60' BUS- DOWN	DOWN	6
TOTAL		155
Open Buses:		
40' OPEN	OPEN	8
60' BUS- OPEN	OPEN	2
Parking:		
NRV		39
Private Cars		172

ORDER OF PULLOUT:
1. NORTH LOT (starting with row 32 towards row 24)
2. SOUTH LOT (starting with row 17.5 towards row 1)

CIRCULATION:

- INBOUND
- INTERNAL
- OUTBOUND
- NRV & PRIVATE CAR PARKING
- PERSONNEL



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1"=80'-0"

PROJECT NO. 12127D
DRAWN BY GA
DATE 01/07/2022
SCALE 11x17: 1" = 80'-0"

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
IAD EXISTING CIRC PLAN

DRAWING NUMBER
XS.9

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APPENDIX A-1 – TABLE 2.2 HISTORICAL IAD POWER CONSUMPTION

Table 2-2. Historical IAD Power Consumption (2021/2022)

100 16TH ST, SAN DIEGO, CA 92101 Meter # 6769166			
Date	Max KW	KWh	Cost
4/28/2021	328	11,765	$ 12,756.07
5/27/2021	329.6	11,499	$ 10,486.01
6/28/2021	326.4	15,067	$ 4,478.45
7/28/2021	332.8	18,299	$ 3,574.81
8/26/2021	334.4	15,820	$ 3,242.59
9/27/2021	339.2	12,964	$ 2,860.62
10/27/2021	318.4	9,438	$ 2,318.60
11/26/2021	225.6	8,545	$ 2,267.04
12/28/2021	312	14,454	$ 3,529.98
1/27/2022	352	27,874	$ 6,064.86
2/28/2022	304	25,015	$ 5,422.47
3/29/2022	318.4	26,486	$ 5,708.63
Annual Value	318.4 Avg	197,226	$ 62,710.13

122 16TH ST, SAN DIEGO, CA 92101 Meter # 6807505			
Date	Max KW	KWh	Cost
3/31/2021	394.9	50,589	$ 22,626.73
4/30/2021	396.8	50,829	$ 22,582.61
5/31/2021	401.9	51,466	$ 22,870.79
6/30/2021	395.5	52,803	$ 23,042.54
7/31/2021	388.5	54,175	$ 22,684.51
8/31/2021	391	55,167	$ 22,750.49
9/30/2021	389.1	52,675	$ 22,726.71
10/31/2021	393	52,376	$ 22,921.52
11/30/2021	395.5	49,593	$ 23,326.20
12/31/2021	396.2	42,785	$ 23,078.80
1/31/2022	403.8	44,515	$ 25,604.54
2/28/2022	396.8	44,542	$ 25,184.22
3/31/2022	400	51,955	$ 25,578.48
Annual Value	395.6 Avg	653,470	$ 304,978.14

Table 2-2. Historical IAD Power Consumption (2021/2022)

150 16TH ST, SAN DIEGO, CA 92101 Meter # 6704702			
Date	Max KW	KWh	Cost
4/19/2021	186.2	87,101	$ 12,739.74
5/18/2021	176	79,305	$ 12,111.48
6/17/2021	177.6	83,088	$ 12,417.76
7/19/2021	200.6	92,224	$ 13,972.70
8/17/2021	201.9	90,746	$ 13,978.85
9/16/2021	201.6	95,358	$ 14,236.36
10/18/2021	208	94,811	$ 14,383.41
11/16/2021	184	81,448	$ 12,854.21
12/16/2021	163.5	79,363	$ 11,732.14
1/18/2022	161	87,409	$ 12,339.05
2/16/2022	169.3	76,418	$ 12,485.50
3/18/2022	149.4	76,073	$ 11,444.21
Annual Value	181.6 Avg	1,023,344	$ 154,695.41

1462 IMPERIAL AVE, SAN DIEGO, CA 92101 Meter # 6694530			
Date	Max KW	KWh	Cost
4/19/2021	52.8	19,047	$ 3,642.08
5/18/2021	50.9	16,007	$ 3,427.02
6/17/2021	50.9	15,851	$ 3,402.20
7/19/2021	49.6	16,704	$ 3,442.75
8/17/2021	52.8	15,553	$ 3,574.11
9/16/2021	50.6	17,153	$ 3,504.50
10/18/2021	57.3	19,657	$ 3,970.90
11/16/2021	56	18,404	$ 3,881.84
12/16/2021	53.4	19,228	$ 3,835.91
1/18/2022	52.8	21,588	$ 4,016.28
2/16/2022	54.7	18,277	$ 4,099.25
3/18/2022	54.7	18,493	$ 4,103.49
Annual Value	53.0 Avg	215,962	$ 44,900.33

Table 2-2. Historical IAD Power Consumption (2021/2022)

1575 K ST, SAN DIEGO, CA 92101 Meter # 6694485			
Date	Max KW	KWh	Cost
4/16/2021	96	46,029	$ 6,817.13
5/17/2021	88.3	45,643	$ 6,344.27
6/16/2021	89.6	44,957	$ 6,337.66
7/16/2021	89	46,206	$ 6,510.78
8/16/2021	85.8	43,237	$ 6,300.86
9/15/2021	85.1	42,086	$ 6,236.20
10/15/2021	85.1	39,074	$ 6,077.00
11/15/2021	83.2	38,302	$ 5,866.15
12/15/2021	73.6	36,098	$ 5,371.53
1/14/2022	76.2	35,517	$ 5,563.97
1/31/2022	63.4	20,338	$ 2,933.44
2/15/2022	83.2	18,583	$ 3,062.33
3/17/2022	72.3	35,767	$ 5,564.72
Annual Value	82.4 Avg	491,837	$ 72,986.04

	Annual Max Avg KW	Annual Total KWh	Annual Cost
Facility Total:	849.43 Avg	1,558,495	$ 485,574.64

Note 1: Annual Value for Max KW is given as a monthly average, for KWH and Cost the value is given as a total

Note 2: Facility Totals are the sum of the Annual Values for each individual meter located at the facility

APPENDIX B – IAD ZEB MASTER PLAN DRAWINGS

LEGEND

40' Down	Down	14
40' BEB Existing		7
40' BEB		93
60' Down	Down	6
60' BEB		36
TOTAL:		156
60' Open	Open	2
40' Open	Open	14

TOTAL

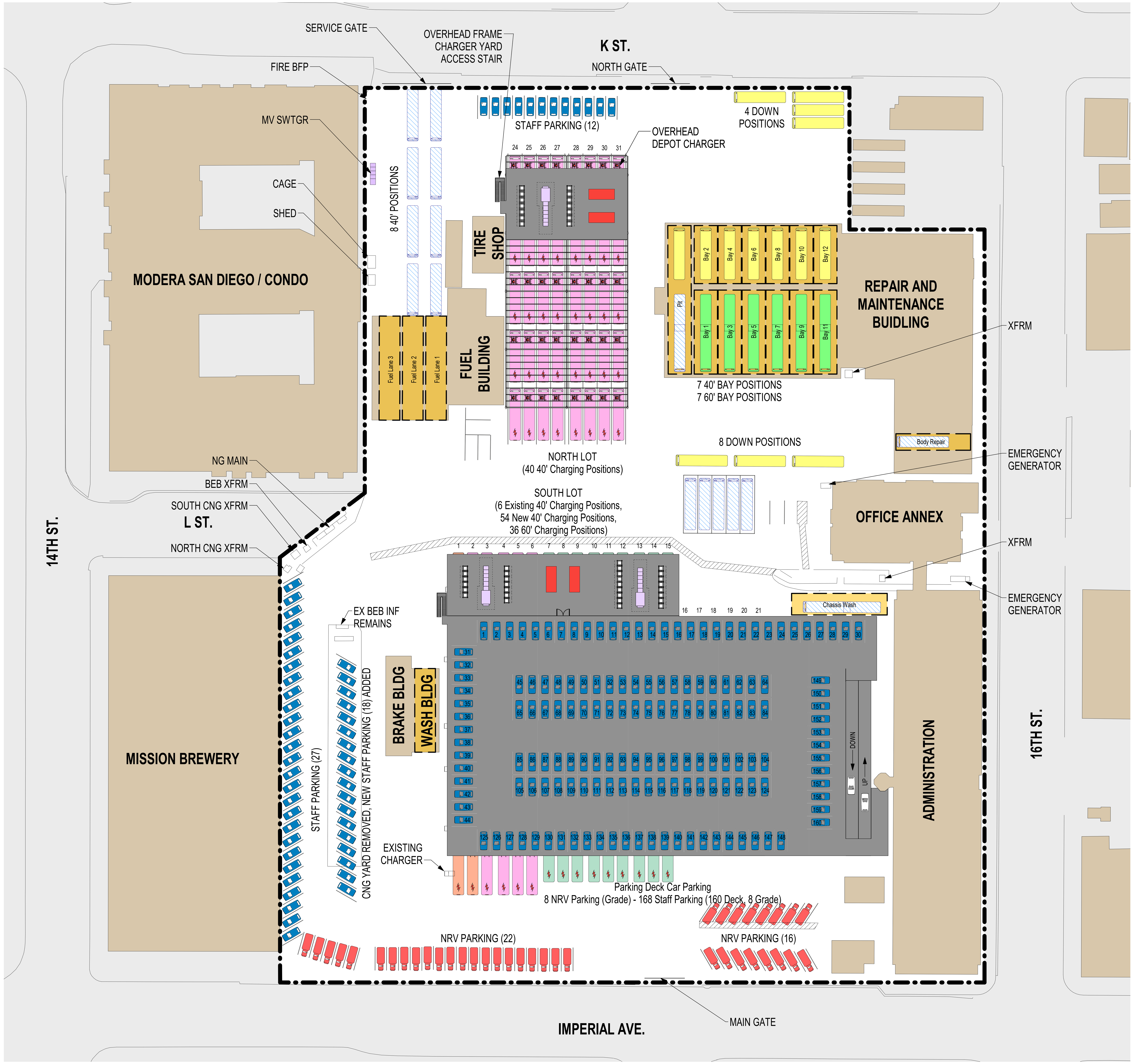
172

Car Parking

Grade	
NRV	46
Staff Parking	65
Top of Parking Deck Staff Parking	160
TOTAL:	271

Charging Equipment

Charging Cabinet, Existing	6
Charging Cabinet, New	44
Depot Dispenser	130



PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=40' 11x17: 1"=80'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP

DRAWING TITLE
FULL PLAN
CNG REMOVED
ADD STAFF PARKING
EX BEB INF REMAINS

DRAWING NUMBER
MASTER PLAN
MP 1A

3/24/2022 9:22:34 AM

LEGEND

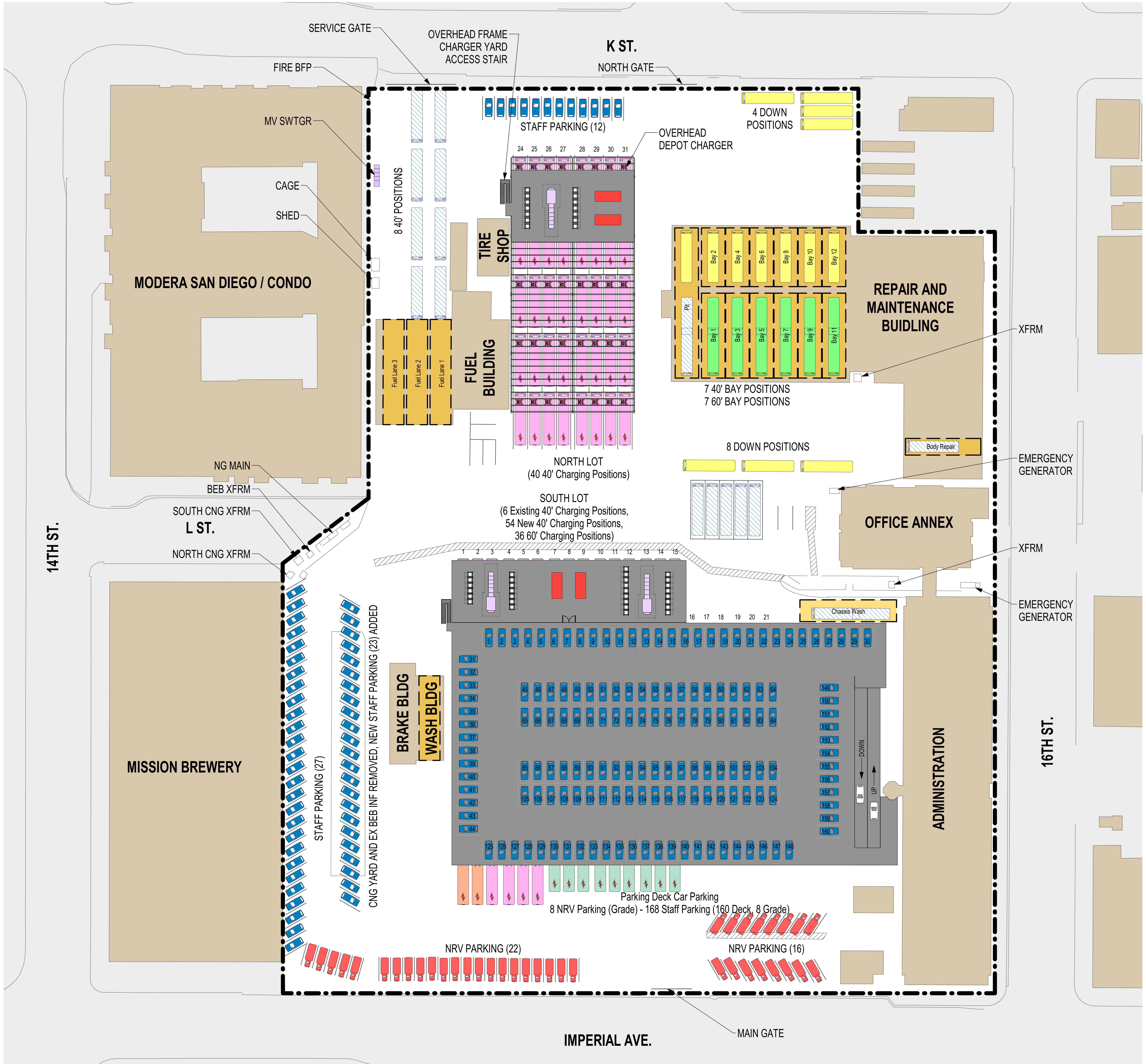
40' Down	14
40' BEB Existing	7
40' BEB	93
60' Down	6
60' BEB	36
TOTAL:	156
60' Open	2
40' Open	14
TOTAL	**172**

Car Parking

Grade	
NRV	46
Staff Parking	70
Top of Parking Deck Staff Parking	160
TOTAL:	276

Charging Equipment

Charging Cabinet, New	44
Depot Dispenser	130



PROJECT NO. 12127D
DRAWN BY ESR
DATE 02/15/22
SCALE 1" = 40'-0"

PROJECT TITLE
IAD ELECTRIC BUS
CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP

DRAWING TITLE
FULL PLAN
CNG REMOVED
ADD STAFF PARKING
EX BEB INF REMOVED

DRAWING NUMBER
MP 1B

3/24/2022 9:30:01 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: MASTER PLAN

LEGEND

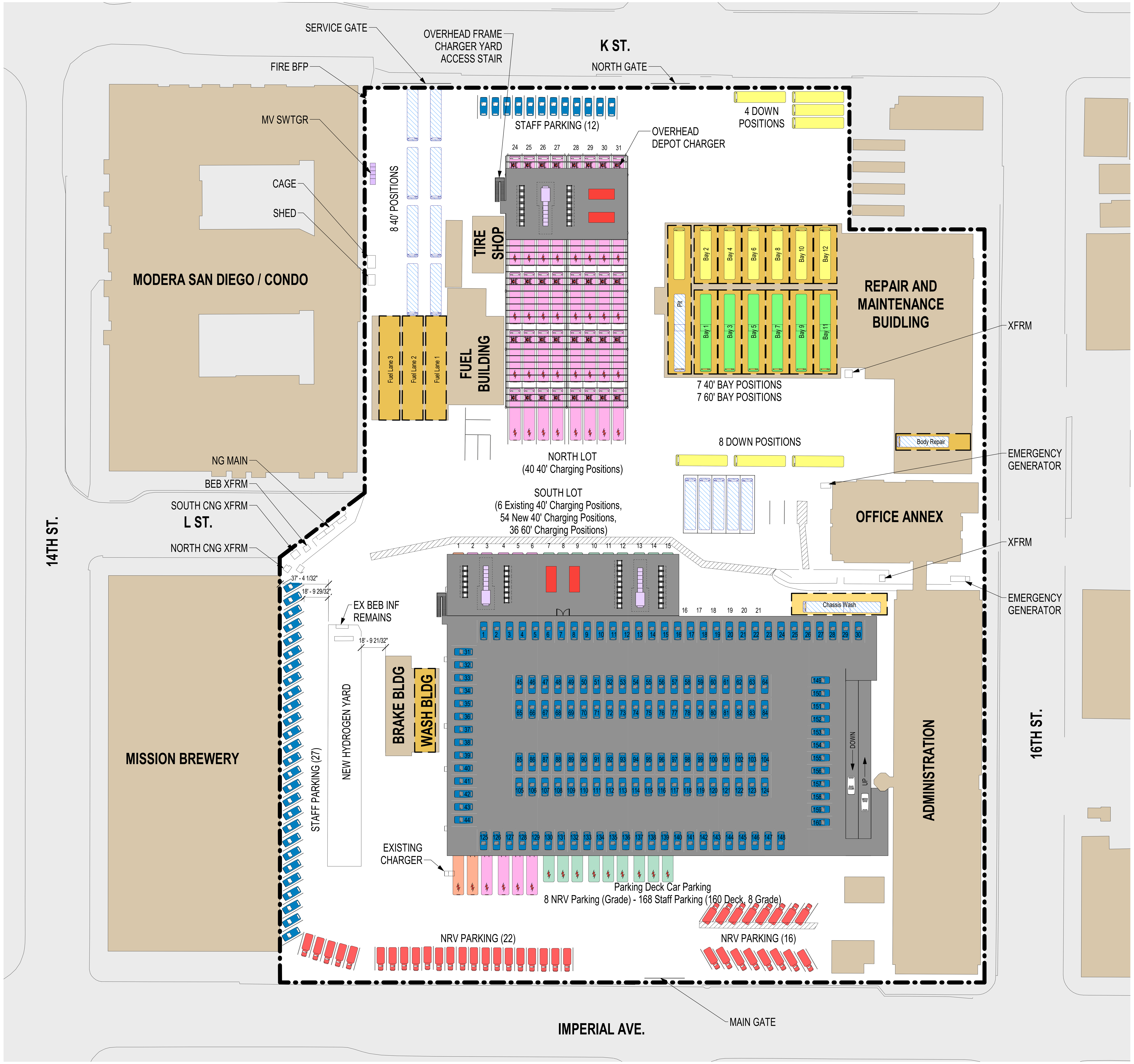
40' Down	14
40' BEB Existing	7
40' BEB	93
60' Down	6
60' BEB	36
TOTAL:	156
60' Open	2
40' Open	14
TOTAL	**172**

Car Parking

Grade NRV	46
Staff Parking	47
Top of Parking Deck Staff Parking	160
TOTAL:	253

Charging Equipment

Charging Cabinet, Existing	6
Charging Cabinet, New	44
Depot Dispenser	130



PROJECT NO.	12127D
DRAWN BY	ESR
DATE	02/15/22
SCALE	1" = 40'-0"

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP

DRAWING TITLE
FULL PLAN
CNG REMOVED
H2 INF ADDED
EX BEB INF REMAINS

DRAWING NUMBER
MP 1C

3/24/2022 9:30:24 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: MASTER PLAN

LEGEND

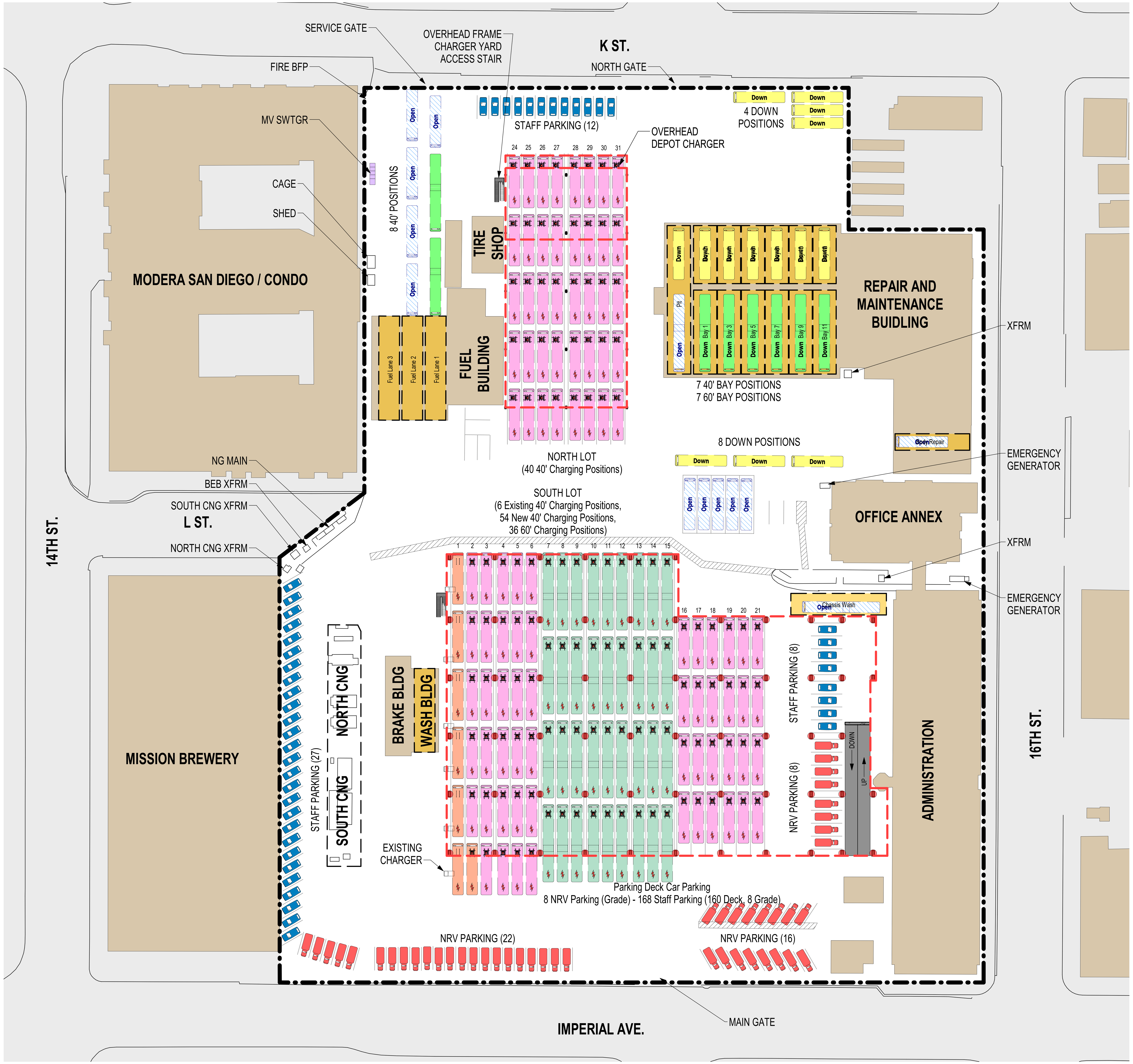
40' Down	14
40' BEB Existing	7
40' BEB	93
60' Down	6
60' BEB	36
TOTAL:	156
60' Open	2
40' Open	14
TOTAL	**172**

Car Parking

Grade NRV	46
Staff Parking	65
Top of Parking Deck Staff Parking	160
TOTAL:	271

Charging Equipment

Charging Cabinet, Existing	6
Charging Cabinet, New	44
Depot Dispenser	130



PROJECT NO. 12127D
DRAWN BY ESR
DATE 2/4/22
SCALE 22x34; 1"=40' 11x17; 1"=80'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP

DRAWING TITLE
GRADE

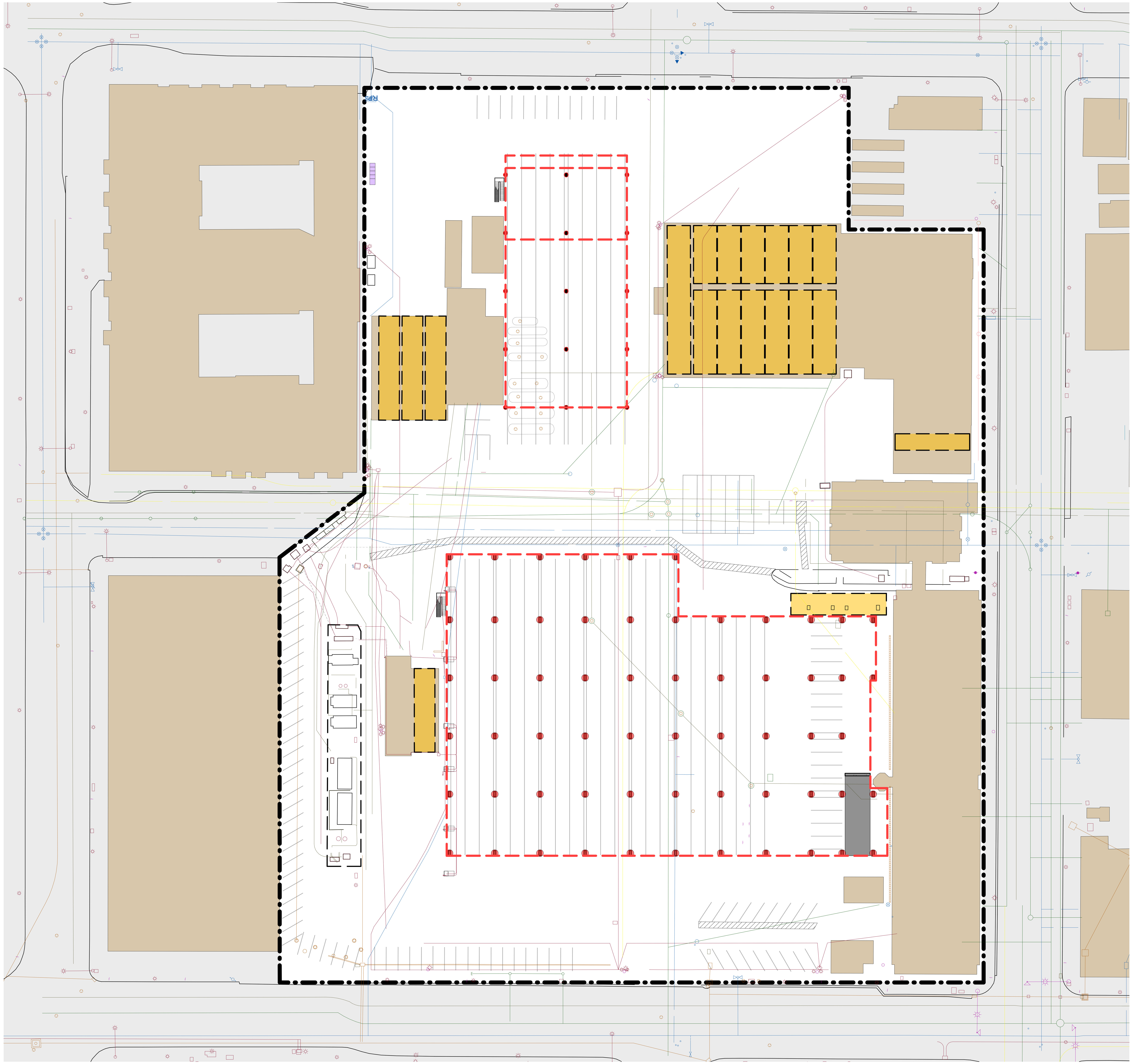
DRAWING NUMBER
MASTER PLAN
MP 2

3/24/2022 9:14:40 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: MASTER PLAN

LEGEND

Electric	
Telephone line	
Gas Line	
Water Line	
Stormwater Line	
Sewer Line	



PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=40' 11x17: 1"=80'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DOKKEN ENGINEERING

DRAWING TITLE
GRADE W UTILITIES AND COLUMNS

DRAWING NUMBER
MASTER PLAN
MP 3

3/24/2022 9:14:42 AM

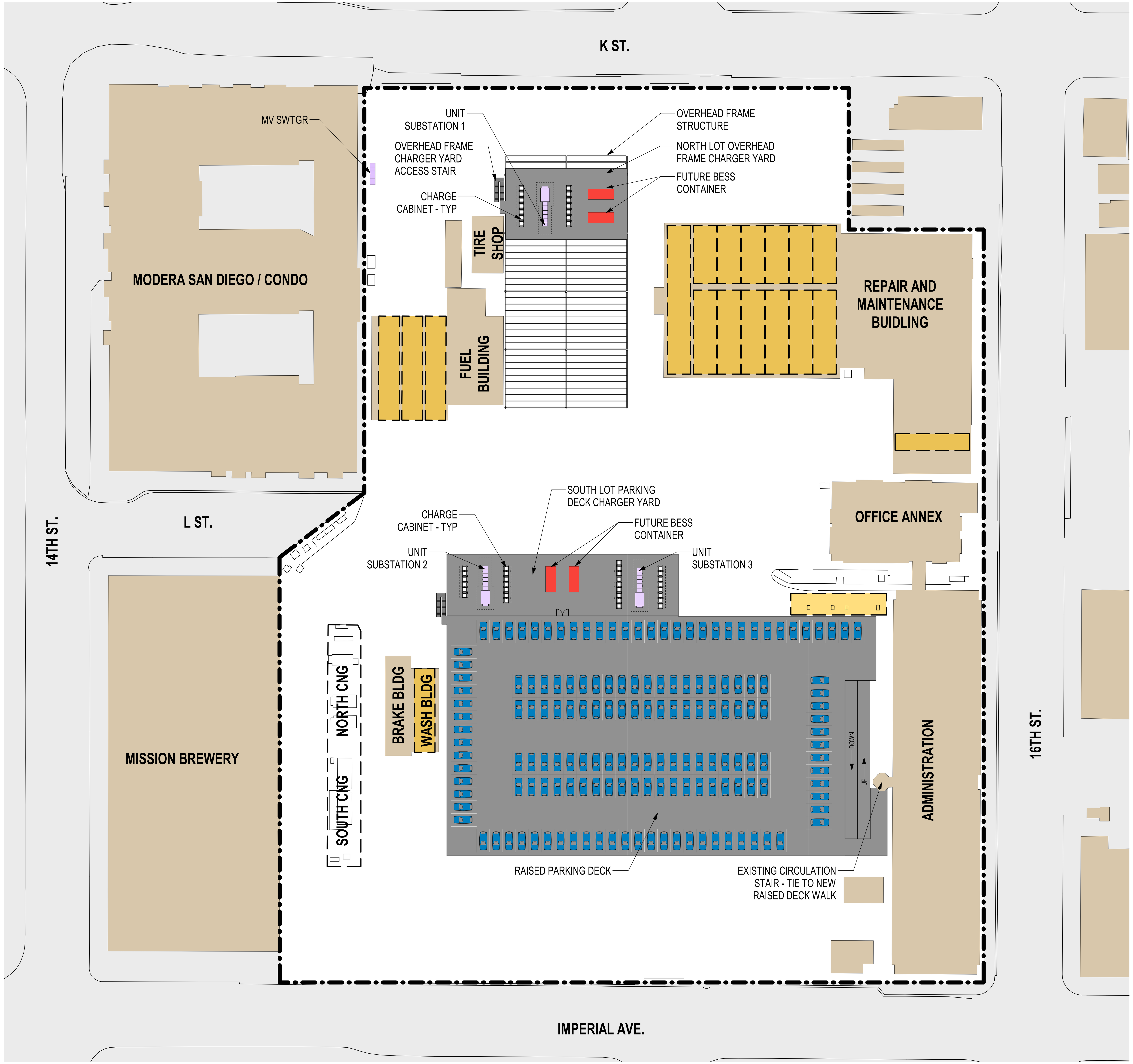
BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: MASTER PLAN

Car Parking

Grade		
NRV		46
Staff Parking		65
Top of Parking Deck		
Staff Parking		160
TOTAL:		271

Charging Equipment

Charging Cabinet, Existing	6
Charging Cabinet, New	44
Depot Dispenser	130



PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=40' 11x17: 1"=80'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP

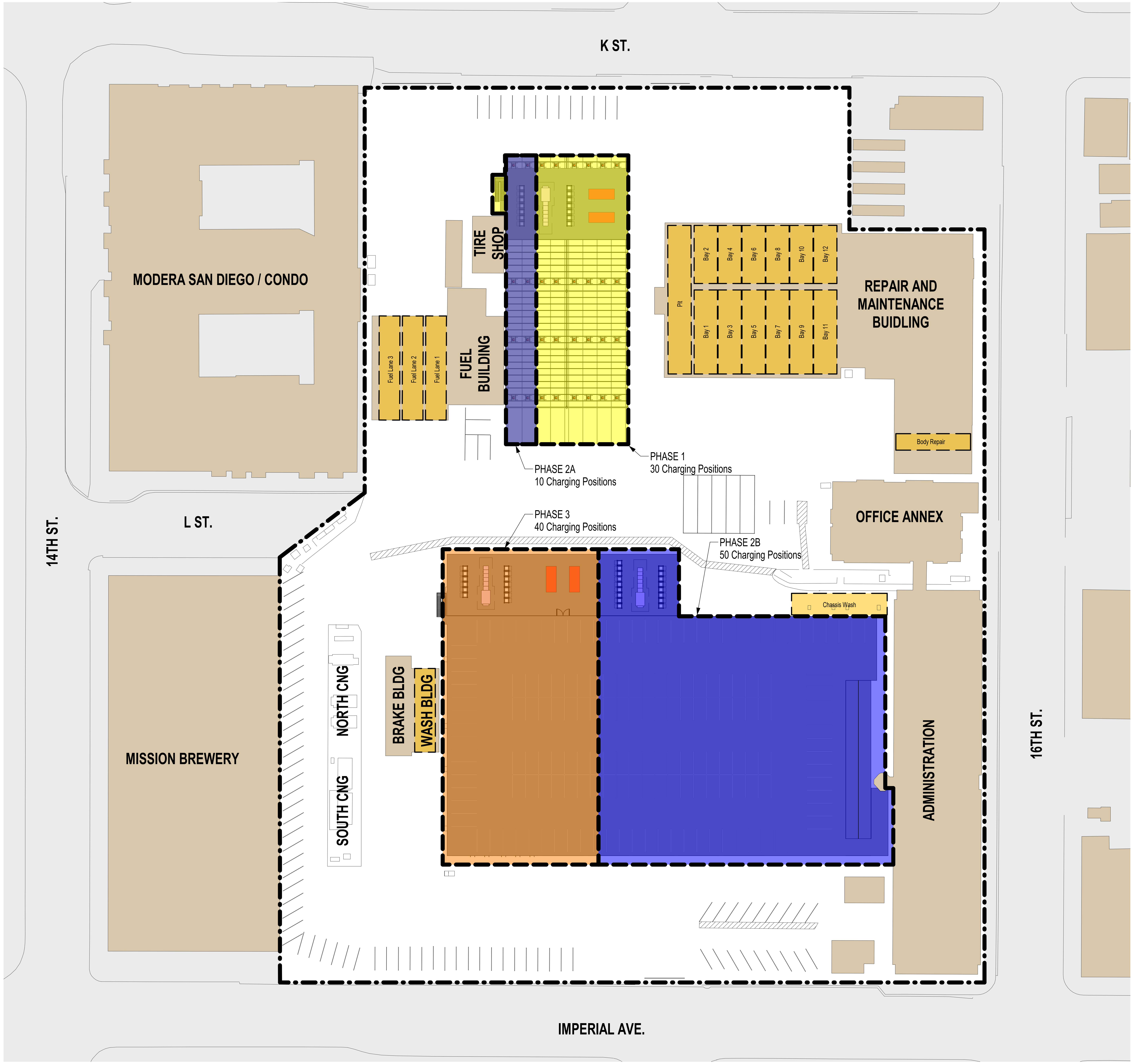
DRAWING TITLE
MEZZANINE AND PARKING DECK

DRAWING NUMBER
MASTER PLAN

MP 4

3/24/2022 9:14:46 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: MASTER PLAN



PROJECT NO. 12127D

DRAWN BY ESR

DATE 2/4/22

SCALE 22x34: 1"=40' 11x17: 1"=80'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP

DRAWING TITLE
OVERALL PHASING PLAN

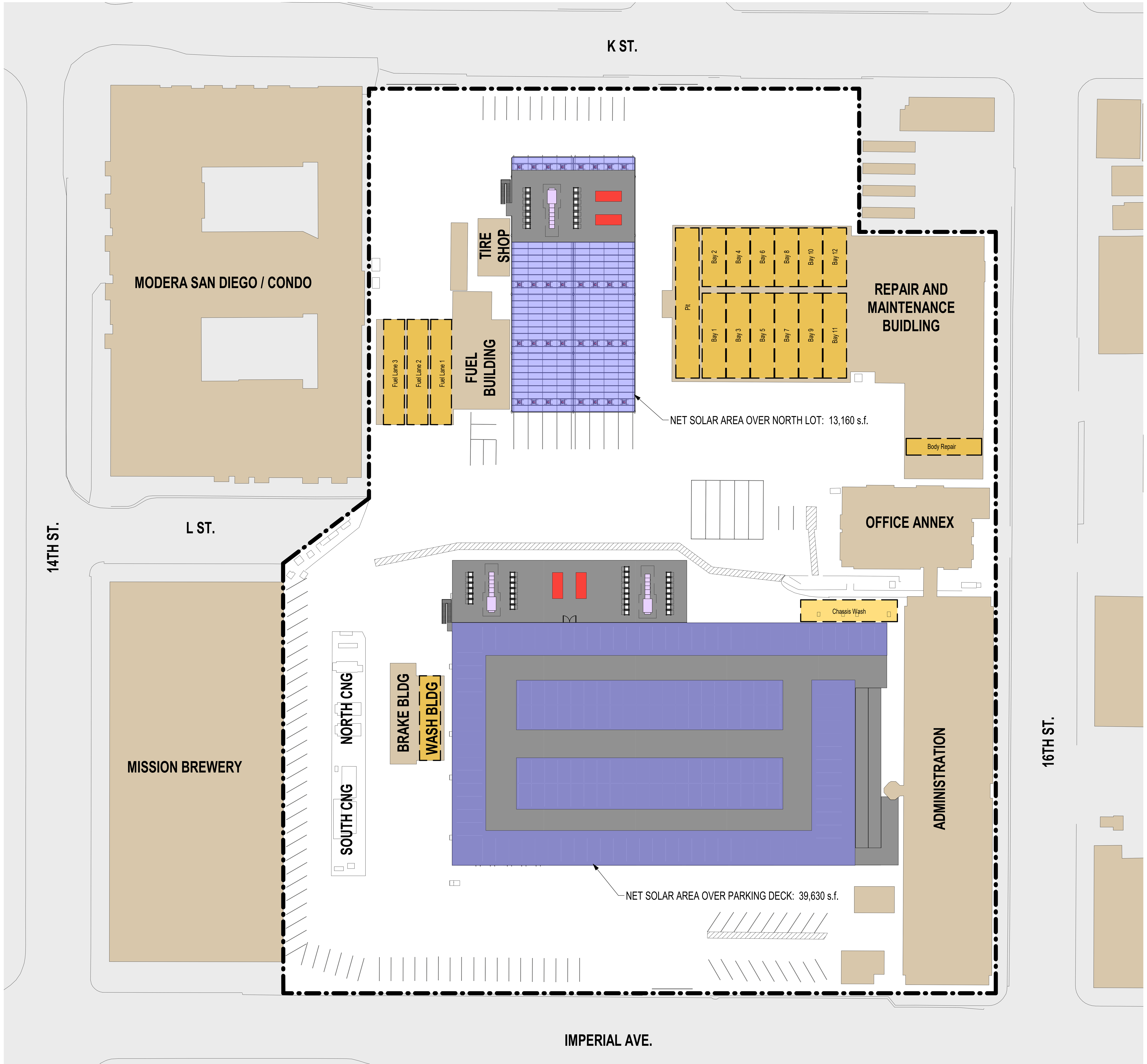
DRAWING NUMBER
MASTER PLAN

MP 5

3/24/2022 9:14:49 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt

Category: REPORT - Set: MASTER PLAN



PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=40' 11x17: 1"=80'

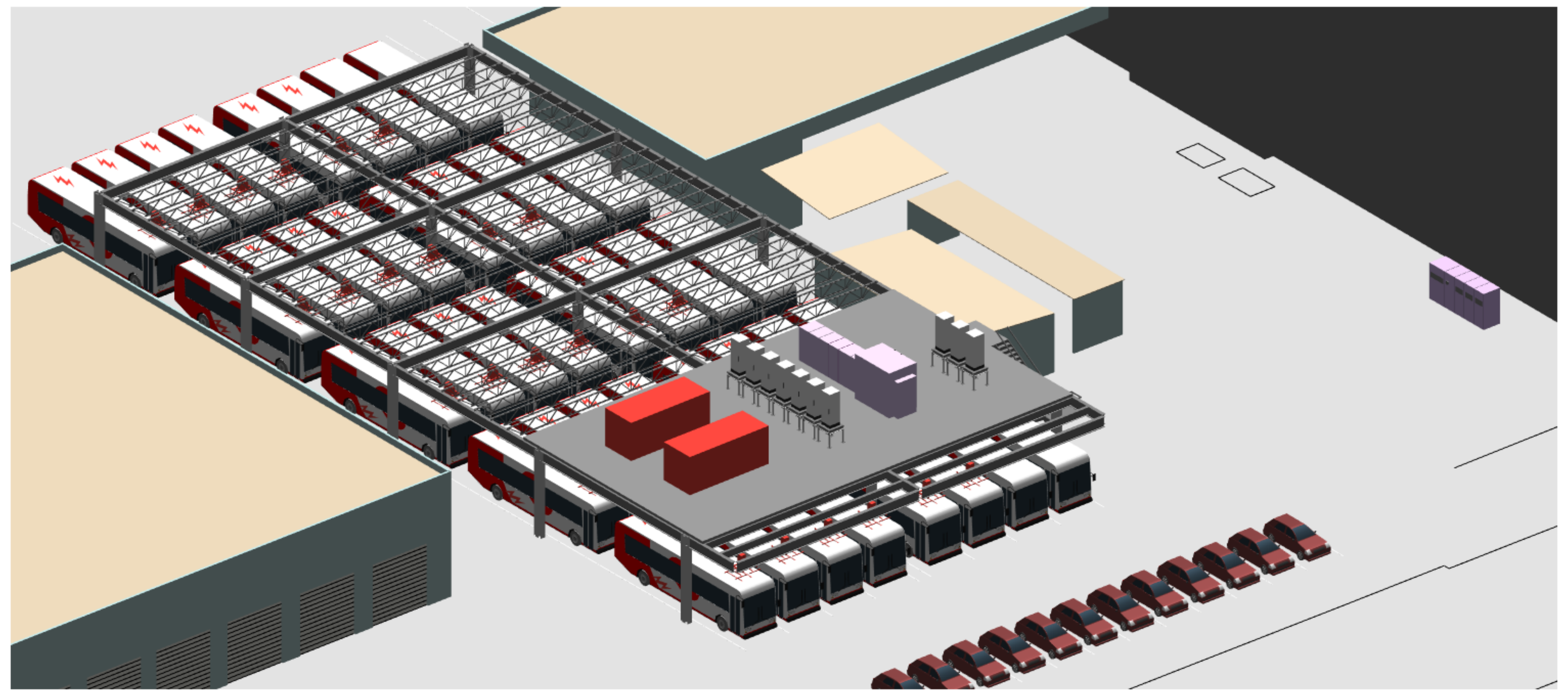
PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
MEZZANINE AND PARKING DECK WITH SOLAR

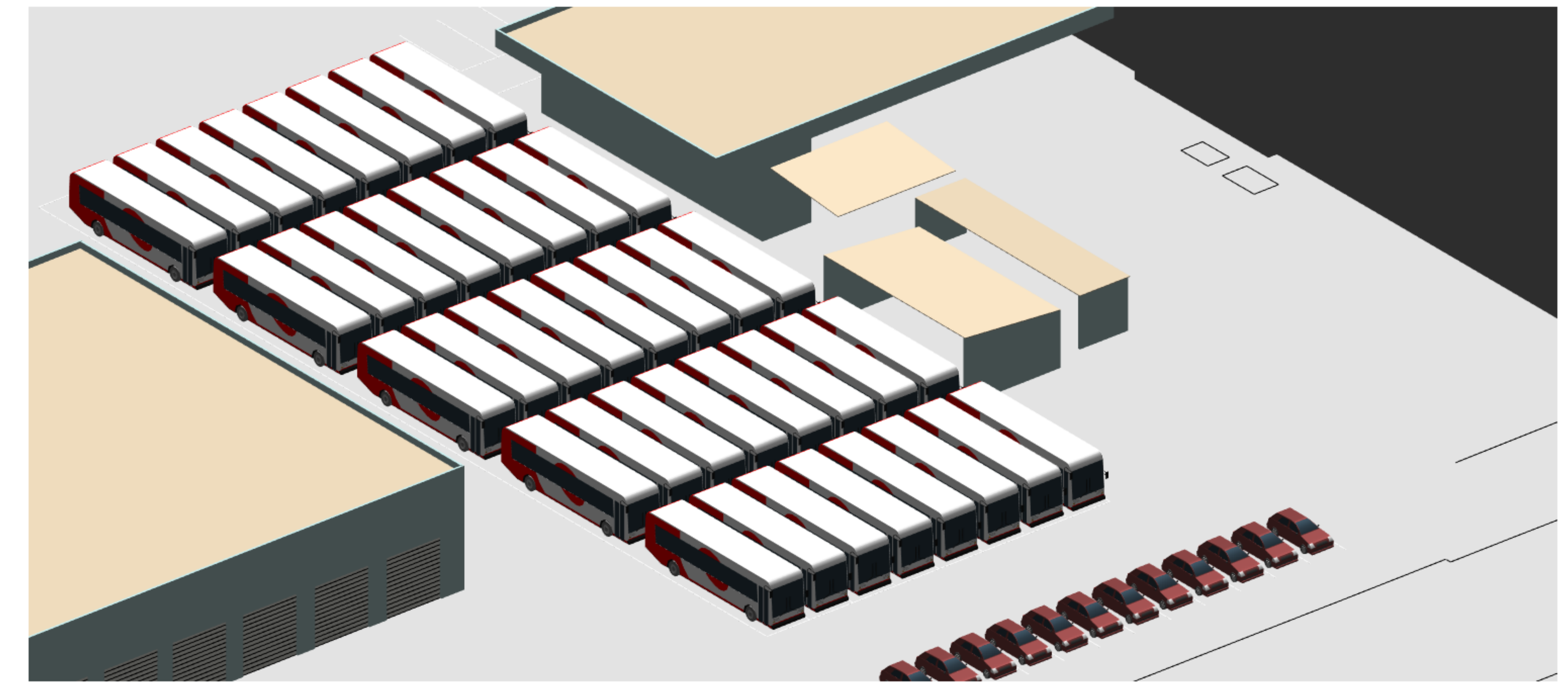
DRAWING NUMBER
MASTER PLAN
MP 6

3/24/2022 9:14:52 AM

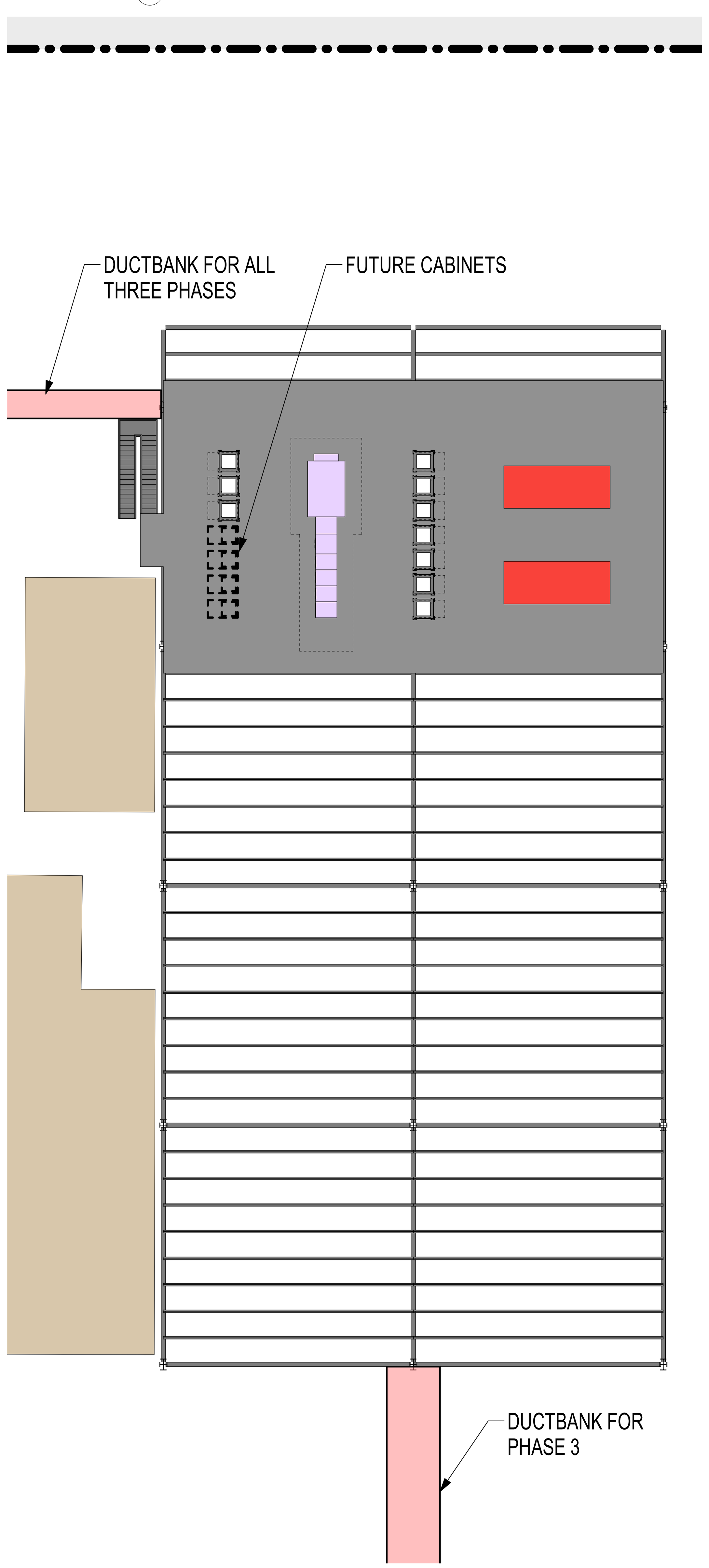
BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: MASTER PLAN



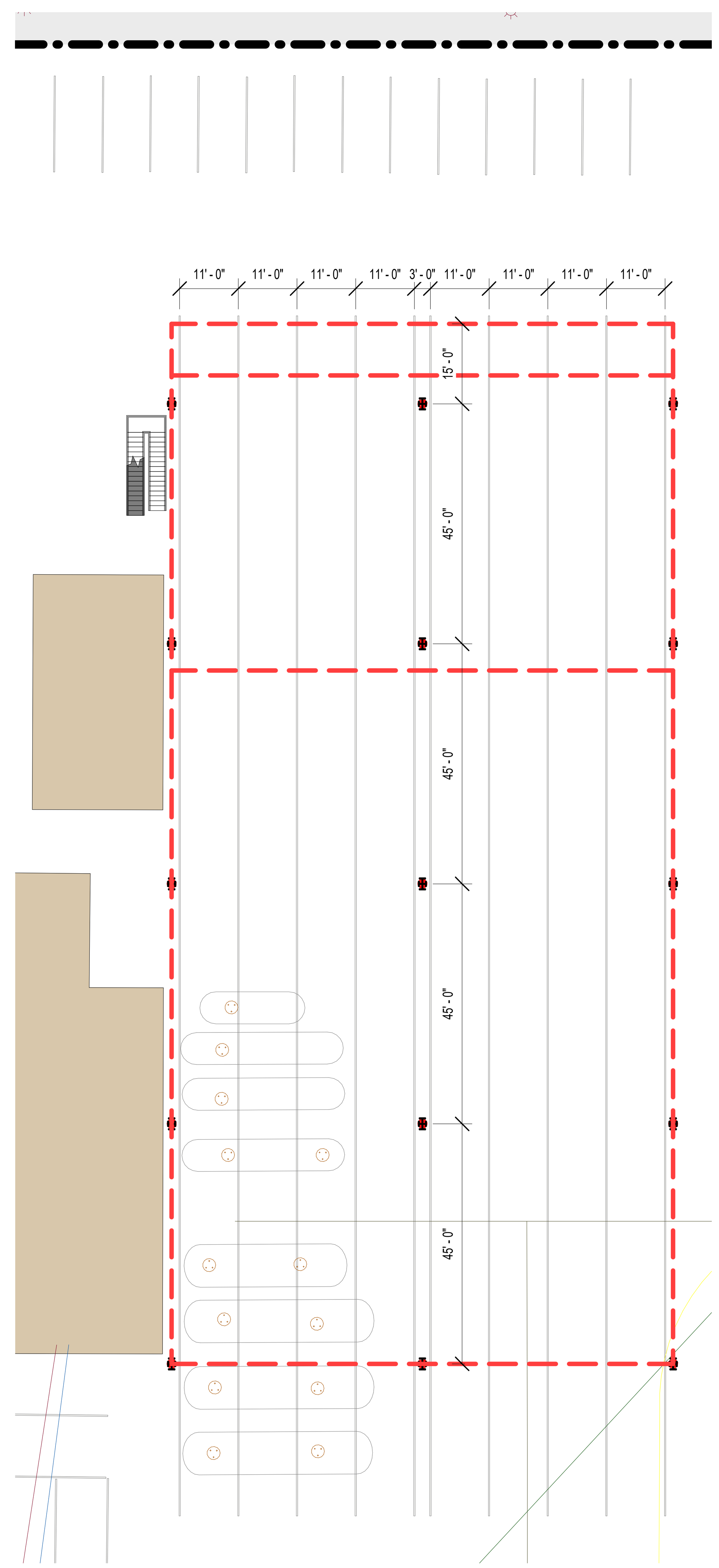
6 NORTH LOT - PHASE 1



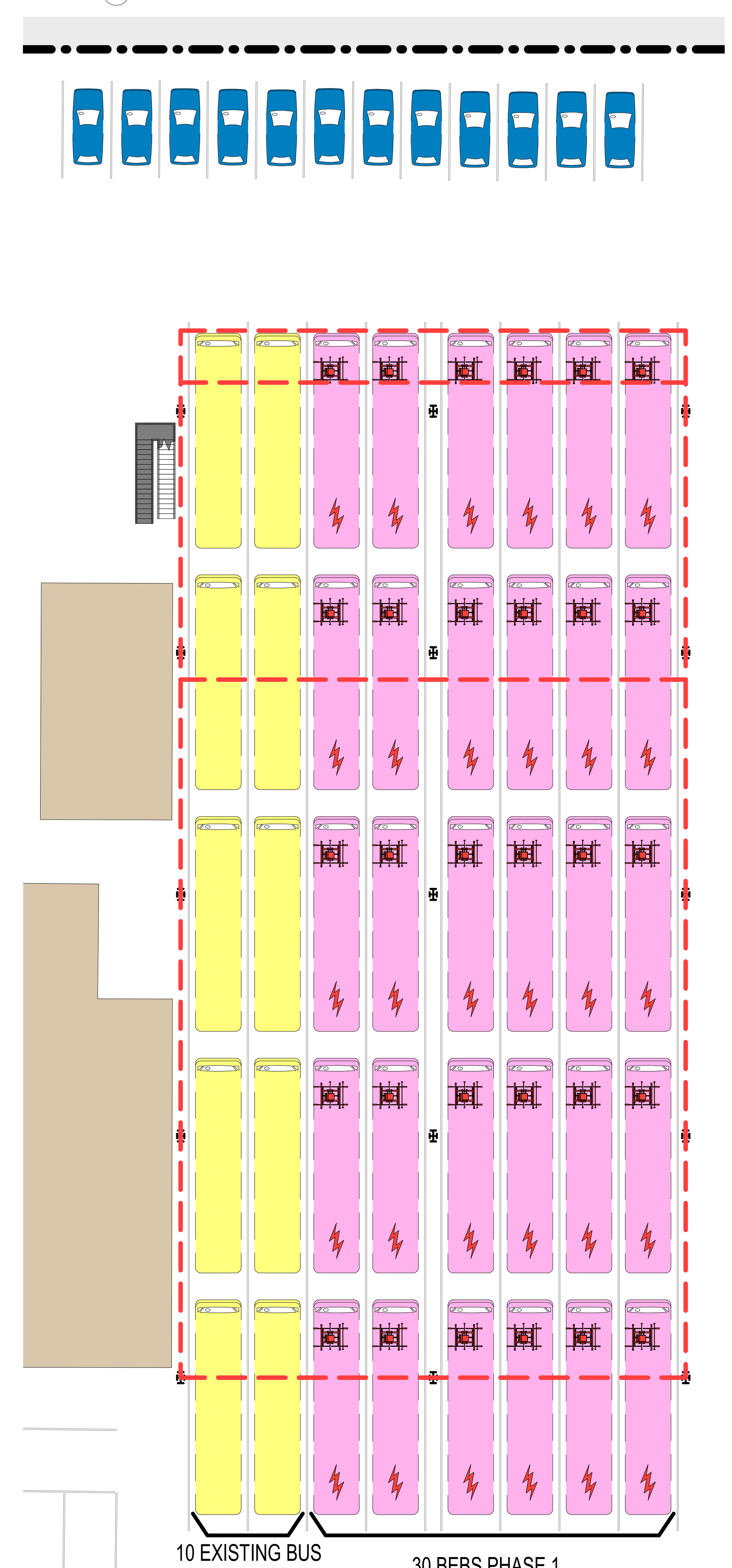
5 NORTH LOT - EXISTING



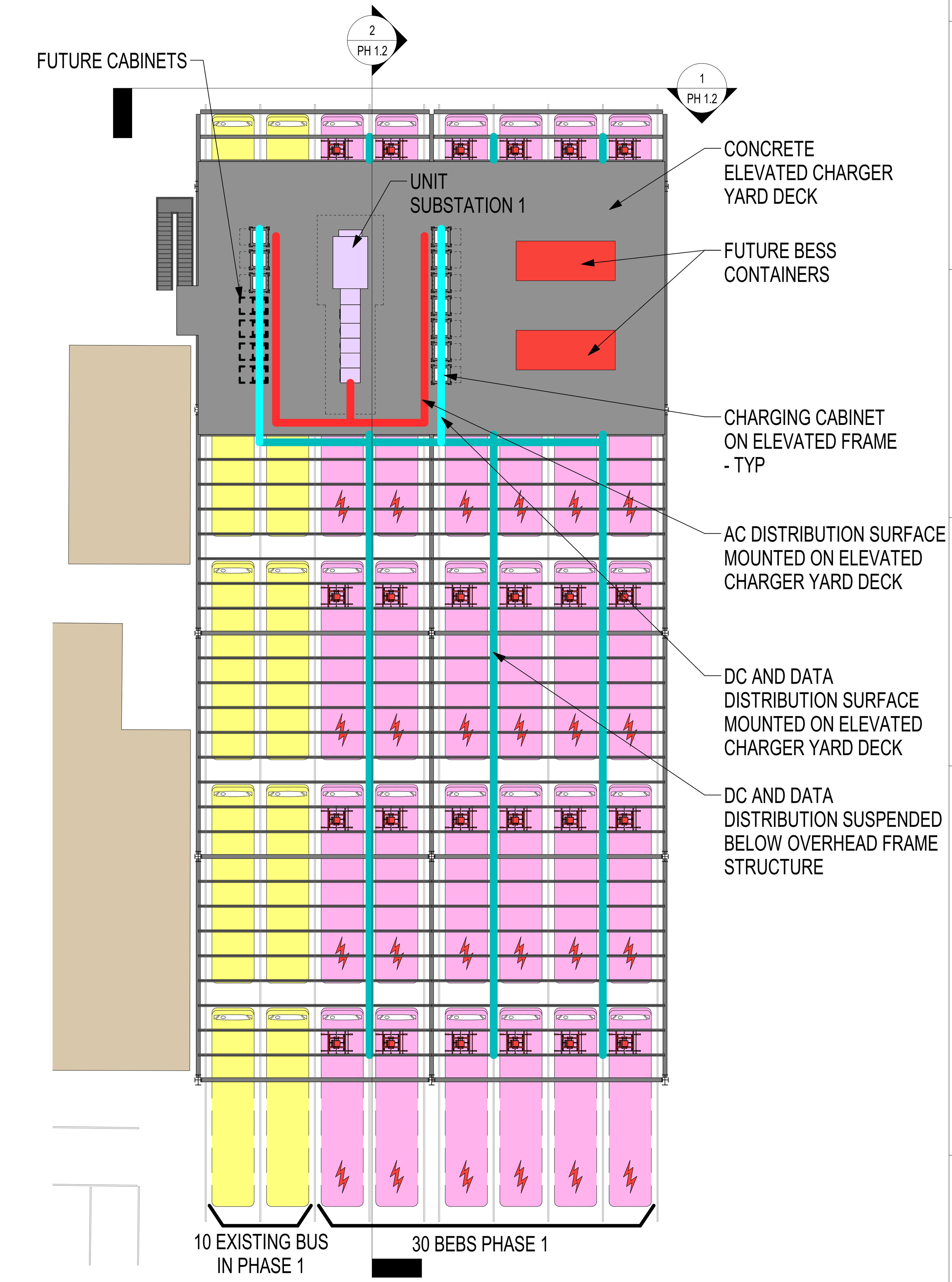
4 PHASE 1 OVERHEAD SUPPORT FRAME
1" = 20'-0"



3 PHASE 1 OVERHEAD FRAME SUPPORT COLUMNS W UG UTILITIES
1" = 20'-0"



2 PHASE 1 GRADE W PHASE 1 BEBS
1" = 20'-0"



1 PHASE 1 OVERHEAD FRAME W PHASE 1 BEBS BELOW
1" = 20'-0"

PROJECT NO. 12127D
DRAWN BY ESR
DATE 2/4/22
SCALE 22x34; 1"=20' 11x17; 1"=40'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

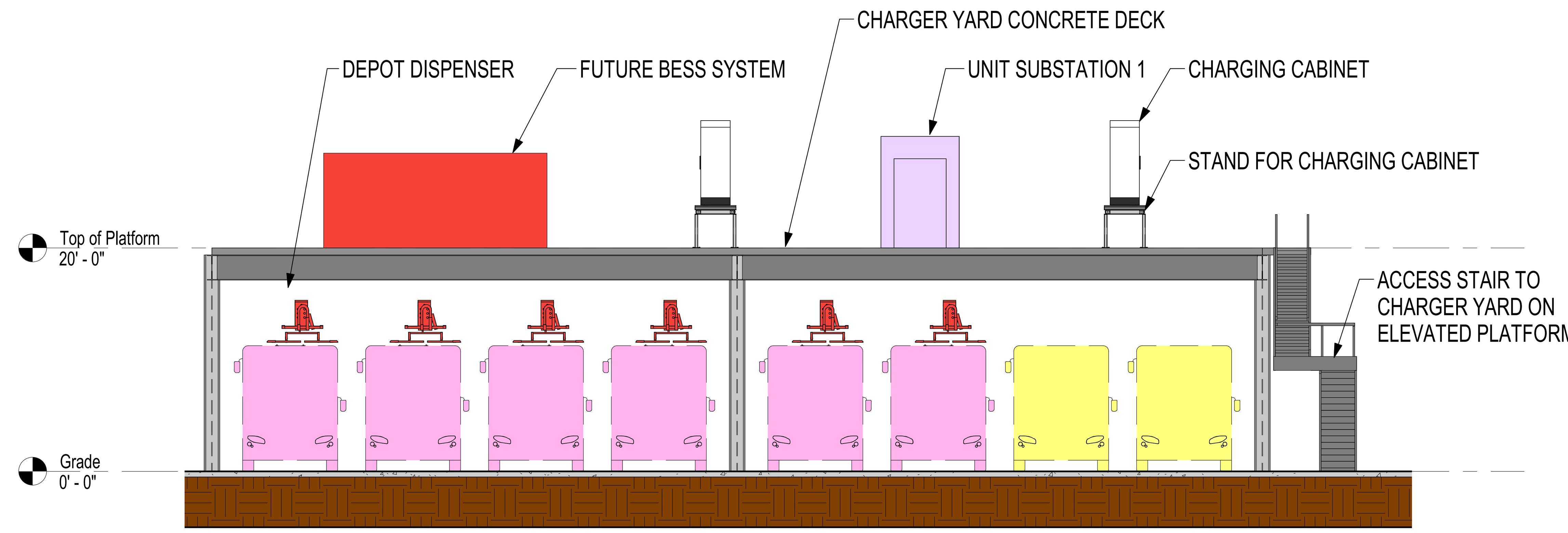
WSP

DRAWING TITLE
NORTH LOT PLANS

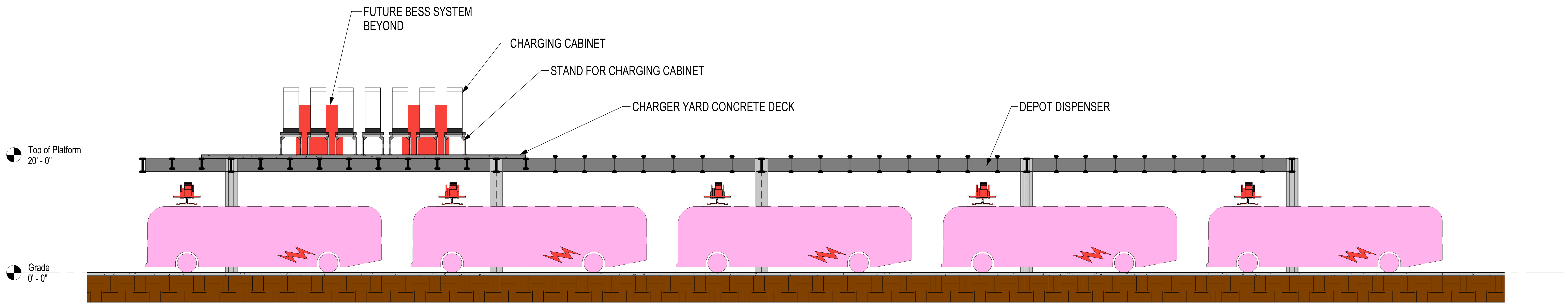
DRAWING NUMBER
PHASE 1
PH 1.1

3/24/2022 9:14:59 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: PHASE 1



1 NORTH LOT - PHASE 1 - ELEVATION
1" = 10'-0"



2 NORTH LOT - PHASE 1 - SECTION
1" = 10'-0"

PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=10' 11x17: 1"=20'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

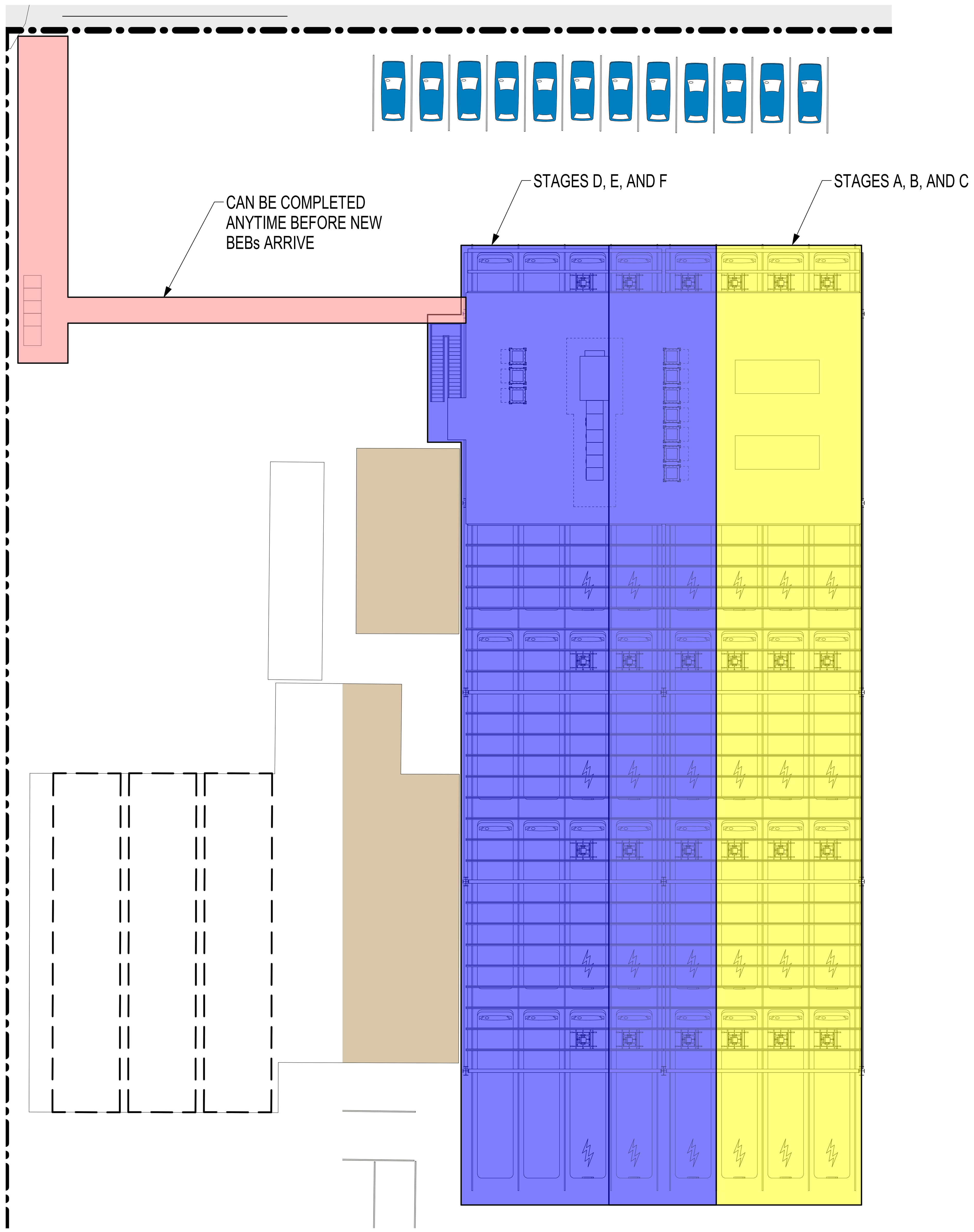
DOKKEN ENGINEERING

WSP

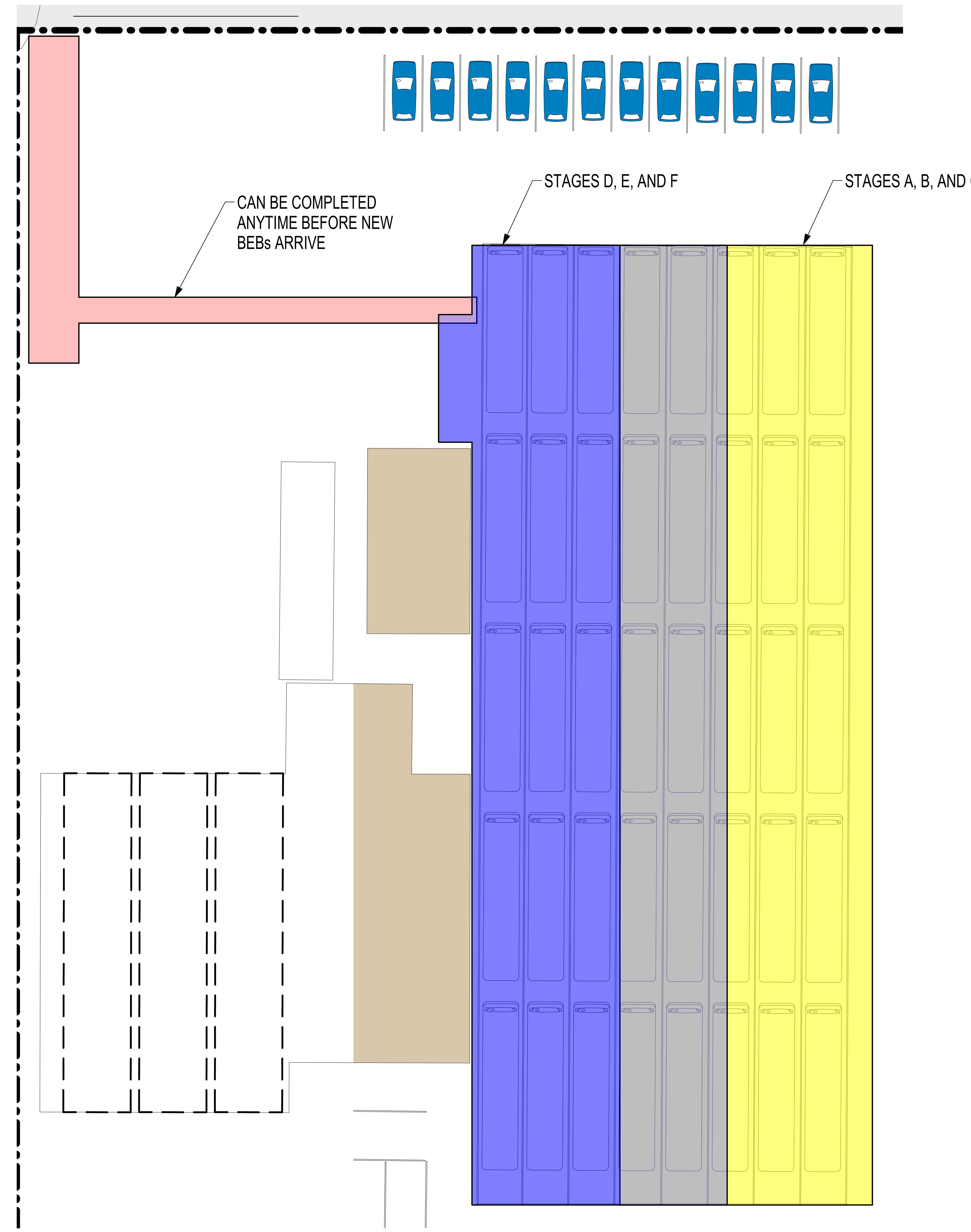
DRAWING TITLE
NORTH LOT SECTIONS

DRAWING NUMBER
PHASE 1
PH 1.2

3/24/2022 9:15:02 AM



2 PHASE 1 STAGING - PHASE 1 COMPLETE
1" = 20'-0"



1 PHASE 1 STAGING - EXISTING
1" = 20'-0"

PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=20' 11x17: 1"=40'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

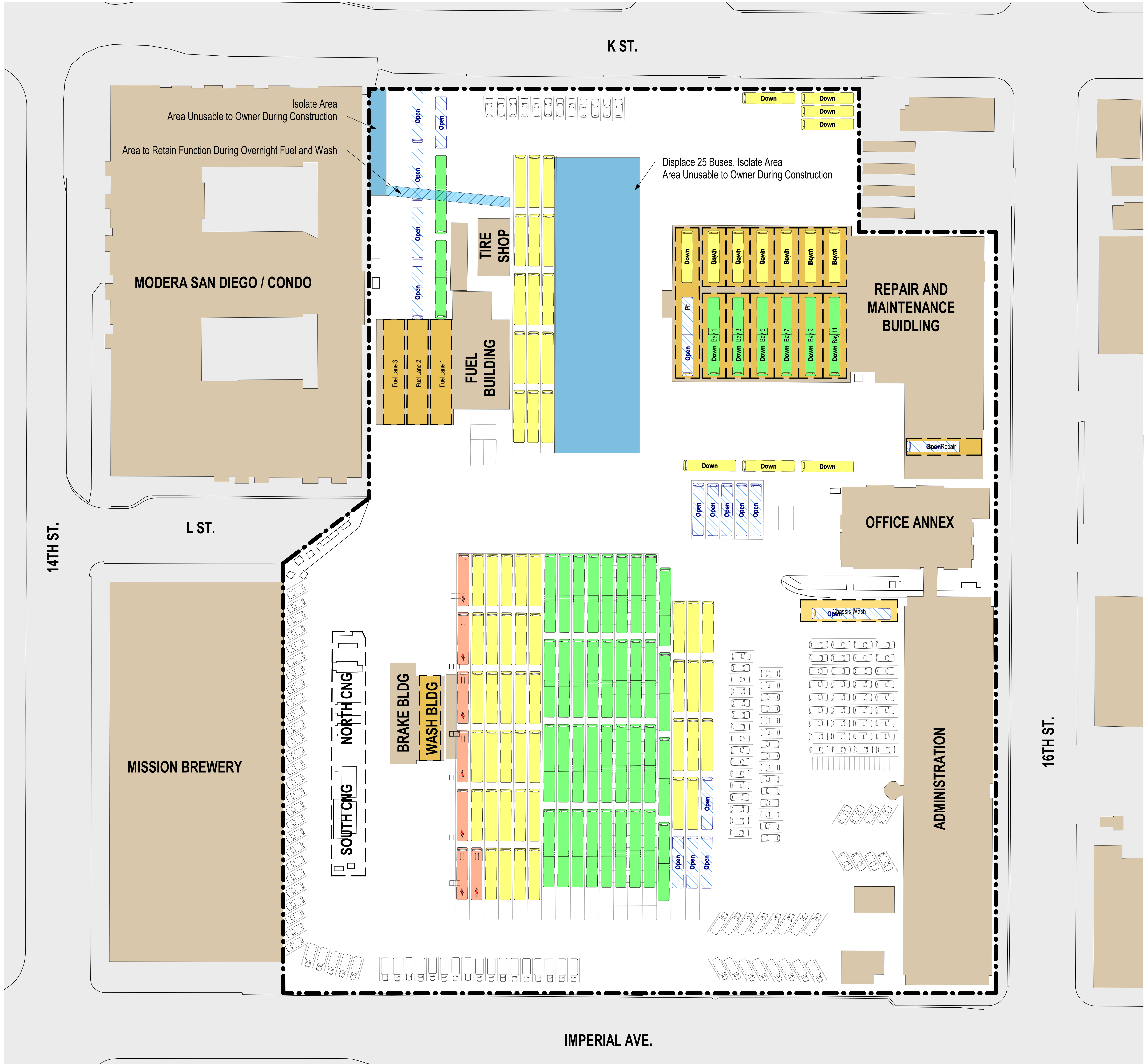
WSP

DRAWING TITLE
NORTH LOT STAGING

DRAWING NUMBER
PHASE 1

PH 1.3

3/24/2022 9:15:05 AM



PROJECT NO. 12127D
DRAWN BY ESR
DATE 2/4/22
SCALE 22x34: 1"=40' 11x17: 1"=80'

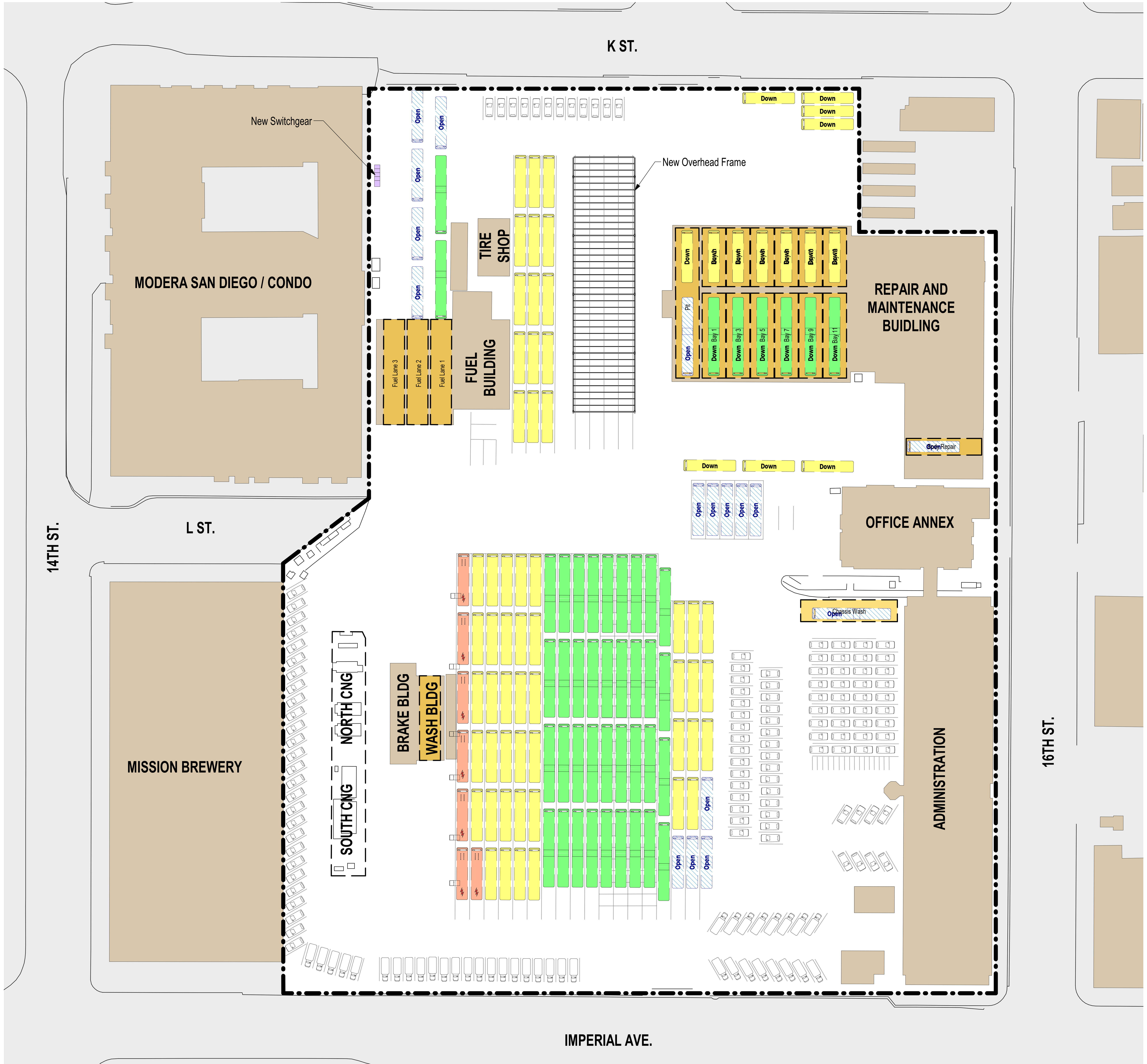
PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DOKKEN ENGINEERING

DRAWING TITLE
STAGE A DEMOLITION / BUS RELOCATION

DRAWING NUMBER
PHASE 1 STAGING
PH 1.A

3/24/2022 9:15:09 AM



PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=40' 11x17: 1"=80'

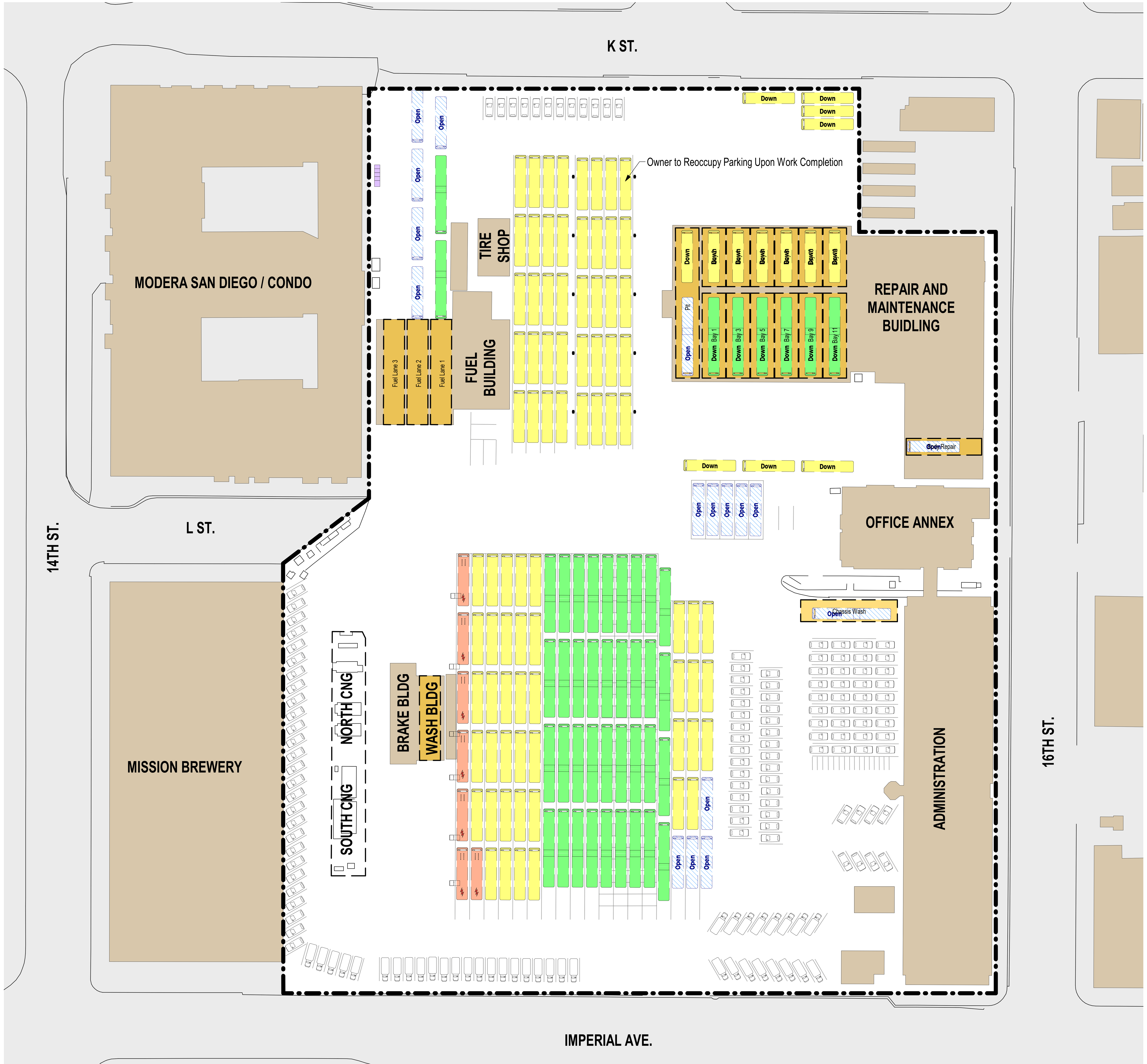
PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
STAGE B CONSTRUCTION

DRAWING NUMBER
PHASE 1 STAGING
PH 1.B

3/24/2022 9:15:12 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: PHASE 1 STAGING



PROJECT NO. 12127D
DRAWN BY ESR
DATE 2/4/22
SCALE 22x34: 1"=40' 11x17: 1"=80'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DOKKEN ENGINEERING

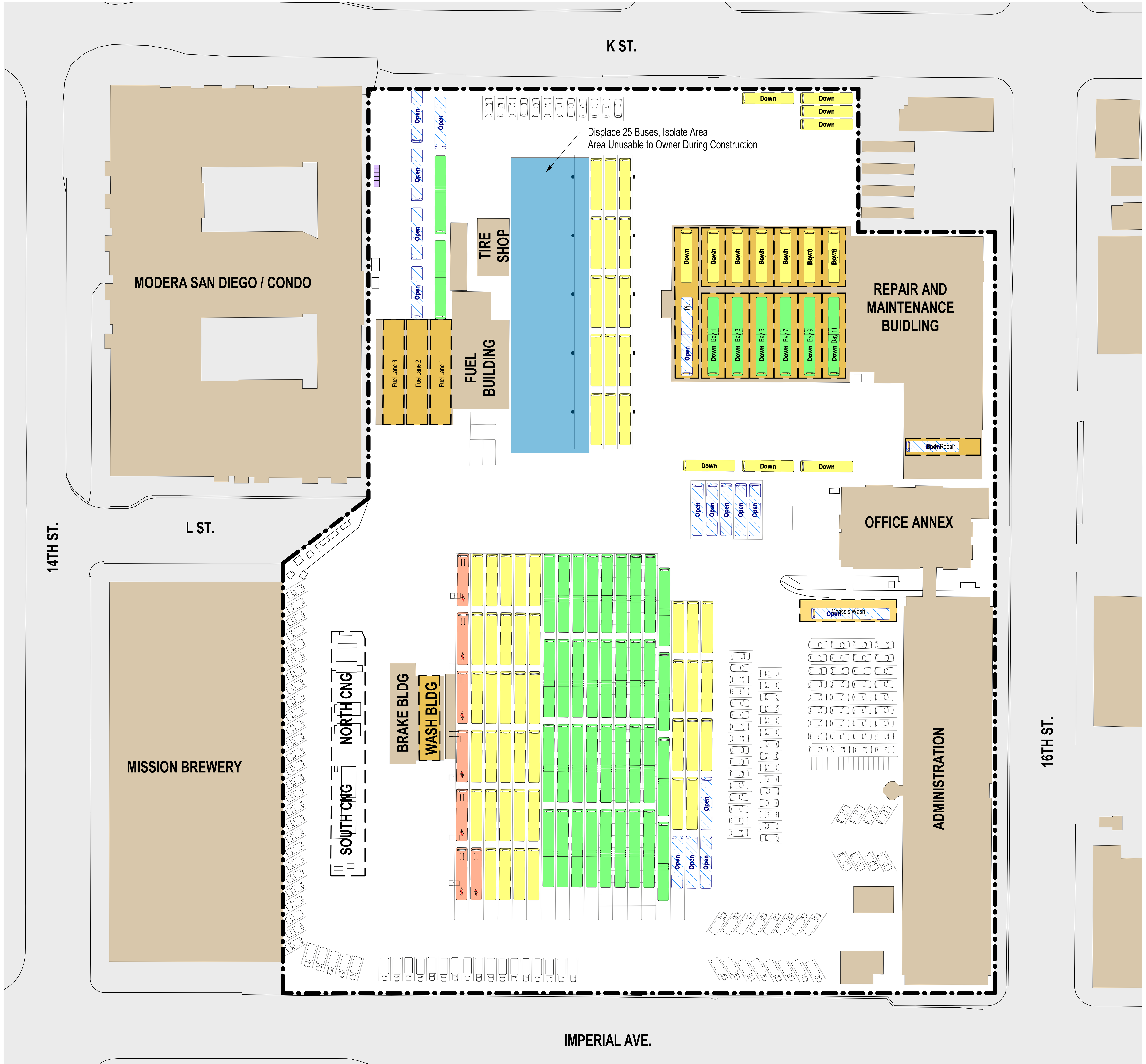
DRAWING TITLE
STAGE C REOCCUPY

DRAWING NUMBER
PHASE 1 STAGING

PH 1.C

3/24/2022 9:15:16 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: PHASE 1 STAGING



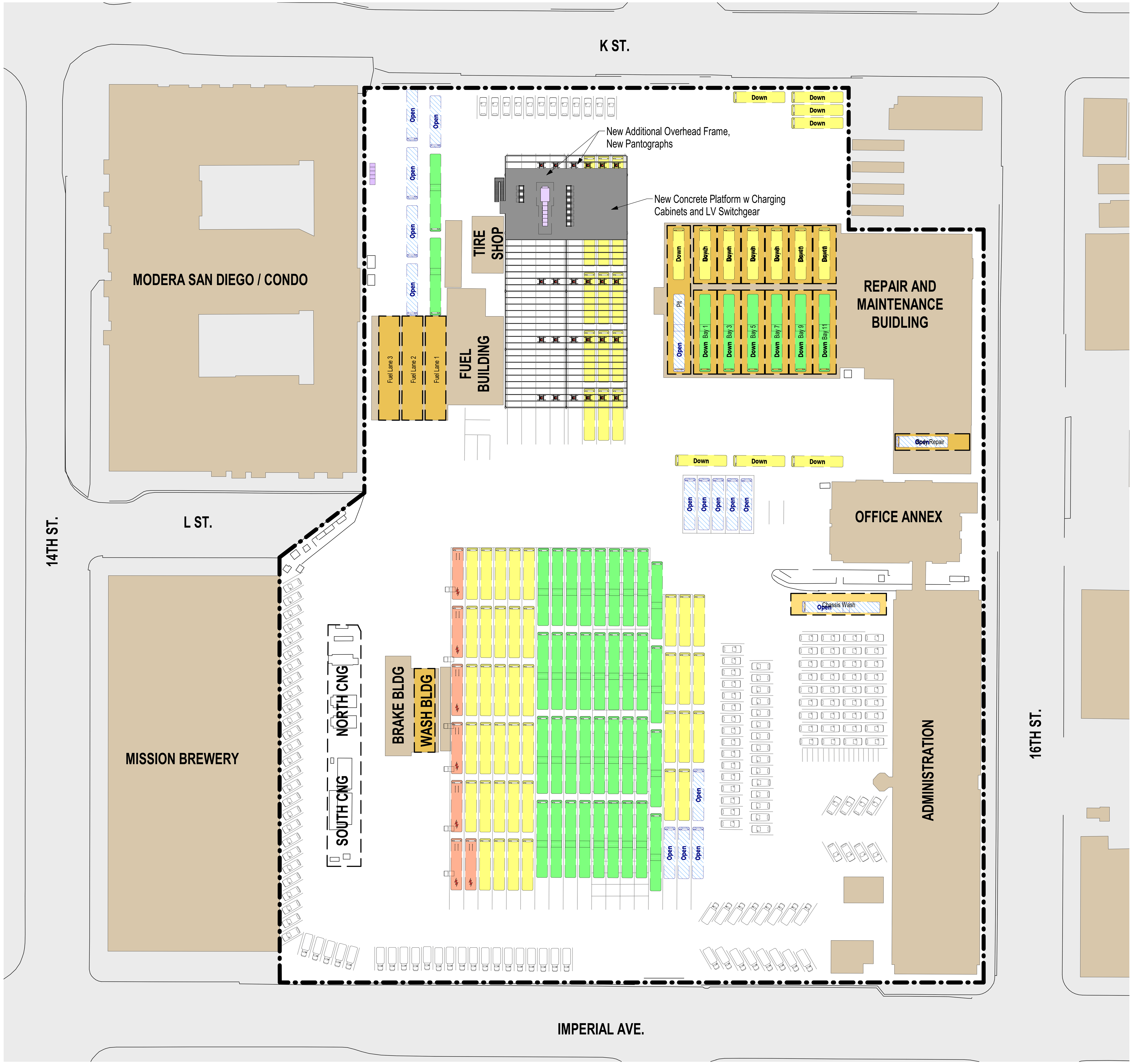
PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=40' 11x17: 1"=80'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
STAGE D DEMOLITION / BUS RELOCATION

DRAWING NUMBER
PHASE 1 STAGING
PH 1.D

3/24/2022 9:15:20 AM



PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=40' 11x17: 1"=80'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

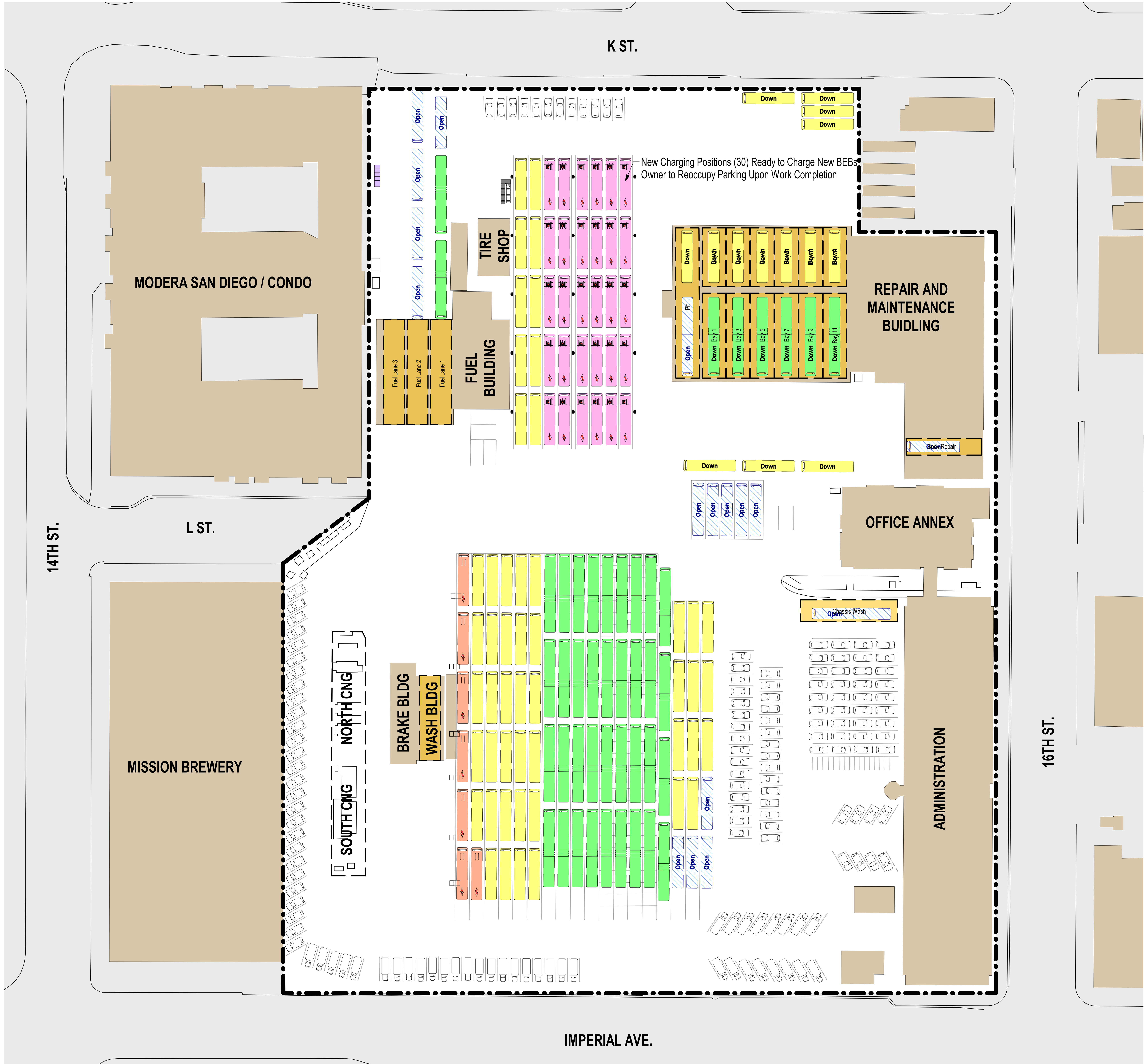
DOKKEN ENGINEERING

DRAWING TITLE
STAGE E CONSTRUCTION

DRAWING NUMBER
PHASE 1 STAGING
PH 1.E

3/24/2022 9:15:24 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: PHASE 1 STAGING



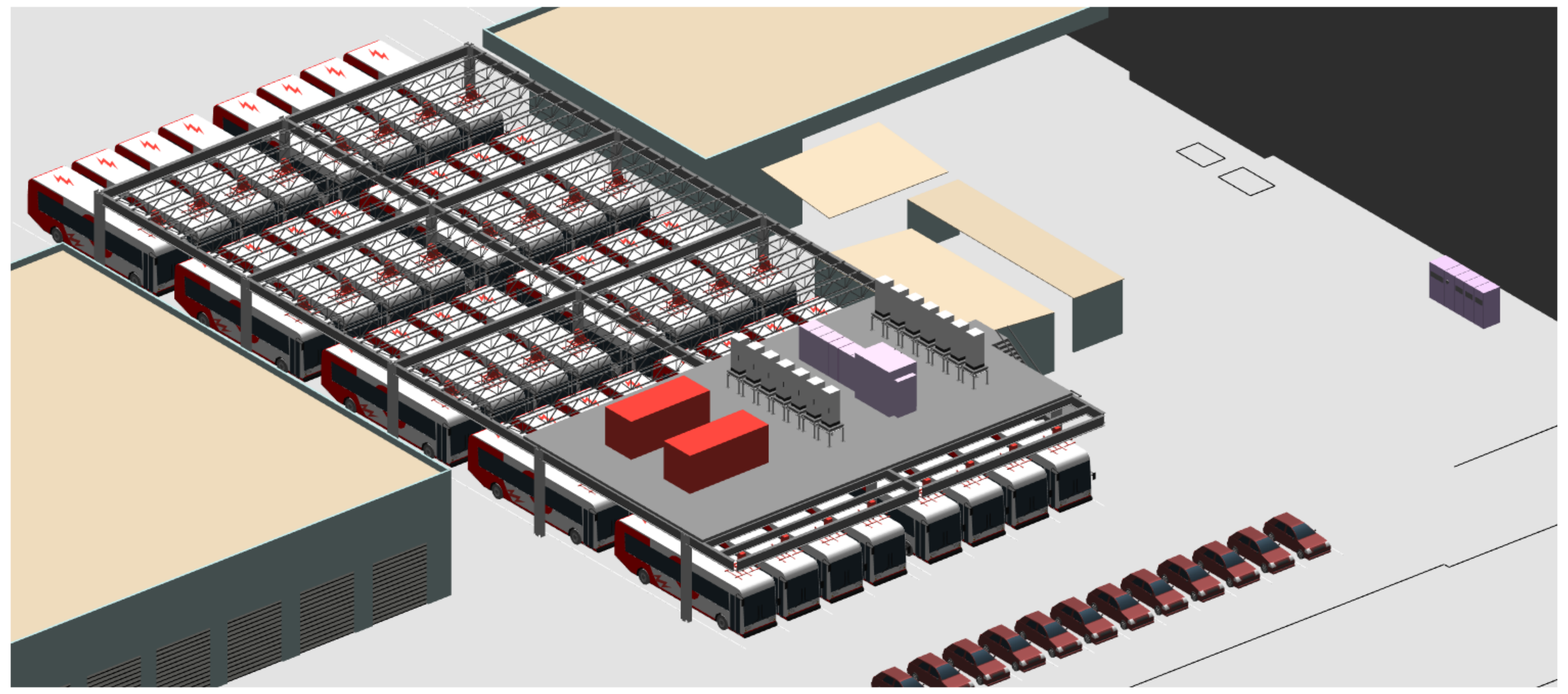
PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=40' 11x17: 1"=80'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

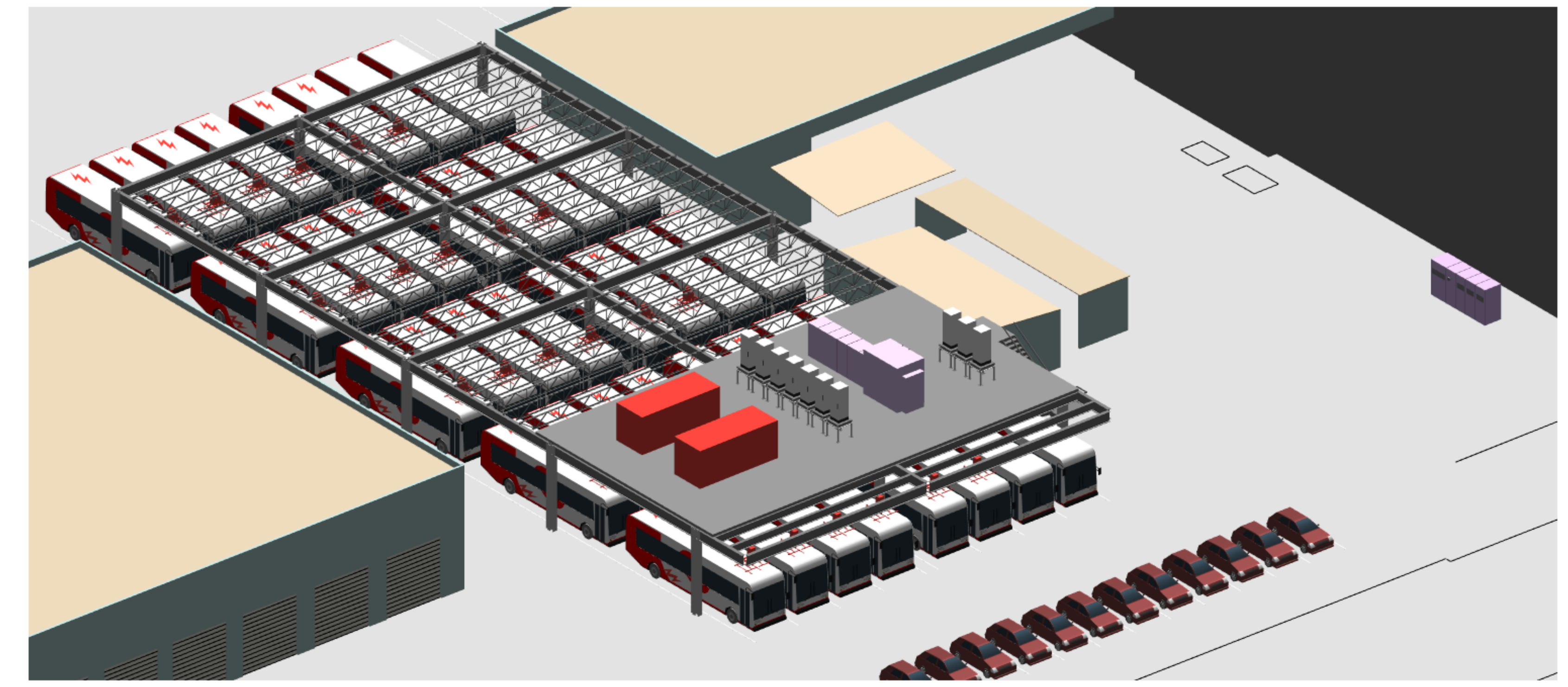
DRAWING TITLE
STAGE F REOCCUPY

DRAWING NUMBER
PHASE 1 STAGING
PH 1.F

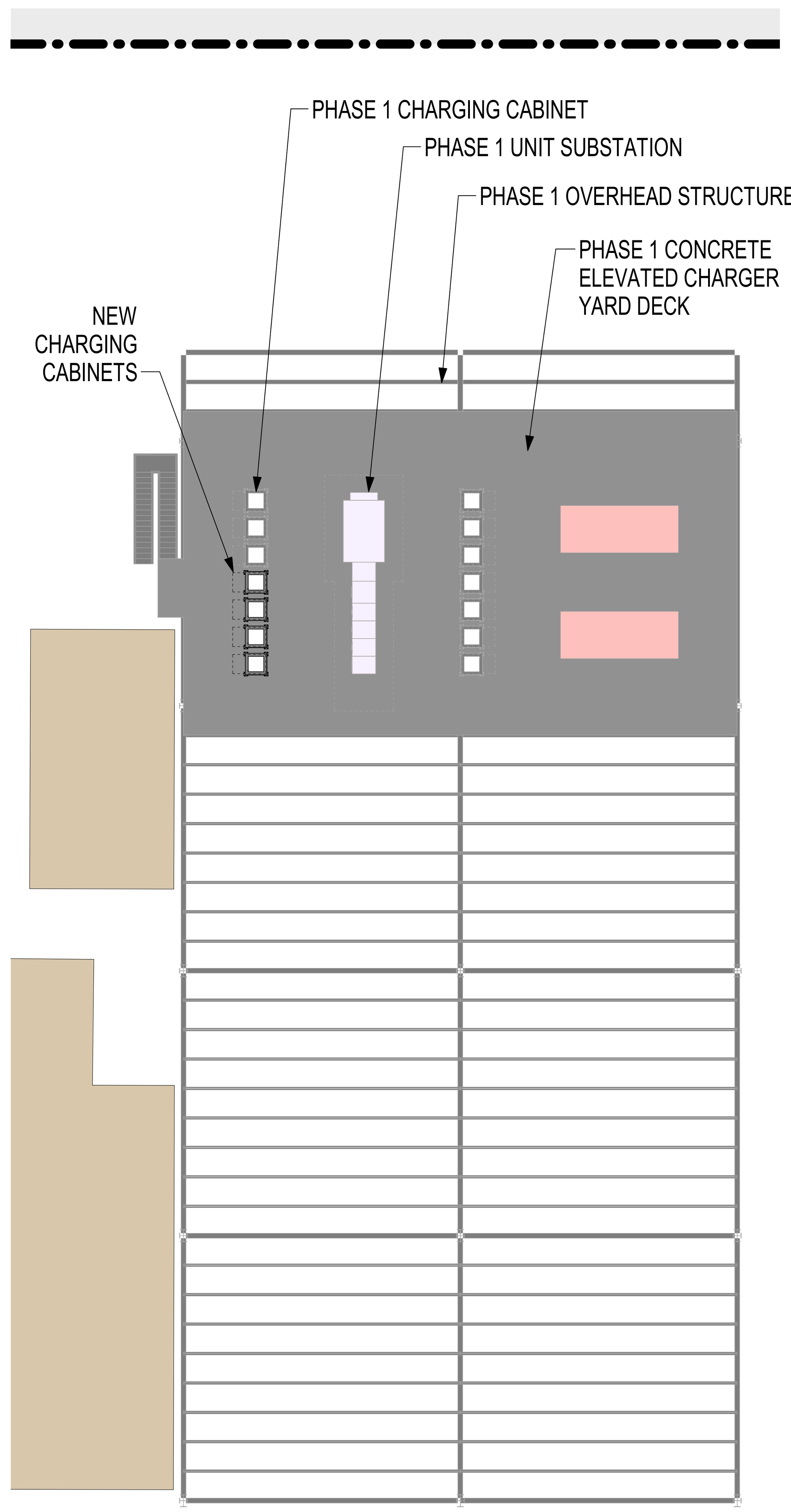
3/24/2022 9:15:28 AM



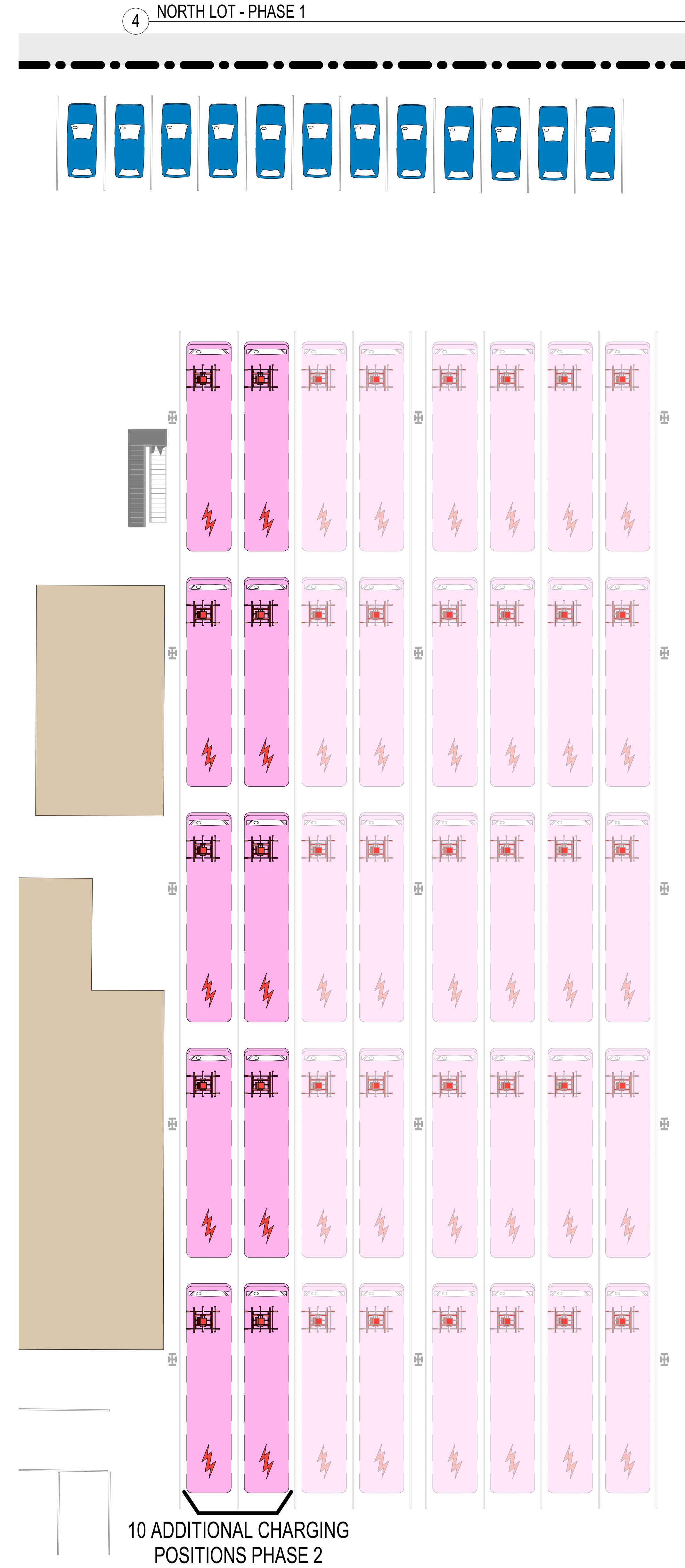
5 NORTH LOT - PHASE 2



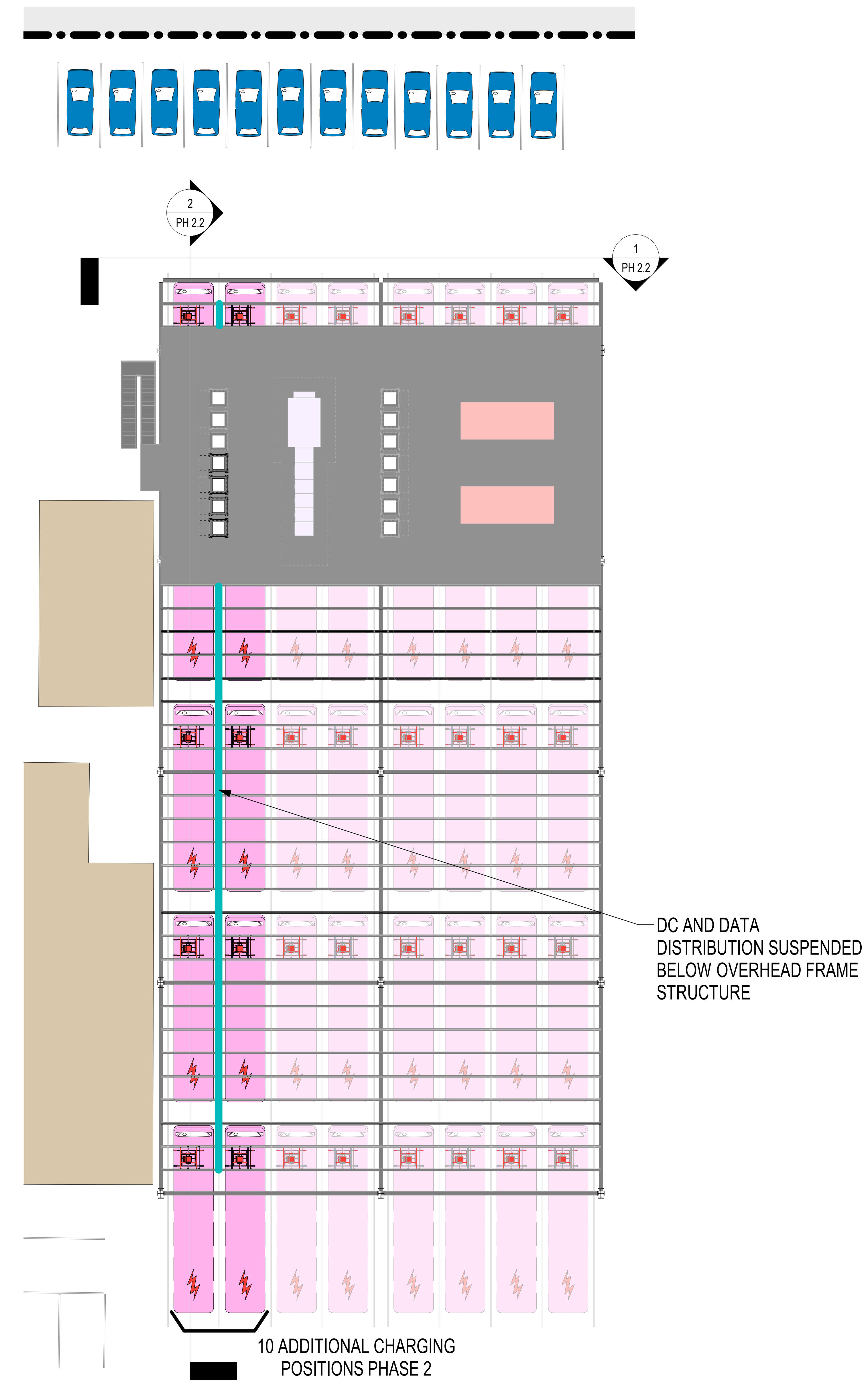
4 NORTH LOT - PHASE 1



3 PHASE 2 OVERHEAD SUPPORT FRAME
1" = 20'-0"



2 PHASE 2 GRADE W PHASE 1 BEBS
1" = 20'-0"



1 PHASE 2 OVERHEAD FRAME W PHASE 1 BEBS BELOW
1" = 20'-0"

PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=20' 11x17: 1"=40'

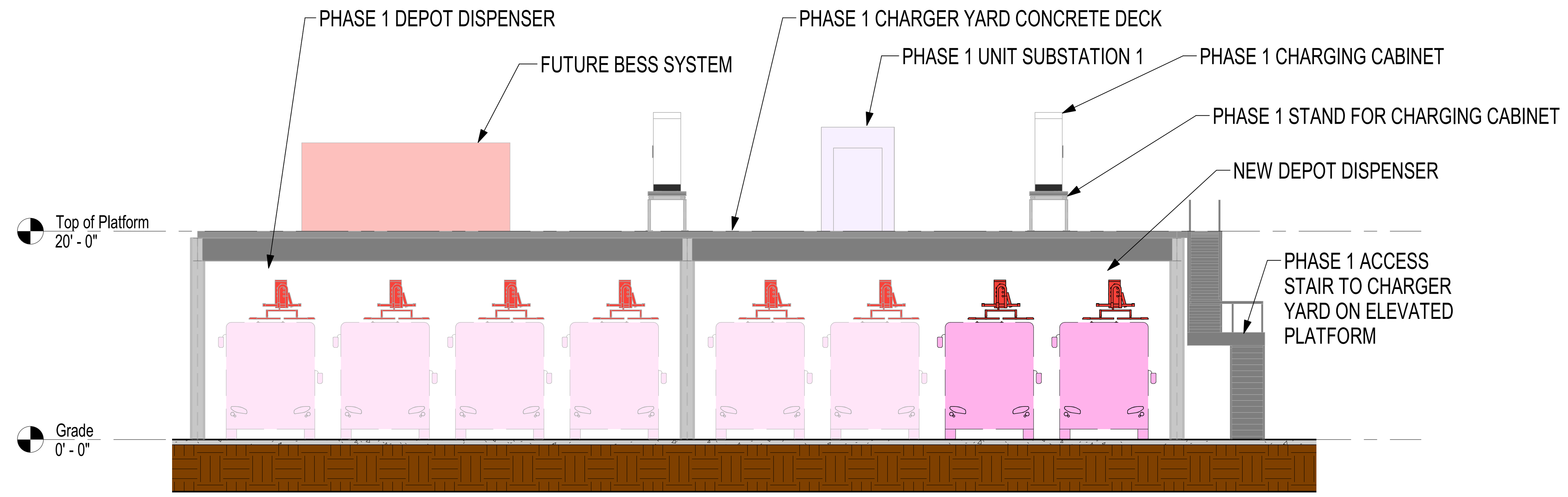
PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
NORTH LOT ADDITIONAL 10 BEB PLANS

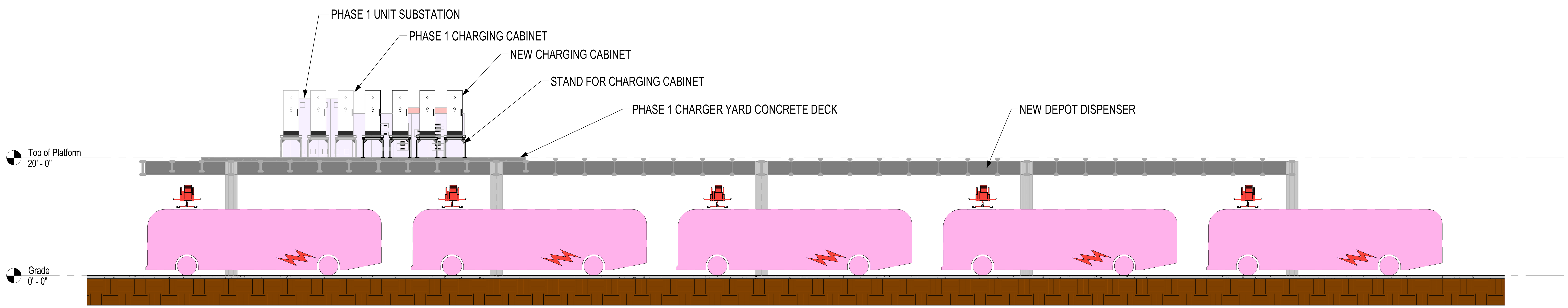
DRAWING NUMBER
PHASE 2
PH 2.1

3/24/2022 9:15:35 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: PHASE 2



1 NORTH LOT - PHASE 2 - ELEVATION
1" = 10'-0"



2 NORTH LOT - PHASE 2 - SECTION
1" = 10'-0"

PROJECT NO. 12127D
DRAWN BY ESR
DATE 2/4/22
SCALE 22x34: 1"=10' 11x17: 1"=20'

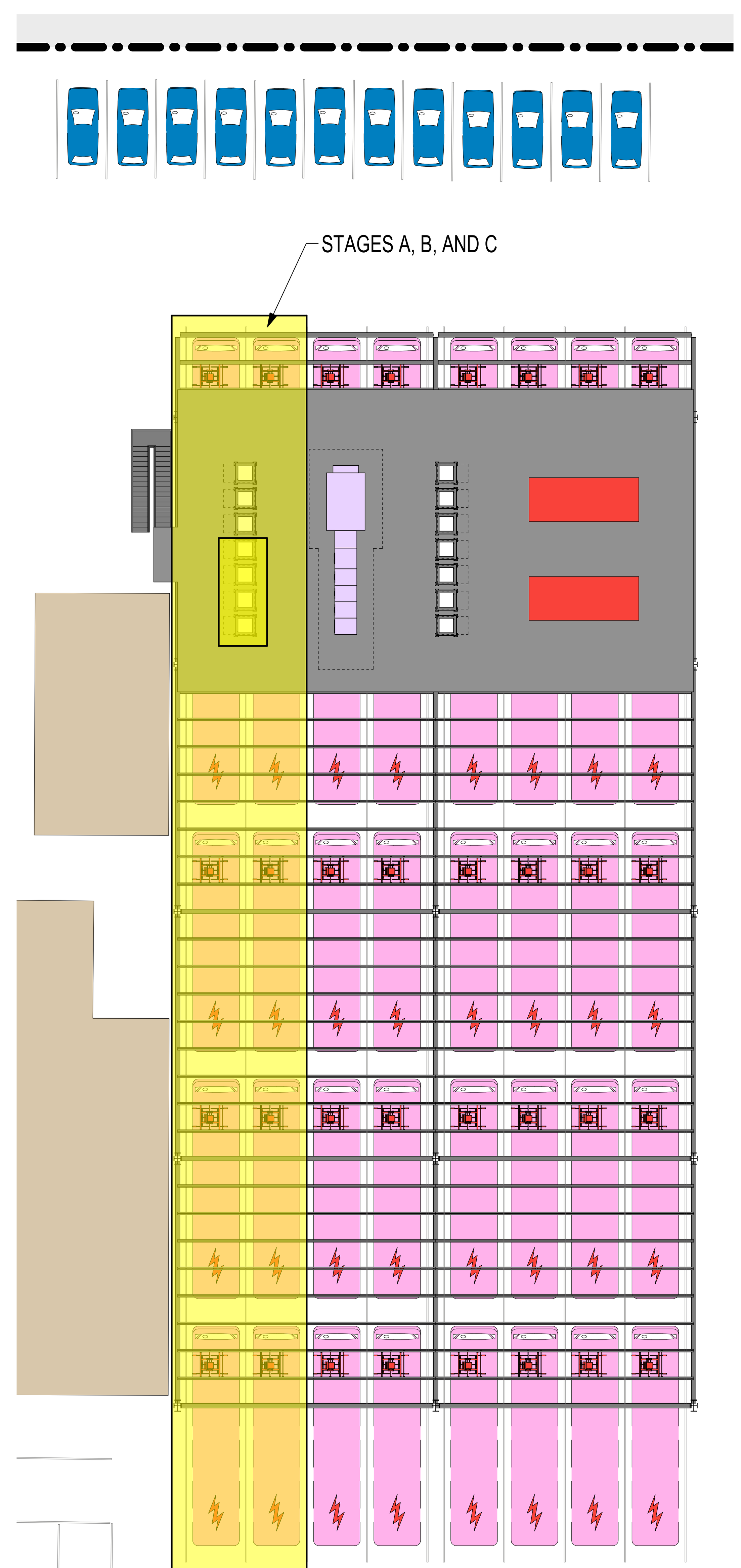
PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
NORTH LOT ADDITIONAL 10 BEB SECTIONS

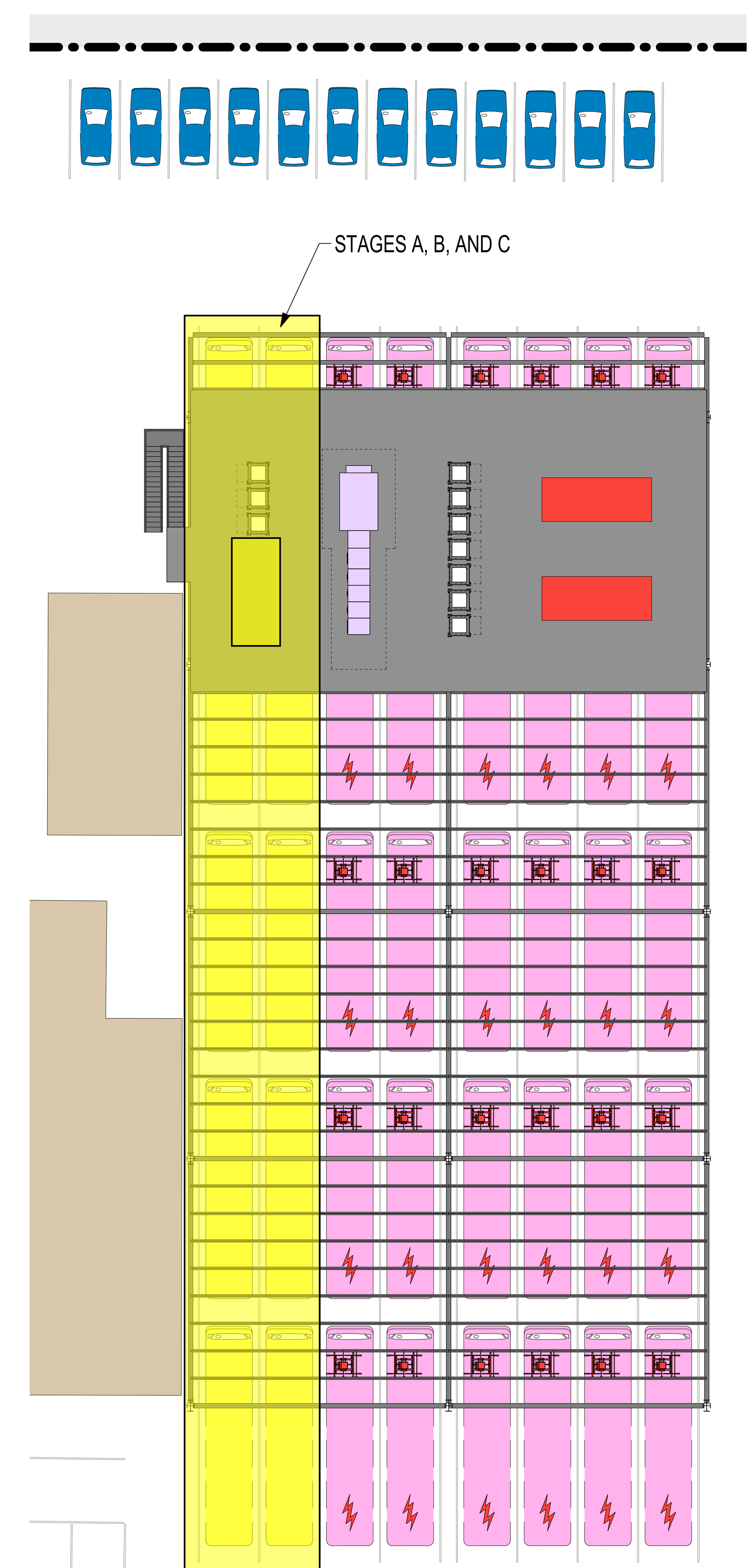
DRAWING NUMBER
PHASE 2
PH 2.2

3/24/2022 9:15:38 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: PHASE 2



2 NORTH LOT - PHASE 2 STAGING - PHASE 2 COMPLETE
1" = 20'-0"



1 NORTH LOT - PHASE 2 STAGING - PHASE 1 COMPLETE
1" = 20'-0"

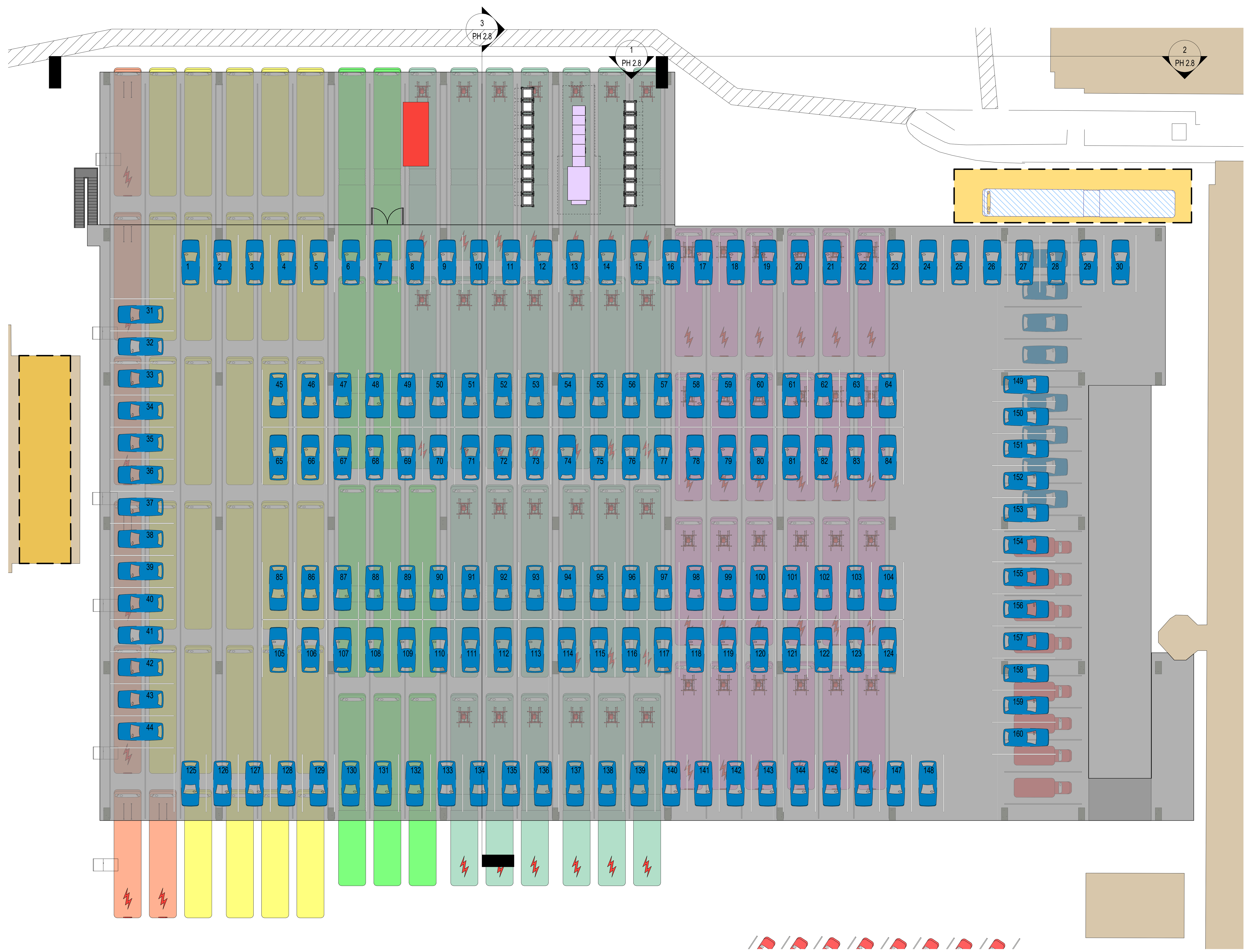
PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=20' 11x17: 1"=40'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
NORTH LOT ADDITIONAL 10 BEB STAGING

DRAWING NUMBER
PHASE 2
PH 2.3

3/24/2022 9:15:42 AM



PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34; 1"=20' 11X17; 1"=40'

PROJECT TITLE

IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE

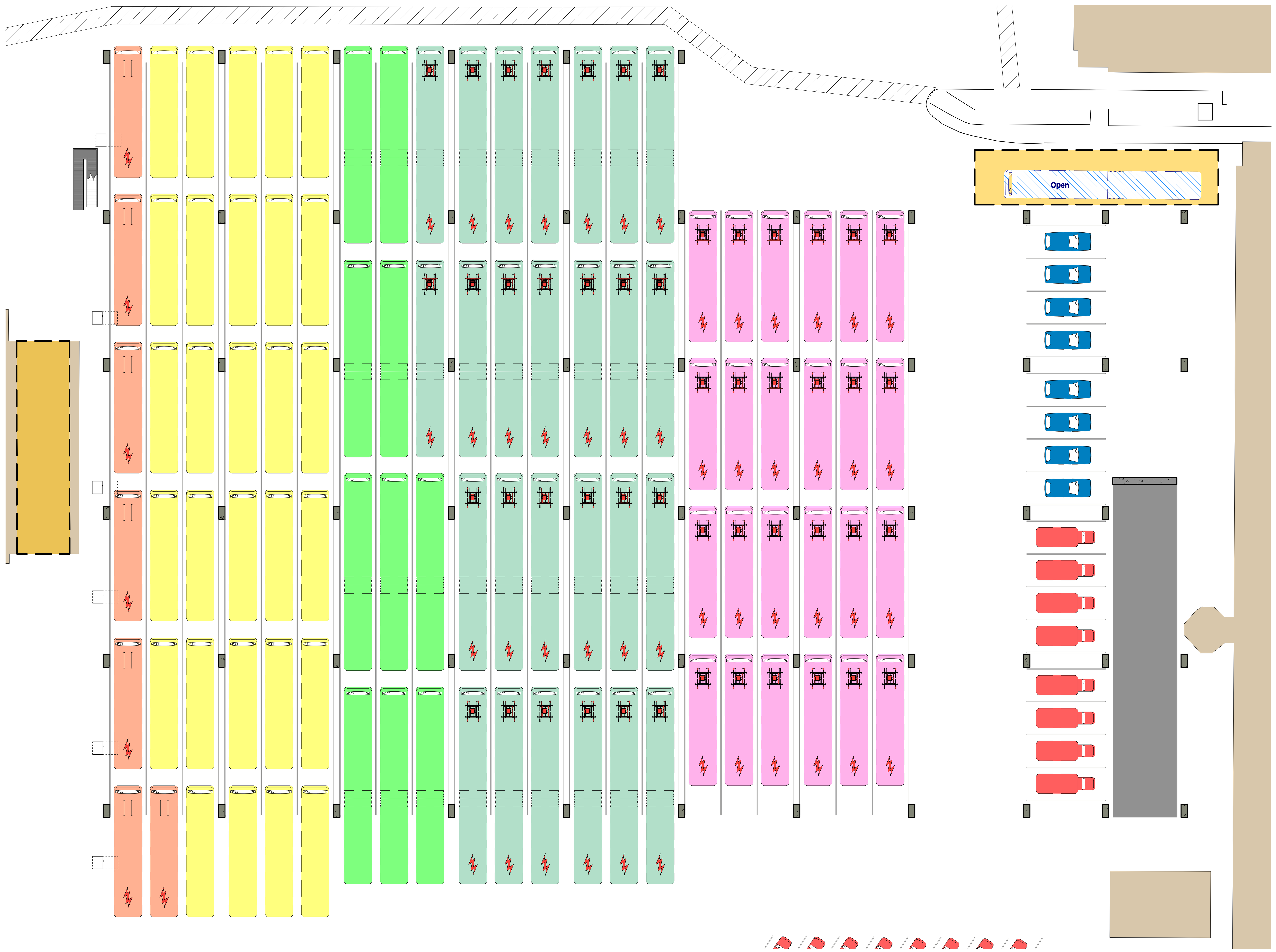
SOUTH LOT

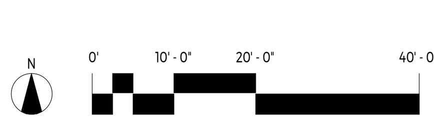
DRAWING NUMBER

PHASE 2

PH 2.4

3/24/2022 9:15:49 AM





PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=20' 11x17: 1"=40'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

WSP

DRAWING TITLE
SOUTH LOT GRADE

DRAWING NUMBER
PHASE 2

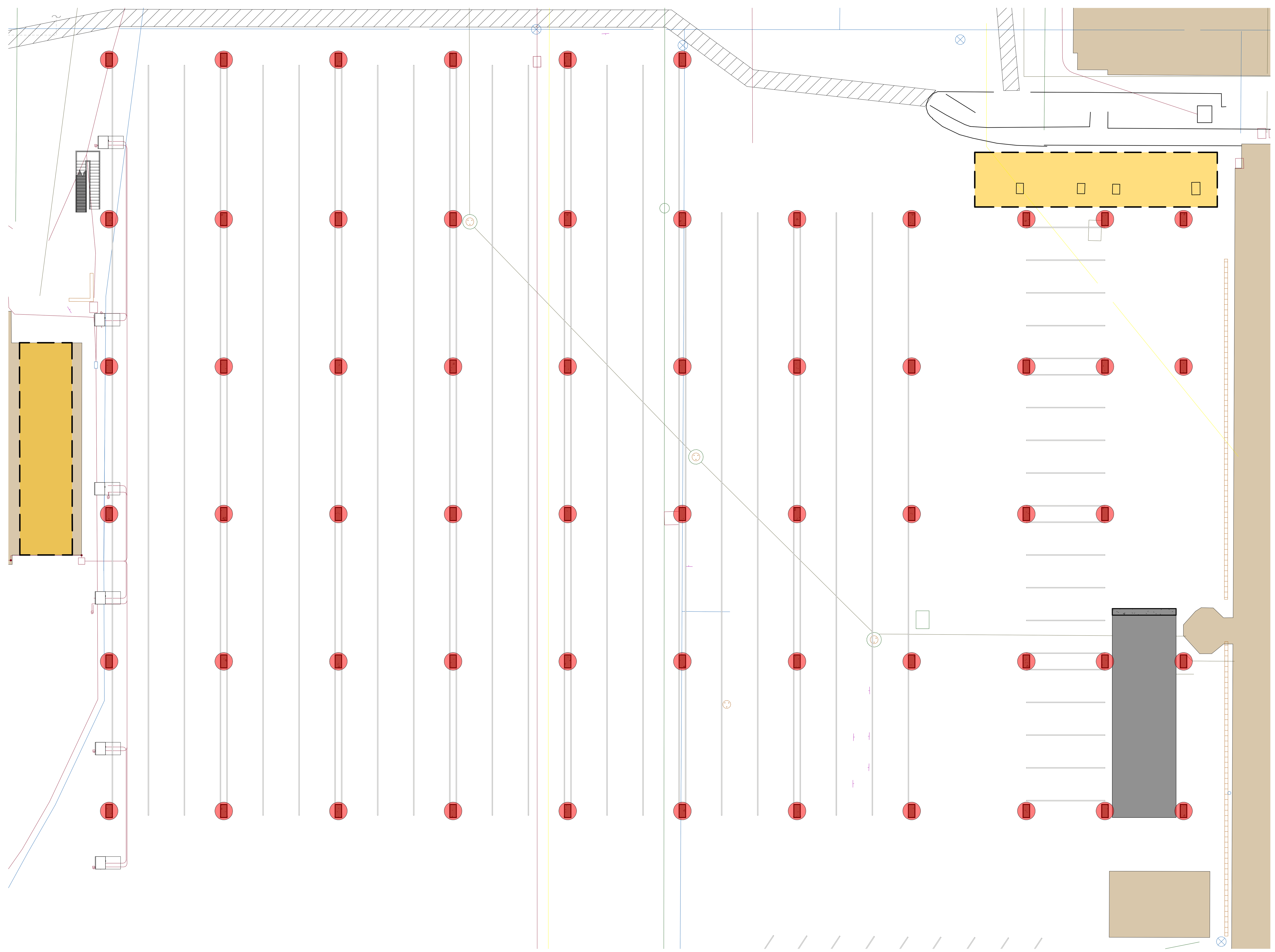
PH 2.5

3/24/2022 9:15:52 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: PHASE 2

LEGEND

Electric	
Telephone line	
Gas Line	
Water Line	
Stormwater Line	
Sewer Line	



PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=20' 11x17: 1"=40'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

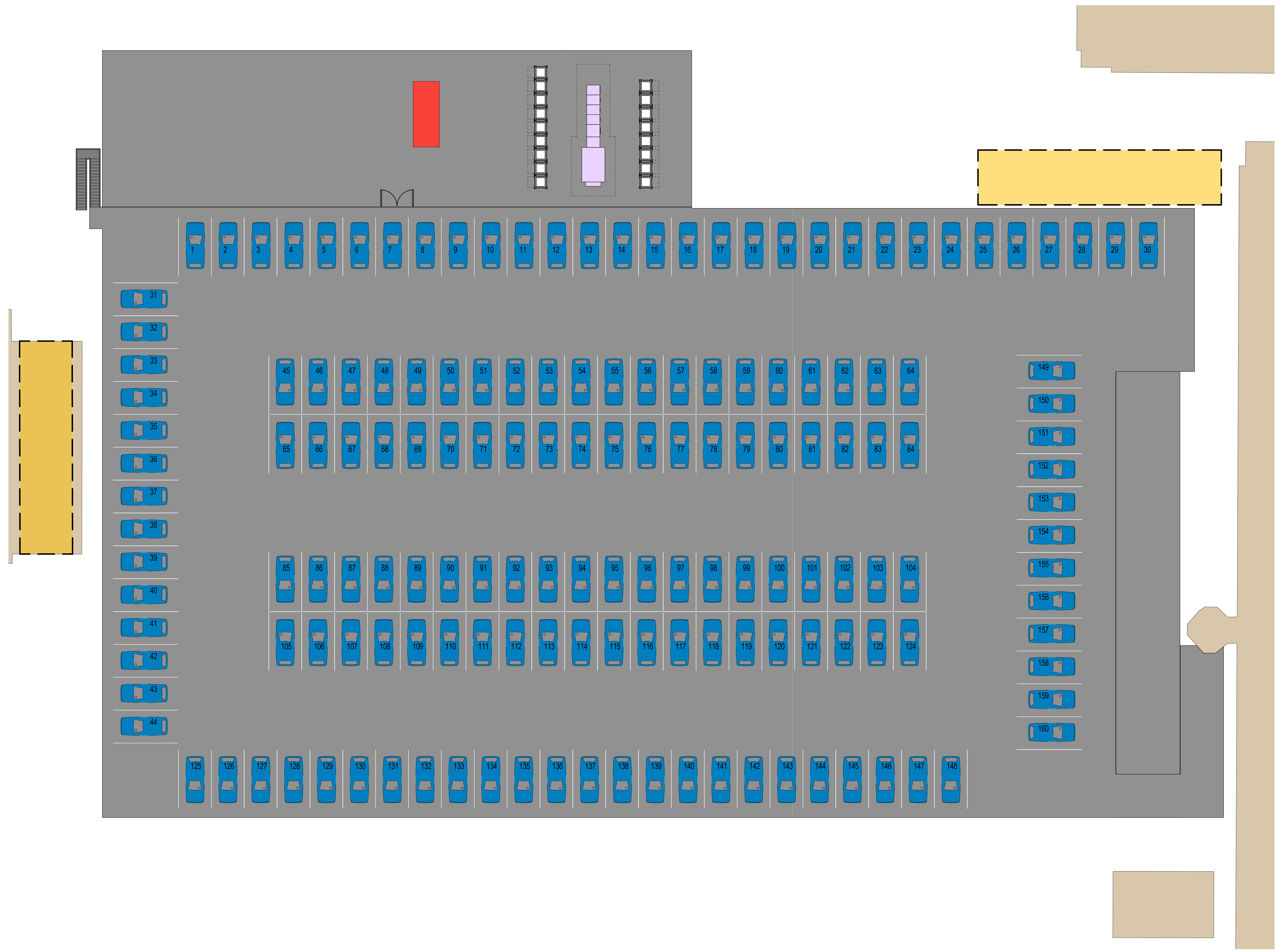
DOKKEN ENGINEERING

WSP

DRAWING TITLE
SOUTH LOT GRADE W UTILITIES

DRAWING NUMBER
PHASE 2
PH 2.6

3/24/2022 9:15:54 AM



PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=20' 11x17: 1"=40'

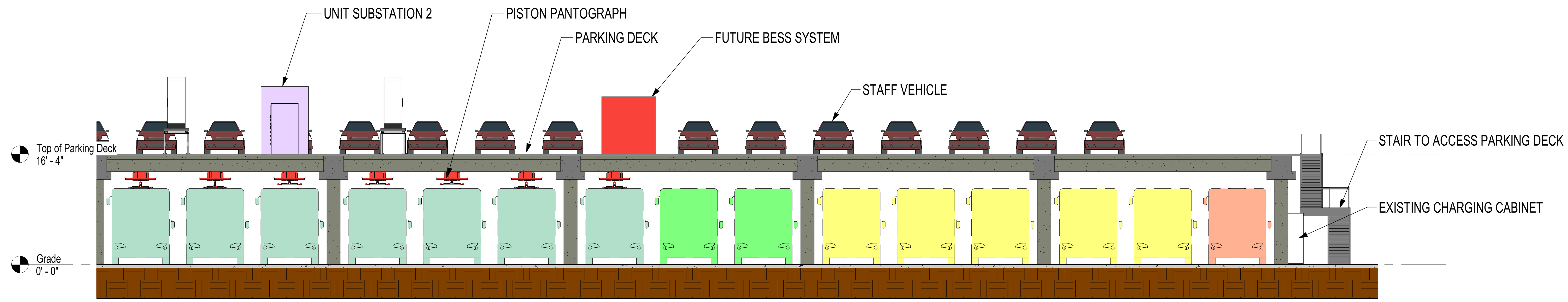
PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
SOUTH LOT PARKING GARAGE DECK

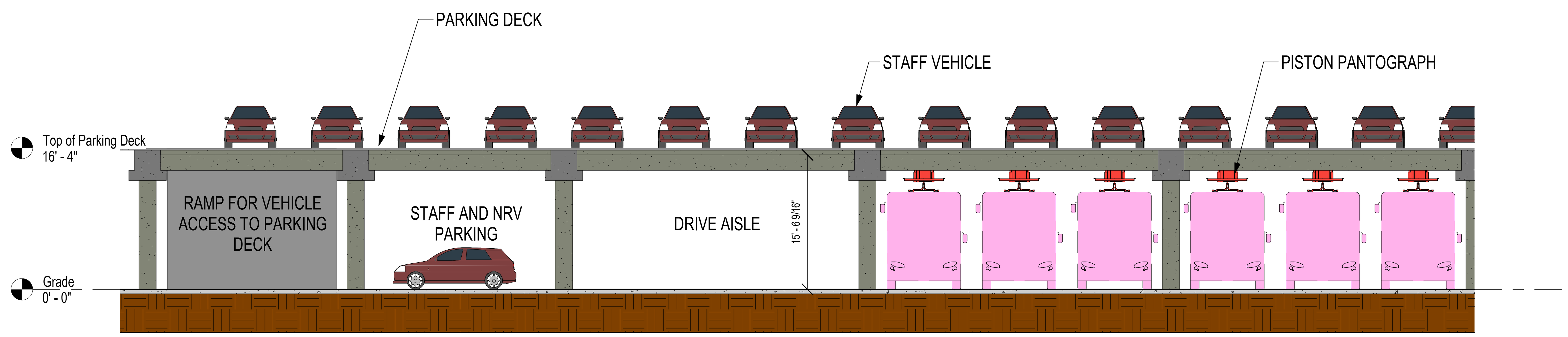
DRAWING NUMBER
PHASE 2

PH 2.7

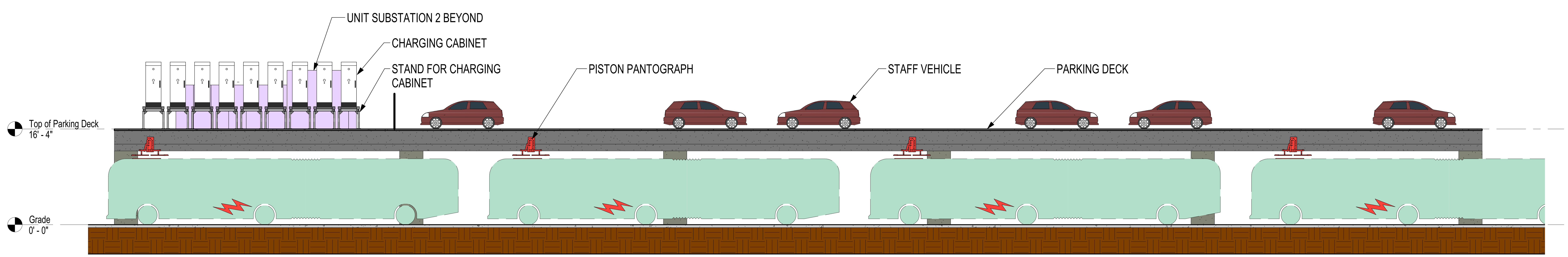
3/24/2022 9:15:58 AM



1 SOUTH LOT - PHASE 2 - SECTION - LATERAL 1
1" = 10'-0"



2 SOUTH LOT - PHASE 2 - SECTION - LATERAL 2
1" = 10'-0"



3 SOUTH LOT - PHASE 2 - SECTION - LONGITUDINAL
1" = 10'-0"

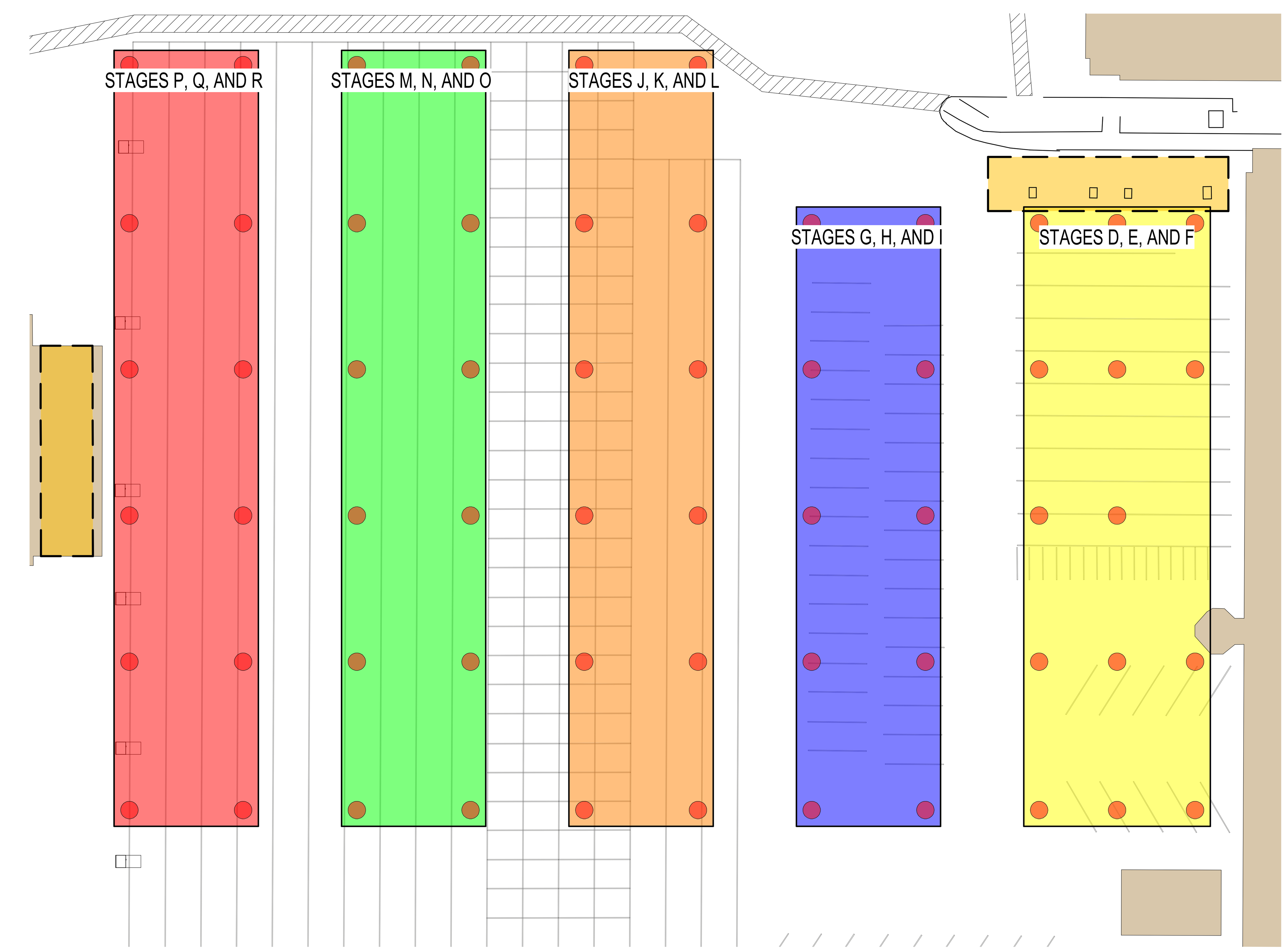
PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=10' 11x17: 1"=20'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

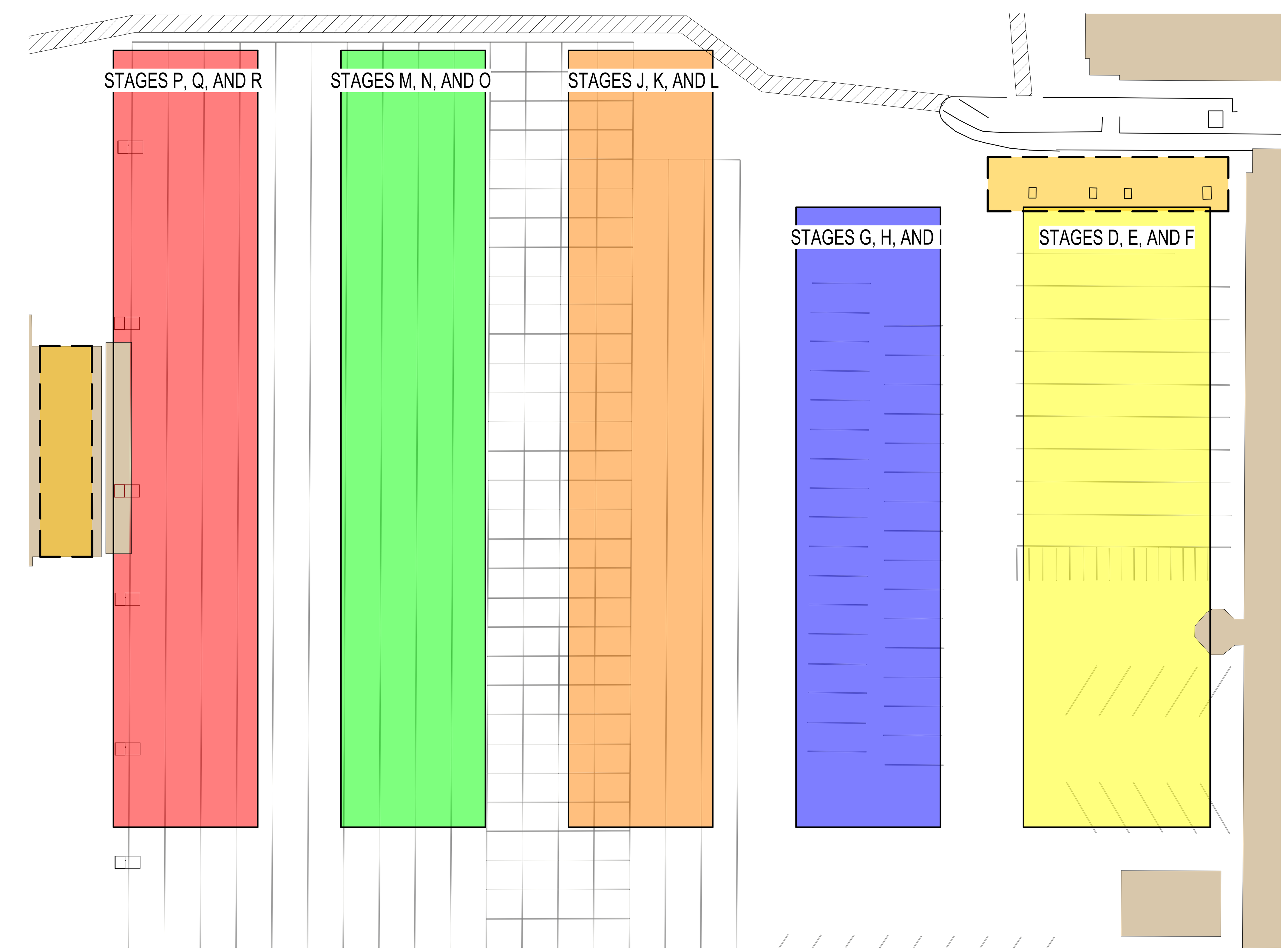
DRAWING TITLE
SOUTH LOT SECTIONS

DRAWING NUMBER
PHASE 2
PH 2.8

3/24/2022 9:16:09 AM



2 SOUTH LOT - PHASE 2 STAGING - PIERS - PIERS COMPLETE
1" = 30'-0"



1 SOUTH LOT - PHASE 2 STAGING - PIERS - EXISTING
1" = 30'-0"

PROJECT NO. 12127D
DRAWN BY ESR
DATE 2/4/22
SCALE 22x34: 1"=30' 11x17: 1"=60'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

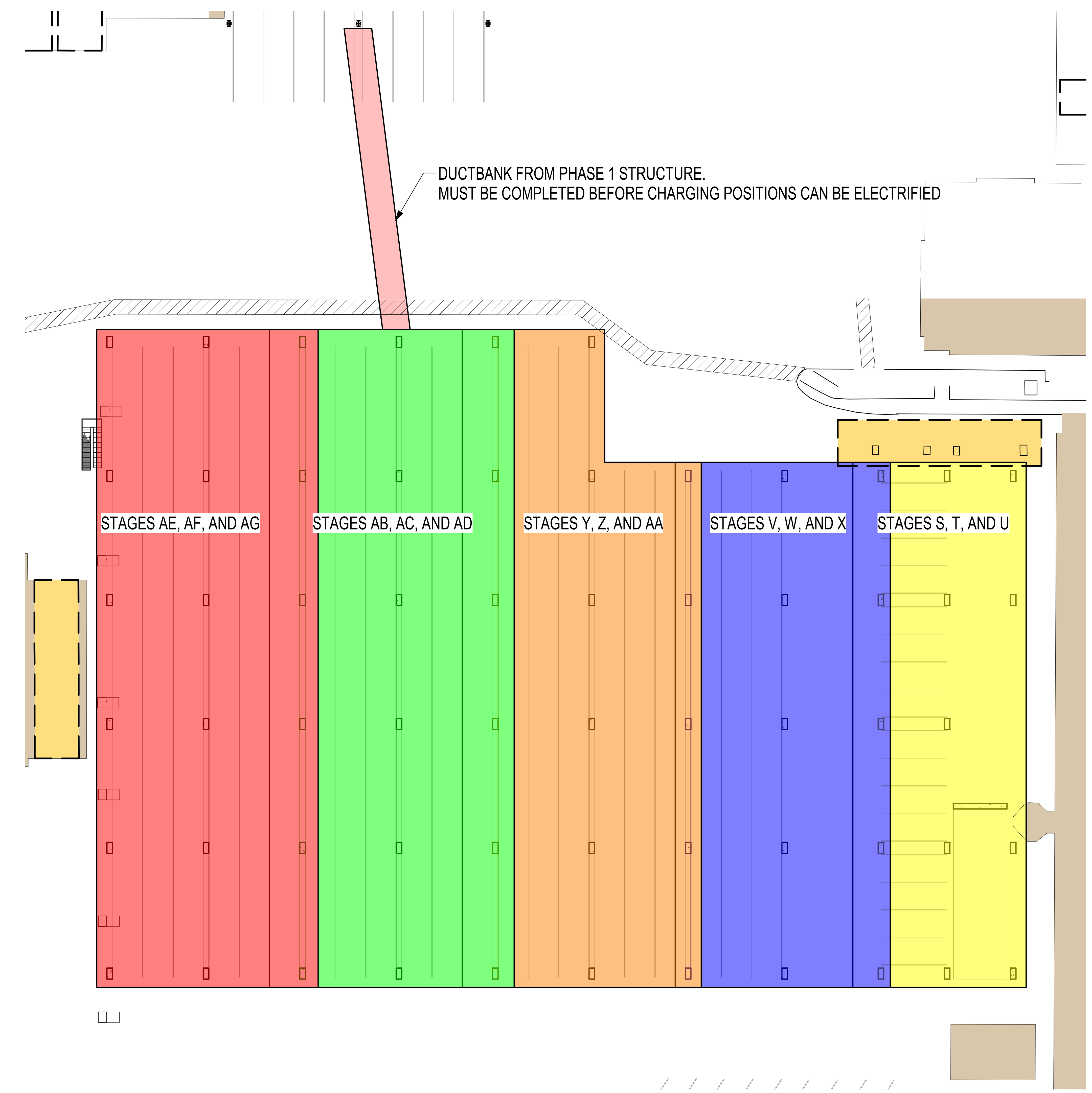
DOKKEN ENGINEERING

DRAWING TITLE
SOUTH LOT STAGING PIERS

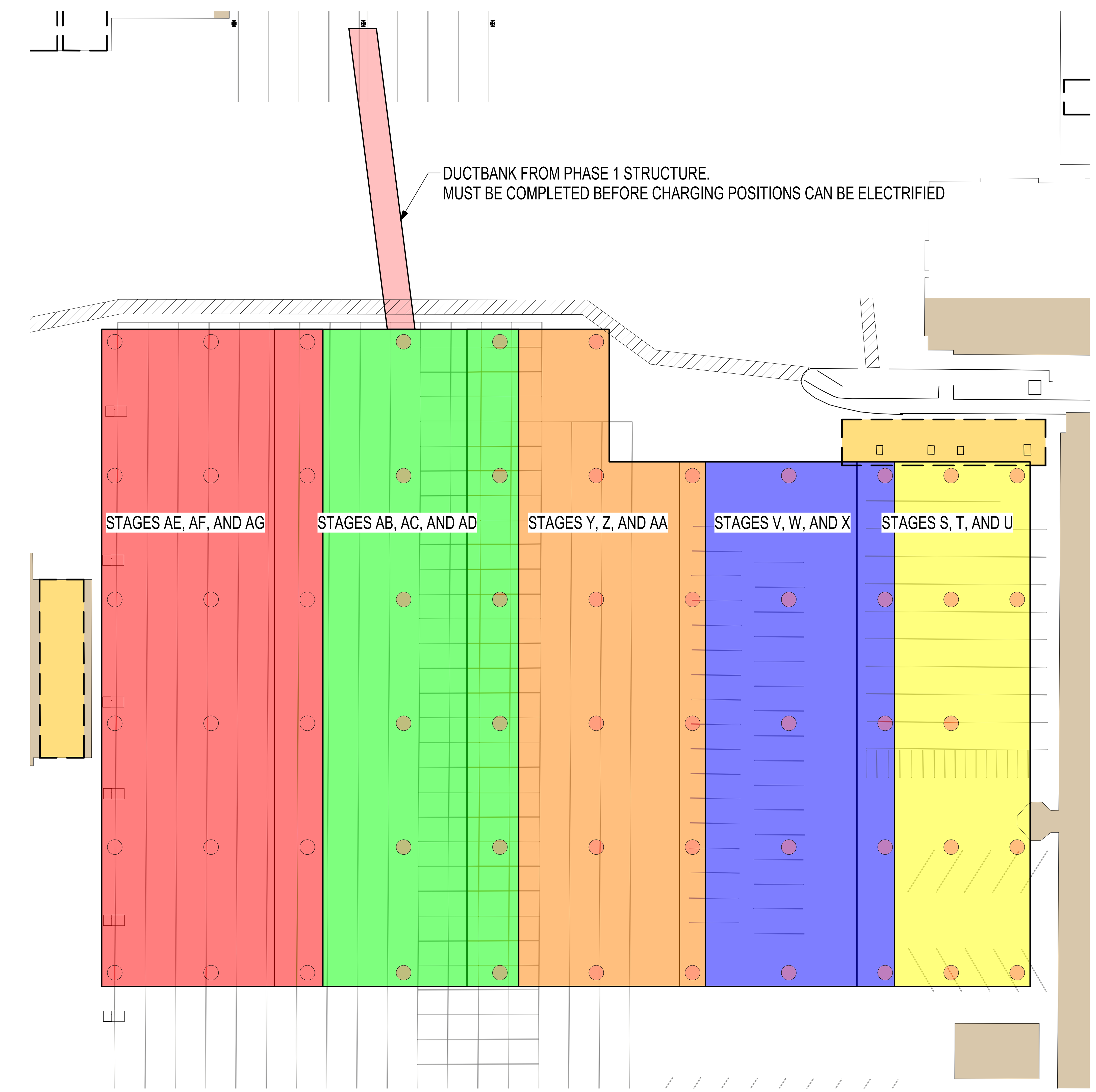
DRAWING NUMBER
PHASE 2

PH 2.9

3/24/2022 9:16:11 AM



2 SOUTH LOT - PHASE 2 STAGING - PARKING DECK - PARKING DECK COMPLETED - GRADE
1" = 30'-0"



1 SOUTH LOT - PHASE 2 STAGING - PARKING DECK - PIERS COMPLETED
1" = 30'-0"

PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34; 1"=30' 11x17; 1"=60'

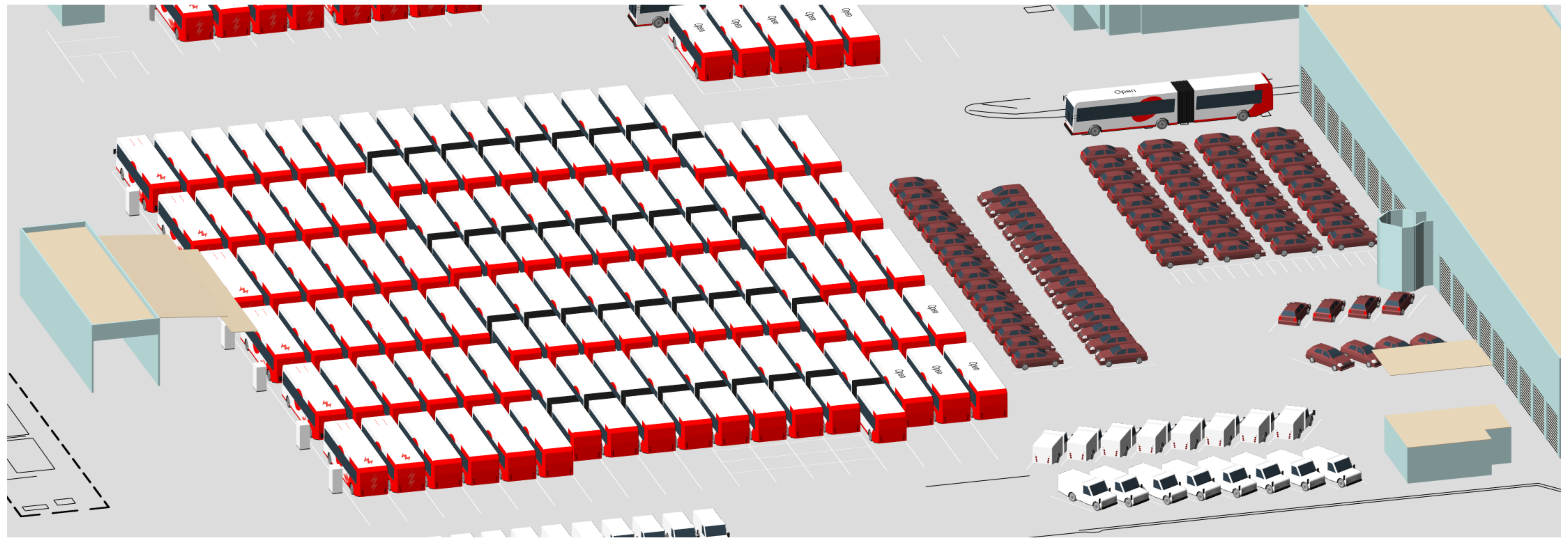
PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DOKKEN ENGINEERING

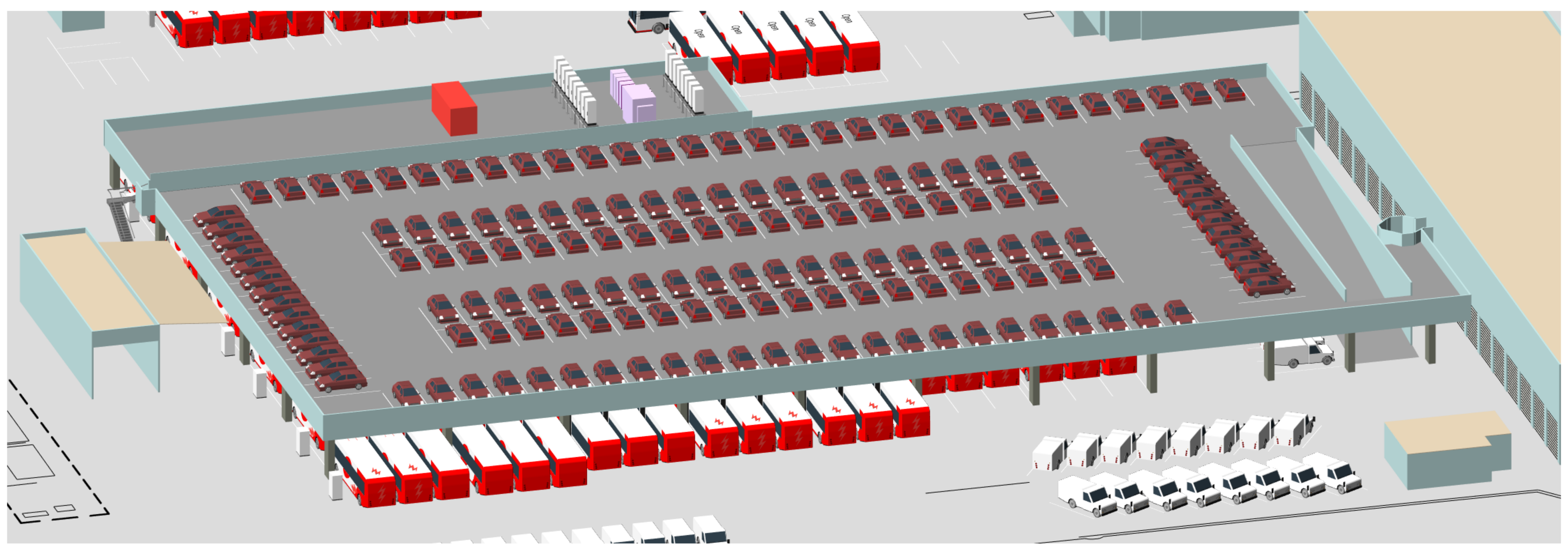
DRAWING TITLE
SOUTH LOT STAGING PARKING DECK

DRAWING NUMBER
PHASE 2
PH 2.10

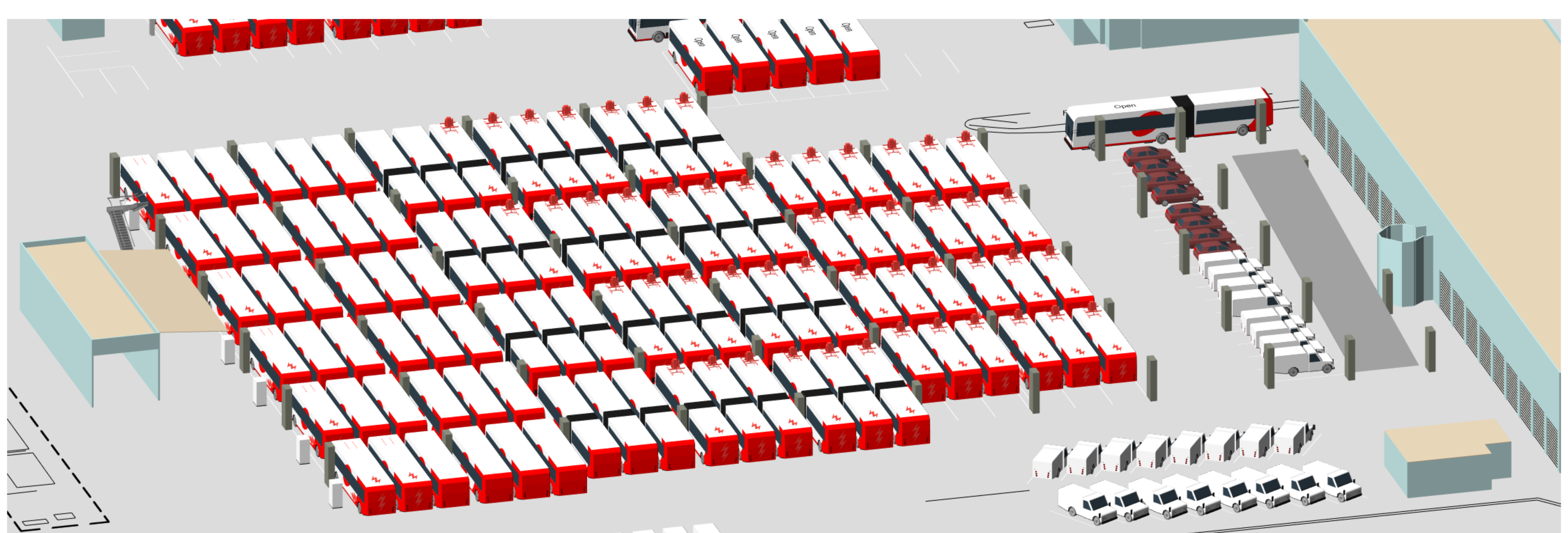
3/24/2022 9:16:14 AM



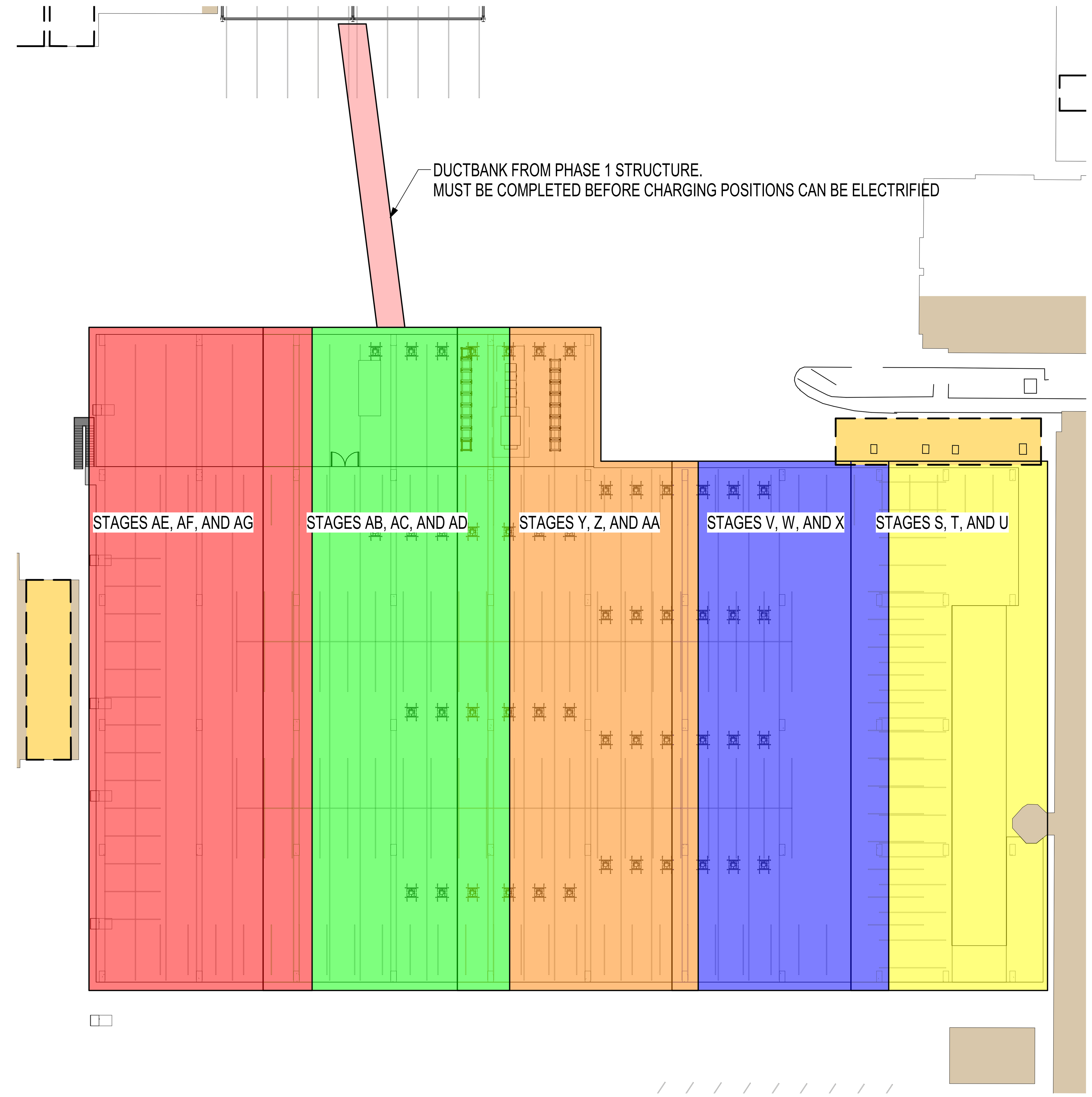
2 SOUTH LOT - EXISTING



3 SOUTH LOT - PHASE 2 - ABOVE DECK



4 SOUTH LOT - PHASE 2 - BELOW DECK



1 SOUTH LOT - PHASE 2 STAGING - PARKING DECK COMPLETED
1" = 30'-0"

PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=30' 11x17: 1"=60'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

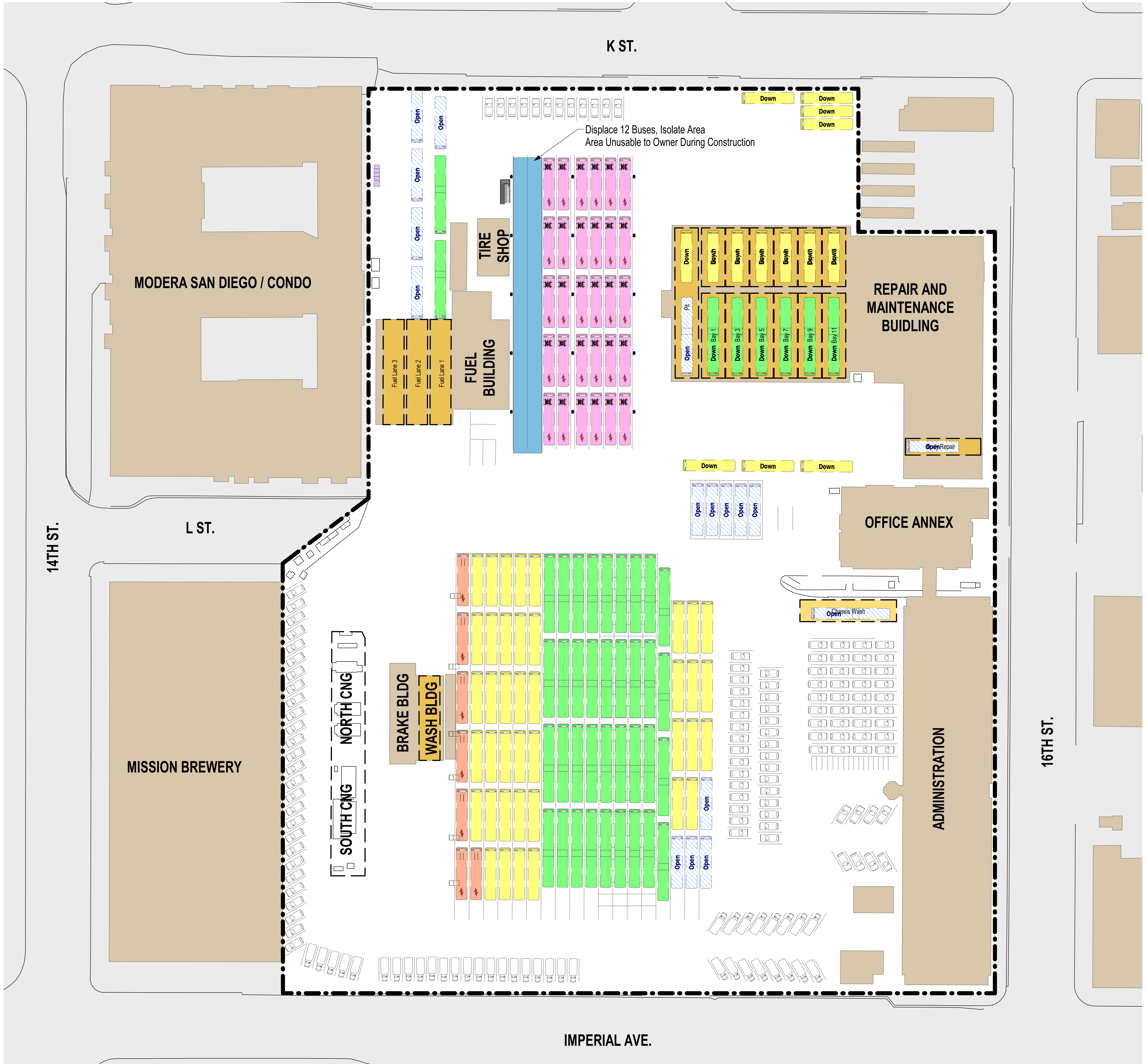
WSP

DRAWING TITLE
SOUTH LOT STAGING PARKING DECK CONTINUED

DRAWING NUMBER
PHASE 2

PH 2.11

3/24/2022 9:16:22 AM



PROJECT NO. 12127D
DRAWN BY ESR
DATE 2/4/22
SCALE 22x34: 1"=40' 11x17: 1"=80'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

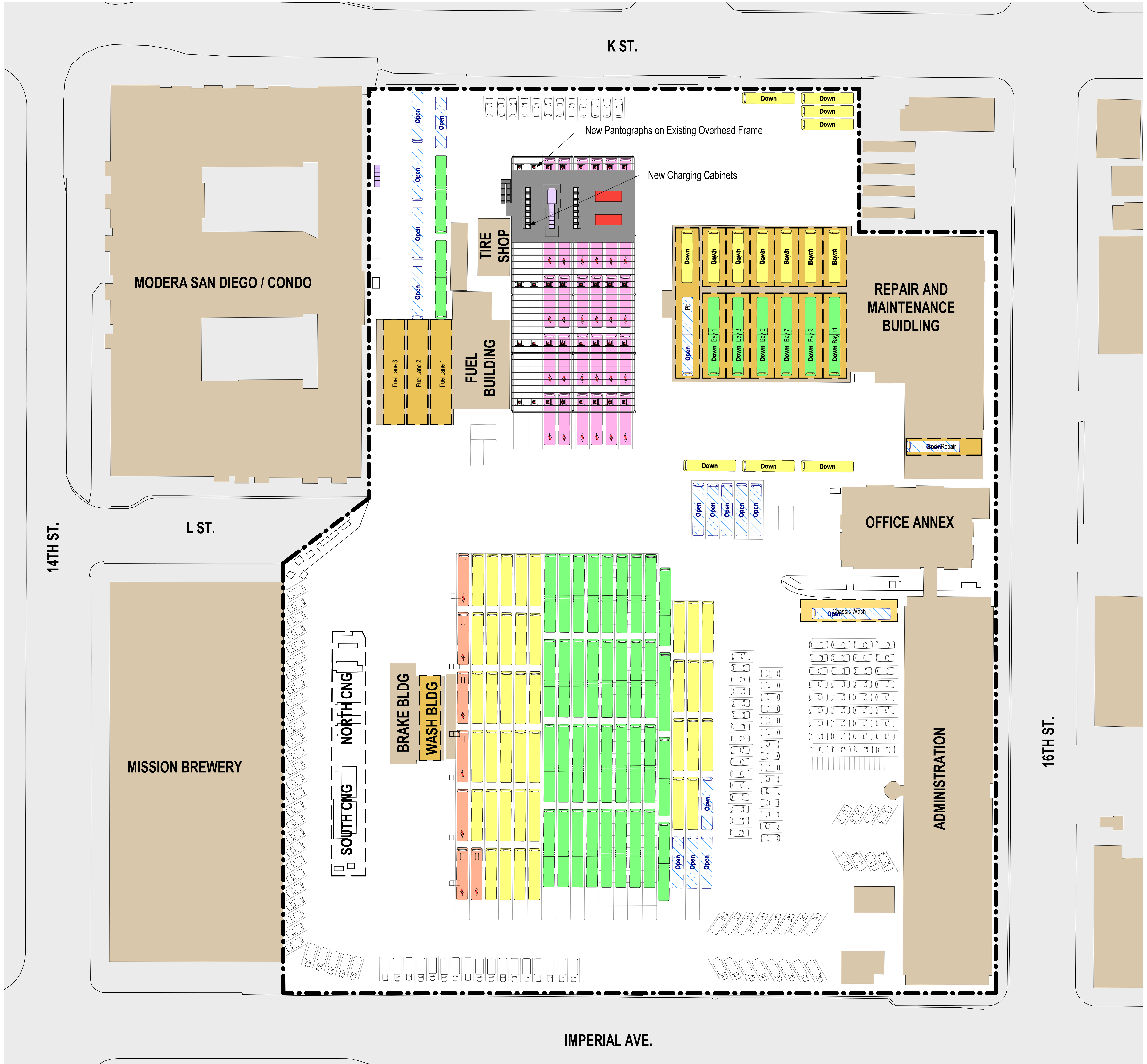
WSP

DRAWING TITLE
STAGE A BUS RELOCATION

DRAWING NUMBER
PHASE 2 STAGING
PH 2.A

3/24/2022 9:16:26 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Category: REPORT - Set: PHASE 2 STAGING



PROJECT NO.	12127D
DRAWN BY	ESR
DATE	2/4/22
SCALE	22x34: 1"=40' 11x17: 1"=80'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DOKKEN ENGINEERING

DRAWING TITLE
STAGE B CONSTRUCTION

DRAWING NUMBER
PHASE 2 STAGING
PH 2.B

3/24/2022 9:16:30 AM

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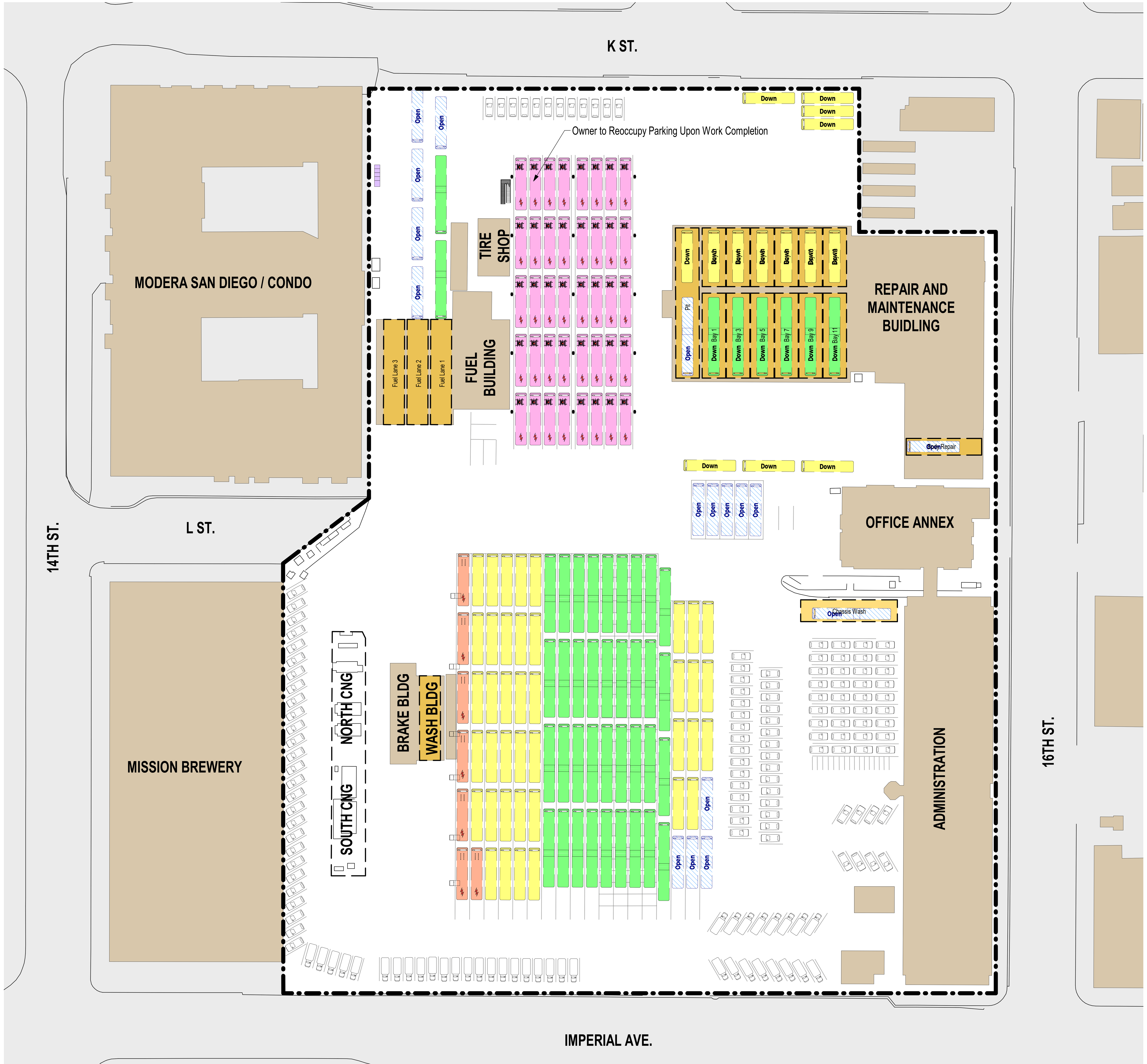


PROJECT NO. 12127D

DRAWN BY ESR

DATE 2/4/22

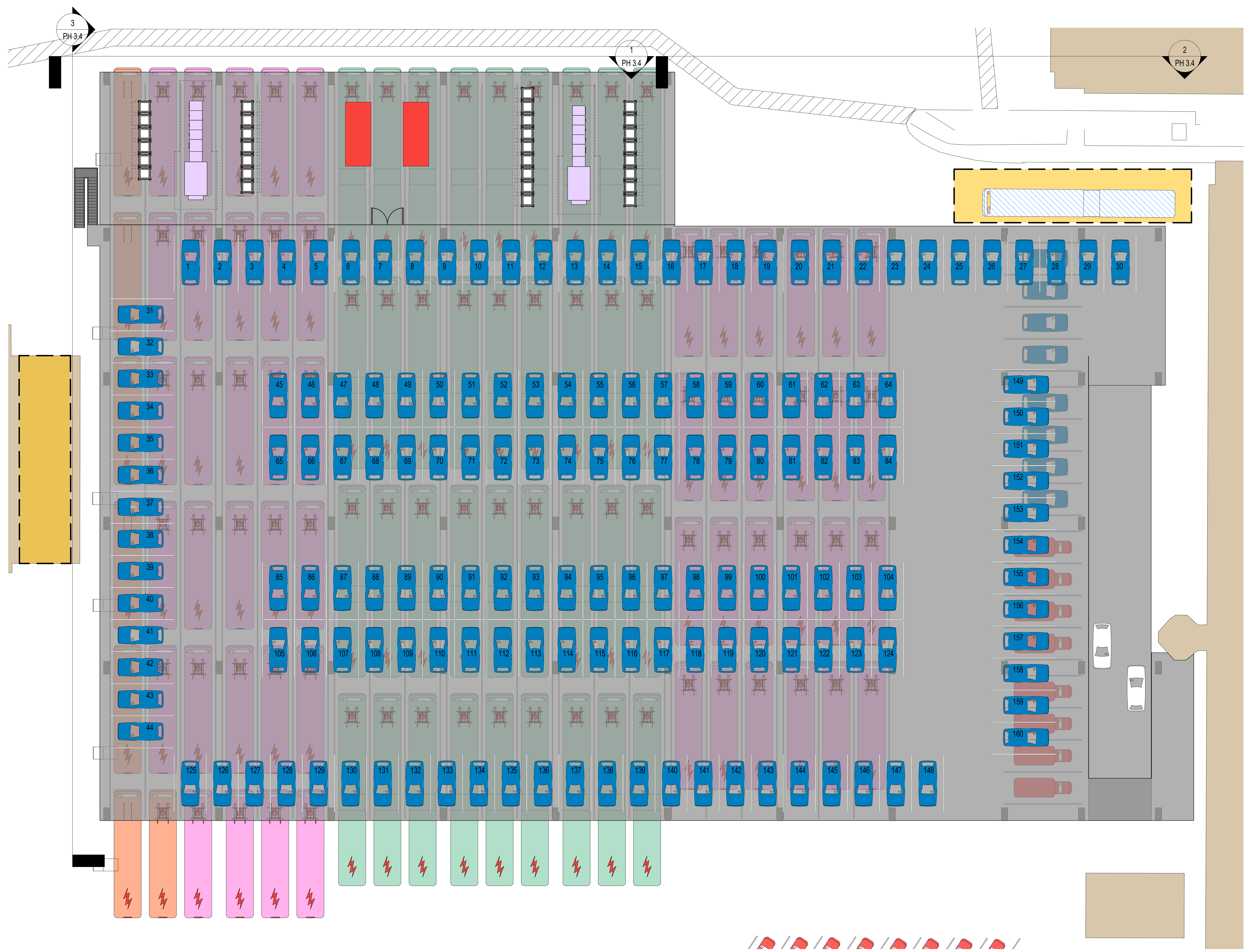
SCALE 22x34: 1"=40' 11x17: 1"=80'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
STAGE C REOCCUPY

DRAWING NUMBER
PHASE 2 STAGING
PH 2.C

3/24/2022 9:16:35 AM



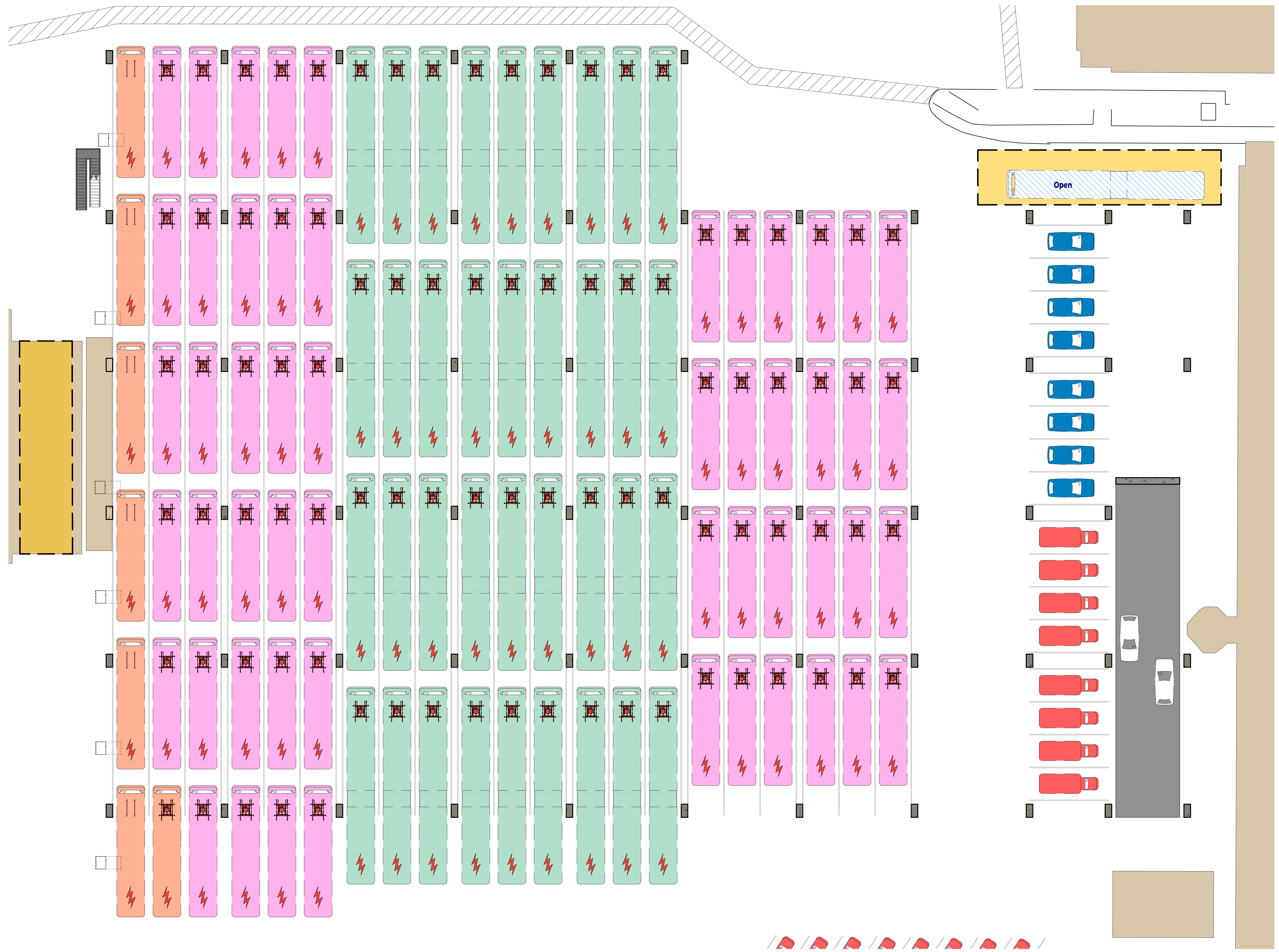
PROJECT NO.	12127D
DRAWN BY	ESR
DATE	03/18/22
SCALE	22x34: 1"=20' 11x17: 1"=40'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
SOUTH LOT

DRAWING NUMBER
PH 3.1

3/24/2022 9:16:41 AM



PROJECT NO.	12127D
DRAWN BY	ESR
DATE	03/18/22
SCALE	22x34: 1"=20' 11x17: 1"=40'

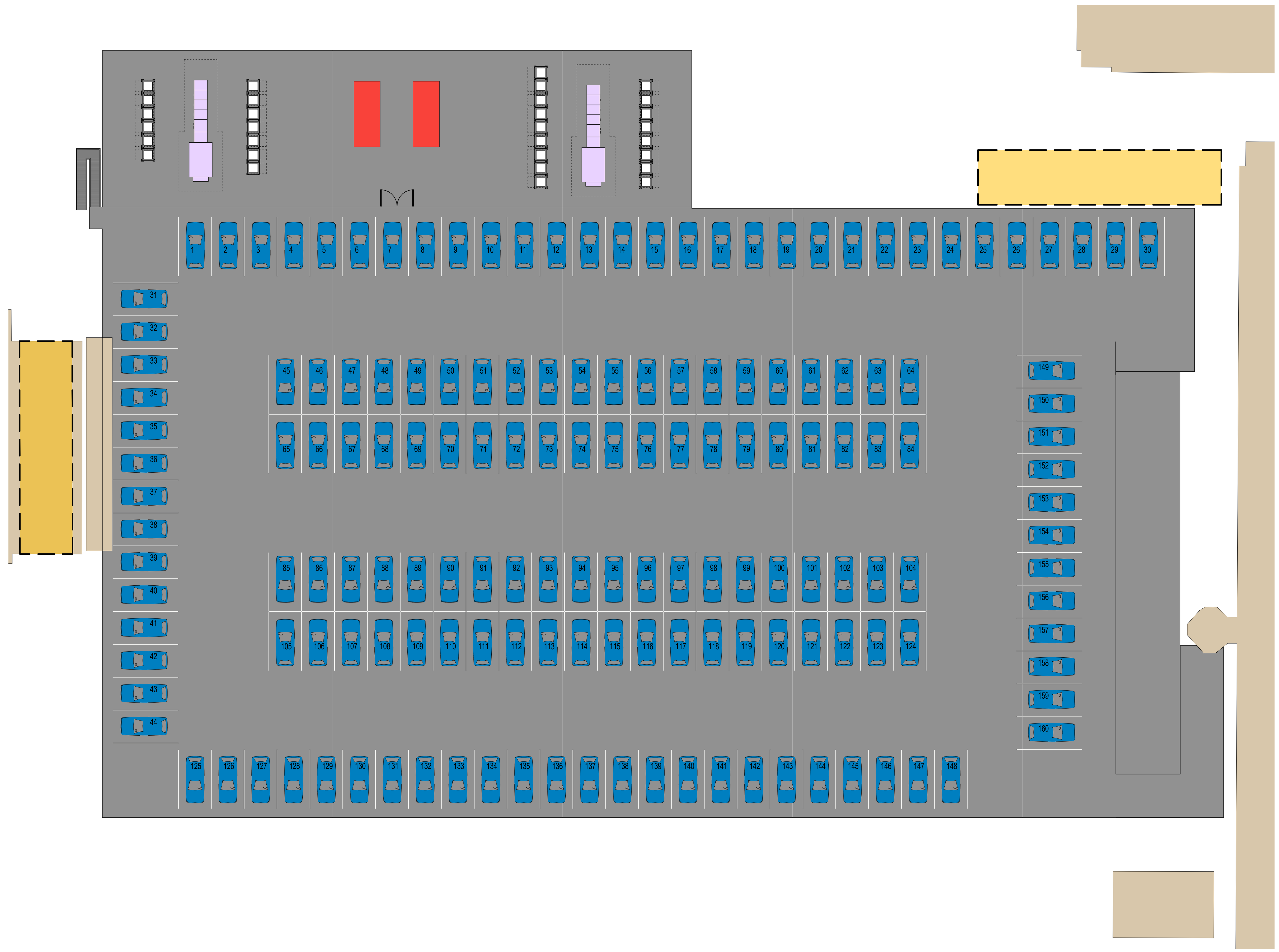
PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE
SOUTH LOT GRADE

DRAWING NUMBER
PH 3.2

3/24/2022 9:16:45 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Set: PHASE 3



PROJECT NO. 12127D

DRAWN BY ESR

DATE 03/18/22

SCALE 22x34: 1"=20' 11x17: 1"=40'

PROJECT TITLE

IAD ELECTRIC BUS CONCEPT LAYOUTS

DRAWING TITLE

SOUTH LOT PARKING GARAGE DECK

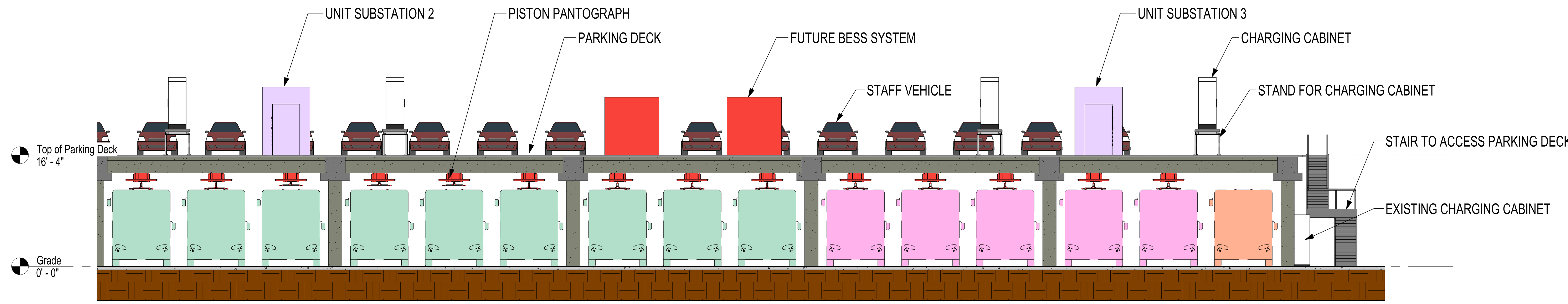
DRAWING NUMBER

PH 3.3

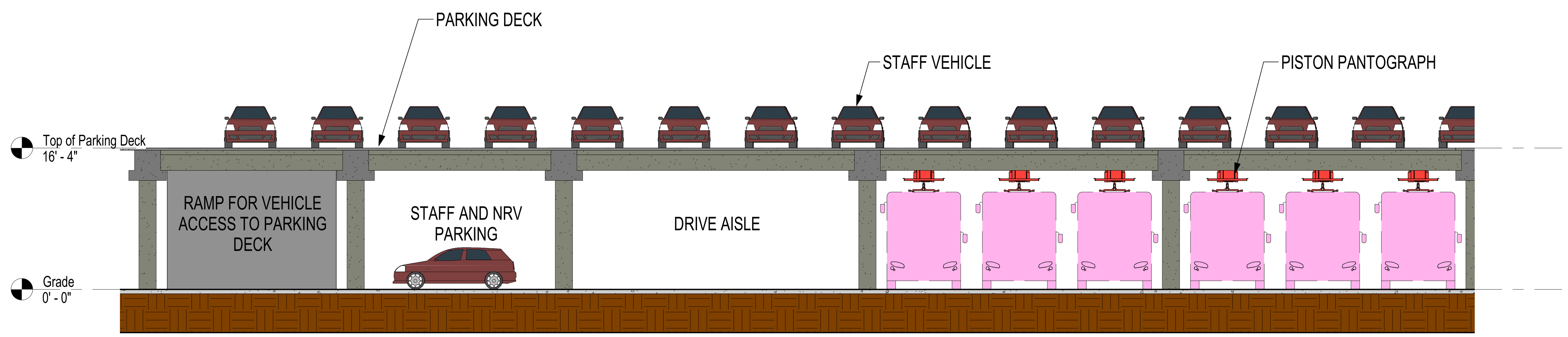
3/24/2022 9:16:49 AM

BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt

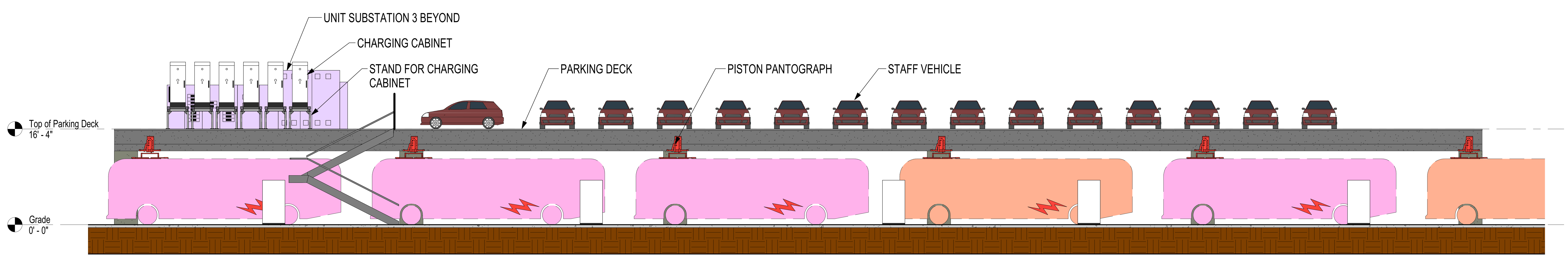
Set: PHASE 3



1 SOUTH LOT - PHASE 3 - SECTION - LATERAL 1
1" = 10'-0"



2 SOUTH LOT - PHASE 3 - SECTION - LATERAL 2
1" = 10'-0"



3 SOUTH LOT - PHASE 3 - SECTION - LONGITUDINAL
1" = 10'-0"

PROJECT NO.	12127D
DRAWN BY	ESR
DATE	03/18/22
SCALE	22x34: 1"=10' 11x17: 1"=20'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

MTS

DOKKEN ENGINEERING

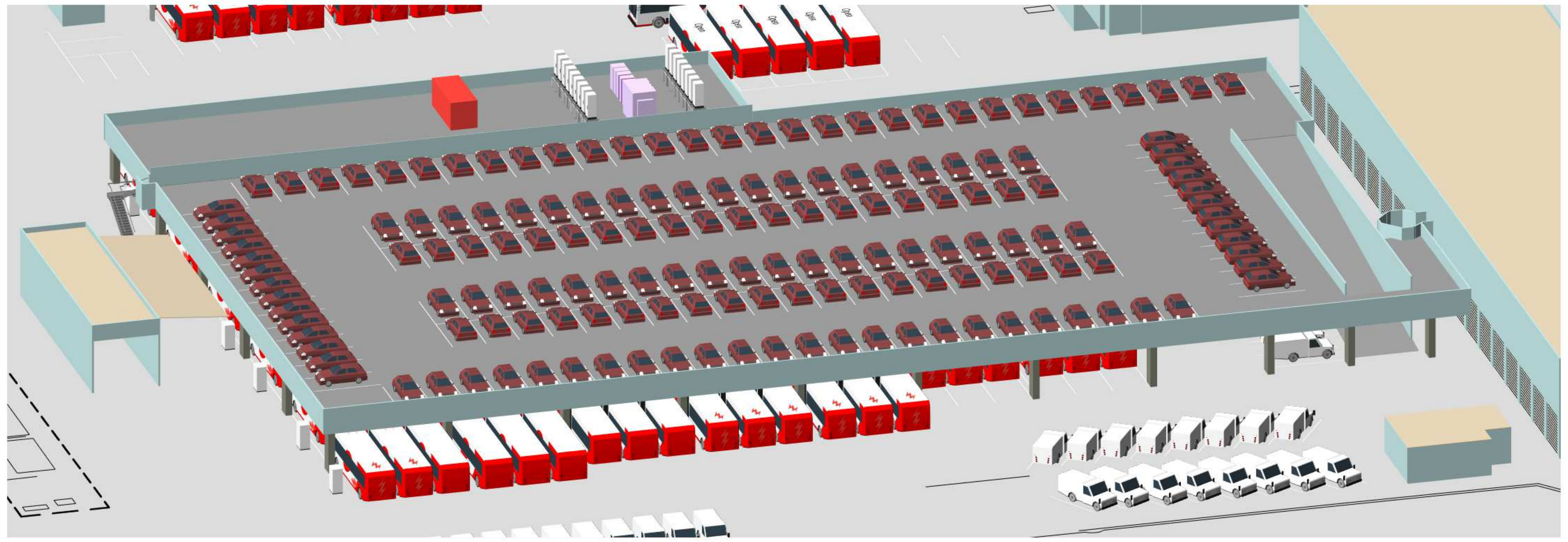
WSP

DRAWING TITLE
SOUTH LOT SECTIONS

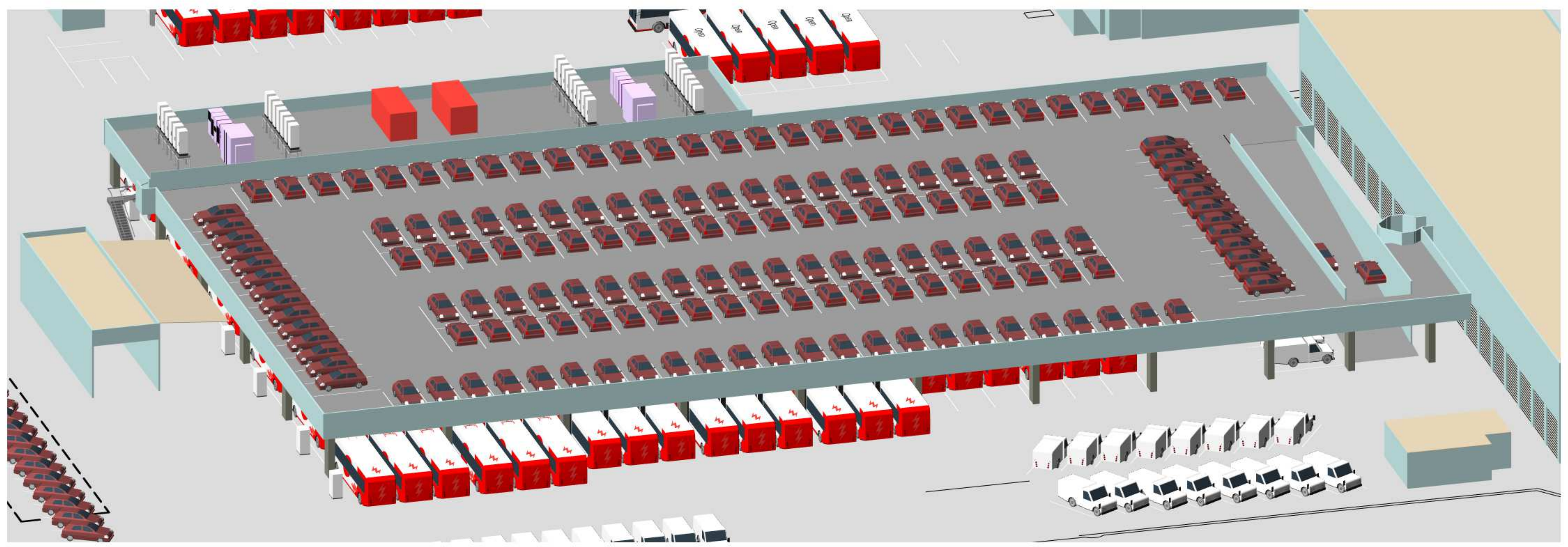
DRAWING NUMBER
PH 3.4

3/24/2022 9:17:02 AM

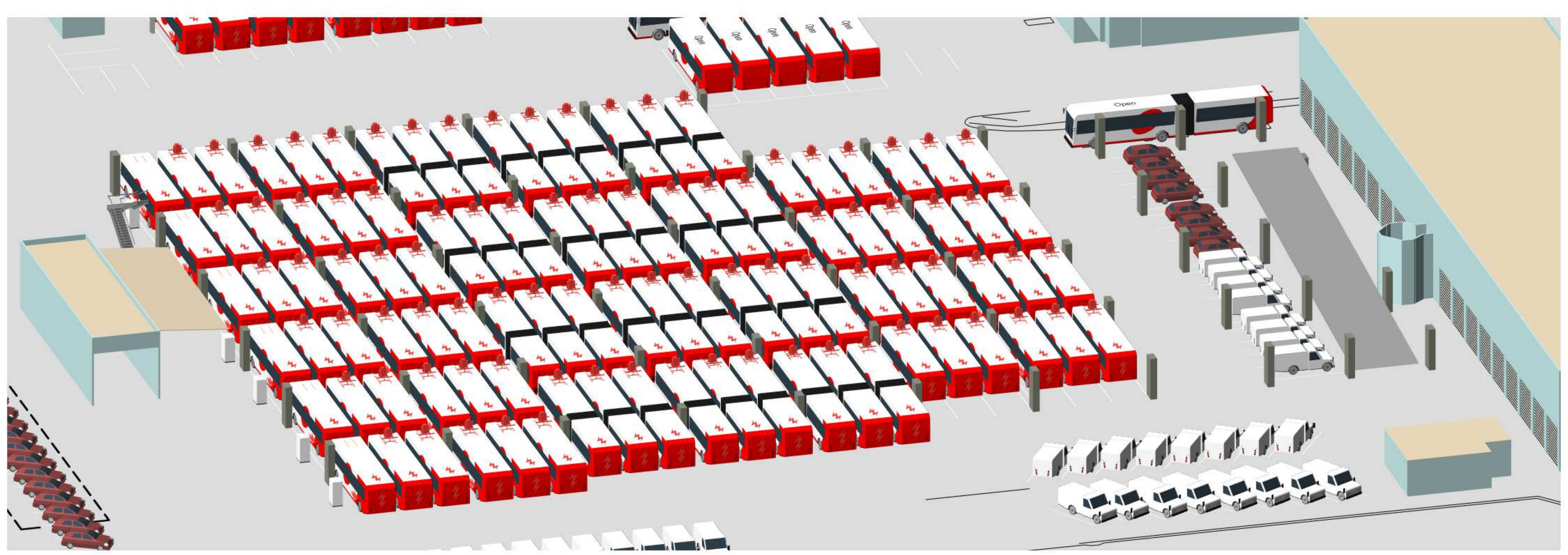
BIM 360://HOU-12127D - MTS IAD BEB MP - R19 - C19/MTS IAD - A n Q.rvt
Set: PHASE 3



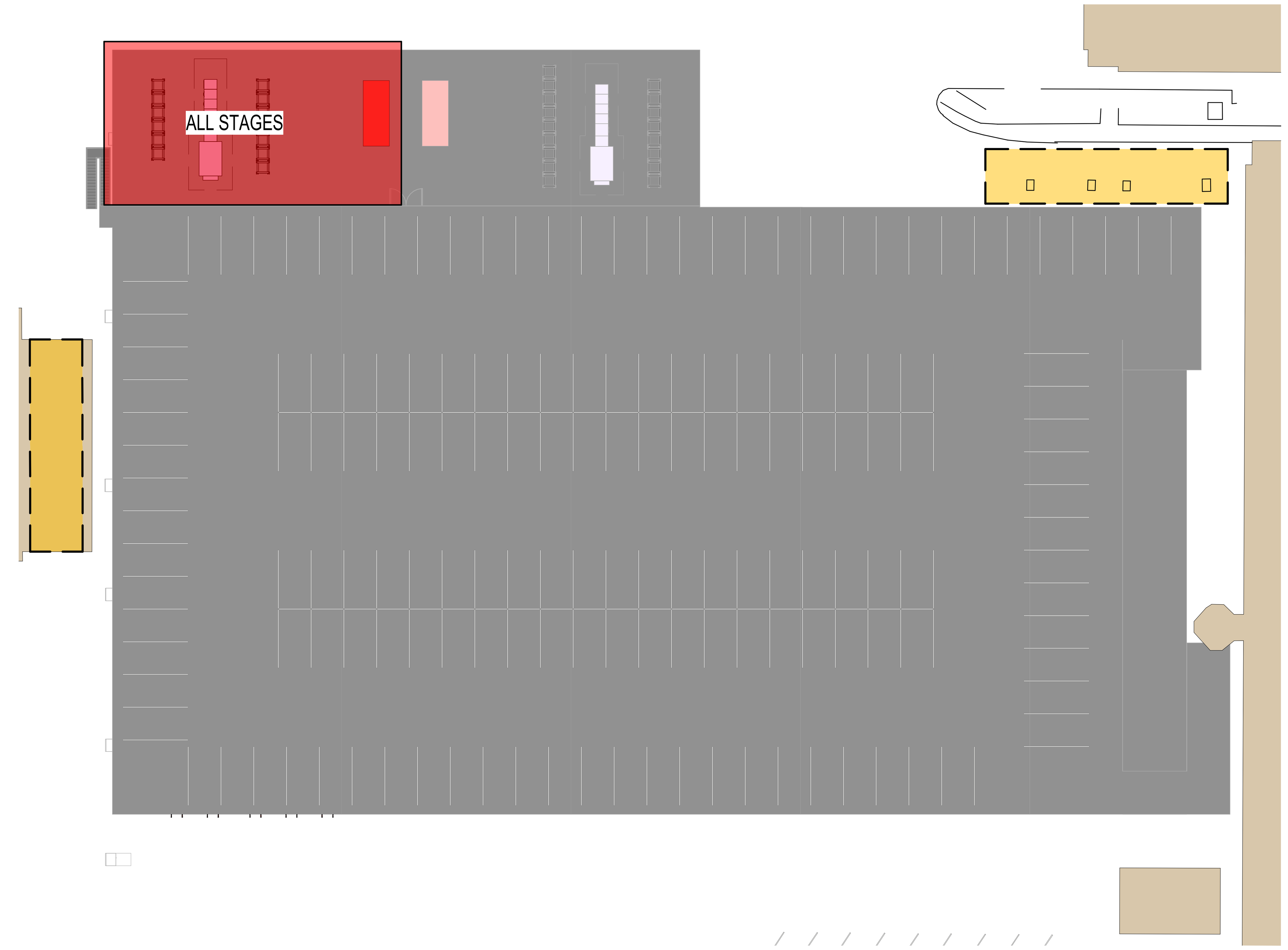
3 SOUTH LOT - PHASE 2 COMPLETION



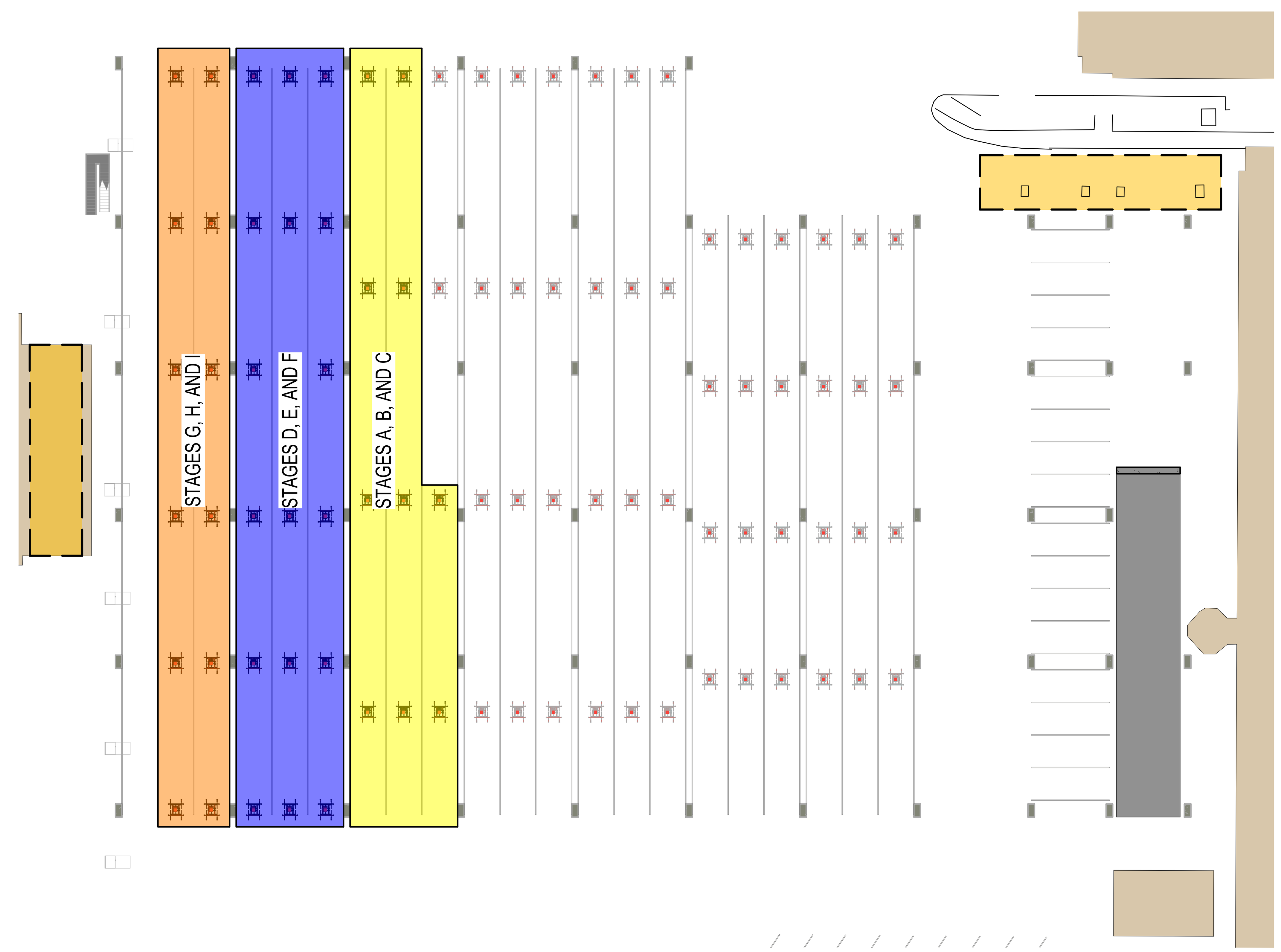
4 SOUTH LOT - PHASE 3 - ABOVE DECK



5 SOUTH LOT - PHASE 3 - BELOW DECK



1 PHASE 3 STAGING - PARKING DECK - TOP OF DECK
1" = 30'-0"



2 PHASE 3 STAGING - PARKING DECK - GRADE
1" = 30'-0"

PROJECT NO.	12127D
DRAWN BY	ESR
DATE	03/25/2022
SCALE	22x34; 1"=30' 11X17; 1"=60'

PROJECT TITLE
IAD ELECTRIC BUS CONCEPT LAYOUTS

DOKKEN ENGINEERING

DRAWING TITLE
SOUTH LOT STAGING PARKING DECK

DRAWING NUMBER
PH 3.5

3/24/2022 9:41:54 AM

APPENDIX C – SDG&E DESKTOP REVEIW

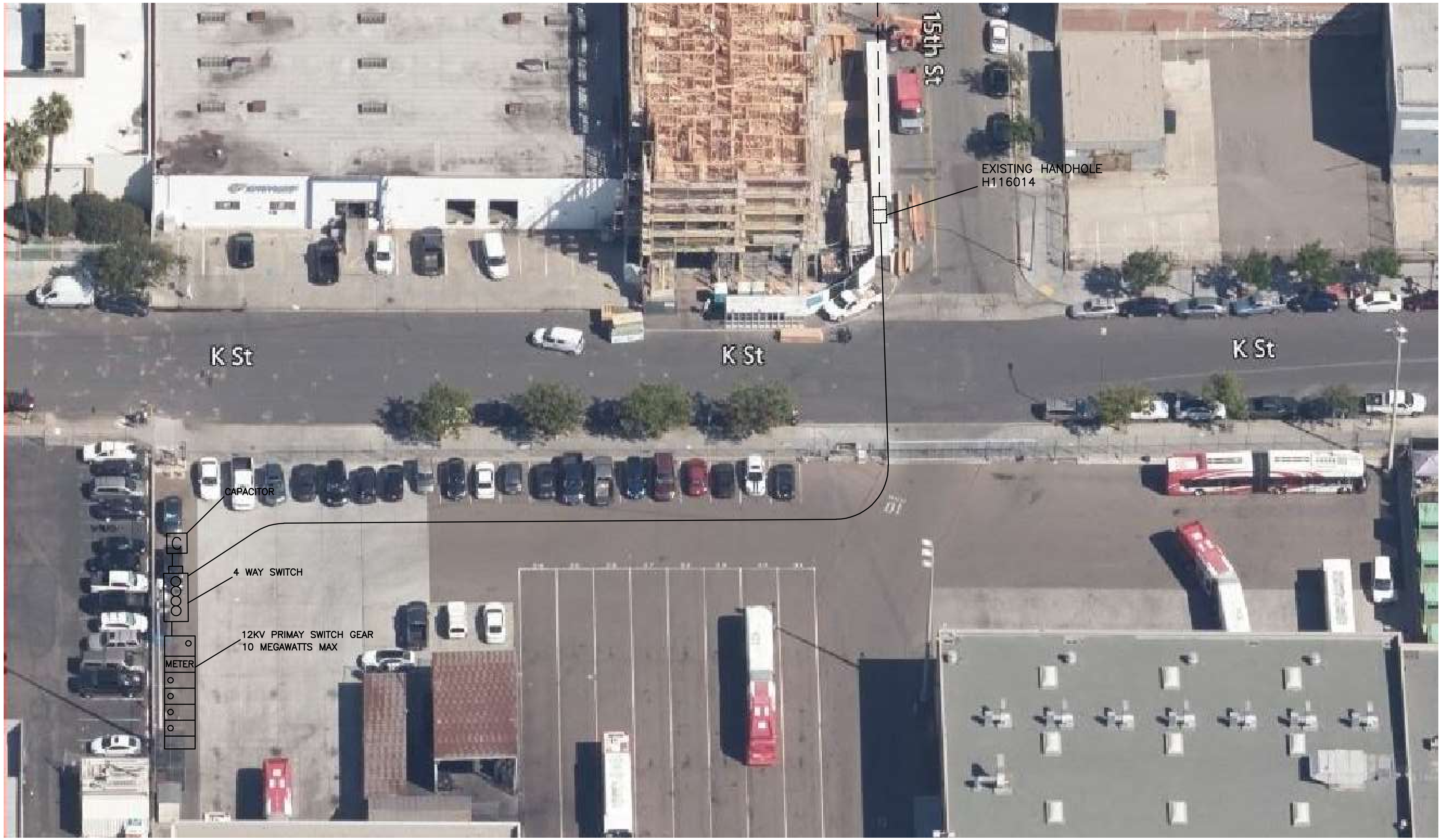
MD220612 - MTS IMPERIAL AVE DEPOT

100 16TH STREET, SAN DIEGO, CA 92101

N

SCALE

0 NONE



SDGE

SAN DIEGO GAS & ELECTRIC
ELECTRIC CONSTRUCTION ORDER
OH/UG BASE DRAWING

DESIGNED BY
SHAKIRA DAVIS

858-654-1863

PLOT DATE
03/17/2022

PROJECT NO.
300000475172

CONSTRUCTION ORDER NO.
3-475123

SHT 1 OF 1

REV/SUPP

NAME