BALBOA RESERVOIR

INFRASTRUCTURE PLAN

MARCH 15, 2019

DRAFT

Prepared by

BkF 100+ YEARS

ENGINEERS . SURVEYORS . PLANNERS

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BKF No. 20160367

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ATTACHMENTS

Attachment A	Balboa Reservoir Design Standards and Guidelines, Chapter 5

The attachments are included for review and approval as part of the Infrastructure Plan approval.

APPENDICES

Appendix A	Preliminary Geotechnical Report
Appendix B	Non-Potable Water Calculator Output
Appendix C	SU-30 and WB-40 Design Vehicle Movements
Appendix D	Fire Engine and Fire Truck Turning Movements
Appendix E	Passenger Vehicle Turning Movements

The appendices are for reference only and are not approved as part of the Infrastructure Plan approval.

1. INTRODUCTION

1.1 Purpose

This Infrastructure Plan is an exhibit to the Development Agreement (DA) between Balboa Community Partners, LLC (Developer) and City and County of San Francisco (City). The Infrastructure Plan describes the Horizontal Improvements (also referred to herein as Infrastructure), and the Infrastructure improvements to be constructed for the Balboa Reservoir Project (Project), associated with Project sustainability, demolition, grading, street and transportation improvements, open space and park improvements, low pressure water system, combined sewer system, auxiliary water supply system (AWSS), stormwater management system and dry utility system.

Initially capitalized terms unless separately defined in this Infrastructure Plan have the meanings and content set forth in the DA.

1.2 Design Standards and Guidelines

The Design Standards and Guidelines (DSG) is a separate document that will also be included as an exhibit to the DA and is a companion document to the Infrastructure Plan. The DSG focuses primarily on the design of the buildings, but also contains relevant sections about the street design, open space and circulation. Chapter 5 of the DSG has been included as Appendix A. This chapter is included in the report as it is relevant to the design of the streets, pedestrian network, loading zones and other features within the public right of way.

1.3 Land Use Program

The Project site includes approximately 17.6 acres (Block 3180, Lot 190). The proposed Project includes the redevelopment of the project site into a mixed-use development including residential, community room, retail, other active uses, and parking. The proposed Project will also include public access areas and open spaces as well as public and private streets.

Overall the proposed Project will construct up to approximately 1,640,400 gross square feet (gsf) including approximately 1,100 residential units, approximately 7,500 gsf of retail use, approximately 339,900 gsf of parking, and approximately 10,000 gsf of daycare facilities.

Table 1.1: Proposed Development Program Scenarios

Proposed Building Use	Preferred Development Program
Residential	1,100 unit
Retail	7,500 sf
Day Care	10,000 sf
Parking	339,900 sf
Public Open Space	4 acres

The land use program may be adjusted in the future provided that it remains within the limits analyzed under the Project EIR. The Project utility demands and infrastructure requirements have been evaluated based on the Development Program that results in the highest utility demand. Accordingly, future adjustments are not anticipated to significantly change the overall Project utility demands or general infrastructure requirements outlined in this Plan.

1.4 Infrastructure Plan Overview

The Project infrastructure obligations of the City Agencies, are described herein, with ownership, maintenance, and acceptance responsibilities of the City Agencies identified in the DA per the terms of the Interagency Cooperation Agreement (ICA). A condition of the Developer's performance under this Infrastructure Plan is the obtaining of all requisite approvals in accordance with the DA and ICA.

1.5 Property Acquisition, Dedication, and Easements

The mapping, dedication and acceptance of streets and other Infrastructure improvements is anticipated to occur through the subdivision mapping process. Except as otherwise noted, Infrastructure described in this Infrastructure Plan shall be constructed within the public right-of-way or dedicated easements to provide for access and maintenance of Infrastructure facilities.

Public service easements will be allowed within the Project as necessary to provide Infrastructure and services to the Project and are subject to review and approval by the affected City agency. Proposed public water, combined sewer, Auxiliary Water Supply System (AWSS), and power easements benefitting the San Francisco Public Utilities Commission (SFPUC) on the property will be reviewed on a case-by-case basis. Full access for vehicles and equipment for the maintenance and repair of utility mains will be

provided. Public utilities within easements will be installed in accordance with applicable City regulations for public acquisition and acceptance within public utility easement areas, including provisions for maintenance access. Where improvement standards proposed herein differ from the 2015 City and County of San Francisco Subdivision Regulations (Subdivision Regulations), such standards and Infrastructure shall be subject to design modification or exception requests and reviewed by the affected City Agencies during the Project Phase application or construction document approval process.

1.6 Project Datum

Elevations referred to herein, are based on the CCSF 2013 NAVD88 Vertical Datum.

1.7 Conformance with EIR/EIS & Entitlements

This Infrastructure Plan has been developed to be consistent with Project mitigation measures required by the Draft Environmental Impact Report (EIR) and other entitlement documents. Regardless of the status of their inclusion in this Infrastructure Plan, the mitigation measures of the EIR shall apply to the Project.

1.8 Applicability of Uniform Codes and Infrastructure Standards

The Infrastructure Plan may be modified in the future to the extent that future modifications are in accordance with the current City of San Francisco Subdivision Regulations and the DA.

1.9 Master Utility Plans

Each publicly-owned or accepted Infrastructure system described herein will be more fully described and evaluated in Master Utility Plans (MUPs), which will be submitted to the City Agencies after approval of the Infrastructure Plan. The MUPs provide detailed layouts and modeling of each Infrastructure system. The Infrastructure Plan is to be approved by the City Agencies as part of the DA approval processes. Approval of this Infrastructure Plan does not imply approval of the MUPs, which will be approved after DA execution and prior to or concurrent with submittal of street improvement plans for the first phase of development and prior to the submittal of the Basis of Design.

1.10 Project Phasing

It is anticipated that the Project will be developed in two phases (Development Phase(s)) subject to the approval process outlined in the DA and ICA. Each Development Phase would include a Development Parcel or Parcels and associated Infrastructure and open space areas. Phased Improvements are the street, access, utility and open space improvements necessary to accommodate development of a particular Development Parcel or Parcels.

The parties acknowledge that certain Horizontal Improvements as described in Sections 3, 5, 6, and 7 of the Infrastructure Plan, such as site preparation, grading, soil compaction and stabilization, may be required or desired at an earlier stage of development and in advance of such Phase Improvements. As described in the DA, the parties will cooperate in good faith in determining the scope and timing of such advance Horizontal Improvements, so as not to delay the construction of Development Parcels and associated Phase Improvements, or affect the criteria for the proportional scope of Phase Improvements.

1.11 Phases of Infrastructure Construction

The construction of Infrastructure, as described in the Infrastructure Plan, tentative map and other Project approvals, will be phased to serve the incremental build-out of the Project in accordance with the Project approvals. Phase Improvements will be described in subsequent improvement plans and associated public improvements agreements or permits approved prior to filing a Final Map for the associated Development Parcels.

For each Development Parcel proposed for development, the associated adjacent and as needed Infrastructure to provide access and utilities to serve that development, such as streets, and improvements therein and thereon, will be constructed. As described in the DA, adjacent Infrastructure refers to Infrastructure that is necessary and near to and may share a common border or end point with the proposed Development Parcel or Parcels.

The limits of the existing Infrastructure to be demolished as well as conceptual layouts of the permanent and/or temporary infrastructure systems for each Development Parcel will be provided as part of the construction document submittals for that Development Parcel or Phase. Repairs and/or replacement of the existing facilities necessary to serve the Development Parcel will be designed and constructed by the Developer.

Where requested by Developer, and if the City Agency(s) with jurisdiction over the affected Infrastructure determines it is appropriate in connection with the phased development of the Project, portions of the Phase Improvements may be constructed or installed as interim improvements to be owned and maintained by the Developer. Interim improvements would be removed or abandoned, as determined by the City Agency, when substitute permanent Phase Improvements are provided to serve a subsequent Development Parcel.

Demolition of existing Project area infrastructure and construction of each proposed Development Parcel and associated Phase Improvements will impact site accessibility. During construction of each Development Parcel and associated Phase Improvements, interim access shall be provided and maintained for emergency vehicles, subject to San Francisco Fire Department (SFFD) approval, as well as pedestrian access on at least one side of the street around the construction perimeter that is American with Disabilities Act (ADA) compliant. Interim access to the existing parking will also be maintained and coordinated between the Developer and City, as required.

At all phases of development prior to full build out, the Developer shall demonstrate to the City Agency that functioning utility systems are in place at all times and comply with applicable City laws, codes and regulations.

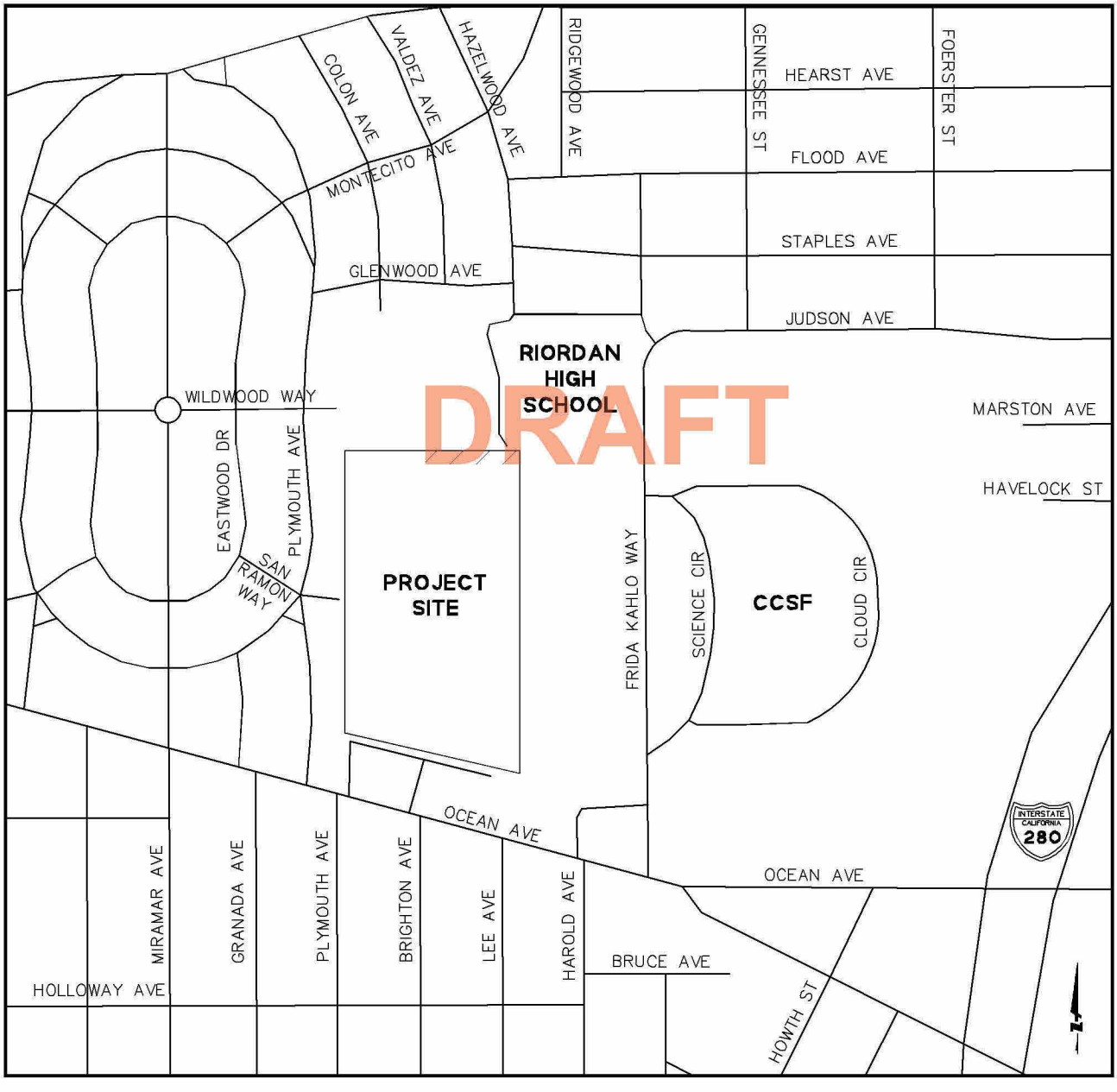
1.12 Operation and Maintenance

After formal acceptance of public infrastructure installed by the Developer, the City will be responsible for maintenance of the infrastructure installed by the Developer, except as otherwise agreed to in writing by the Developer and the City. A maintenance agreement, as required by the Public Improvement Agreement (PIA), will be prepared in conjunction with the first phase of the Improvement Plans and may be subject to a Major Encroachment Permit (MEP).

1.13 Companion Documents

The following appendices contain reference documents that are referenced by the Infrastructure Plan:

- Appendix A Preliminary Geotechnical Report
- Appendix B Non-Potable Water Calculator Output
- Appendix C SU-30 and WB-40 Design Vehicle Movements
- Appendix D Fire Engine and Fire Truck Turning Movements
- Appendix E Passenger Vehicle Turning Movements



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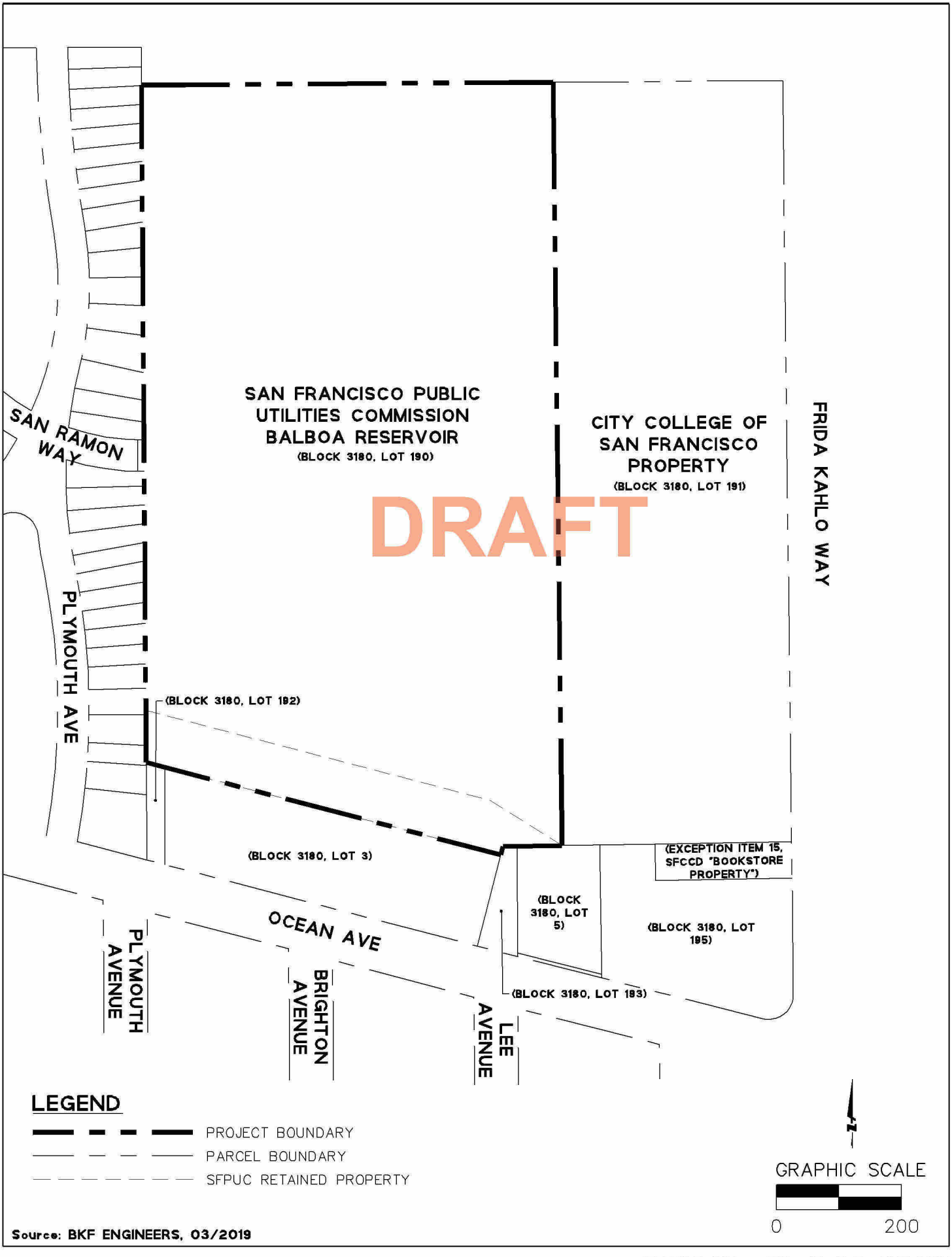
Source: BKF ENGINEERS, 03/2019

BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 1.0 – SITE LOCATION



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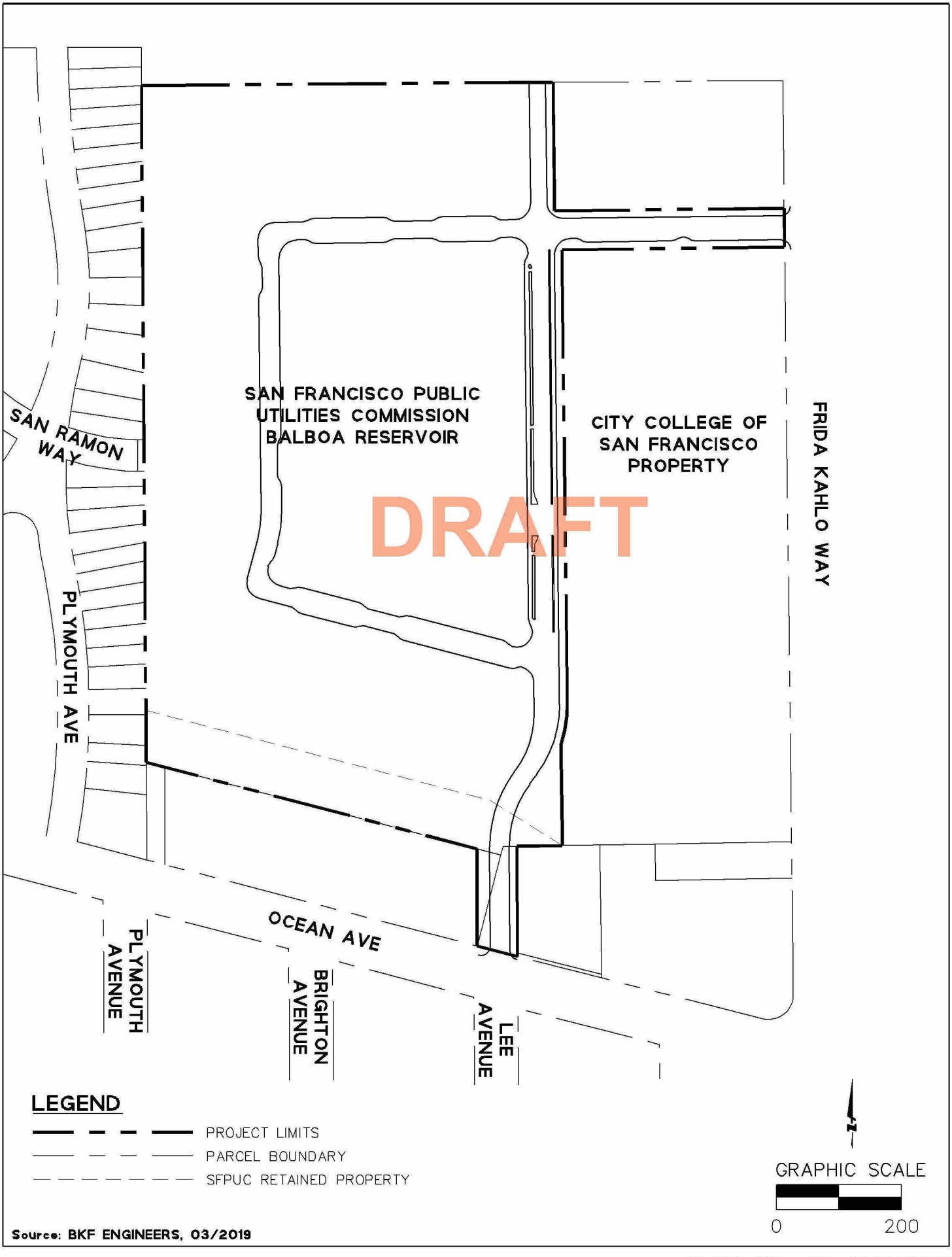
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 1.1A – PROJECT BOUNDARY



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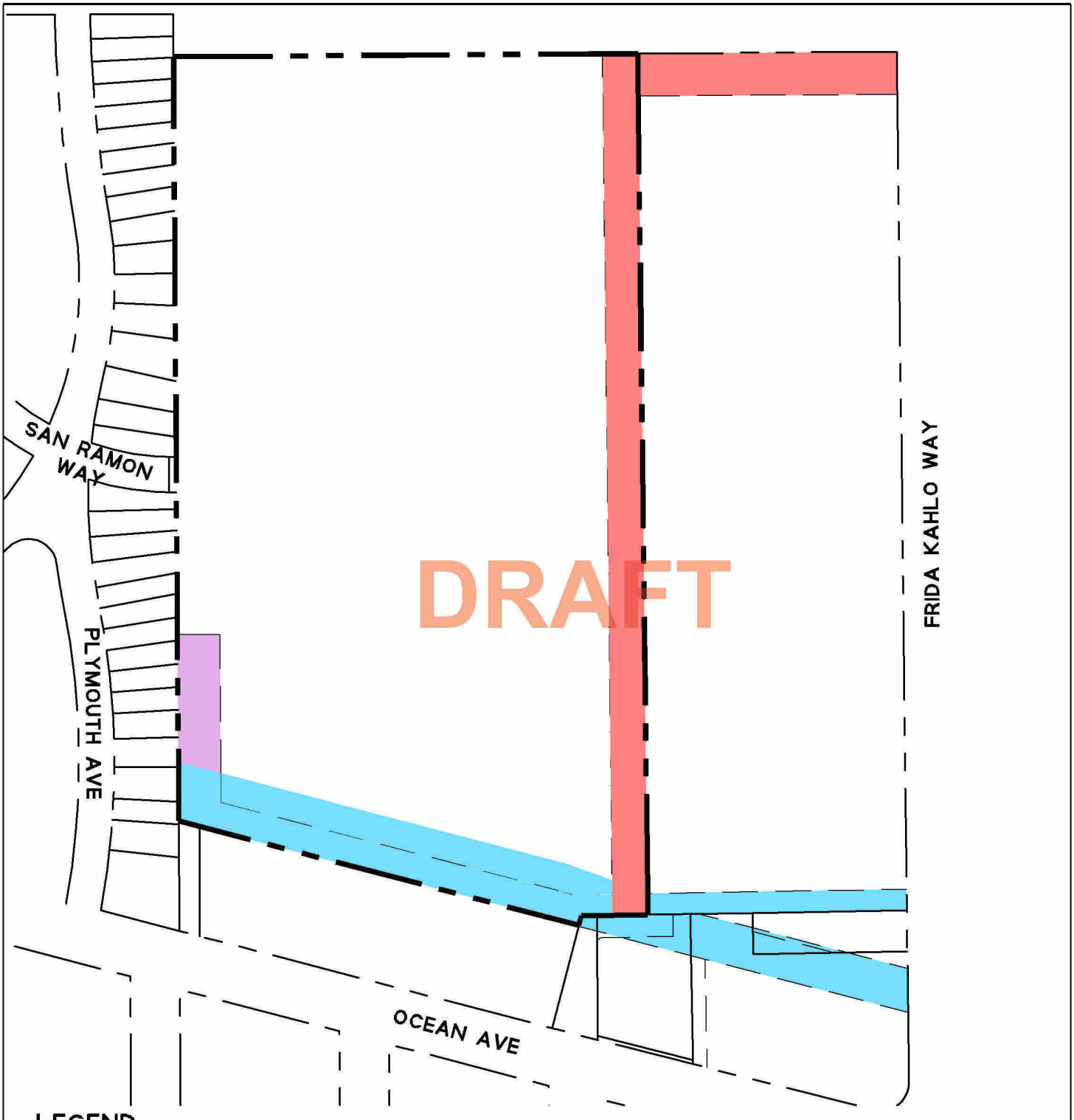
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 1.1B – PROJECT LIMITS



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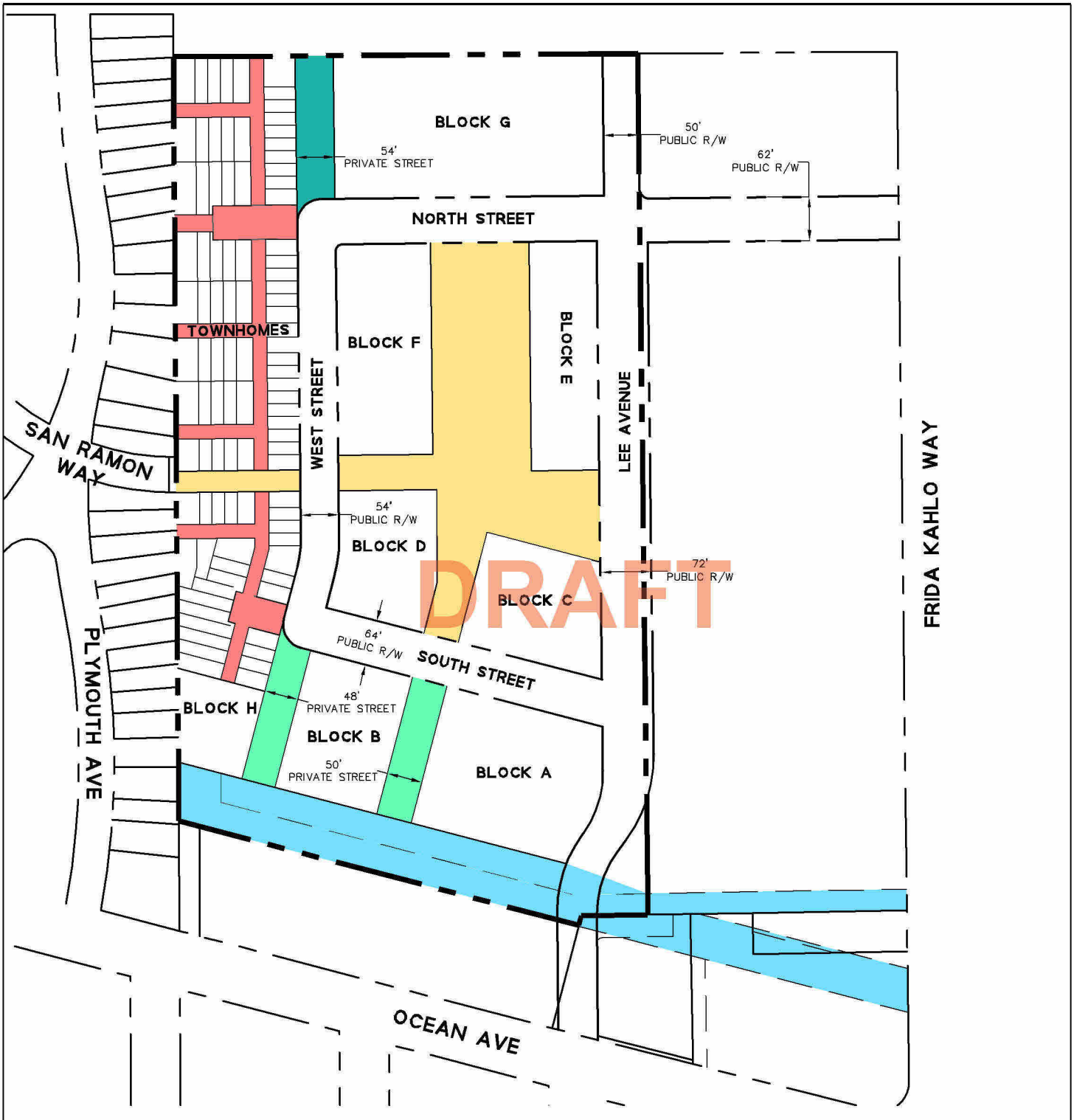
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 1.2A – EXISTING PROPERTY LINES & EASEMENTS



LEGEND

- PROJECT BOUNDARY
- EXISTING PARCEL BOUNDARY
- EXISTING EASEMENT BOUNDARY
- PUBLIC ACCESS
- SAN FRANCISCO PUBLIC UTILITY COMMISSION RETAINED PROPERTY
- PRIVATE STREET (SUBJECT TO FINAL DESIGN BY TOWNHOME DEVELOPER)
- PRIVATE STREET WITH PUBLIC ACCESS
- PRIVATE STREET WITH PUBLIC ACCESS & PUBLIC UTILITY EASEMENT

GRAPHIC SCALE

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Source: BKF ENGINEERS, 03/2019

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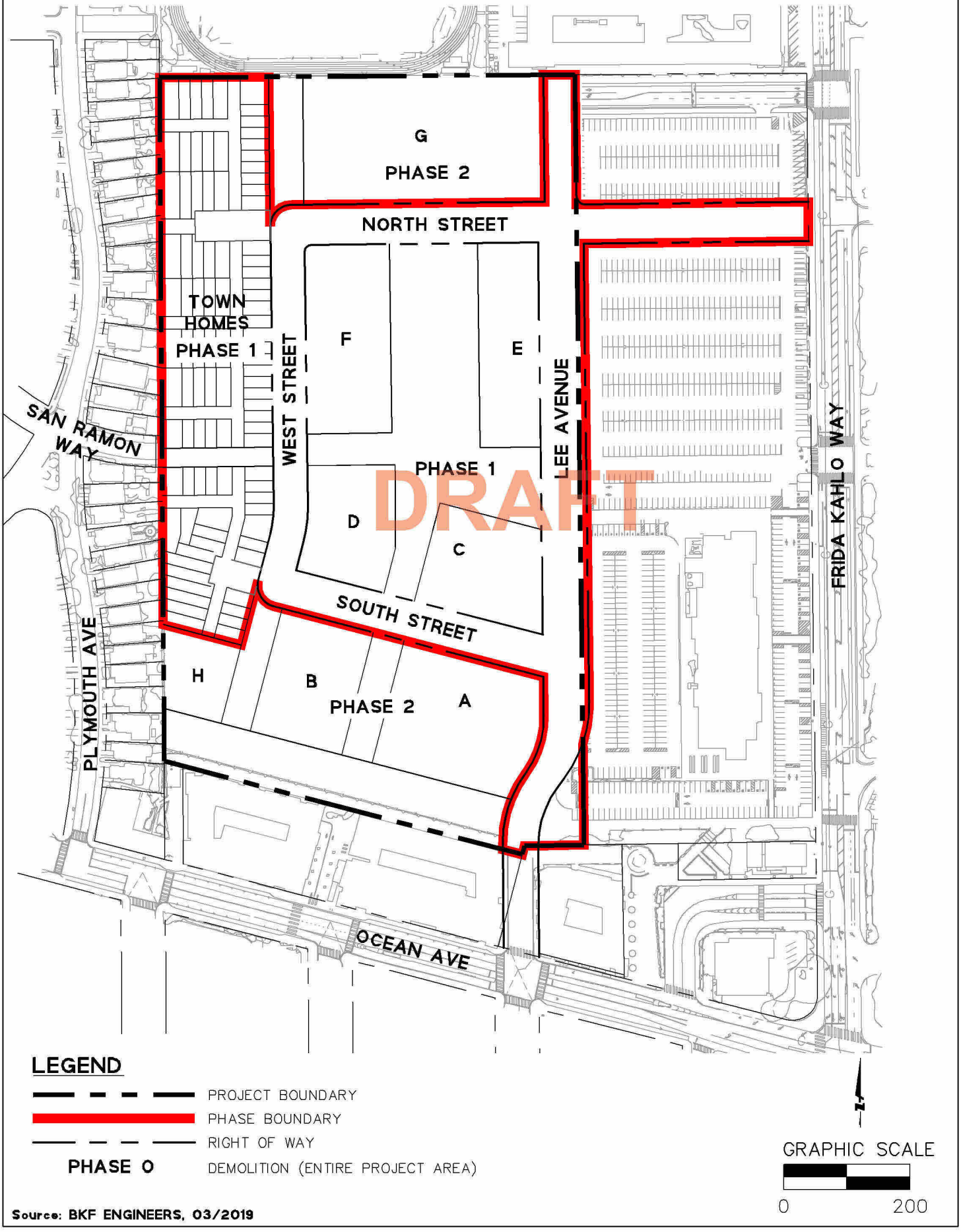
BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 1.2B – PROPOSED PROPERTY LINES & EASEMENTS**



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BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 1.3 – PROJECT PHASING

2. SUSTAINABILITY

2.1 Sustainable Infrastructure

The Balboa Reservoir Project include sustainable design development through modern infrastructure and attention to community health and prosperity. Improvements comply with the City and County of San Francisco and State sustainability requirements including Title 24 (Divisions 6 and 11) and The San Francisco Green Building Code. A summary of the key sustainable infrastructure design strategies are as follows:

Section 4 – Site Demolition

- Recycle materials on-site where feasible.

Section 6 – Site Grading

- Erosion and sedimentation control measures during construction will be implemented consistent with an approved Erosion and Sediment Control Plan for the site during grading and construction to protect and control runoff.

Section 6 – Street, Mobility, and Circulation Designs

- New infrastructure and facilities to improve circulation and safely support all transportation modes such as walking and cycling to regional transit hubs.
- Establish an accessible neighborhood that prioritizes walking and biking.
- New public bicycle and pedestrian paths to provide connection to open spaces to support safety of bicycles and pedestrians.
- Selection of street trees that support Site ecosystems.

Section 7 – Open Space and Parks

- New parks and recreation facilities that will complement the existing surrounding neighborhood and citywide open space network.
- Selection of plants and trees that support Site ecosystems and habitats.

Section 9 – Low Pressure Water System

- New reliable potable water system.
- Use of water conservation fixtures.

Section 11 – Auxiliary Water Supply System (AWSS)

- New AWSS to improve reliability of fire suppression systems and improve site resiliency during a seismic event.

Section 13 – Stormwater Management System

- Stormwater management controls included in the buildings, streets, and open spaces to reduce runoff volume and rate affecting the City Combined Sewer System.

Section 14 – Dry Utility Systems

- New power, gas, and communication systems to serve the Development.
- Installation of photovoltaics and solar preheat systems on building rooftops in accordance with the Better Roofs Ordinance for renewable generation as approved by the power provider.
- Use of energy efficient equipment and fixtures to reduce energy demands.

3. SITE DEMOLITION

3.1 Scope of Demolition

The Developer will be responsible for the demolition and deconstruction of all non-retained existing buildings and infrastructure features. Demolition and deconstruction will include removal and disposal of hardscape, landscape and utilities. The demolition limit of work consists of the existing surface parking lot, earthen berm on the west side of the site, and road on the east side. Project demolition and grading activities will comply with City Ordinance 175-91 for use of non-potable water for soil compaction and dust control. Where feasible, concrete and asphalt pavements will be recycled and used on-site or made available for use elsewhere. Soil removal associated with demolition activities will comply with the Project environmental permit requirements.

As part of the vegetation grubbing and clearing operation, trees and other plant materials will be removed, relocated or protected in placed, as required. Trees and plant materials removed as part of the demolition process will be recycled by composting or similar methods for on-site uses associated with the planting of new vegetation and erosion control to the extent feasible.

The Developer shall be responsible for providing for the Infrastructure permanent improvements proposed to replace the existing infrastructure in accordance with approved building and construction permits issued by the City Agency. The extent of these improvements and associated demolition will be finalized during the construction document approval process.

3.2 Phases of Demolition

Demolition will occur in one phase for the entire site. Demolition will staged to allow the existing utility services, vehicular and pedestrian access areas, and landscaped spaces to remain in place as long as possible and reduce disruption of existing uses on the site and adjacent facilities. Project demolition activities will comply with City Ordinance 175-91 for use of non-potable water for soil compaction and dust control.

4. GEOTECHNICAL CONDITIONS

4.1 Existing Site Geotechnical Conditions

The site is currently owned by the San Francisco Public Utilities Commission and was originally planned for use as a municipal water reservoir. Although the site was never used as a reservoir, the central portion of the site was excavated down approximately 15 feet and an embankment approximately 30 feet tall was constructed along the western and southern boundary. The southern embankment was removed in 2008, and a new embankment was constructed along the eastern site boundary between 2008 and 2009. The central, depressed portion of the site is currently occupied by an asphalt parking lot.

A preliminary geotechnical investigation was performed at the site by Rockridge Geotechnical, Inc. (Rockridge) on January 3, 2017. The investigation consisted of advancing four borings to depths of between 6 and 26 feet below ground surface (bgs) and advancing six cone penetrations tests (CPTs) until practical refusal in very dense sand, which occurred at depths between 5 and 46 feet bgs.

The site is mapped in a zone of early-Pleistocene alluvium (Qoa) (Graymer, 2006). Based on the results of the preliminary geotechnical investigation, the non-embankment portion of the site is underlain by a deposit of medium dense to very dense silty sand with occasional clay interbeds, known locally as the Colma formation. The Colma formation extends to a depth of at least 46 feet bgs at location CPT-6, the maximum depth explored. The embankment consists of sand fill which was likely excavated onsite and re-worked. Documentation of the embankment construction was not available; however, the results of the preliminary investigation indicates that the fill appears to have been well-compacted and is generally dense to very dense in consistency.

Free groundwater was not observed in the borings drilled for the preliminary investigation. A geotechnical investigation was previously performed in 2010 for a development on Phelan Loop immediately southeast of the site. In that investigation, groundwater was encountered in one boring at a depth of about 22 feet bgs, while a second boring drilled to 40 feet did not encounter groundwater.

4.2 Existing Site Geotechnical Constraints

Based on the results the preliminary geotechnical investigation, Rockridge conclude there are no major geotechnical or geological issues that would preclude development of the site as proposed. The primary geotechnical issues affecting the proposed development include site grading and support of the proposed structures.

4.3 Site Grading

Conceptual development plans include removing the western berm and raising grades across the remainder of the site. In some areas, grades may be raised 20 feet or more. Even where fill is properly placed and compacted, some settlement of the new fill is expected.

4.4 Foundations

Foundations should be designed to provide adequate foundation support and limit total and differential settlements of the proposed buildings to acceptable levels.

4.5 Stormwater Infiltration

Conceptual development plans include incorporating infiltration facilities to manage stormwater runoff from impervious surfaces.

4.6 Geotechnical Approaches

4.6.1 Site Grading Approach

Fill should be placed and compacted in accordance with the recommendations of the final geotechnical report. In general, fill should consist of on-site soil or imported soil (select fill) that is free of organic matter, contains no rocks or lumps larger than three inches in greatest dimension, has a liquid limit of less than 40 and a plasticity index lower than 12, and is approved by the Geotechnical Engineer. It is anticipated that the embankment material will meet these criteria.

Where proposed buildings will span different fill thicknesses, the Geotechnical Engineer should evaluate the need of overexcavating and recompacting in-place soil to reduce potential for differential performance.

4.6.2 Foundation Approach

Rockridge preliminarily concluded the proposed buildings could be supported on shallow foundations bearing on firm native soil or properly placed and compacted engineered fill.

4.6.3 Stormwater Infiltration Approach

Where explored in the preliminary geotechnical investigation, the soil at the site primarily consists of silty sand. The silty sand is anticipated to have moderate to high infiltration rates, depending on the exact gradation and mineralogy of soil exposed at designated infiltration areas. Infiltration

facilities, including determination of infiltration rates, will be designed and constructed in accordance with SFPUC standards.

4.7 Schedule for Additional Geotechnical Studies

Prior to starting final design of the new infrastructure, the Geotechnical Engineer should perform additional borings/CPTs and prepare a final geotechnical report based on the supplemental field investigation. The geotechnical report should provide information about the soil and groundwater conditions at the site and include design-level recommendations regarding:

- site seismicity and seismic hazards, including the potential for liquefaction and liquefaction-induced ground failure
- the most appropriate foundation type for the proposed buildings
- design criteria for the recommended foundation type, including vertical and lateral capacities
- estimates of foundation settlement
- lateral earth pressures (static and seismic) for design of below-grade walls
- design groundwater level
- subgrade preparation for floor slabs, pavements, and exterior concrete flatwork
- flexible and rigid pavement design
- site grading and excavation, including criteria for fill quality and compaction
- temporary slopes
- temporary shoring and underpinning of adjacent structures, if required
- 2016 San Francisco Building Code (SFBC) site class and design spectral response acceleration parameters
- soil corrosivity
- construction considerations

In addition, infiltration rates should be determined in accordance with SFPUC guidelines[1] after the location of infiltration facilities have been finalized. Approved infiltration testing methods for a development of this size include "Large Pilot Infiltration Test (PIT)" and "Soil Grain Size Analysis", as appropriate.

[1] *Determination of Design Infiltration Rates for the Sizing of Infiltration-based Green Infrastructure Facilities,* April 2017

5. SITE GRADING

5.1 Project Datum

Site elevations, referred to herein are on the CCSF 2013 NAVD88, unless identified otherwise.

5.2 Existing Site Conditions

The existing grade within the Project site slopes gradually north, south, and west, away from the roadway to the north east with ground elevations ranging from approximately 315 feet elevation at the roadway to approximately 292 feet elevation to the south of the existing berm. The northern border is bounded by the track and field of Riordan High School with elevations between 315 and 325. The eastern border is bounded by the City College of San Francisco (CCSF) parking lot and drive aisle with grades varying between elevation 307 and 315. Along the southern border, there is a grade different of approximately 10 feet at the termination of Lee Avenue with elevation change from 308 on the project site to 298 at the termination of Lee Avenue. Mixed-use buildings border the south boundary. The elevation differential is reduced at the southwest corner of the site at elevation 289 where it conforms to the adjacent parcel. Along the western border, the site is bounded by and conforms to the existing grades along the backyards of residences fronting Plymouth Ave with ground elevations ranging from 286 feet to 320 feet in elevation. The existing site elevations are shown in Figure 5.1.

5.3 Site Geotechnical Constraints and Approaches

The Geotechnical Report was prepared for the Project by Rockridge Geotechnical. Although the site was intended to be used as a reservoir, it never fulfilled that purpose as it was converted into a parking lot. The central of the portion of the site was excavated down approximately 15 feet and an embankment approximately 30 feet tall was constructed along the west and east boundaries. The southern embankment was removed in 2008 and a new embankment was constructed on the east boundary between 2008 and 2009.

The Project site sits on sufficiently dense soil which is able to resist liquefaction, and associated manifestations such as settlement, loss of bearing capacity, sand boils, and lateral spreading. Furthermore, as the soil above the groundwater table consists primarily of dense to very dense silty sand, the Project site is not susceptible to cyclic densification (also referred to as differential compaction).

5.4 Project Grading Overview

The Developer will be responsible for the design and construction of the proposed grading for the Project. Below is a description of the grading design for the different areas of the site. The proposed Project conceptual grading plan is shown in Figure 5.2.

The Project is comprised of a street network with North Street, West Street, and South Street located as described in their name and Lee Avenue occupying the eastern leg of the loop. The street network connects to Ocean Avenue to the south via Lee Avenue and Frida Kahlo Way at the northeast via North Street. Development areas are divided into Blocks with Block A and B south of South Street, Blocks C, D, E, and F occupying the center, Block G to the north, and Block H and townhomes to the west.

Proposed grading for the Project raises the development area to approximate elevations of 299.6 feet to 315.5 feet at the center of the site. The looped street grades will slope generally to the southwest through a private street into the existing SFPUC easement. The streets and sidewalks will be designed to provide overland release and ADA compliant accessible pathways throughout the site and adjacent parcels. The proposed looped street with interconnected open space and accessible pathways will be constructed to link San Ramon Way and CCSF in the west-east direction and Ocean Avenue and North Street in the north-south direction. Throughout the site street grades less than 5 percent will be provided.

5.5 Proposed Grading Designs

5.5.1 Building Areas

Proposed finished floors will be set at highest adjacent grades. Project development and grading designs will be developed to comply with the City requirements for ADA accessible paths of travel.

5.5.2 Proposed Roadways

Proposed slopes along public streets and private streets will be set at a maximum longitudinal slope of 5 percent to provide ADA accessible pathways of travel without requiring handrails as shown in Figure 5.2. The proposed public street system is designed in linear grading pattern from north to south and generally east to west as illustrated in Figure 5.2. At conforms, the site conforms or slopes down to the existing adjacent streets. Handrails will be provided for stairs and accessible areas exceeding 5 percent, where required.

At street intersections, grades will be designed at a maximum slope of 2% to provide an accessible path of travel in crosswalks. In addition, vertical curves within the streets will be designed to both begin and end outside the limits of the crosswalk areas.

5.5.3 Overland Release

As required by the Subdivision Regulations, grading designs will be developed such that the 100-year HGL is contained within the top of curb elevations on opposite sides of a street throughout the Project site. The proposed on-site street loop will be graded to provide overland release at the south end of the Project. One release point will be via Lee Avenue to Ocean Avenue. The second release point being considered is through the SFPUC property at the southwest corner of the site. There are existing uses on the SFPUC property that will need to be evaluated prior to completion of the MUPs to determine if this will be a viable overland release point.

5.6 Proposed Site Earthwork

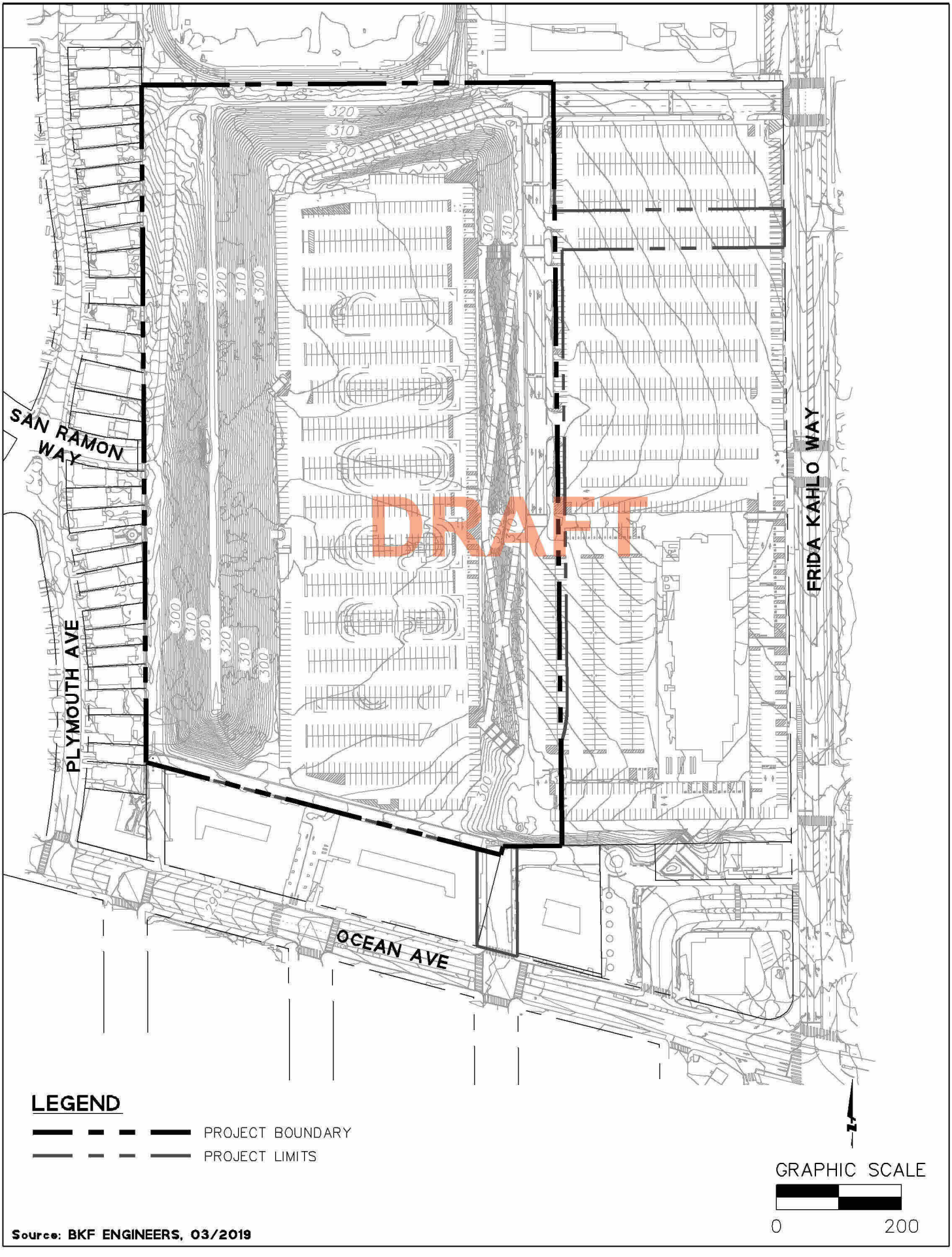
The conceptual grading plan for the Project will require approximately 171,000 CY of gross earthwork. To support grading activities, an Erosion and Sediment Control Plan (ESCP) will be submitted in parallel with future grading permits. Grading in conjunction with site remediation efforts will be performed by the Developer.

5.7 Cut/Fill Quantities

Approximate total quantity of soil to be exported is 56,000 CY. The remaining excavated material will be reused on site to eliminate the need to import additional fill.

5.8 Phases of Grading Activities and Approvals

The Developer will grade the site based on the principle of adjacency and as-needed to facilitate a specific proposed Development Phase and consistent with the requirements of the DA, and ICA. The amount and location of the grading proposed will be the minimum necessary to support the Development Phase. The new Development Phase will conform to the existing grades as close to the edge of the Development Phase area as possible while maintaining the integrity of the remainder of the Project. Repairs and/or replacement of the existing facilities necessary to support the proposed Development Phase will be designed and constructed by the Developer. Interim grading will be constructed and maintained by the Developer as necessary to maintain existing facilities impacted by proposed Development Phases. Project grading activities will comply with City Ordinance 175-91 for use of non-potable water for soil compaction and dust control.



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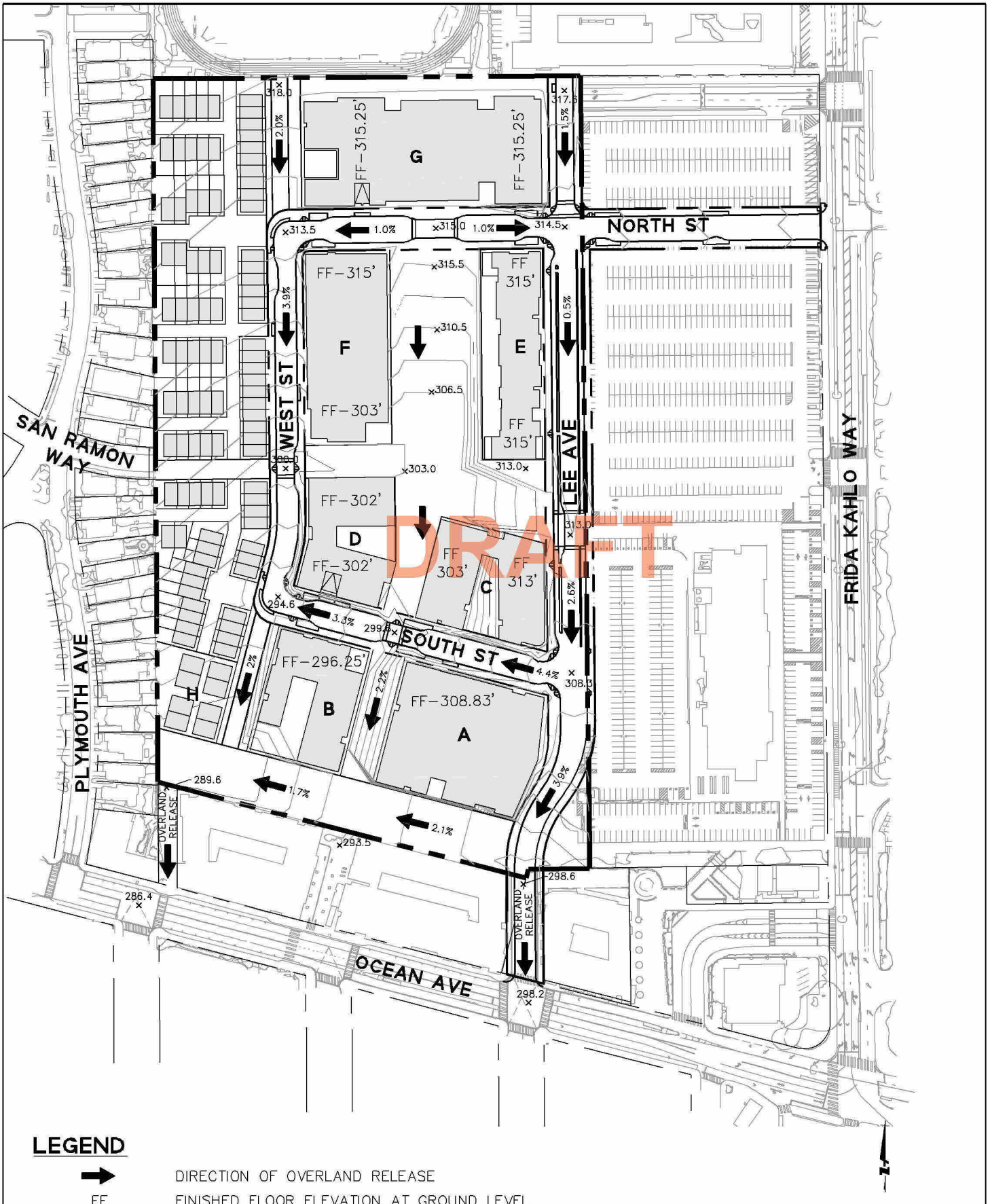
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 5.1 – EXISTING SITE TOPOGRAPHY



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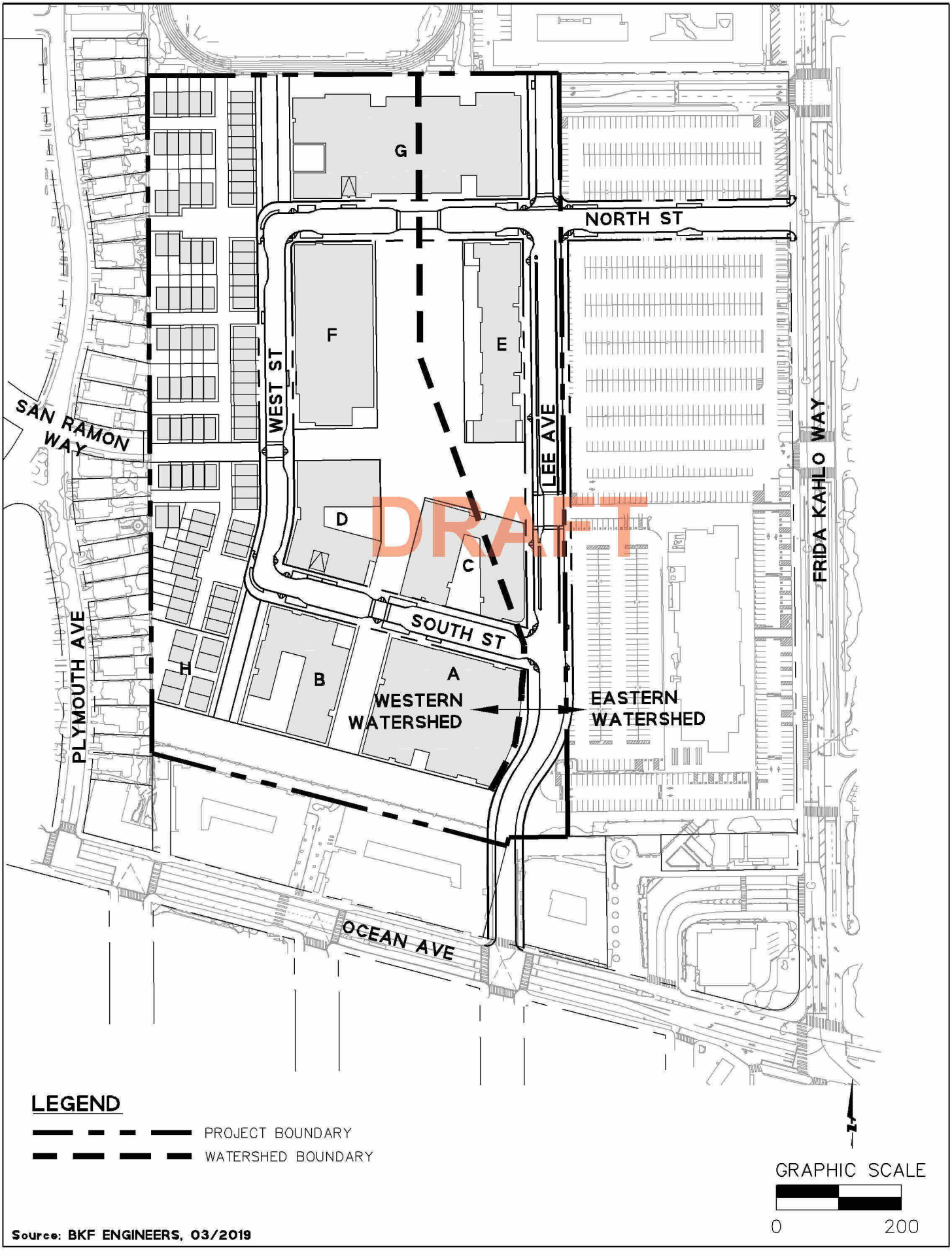
BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 5.2 – PROPOSED GRADING**



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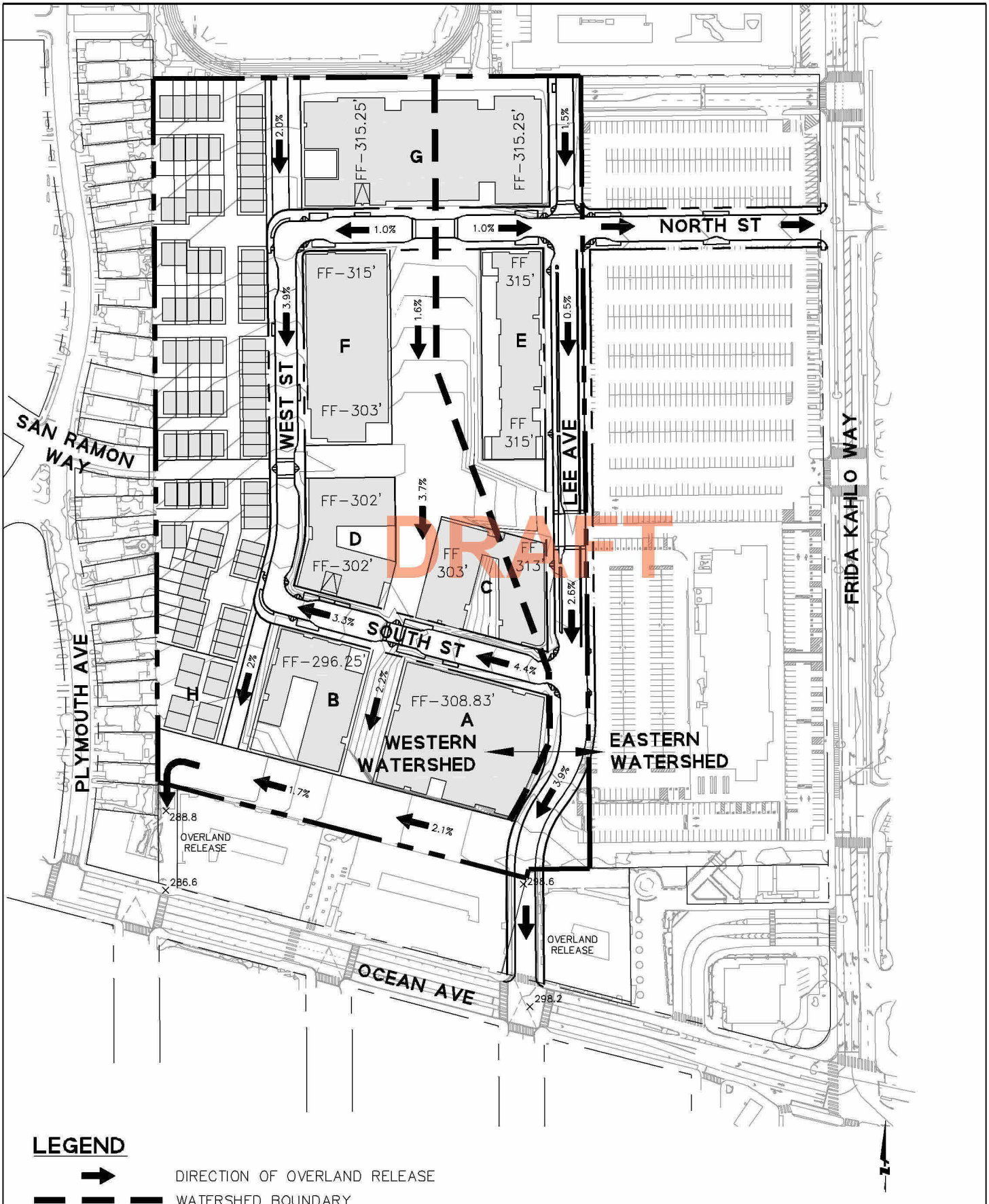
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 5.3 – PROPOSED WATERSHED



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BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 5.4 – PROPOSED OVERLAND RELEASE

6. STREET, MOBILITY AND CIRCULATION DESIGNS

Balboa Reservoir's street network will be comprised of short, walkable blocks that connect to existing the existing neighborhoods, CCSF, and adjacent streets. The Project will prioritize pedestrian and bicycle safety and access to the buildings, streets, and open spaces through careful consideration of transit and transportation connections, accessibility, traffic calming measures, and on-street parking. The bicycle network at will provide safe and convenient access within the Project and connections to nearby Ocean Avenue and Frida Kahlo Way. These facilities will be integral to the character of Balboa Reservoir's streets.

The report makes reference to specific sections of Chapter 5 of the DSG which is included as Attachment A to this report. The reviewer shall review both Chapter 6 of the Infrastructure Plan and Chapter 5 of the DSG concurrently.

6.1 Plan Overview

As a pedestrian-priority development, the street network will provide safe and easy access to open spaces, building entrances, and retail, with unique street types designed to the scale and speed of the pedestrian experience. A combination of traffic calming strategies will discourage unnecessary vehicle traffic and ensure that internal traffic will be low-speed and low-volume. The public realm will be fully integrated with the design and scale of the ground floor of the buildings.

Chapter 5 of the Balboa Reservoir Design Standards and Guidelines (DSG) is a companion document and contains supplemental information regarding the design of the street network. The reader is encouraged to also review Chapter 5 of the DSG.

6.2 Public Street Modes of Travel and Access

6.2.1 Pedestrian Circulation and Accessibility

Creating a safe, accessible, and comfortable pedestrian experience will be a priority on all streets, with safe pedestrian street crossings and connections to open spaces and surrounding streets. All of the proposed streets will have raised crosswalks which reduce the height of curbs separating the pedestrian walkways from the vehicular traveled way. Passenger loading and building servicing strategies will be designed to minimize conflicts between pedestrians and vehicles, and to maximize the special street-life elements that create a rich pedestrian experience.

The pedestrian network is further defined in Section 5.2 of the DSG.

6.2.2 Bicycle Circulation

The Project is dedicated to improving bicycle transportation throughout the area by providing infrastructure for improved cyclist safety. Bicycle lanes of various class designations will be incorporated into the public streets throughout the site. Lee Avenue will accommodate the majority of bicycle traffic traveling north and south through the site on via Class II and Class IV bike lanes providing a safer environment that separates bicycles from vehicular traffic and prioritizes bicycle travel. North, South, and West Streets will incorporate Class III shared bike lanes. Figure 6.2 shows the conceptual strategy for bicycle facilities at a network scale. Refer to Section 6.4 for specific street designs, bicycle facilities, and safety strategies.

The bicycle network is further defined in Section 5.3 of the DSG.

6.2.3 Vehicular Circulation and Intersections

All streets at shall have two-way low-volume, low-speed traffic circulation. Controlled intersections are shown on Figures 6.5A – 6.4E.

All stop-controlled and signalized intersections shall adhere to City standards for signage and street markings. Where crosswalks at uncontrolled intersections are proposed at Open Space connections, an appropriate combination of traffic control strategies, including crosswalk markings, shall be employed to maximize visibility and safe pedestrian crossing. Refer to Section 6.8 for more detailed information on intersection design and controls.

6.2.4 Fire Department Access

Based on the planning efforts undertaken during the initial meetings with the San Francisco Fire Department, intersection radii, street widths from curb to curb, and right-of-way layouts have been designed to accommodate fire truck turning movements at the Project intersections shown in Appendix D. Per the SFFD requirements, intersections are designed to accommodate the truck turning movements of the City of San Francisco 57-foot Articulated Fire Truck (Fire Truck). Other emergency vehicles turning movements analyzed include the SFFD Engine. The SFFD 57-foot Articulated Fire Truck shown in Figures D.6-D.9 was the most restricted vehicle and thus was the basis for street layout designs. At intersection approaches and within intersections, the Fire Truck may encroach into the opposing vehicular travel lane to complete turning movements, but a minimum of 7-feet of refuge area is provided for any cars within these lanes. Appendix D shows enlargements of the fire truck turning movements for the San Francisco 57-foot Articulated Fire

Truck at the site intersections. *Refer to Section 5.5 of the DSG for additional fire and emergency vehicle access.*

6.2.5 Parking, Loading, and Service

Parking, loading, and service will be distributed to minimize impact on the public realm pedestrian experience. Passenger loading across the site will be accommodated in dedicated areas. Servicing needs for Development Parcels will be accommodated on all streets in time-limited or dedicated zones. Loading and service areas are shown on Figure 6.9. *Refer to Section 5.6 of the DSG for more detailed information on parking, loading, and service.*

6.2.6 Large Vehicle Access

All Project streets within the public right-of-way shall accommodate commercial vehicle circulation. Access through the public right-of-way shall be designed for the SU-30 truck and accommodate the WB-40 trucks. Refer to Appendix C for truck turning studies.

6.3 Public Street System

The Developer will be responsible for the design and construction of the public streets as shown on Figure 6.1. Improvements will generally include the following:

- Pavement structural sections
- Concrete curbs and gutters
- Concrete sidewalk and curb ramps
- Traffic control signage and striping
- Traffic signal
- Street chicane for traffic calming
- Street lighting and pedestrian-scale lighting
- Street landscaping and trees
- Stormwater management facilities (may include such methods as landscape strips, permeable pavements, and bioretention areas)
- Street furnishings (includes, but are not limited to, benches, trash cans and bike support facilities)
- Accessible on-street passenger loading zones with adjacent street level passenger loading aisles and curb ramps.
- Accessible curb ramps
- Accessible Pedestrian Signal (APS) at traffic signal

- Raised crosswalks
- Sidewalk bulb-outs
- Class II, III, and IV bikeways
- Enhanced Paving
- Utility Clearance Requirements

Streetscape and landscape improvements are further defined in Chapter 5 of the DSG. Approval of and responsibility for maintenance and liability for non-standard stormwater treatment facilities shall be as described in the DA.

6.3.1 Public Street Layout and Parcelization

A system of street and parcel numbers has been created to facilitate planning and design coordination and is shown on Figure 6.1. The new grid network of public streets includes two streets oriented north to south: the Lee Avenue and West Street. Lee Avenue will conform to the existing dead-end street just north of Ocean Avenue. Property frontage improvements will result in partial renovation of the existing CCSF parking lots to the east. North Street and South Street will be oriented east to west. North Street will tie into Frida Kahlo Way at a new intersection. The existing intersection just north of North Street will be closed.

6.3.2 Roadway Dimensions

Street widths—curb to curb—are designed to accommodate emergency access, utility clearances, bicycle facilities, passenger loading and building servicing, and vehicular access throughout the site. Typical vehicular travel lanes within streets will range from 10-feet to 13-feet in width. Travel lanes are measured from the face of curb or outside edge of bicycle facilities. All streets will provide for two-way traffic and fire access, with street widths varying from 22 to 34-feet. Additional roadway dimension information at intersections is shown in Figure 6.5A-D and detailed cross section information is shown on the utility cross section exhibits in Figures 8.2A-G.

6.4 Public Street Network and Hierarchy

The Balboa Reservoir street network will include several street types with distinctive character, planting, traffic speed, and street-life elements – site furniture, street trees, special paving, and understory planting that combine with active ground floor uses to enrich the pedestrian experience. *Refer to Chapter 5 of the DSG for detailed information about the public street network and hierarchy.*

6.4.1 Street Zones and Designs

The streets will contribute to a varied public realm while satisfying above- and under-ground infrastructure needs at the Project. Proposed streets shall conform to the 2015 Subdivision Regulations. The public right-of-way must be open to the sky with the exception of permitted landscape and street-wall encroachments per the DSG, and publicly accessible at all times unless subject to maintenance, operations, security and safety rights, or closure by Master Developer for events. Street closure by Master Developer or others shall be subject to all applicable City permitting and authorizations. Ownership and maintenance and liability for streetscape elements and encroachments shall be addressed as set forth in the ICA including, but not limited to non-standard design features, such as lighting, stormwater gardens, and other stormwater treatments.

6.5 Components of Public Streets

6.5.1 Curb Heights

The curb heights shall be 6-inches unless at a raised crosswalk where they are reduced to 4-inches.

6.5.2 Paving

Final pavement design for the roadway sections will be designed for the anticipated traffic load and equivalent single axial loads (ESAL) for a design life coordinated with the City Agency per the terms of the DA and ICA.

The Pedestrian Throughway defined on each street shall be an accessible path of travel that is unobstructed by non-ADA-compliant paving or material treatments. Paving and built-in site elements shall be comprised of high-quality materials and finishes that are durable to withstand high-intensity use. All material textures in designated clear path of travel and accessible use areas shall be ADA-compliant.

Street paving materials can be found in Section 5.20 of the DSG.

6.5.3 Street Trees

Planting will function ecologically to help achieve the Project's goals for sustainability and contribute to a healthy environment. Composition and distribution of a diverse, adapted urban forest, stormwater gardens, and planted areas will create a resilient ecological framework to shape varied sensory experiences across the site and urban habitat. *Refer to Section 5.11 and 5.19 of the DSG for more detailed information about the public street trees and planting palette.*

6.5.4 Sustainable Water Strategies

The Project's landscape and building systems will work together and be designed to conserve, re-use, and filter water. Site hydrology will be intertwined with daily life in a unique and systematic way, with stormwater treatment gardens that are a part of the public experience in every streetscape and open space. Irrigation is an essential element of plant health and should be considered as part of the site hydrology strategy.

6.5.5 Lighting

Lighting will be an important component of nighttime identity, experience, and safety. Lighting of special, unique character should reinforce key pedestrian routes along the streetscapes. Where possible, a variety of lighting types should work together to create a warm, inviting, and safe nighttime environment. *Refer to Section 5.22 of the Balboa Reservoir DSG for additinoal information on public street lighting.*

6.5.6 Accessible Loading

Loading zones for vehicular and paratransit loading and unloading will be distributed across the site to enable access to all Development Parcels and open spaces, with priority given to significant pedestrian connections. Proposed configurations for loading stalls are described for integration with DPW-Standard Curb, 6-inches typical. *Refer to Figure 5.6-1 of the Balboa Reservoir DSG for detailed information about the accessible loading zones.*

6.5.7 Utility, Driveway, and Streetscape Coordination

The project will ensure that locations of above-grade utility boxes, where provided, are coordinated with streetscape elements. These locations shall be coordinated with tree spacing to ensure Urban Forestry standards are applied to the greatest extent possible. Driveway locations shall be coordinated with placement of streetscape elements. *Refer to Section 5.13 of the Balboa Reservoir DSG for additional information on streetscape coordination.*

Full-street cross-sections with utilities are shown in Figures 8.2A-8.2F in Section 8

6.6 Traffic Calming

As part of the pedestrian and bicycle focused development plan, traffic calming elements are proposed to improve non-vehicular traffic safety and access. Proposed traffic calming elements for the Project street rights-of-way are identified in Figure 6.3 and include raised crosswalks, chicanes, bulb-outs,

narrowed lane widths to accommodate bicycle infrastructure. *Traffic calming strategies are also expanded upon in Section 5.12 of the DSG.*

6.6.1 Raised Mid-Block Crosswalks

Raised mid-block pedestrian crosswalks are proposed along all streets except the portion of North Street east of Lee Avenue. At raised crosswalk locations, the street pavement areas will be raised as much as 2-inches to reduce the adjacent curb heights to 4-inches and will change paving material for a more effective visual cue to motorists. Final grades are dependent on overland release feasibility studies.

Where raised crossings are proposed, decorative crosswalk treatments or striped continental crosswalks shall be provided and comply with City and MUTCD standards and required review. Proposed decorative treatments shall meet ADA standards for slip-resistance. The design for these crosswalks will be coordinated with and are subject to the approval of the SFPUC, SFDPW, the SFMTA, and the San Francisco Fire Department (SFFD). Refer to Section 5: Site Grading for additional information about Project grading and overland release requirements. Raised crossing configurations are shown on Figure 6.4A-E.

The Developer or HOA will be responsible for maintenance and restoration of the street pavement sections, including pavement markings, within the raised crosswalk. Designs will incorporate measures to minimize maintenance and reduce the potential for dirt, silt and other debris to settle within the crosswalks.

6.6.2 Street Chicane

A chicane is integrated at the northern end of West Street to calm traffic and reduce vehicle speeds approaching and departing from the intersection at North Street and West Street. The chicane offset is 8-feet and maintains a 12.5-foot travel lane consistent with the land widths of West Street. Layout of the chicane is shown on Figure 6.5B.

6.6.3 Intersection Bulb-Outs

Bulb-outs have been incorporated at all intersections. These locations are expected to have a high concentration of pedestrian traffic. Bulb-outs will narrow driving lanes, create a shorter pedestrian crossing, make pedestrians more visible to motorists and require vehicles to reduce speeds. The final design for the bulb-outs will be coordinated with the SFMTA, SFDPW, SFPUC, and the SFFD.

Bulb-out improvements will be constructed if the designs can meet the City Agency's requirements for overland drainage release, utility clearances, and accessibility for persons with disabilities. Overland Release at these locations will be studied in the Grading and Drainage Master Plan. Typical intersection bulb-out details are shown on Figures 6.5A-D.

6.7 Off-Site Traffic Signalization

The Developer will be responsible for design and construction funding, either as partial contribution or in full, of traffic signal modifications or new traffic signals, as well as striping. Where possible, the electrical service for traffic signals will be located within the joint trench (see Section 17). Traffic signals shall be designed by and constructed to the specifications of the SFMTA and SFDPW. If determined feasible, planned off-site intersection improvements include, but may not be limited to the following:

6.7.1 Frida Kahlo Way and North Street Intersection

A new signalized intersection will be constructed at the proposed intersection of North Street and Frida Kahlo Way. The existing signalized intersection at the northern access road to the existing surface parking lot will be removed. See Figure 6.6 for the proposed intersection geometry.

6.8 On-Site Traffic Controls

Traffic calming and stop-controlled intersections, rather than signalization, are the primary strategy for on-site traffic control. Stop signs will be added at all intersections, with final locations to be determined by traffic sight distance requirements and coordination with the City. If implemented, stop signs on city streets will require legislation from SFMTA Board and traffic calming may also require SFMTA Board and/or public hearing.

6.9 Public Transportation System

No public transportation is envisioned within the Project site. However the site is located within a 1/4 mile of bus and streetcar service and less than 1 mile from the Balboa BART Station.

6.10 SFMTA Infrastructure

Where required, the following list of infrastructure items includes items to be owned, operated and maintained by the SFMTA within public right-of-ways:

- Security monitors and cameras
- Signals and Signal Interconnects, including Muni Bus Prioritization signals
- TPS signal preempt detectors

- Conduit containing TPS signal cables
- Shelters (with Vendor)
- Paint – poles and asphalt delineating coach stops
- Asphalt painting for transit lanes
- Departure prediction ("NextBus") monitors and related communications equipment
- Bicycle racks
- Crosswalk striping, except for areas with a raised crosswalk or with painted concrete special striping or other special decorative treatment
- Bike lane and facility striping
- APS/Pedestrian crossing signals
- Street Signs

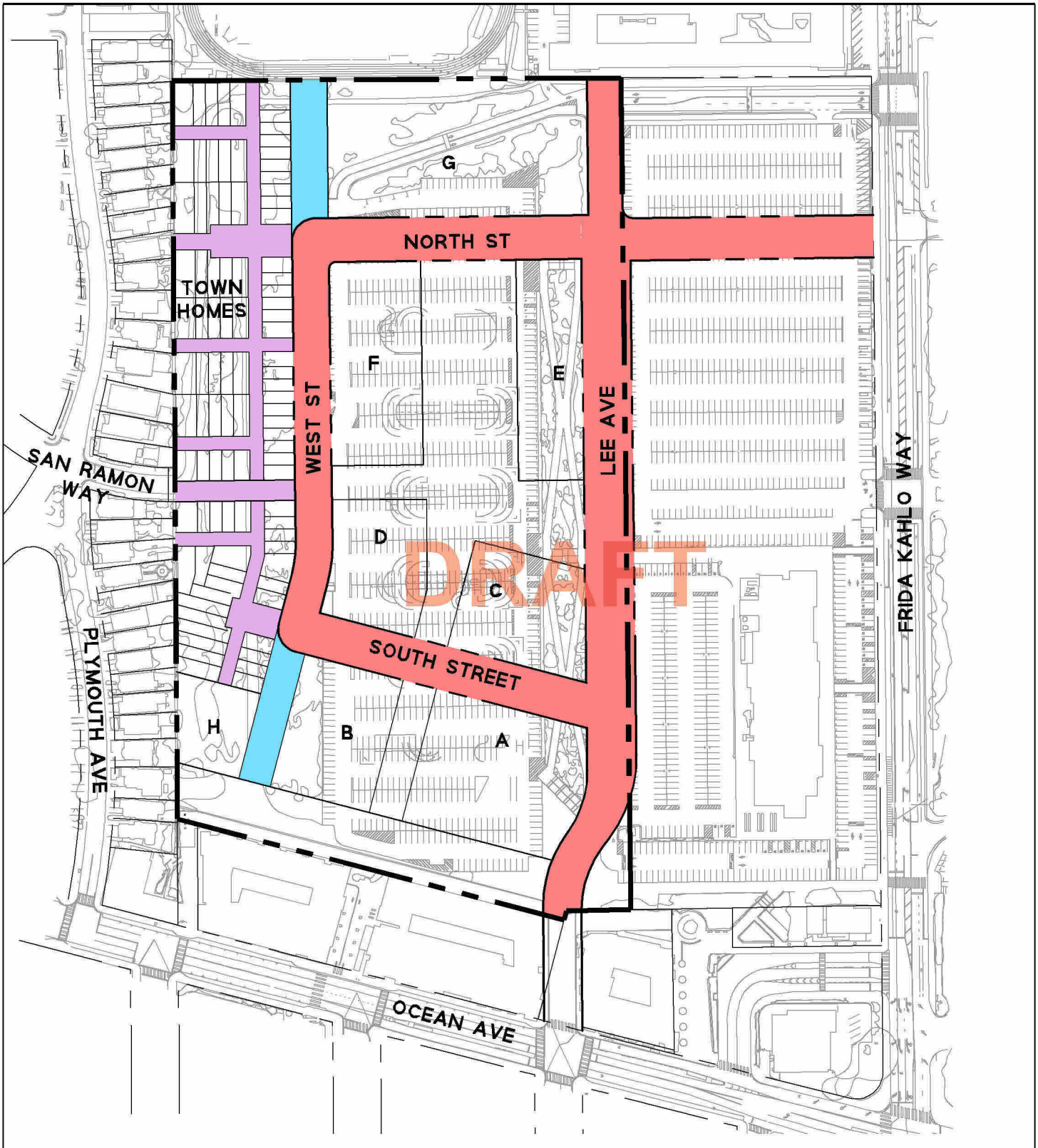
6.11 Acceptance and Maintenance of Street Improvements

Upon acceptance of the new and/or improved public streets by the City Agency, responsibility for the operation and maintenance of the roadway and streetscape elements will be designated to the appropriate City Agency as defined in the City of San Francisco Municipal Code and related ordinances, and the Project DA or ICA. Conflicts between proposed public utility infrastructure and the surface improvements proposed as part of the Project, including but not limited to dedicated transportation routes, trees, bulb-outs, and medians, shall be minimized in the design of the infrastructure and surface improvements. The City Agency responsible for said utility infrastructure will review all proposals for surface improvements above proposed public utility infrastructure on a case-by-case basis to ensure that future access for maintenance is preserved. Stormwater management and treatment infrastructure installed as part of the streetscape to meet the Stormwater Management Requirements and Design Guidelines (SMR) will be maintained by the Master Developer and/or City Agency subject to the terms of the Project DA or ICA.

As outlined in the DA or ICA, the Master Developer will be responsible for maintenance and restoration of the non-standard materials and design features, including decorative paving and hardscape elements, as well as specific streetscape elements and encroachments. Restoration will include replacement of the pavement markings within areas with non-standard materials.

6.12 Phasing of New Roadway Construction

All new public roadways will be constructed in Phase 1.



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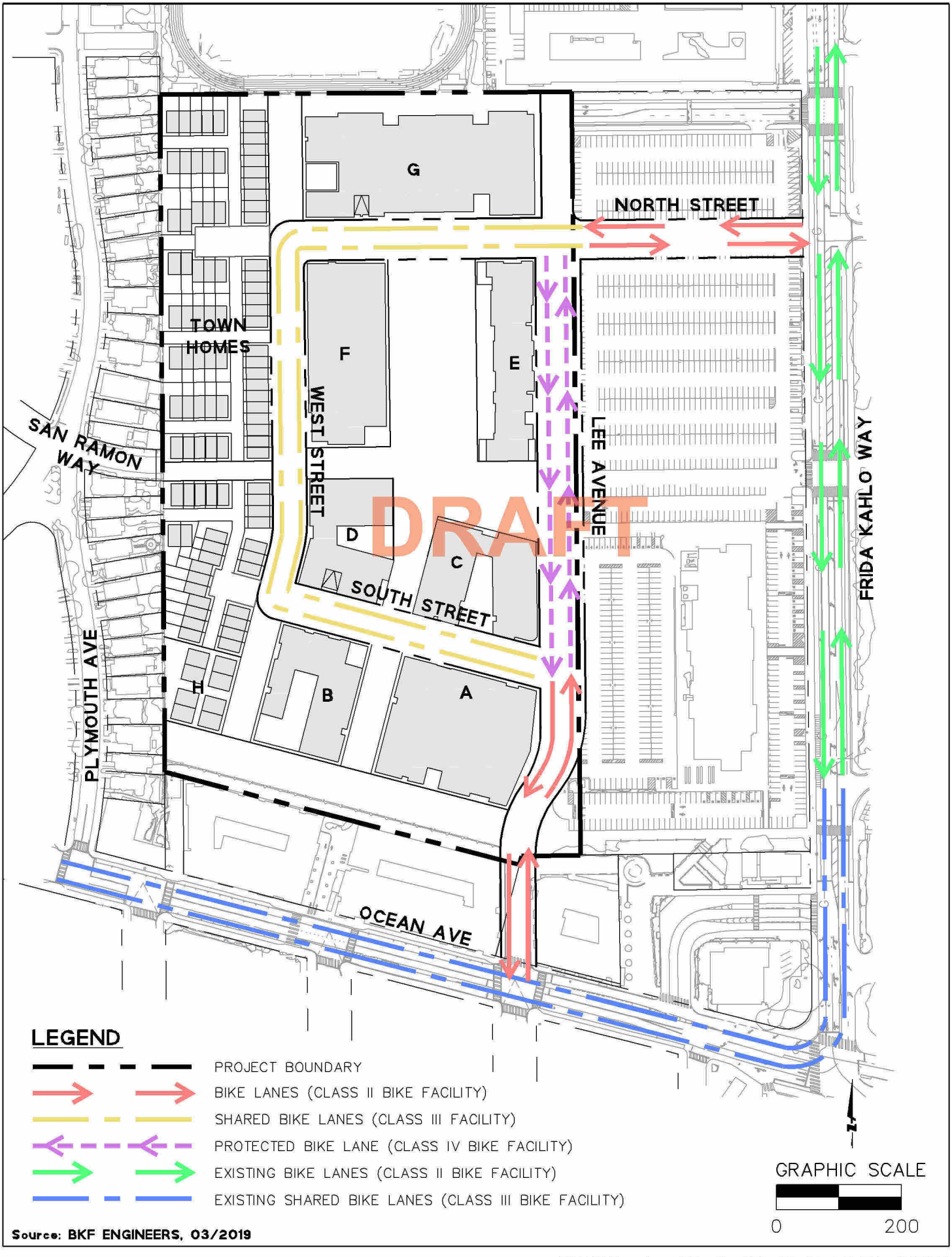
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.1 – PROPOSED STREET SYSTEM



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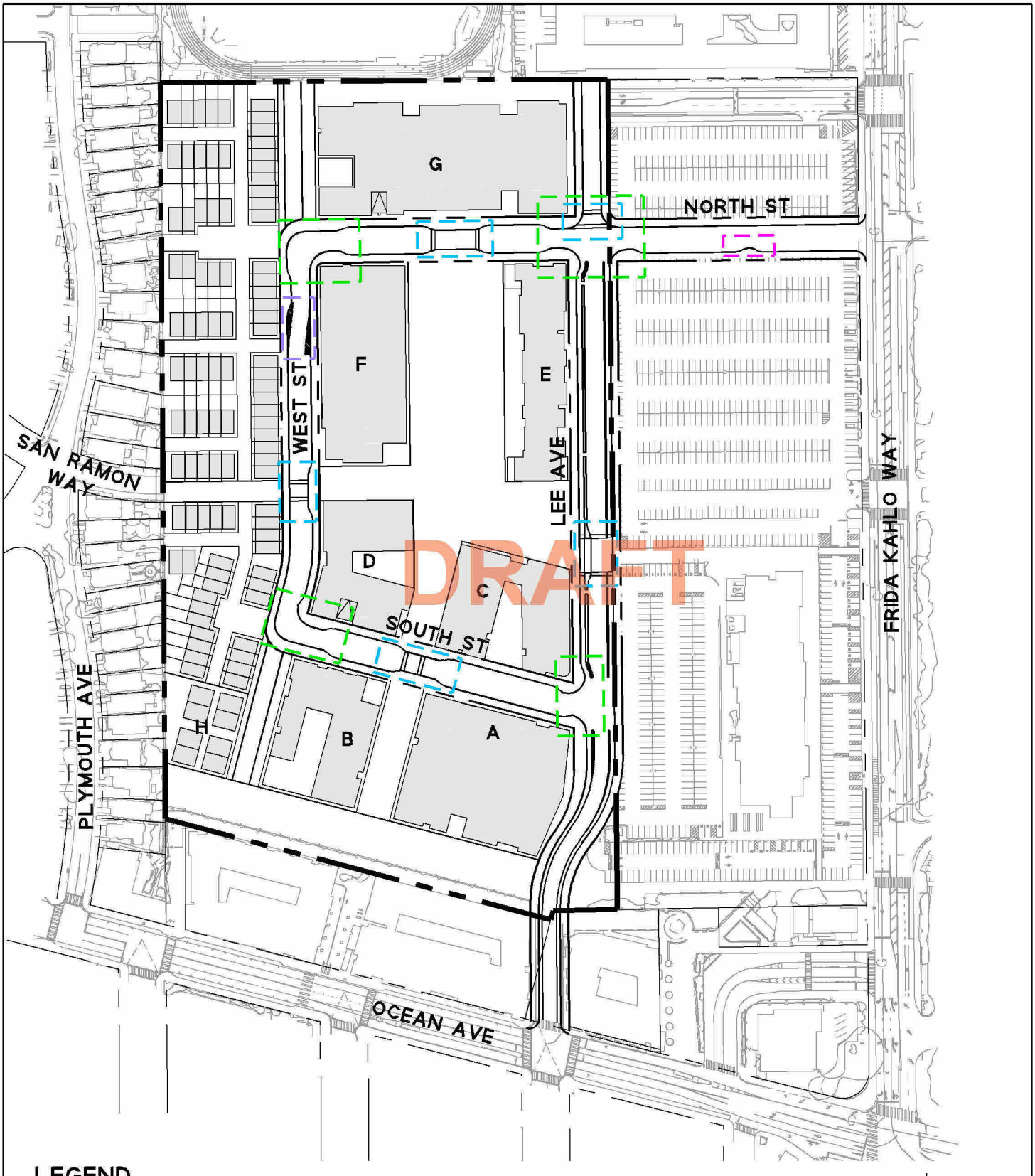
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.2 – PROPOSED BICYCLE FACILITIES



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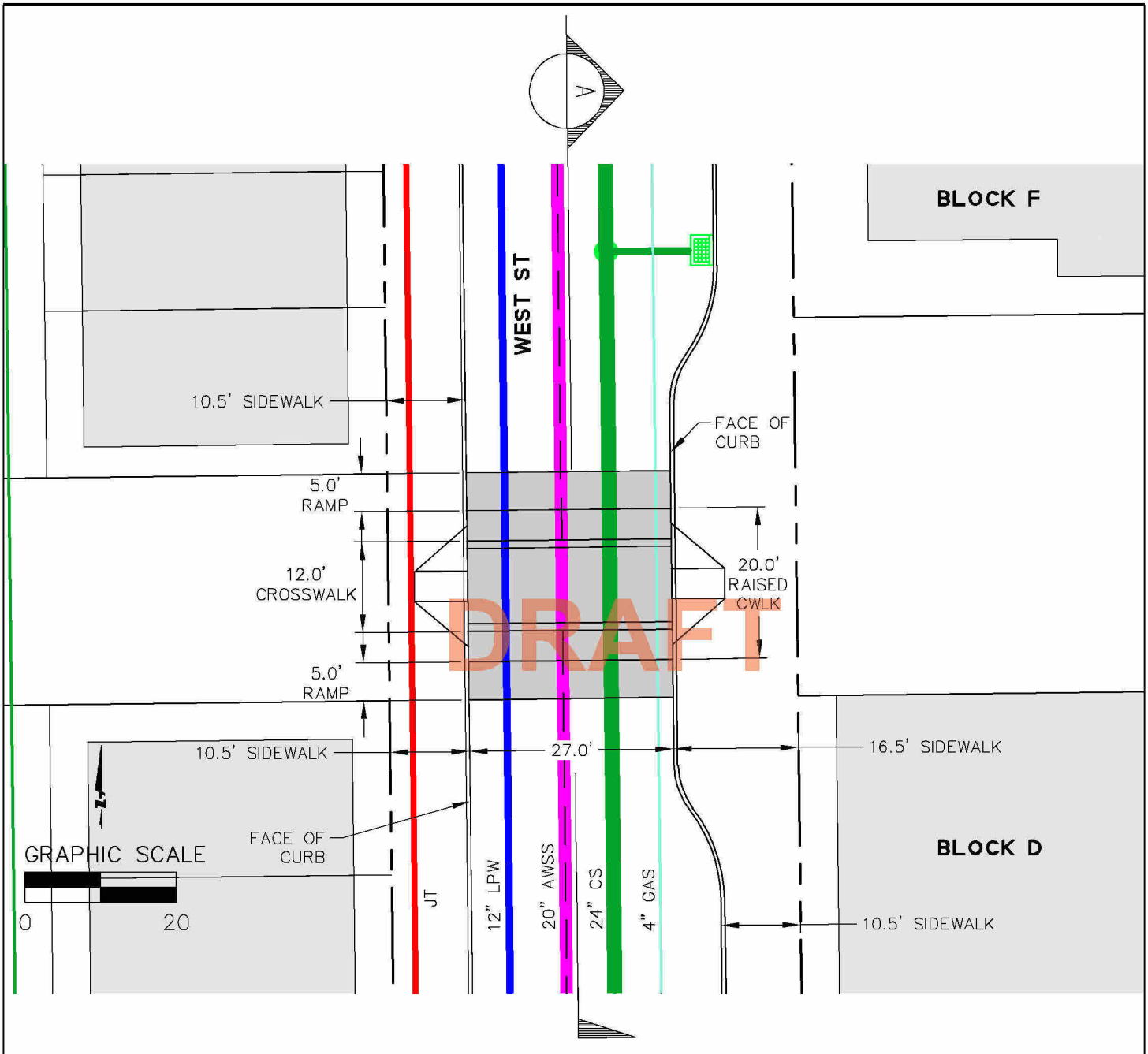
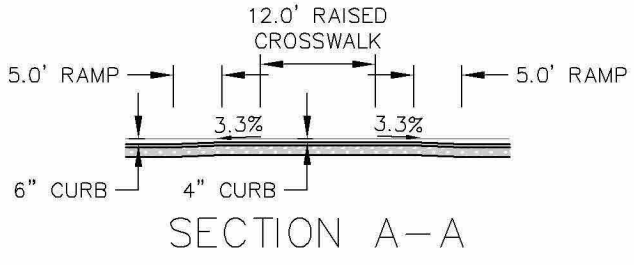
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.3 – TRAFFIC CALMING MEASURES





SECTION A–A

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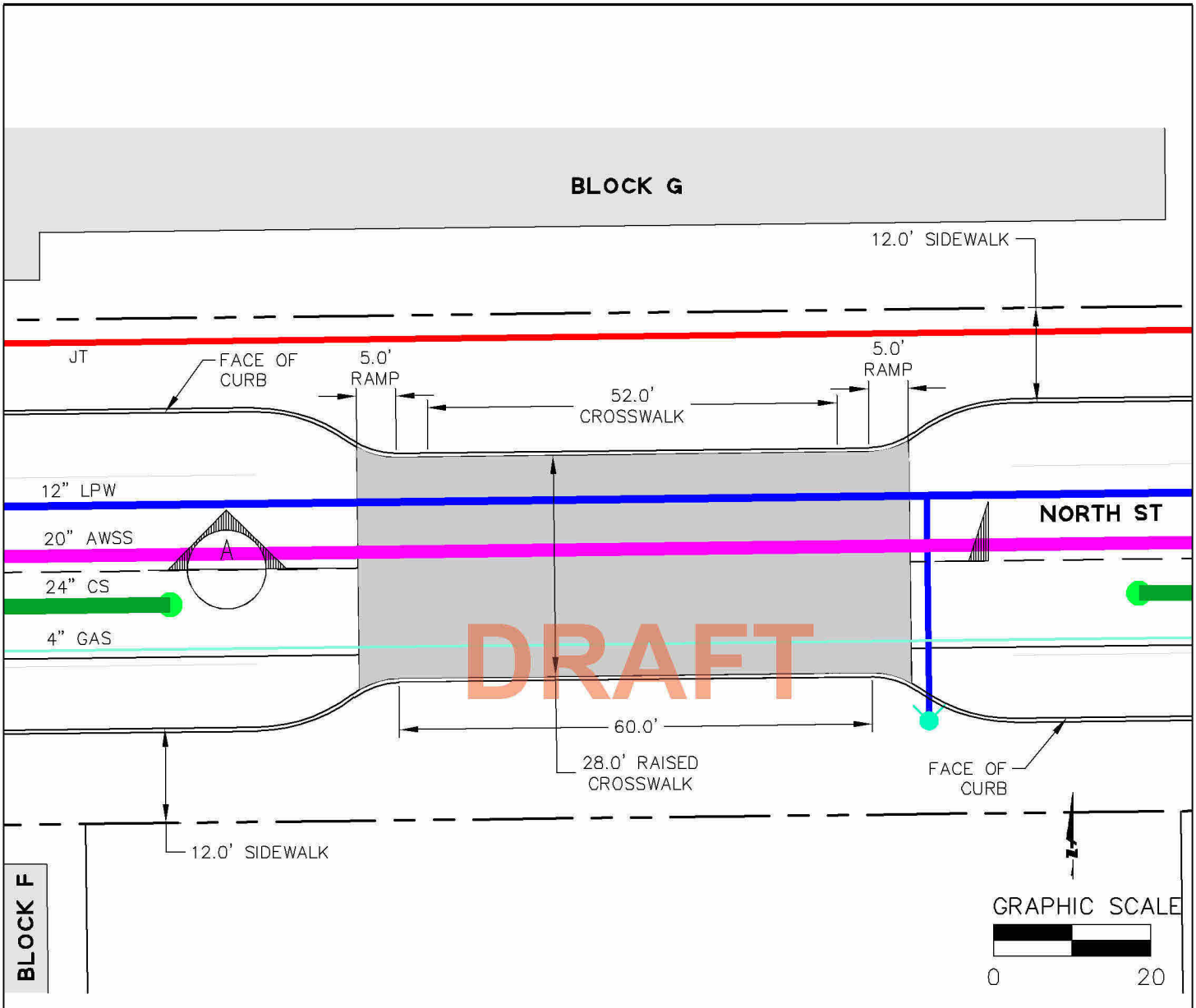
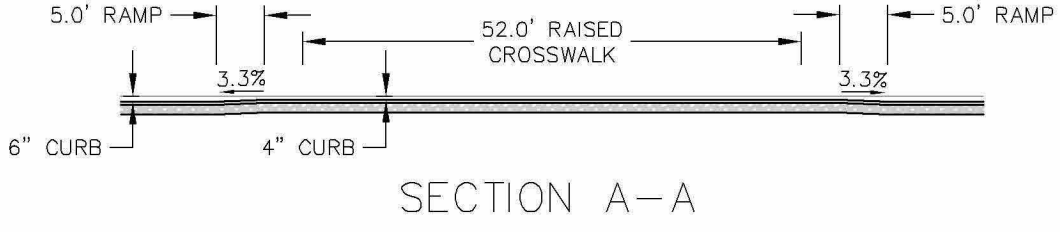
BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 6.4A – RAISED STREET CROSSING (WEST STREET)





SECTION A–A

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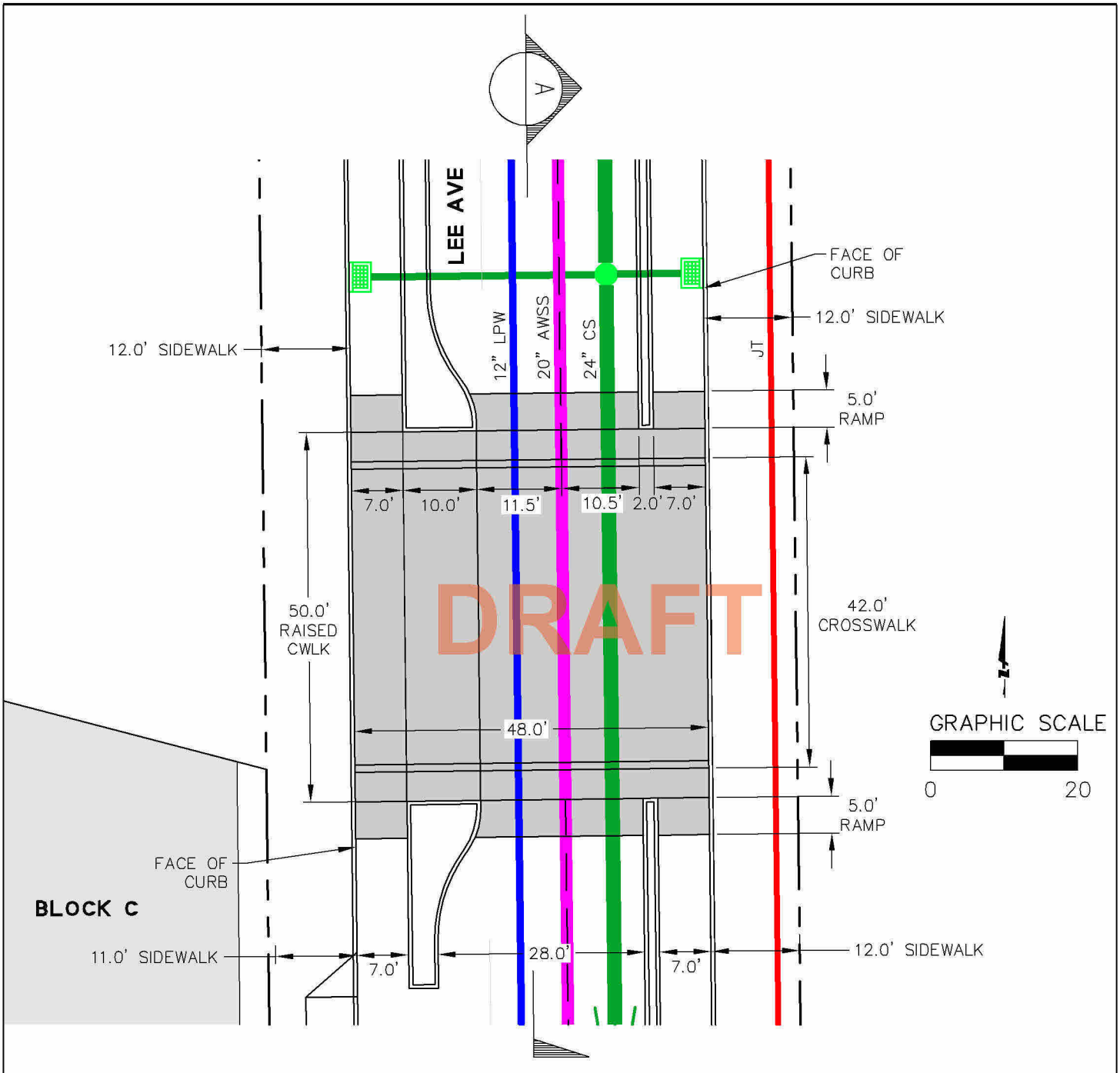
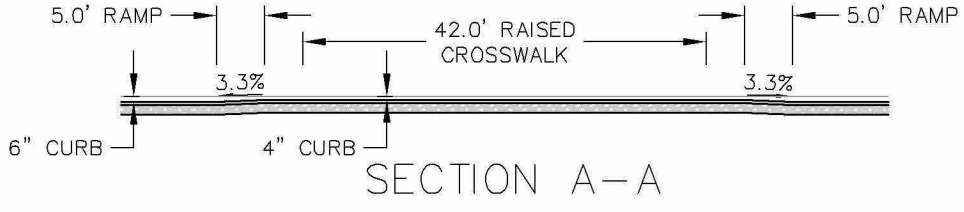
BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 6.4B – RAISED STREET CROSSING (NORTH STREET)**





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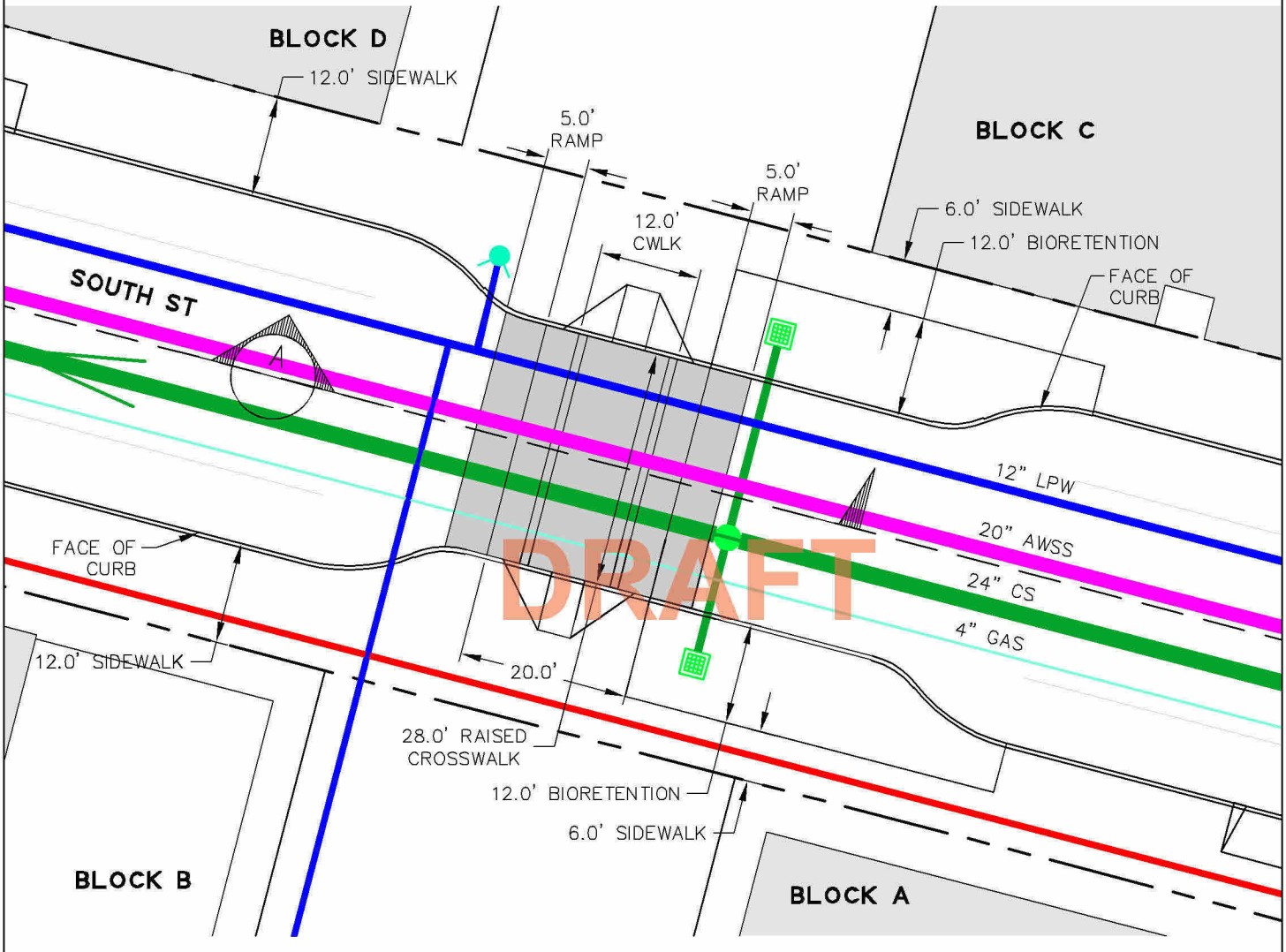
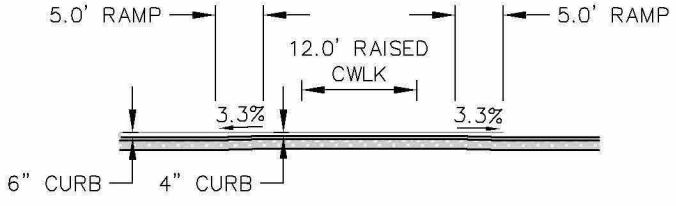
BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 6.4C – RAISED STREET CROSSING (LEE AVE)**





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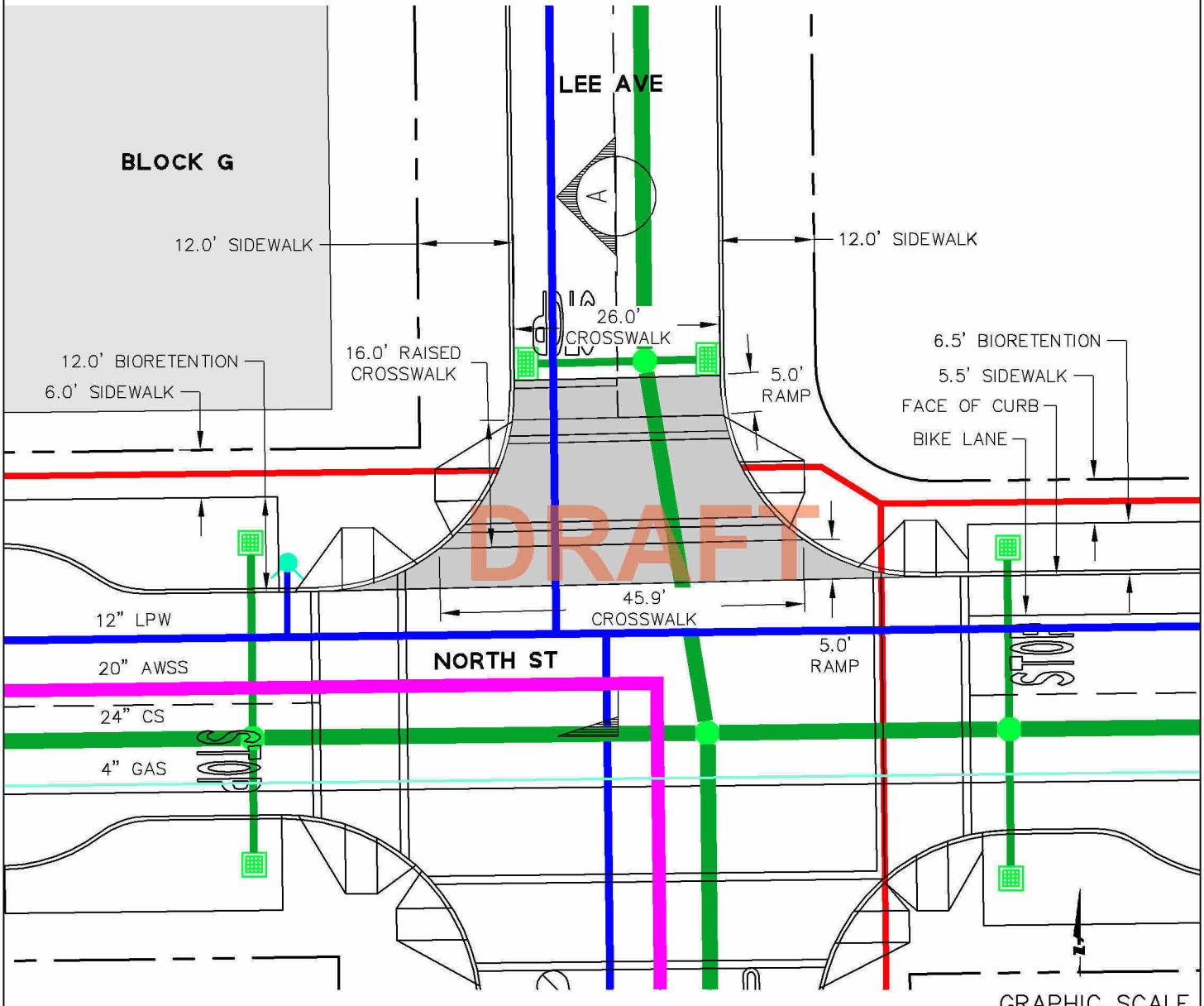
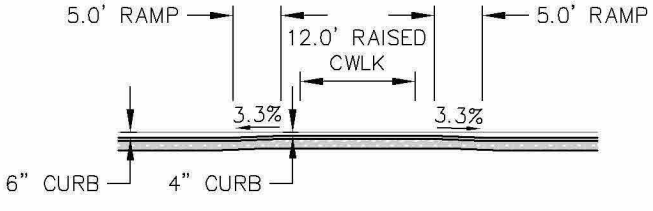
BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 6.4D – RAISED STREET CROSSING (SOUTH STREET)**





SECTION A–A

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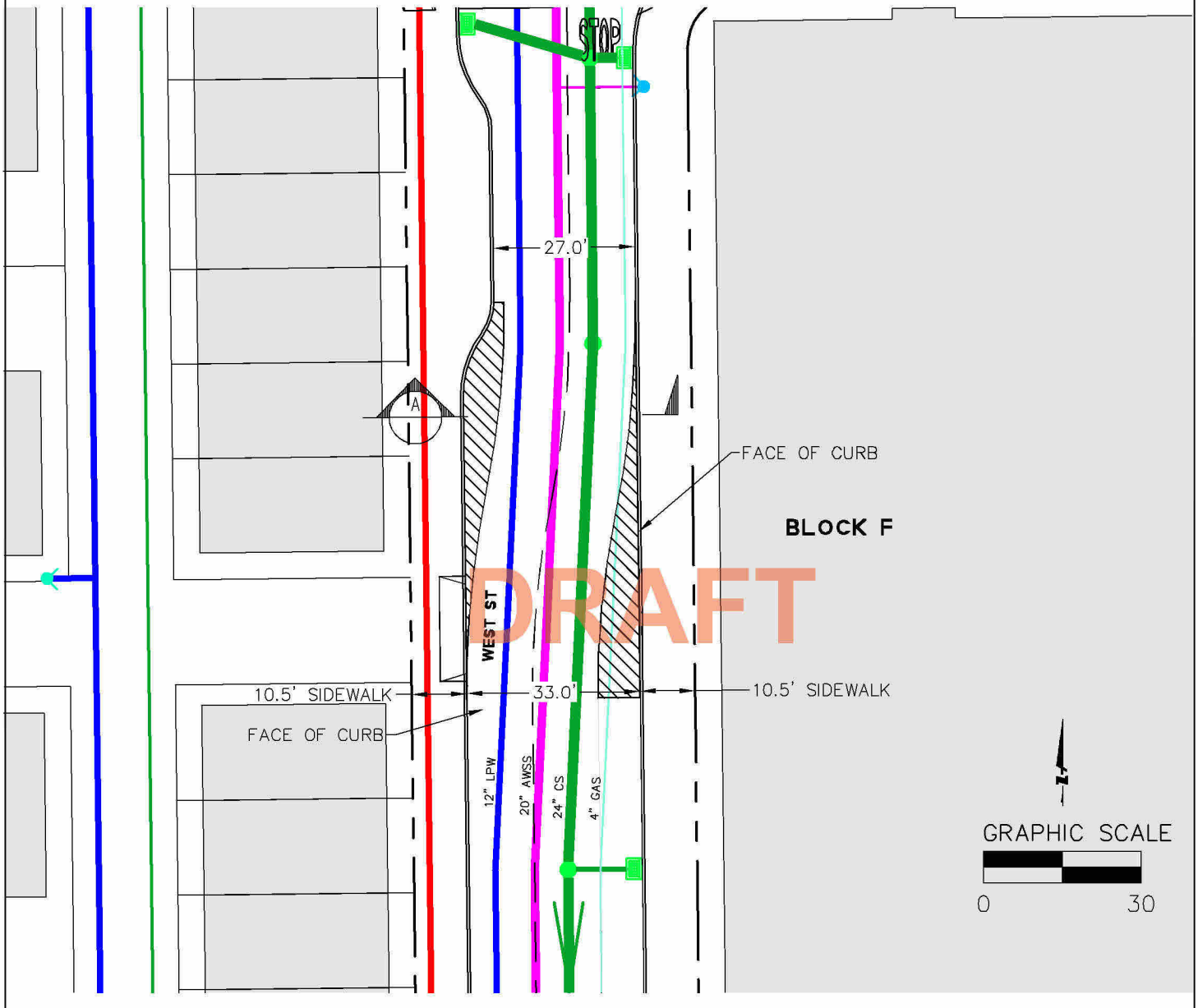
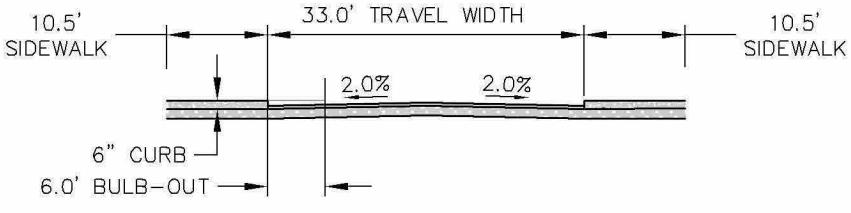
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.4E – RAISED STREET CROSSING (NORTH ST/LEE AVE)





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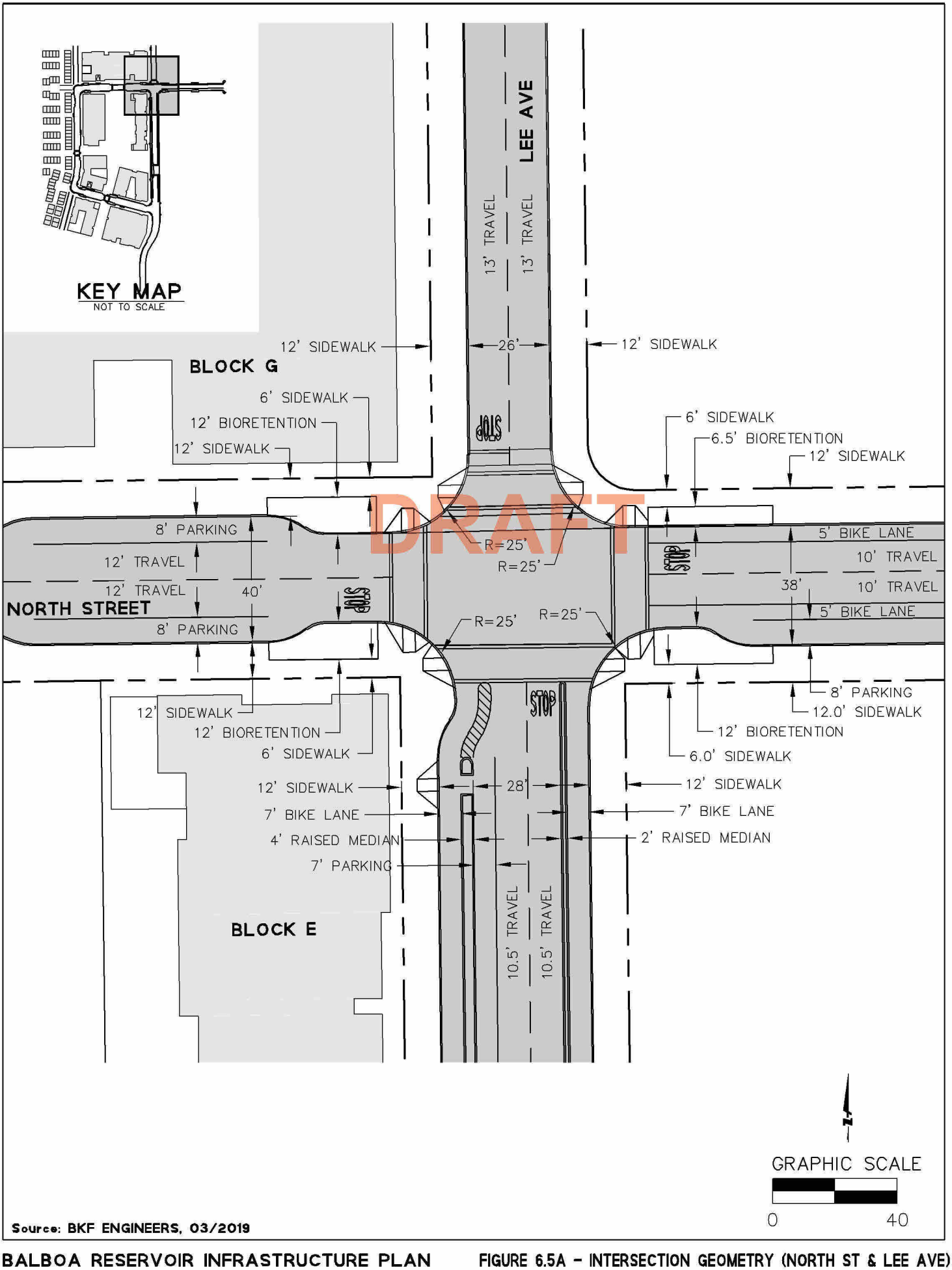
BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 6.4F – CHICANE (WEST STREET)**



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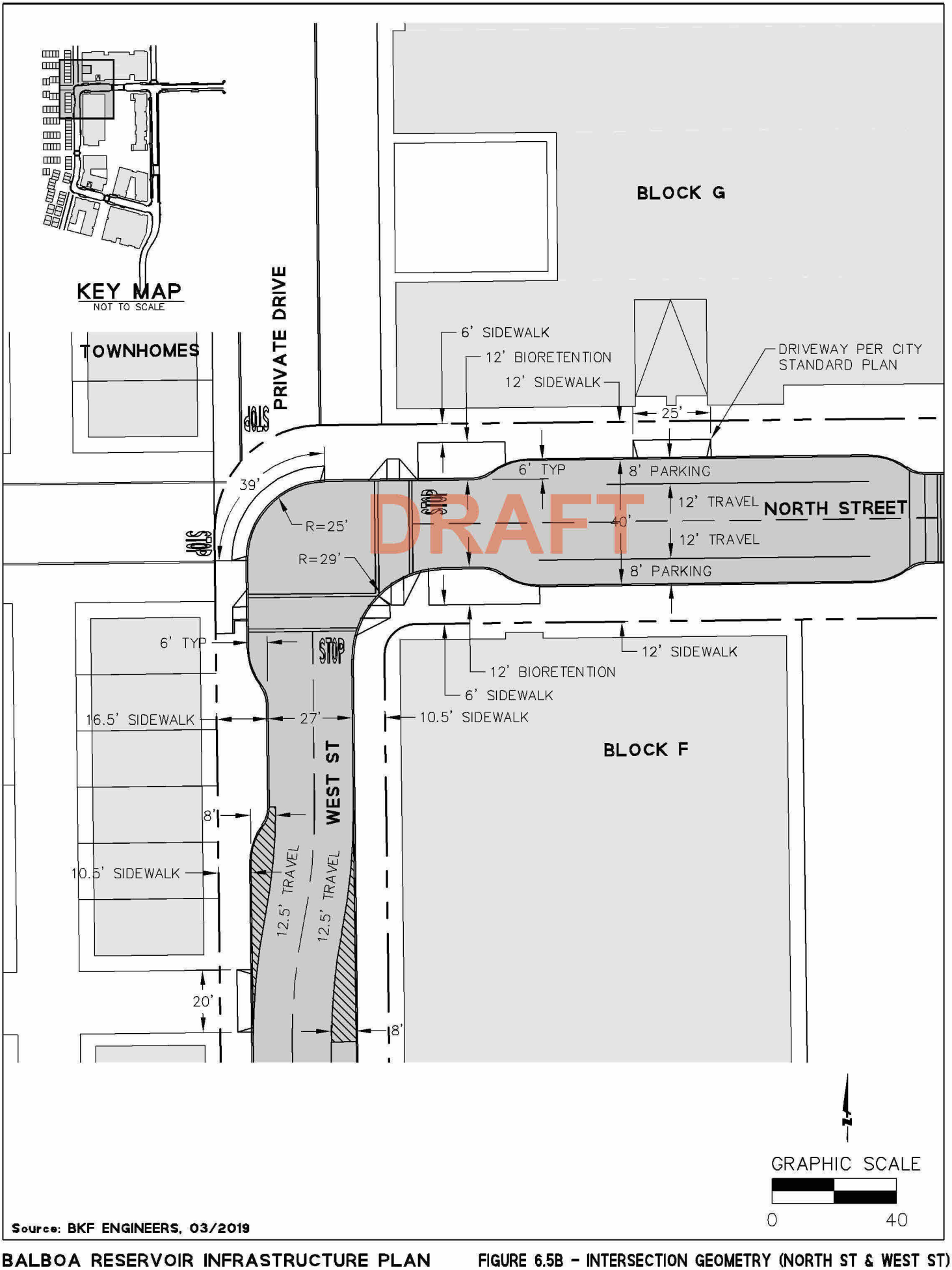
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.5A – INTERSECTION GEOMETRY (NORTH ST & LEE AVE)



Source: BKF ENGINEERS, 03/2019

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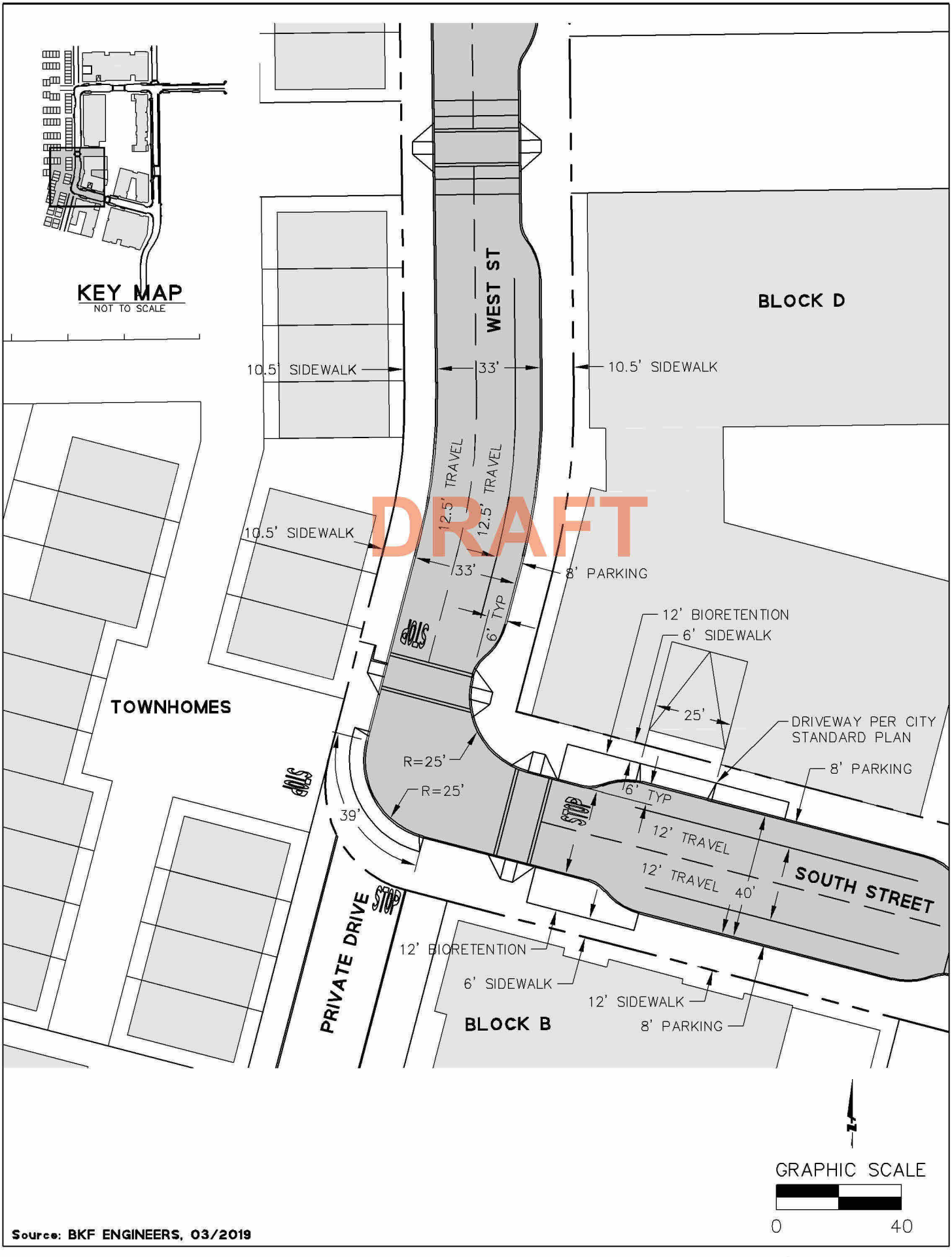
PLOT DATE: 03-07-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.5B – INTERSECTION GEOMETRY (NORTH ST & WEST ST)



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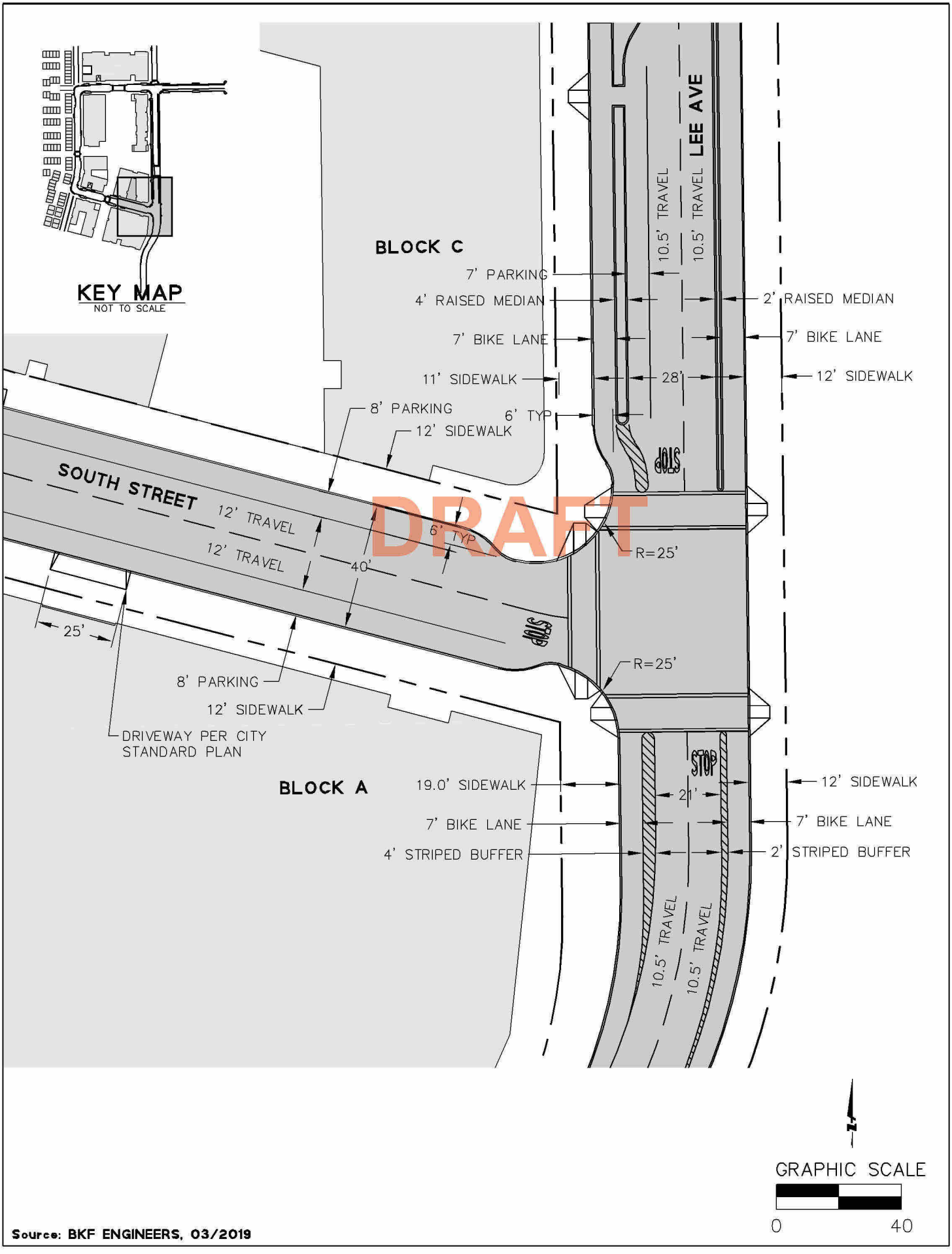
PLOT DATE: 03-07-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.5C – INTERSECTION GEOMETRY (SOUTH ST & WEST ST)



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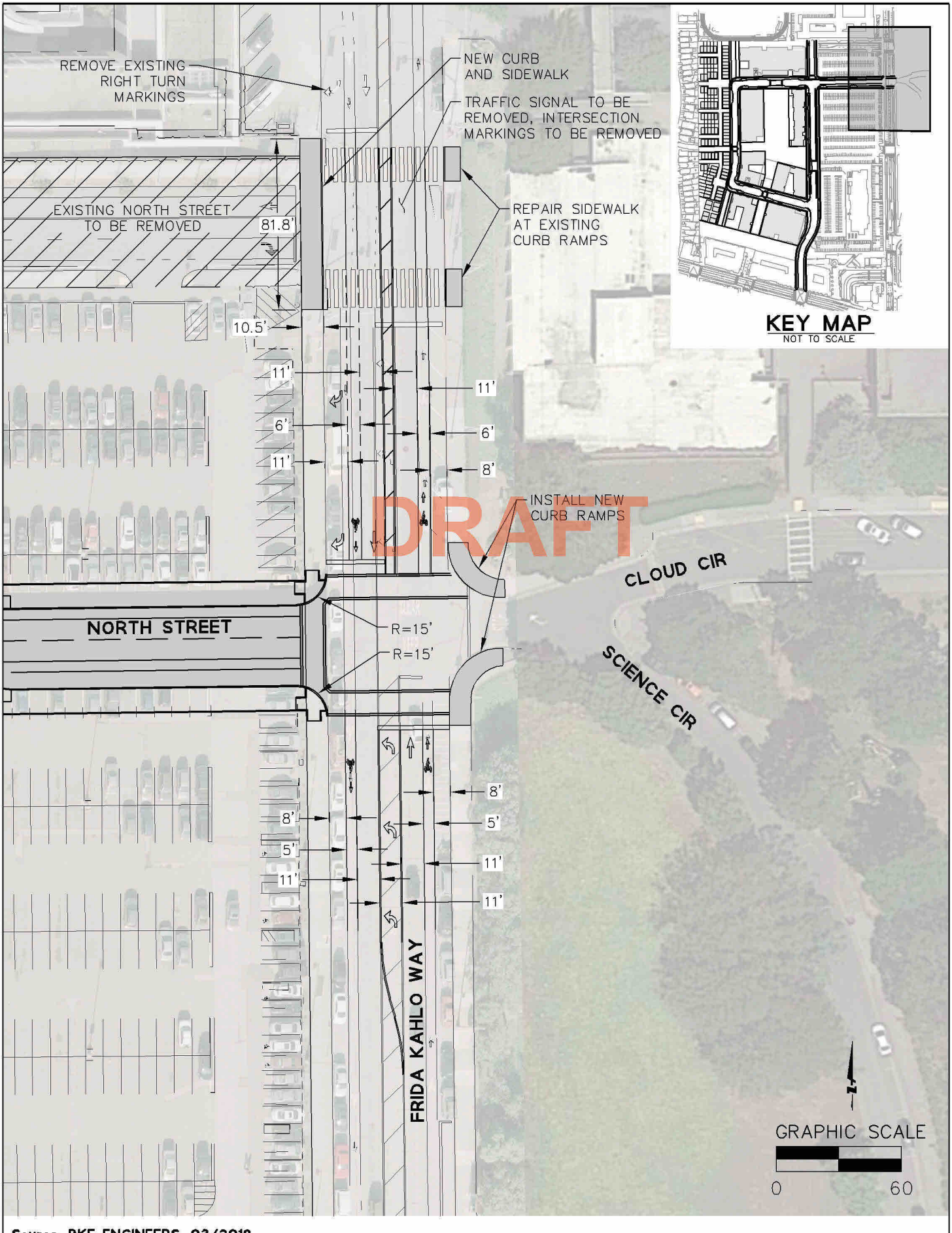
PLOT DATE: 03-07-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.5D – INTERSECTION GEOMETRY (SOUTH ST & LEE AVE)



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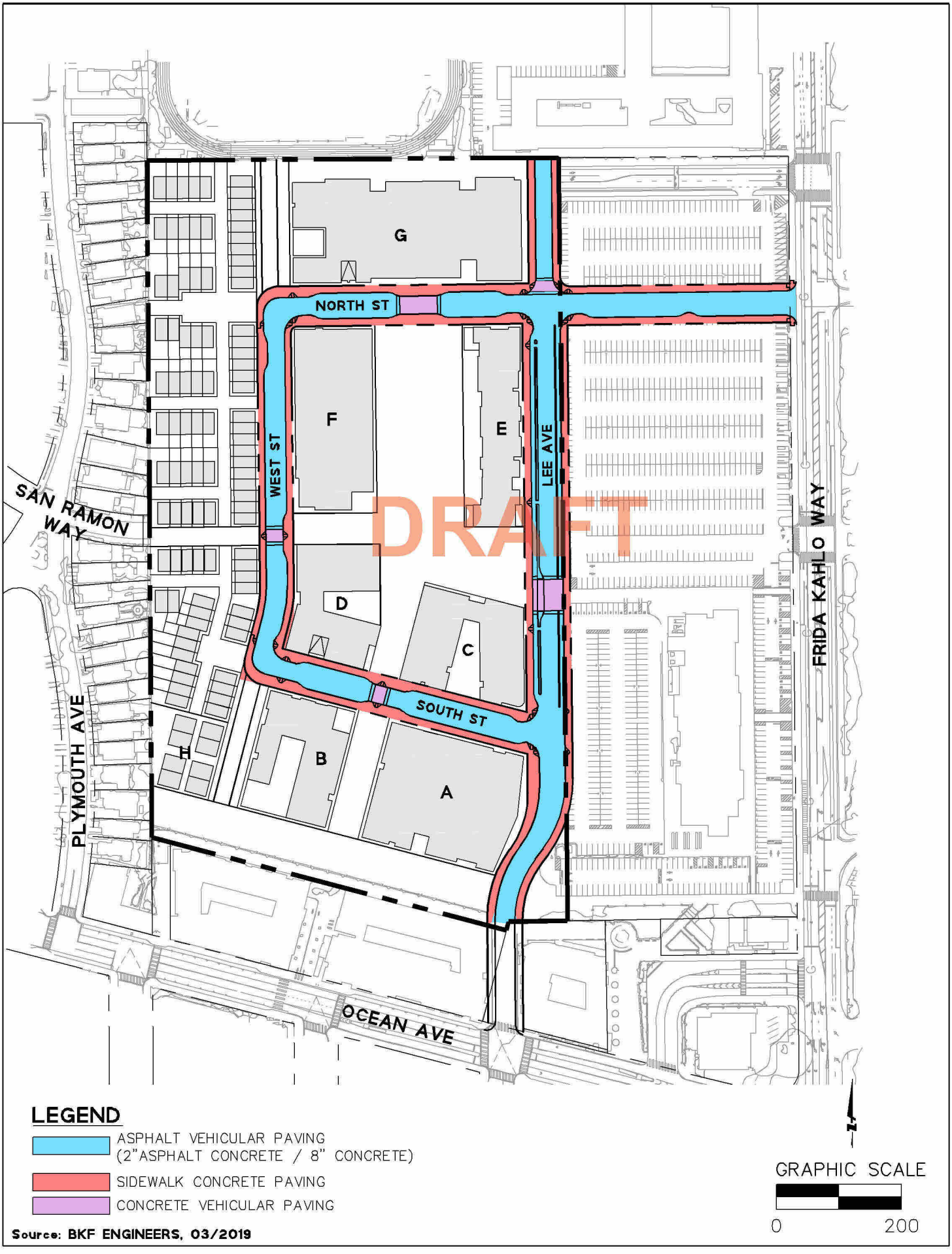
PLOT DATE: 03-06-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.6 – FRIDA KAHLO WAY INTERSECTION



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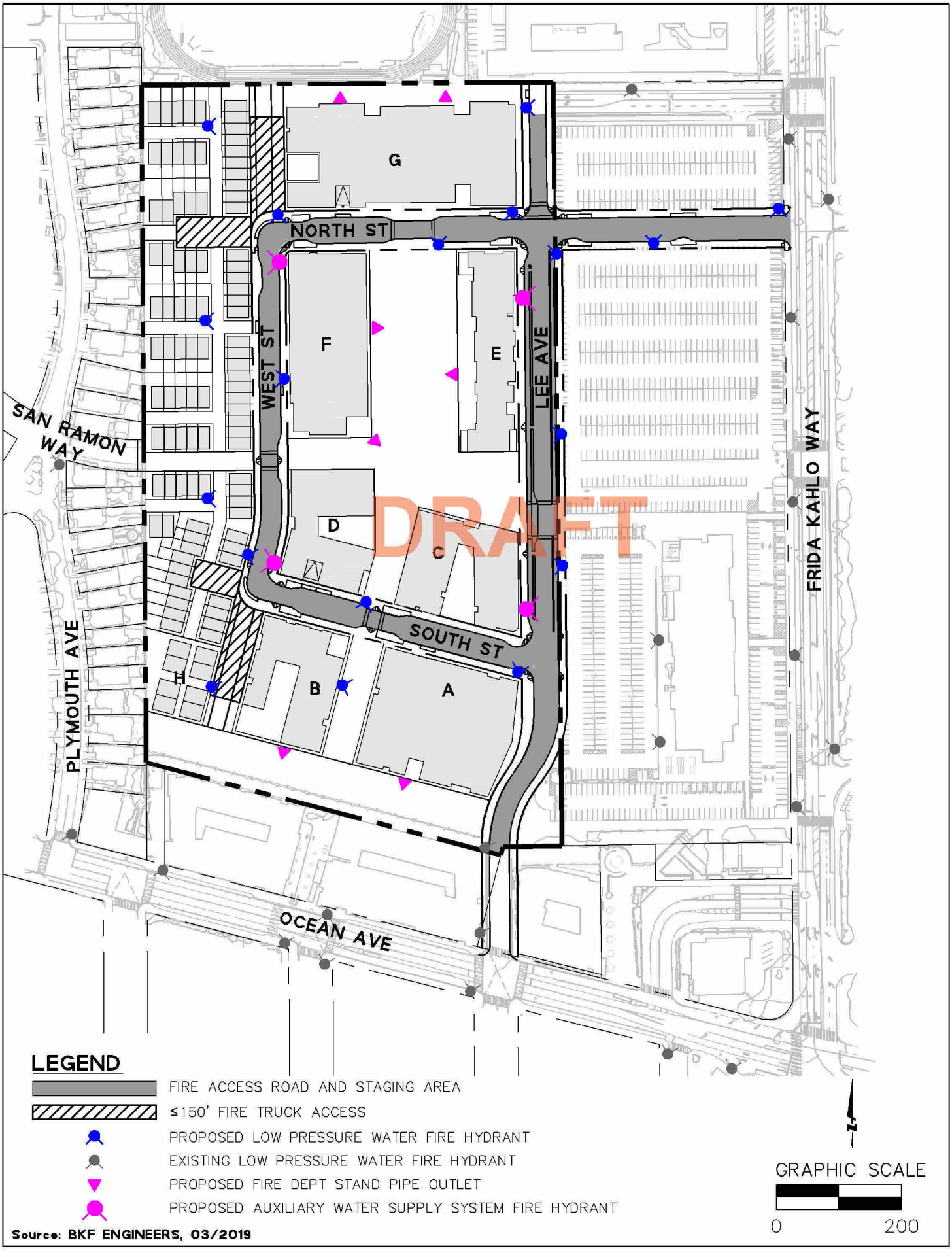
PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.7 – PAVEMENT SURFACES



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PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.8 – FIRE ACCESS PLAN

Source: BKF ENGINEERS, 03/2019

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PLOT DATE: 03-15-19 PLOTTED BY: cheh

BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 6.9 – PROPOSED SERVICE & LOADING PLAN

7. OPEN SPACE AND PARKS

The proposed Project will provide approximately 4.0 acres of publicly accessible open space. The following is a summary of the major components of the open space network. Please see the DSG Open Space section for a detailed description of the Open Space System. These improvements are intended to extend the connection from San Ramon Way to CCSF, and create a connection from the SFPUC easement south of the project to the centralized public open space. The Developer's infrastructure obligations include the design and construction of the open space and park improvements. Key components of the open space program area are described below.

Refer to Chapter 6 of the Balboa Reservoir DSG for detailed information about the open space design.

7.1 Proposed Open Space and Parks to be built by Developer

Open space to be built by the Developer shall be substantially completed consistent with the following schedule:

Central Park	2.0 acres
PUC Open Space	1.2 acres
Paseos	0.8 acres

7.2 Phasing, Ownership, Operation, and Maintenance

New open space and parks system will be constructed in phases to match the Phases of the Project and as depicted on the Phasing Plan, Figure 1.3. The Phase will connect to the existing open space and parks as close to the edge of the Phase area as possible where a logical transition line can be established within the open space improvement features.

The proposed parks and open space will be owned and maintained by the Master Homeowner's Association and will be added to the City inventory of permittable spaces.

8. UTILITY LAYOUT AND SEPARATION

8.1 Utility Systems

The Project proposes to install public utility systems, including the combined sewer system, low pressure water (LPW) system, auxiliary water supply system (AWSS), and dry utility systems. Ownership, maintenance, and acceptance responsibilities of utility infrastructure will be documented in the DA.

8.2 Utility Layout and Separation Criteria

Utility main layout and separations will be designed in accordance with the Subdivision Regulations and SFPUC Utility Standards. Utility main separation requirements are presented in Figure 8.1 Utility Separation Criteria.

8.3 Conceptual Utility Layout

The Project utility layout is designed to connect the proposed Project utility infrastructure to the existing adjacent public utility infrastructure facilities. The proposed LPW system, shown on Figure 9.1, will be a looped system and have two connections to the existing SFPUC LPW system on Frida Kahlo Way and Ocean Avenue. The proposed AWSS, shown on Figures 11.1A and B, will likely have a single connection point at the intersection of Ocean Avenue and Lee Avenue. The Project studied the feasibility of installing a new AWSS line through the SFPUC property at the southwest corner of the project (Block 318 Lot 192) to create a looped system but was deemed infeasible by SFPUC. The proposed combined sewer system, shown on Figure 12.1, will have two connections to the existing SFPUC combined sewer system in Ocean Avenue via Lee Avenue and the SFPUC property.

8.4 Utility Layout and Clearance Design Modifications and Exceptions

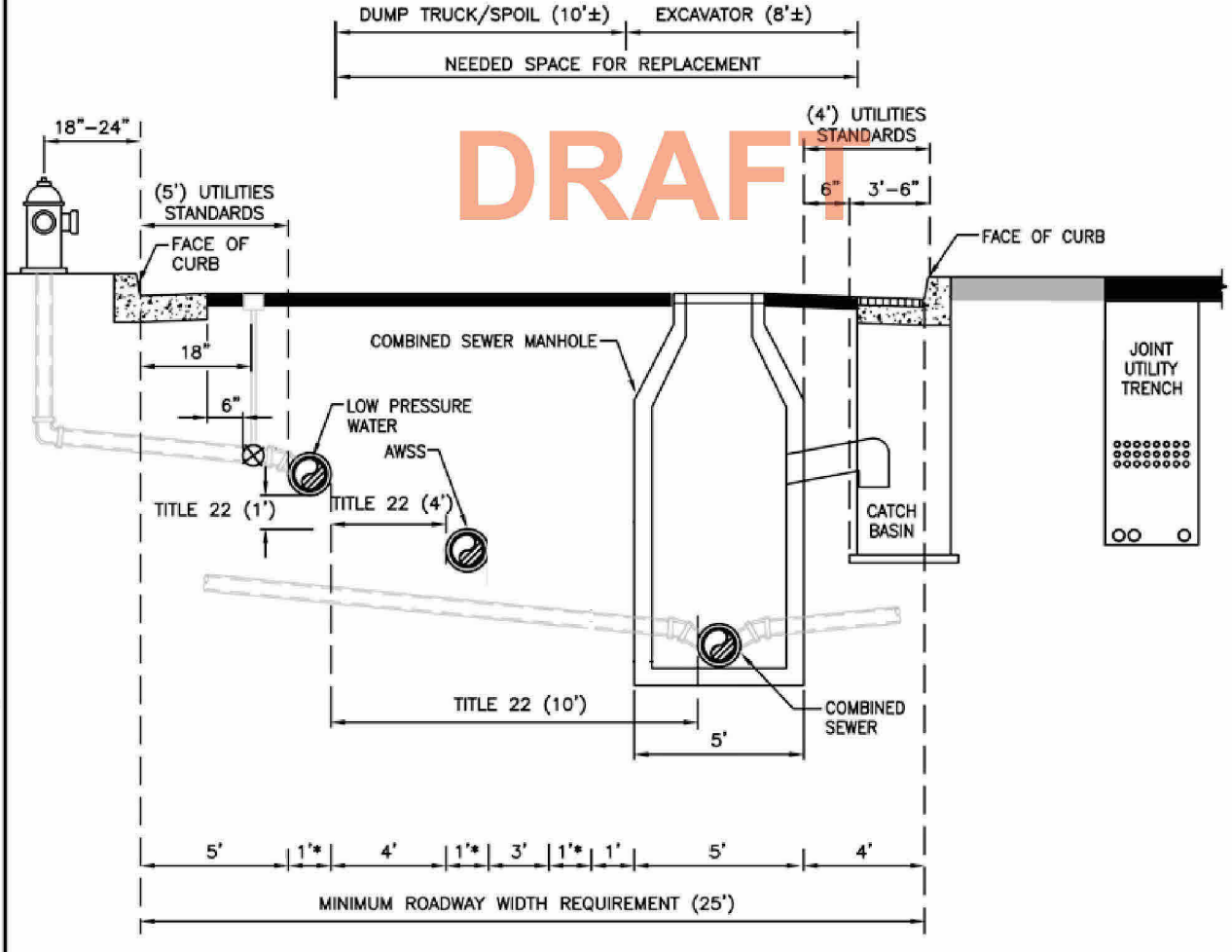
Due to constraints within the Project site, design modifications and exceptions to standard sizing, spacing, and locations of utilities may be requested. A design modification and exception request to utility standards and requirements is subject to the review and approval by the department with authority over each utility. The combined sewer system, LPW system, and AWSS design modifications and exceptions receive authorization per the process outlined in the Subdivision Regulations. Potential locations for the design modifications and exceptions will be identified. Approval of this Infrastructure Plan does not constitute authorization of utility-related design modifications and exceptions.

* ASSUME 1' OUTSIDE DIAMETER FOR ALL PIPES

** MINIMUM HORIZONTAL CLEARANCE BETWEEN SEWER MAIN AND OTHER UTILITIES SHALL BE 3.5' FOR FUTURE REPAIR AND REPLACEMENT (IE. EXCVACATION/SHORING)

NOTES:

1. ALL DIMENSIONS REPRESENT MINIMUM SEPARATION REQUIREMENTS.
2. SFPUC NEEDS TO REVIEW AND APPROVE A VARIANCE FOR UTILITY CLEARANCES FOR PROPOSALS OF ROADWAY WIDTHS LESS THAN INDICATED IN DRAWING.
3. MINIMUM ROADWAY WIDTH REQUIREMENT WILL INCREASE FOR LARGER MAINS.
4. A 15' MINIMUM SURFACE AREA IS REQUIRED FOR BASIC VEHICLE AND EQUIPMENT ACCESS, SERVICING, AND MAINTENANCE OF WASTEWATER ASSETS.
5. TITLE 22 CA CODE OF REGULATIONS REQUIRES MINIMUM 10' HORIZONTAL AND 1' VERTICAL SEPARATION BETWEEN PARALLEL POTABLE WATER AND SEWER LINES; MINIMUM 4' HORIZONTAL AND 1' VERTICAL SEPARATION BETWEEN PARALLEL POTABLE WATER AND STORM DRAIN, RECYCLED WATER AND OTHER NON-POTABLE WATER LINES.
6. MINIMUM HORIZONTAL CLEARANCE OF LOW PRESSURE WATER, AWSS, AND RECYCLED WATER WITH OTHER DRY UTILITIES SHALL BE 3'.
7. MINIMUM OUTSIDE DIAMETER MANHOLE IS 5' FOR MAIN SEWER SIZES UP TO 24"ø. MANHOLE DIMENSION INCREASES FOR MAIN SEWERS LARGER THAN 24"ø. (EX. 9.75' WIDE FOR 72"ø MAIN)



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APPROVED XXXXX
DRAFT 2014

San Francisco Water Power Sewer

SAN FRANCISCO PUBLIC UTILITIES COMMISSION
MINIMUM UTILITIES SEPARATION REQUIREMENTS FOR WASTEWATER AND WATER - COMBINED SEWER SYSTEM

DWG NO. 1

DATE OCTOBER 2014 | REVISION 1.0 | REVISED

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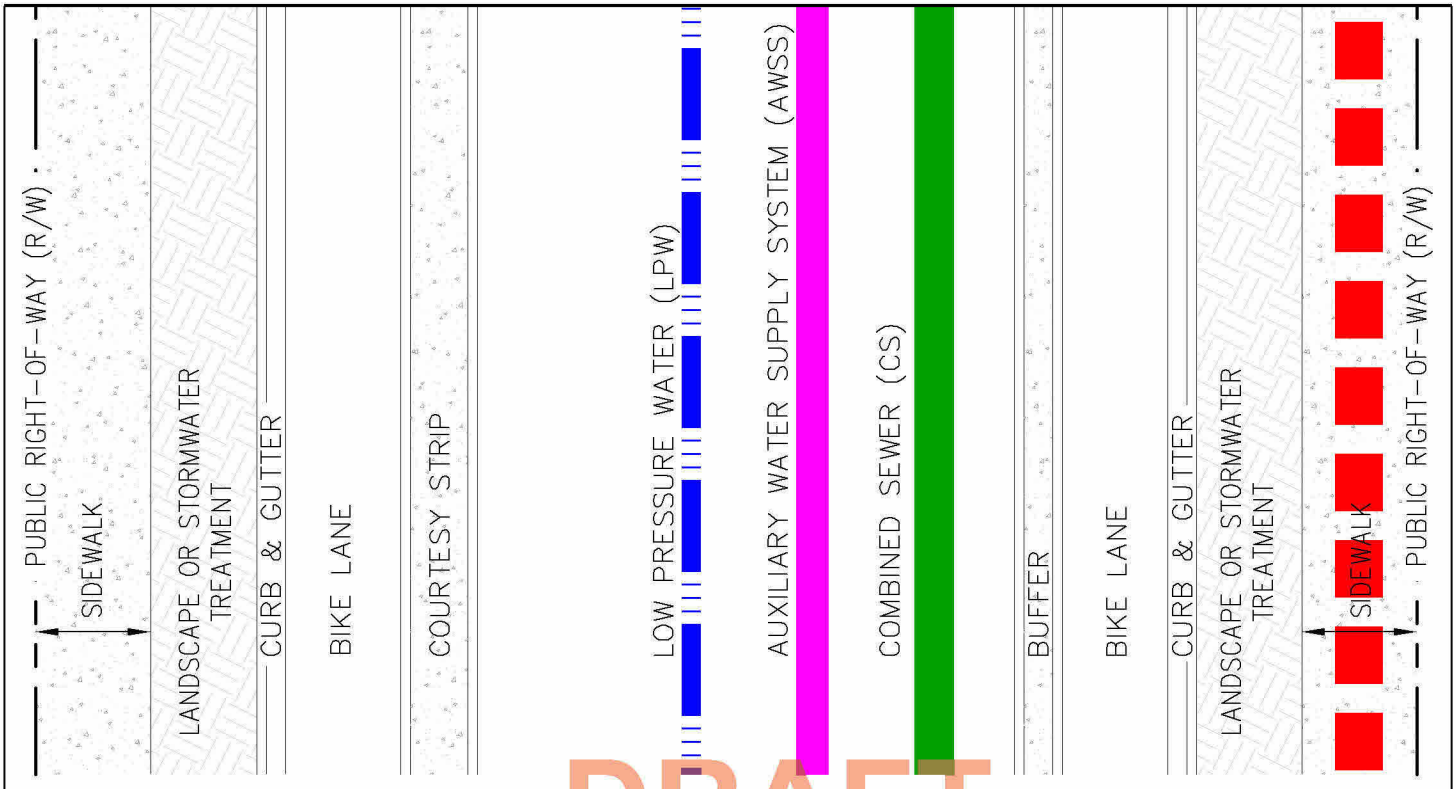
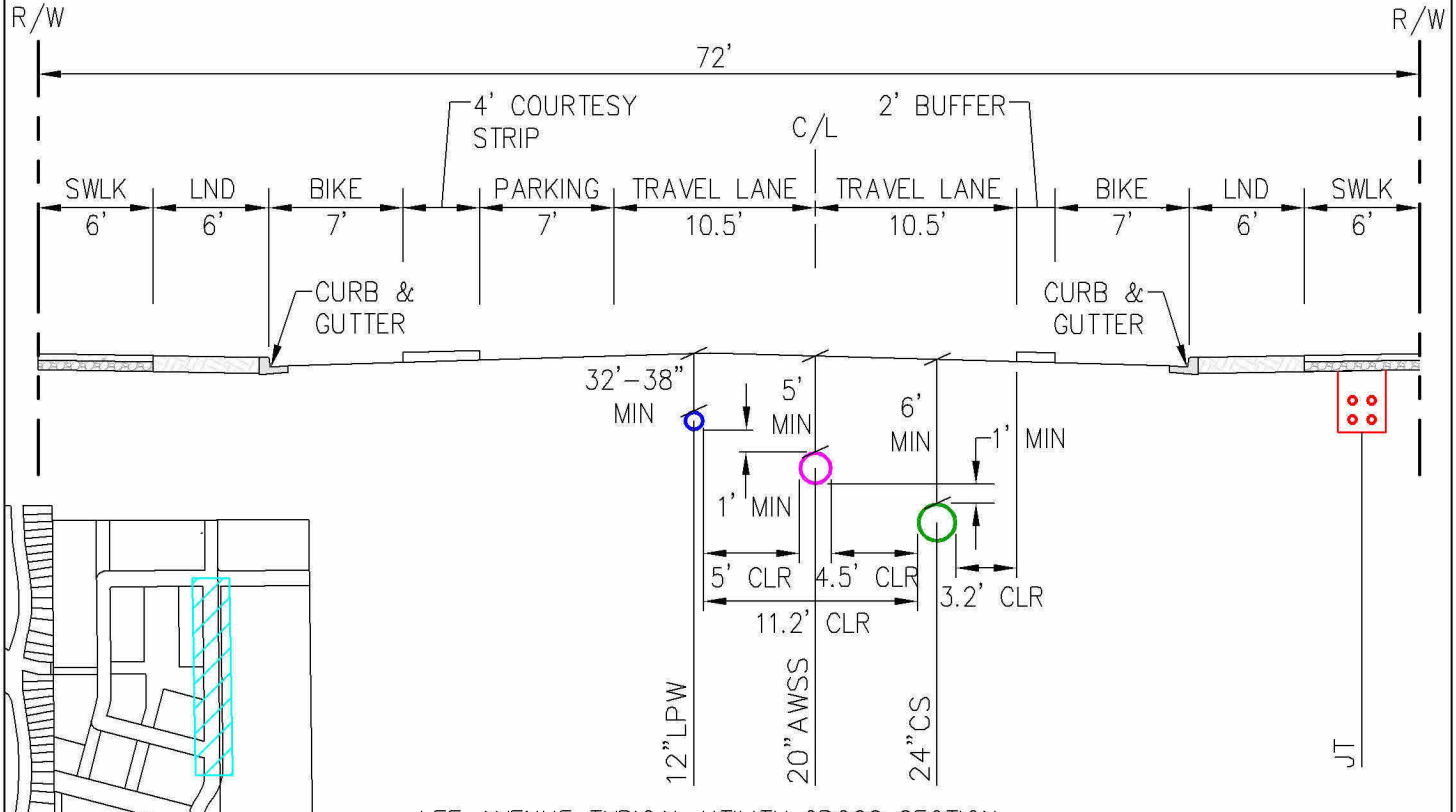
Source: BKF ENGINEERS, 03/2019



LEE AVENUE TYPICAL UTILITY PLAN
NTS



LEE AVENUE TYPICAL UTILITY CROSS SECTION
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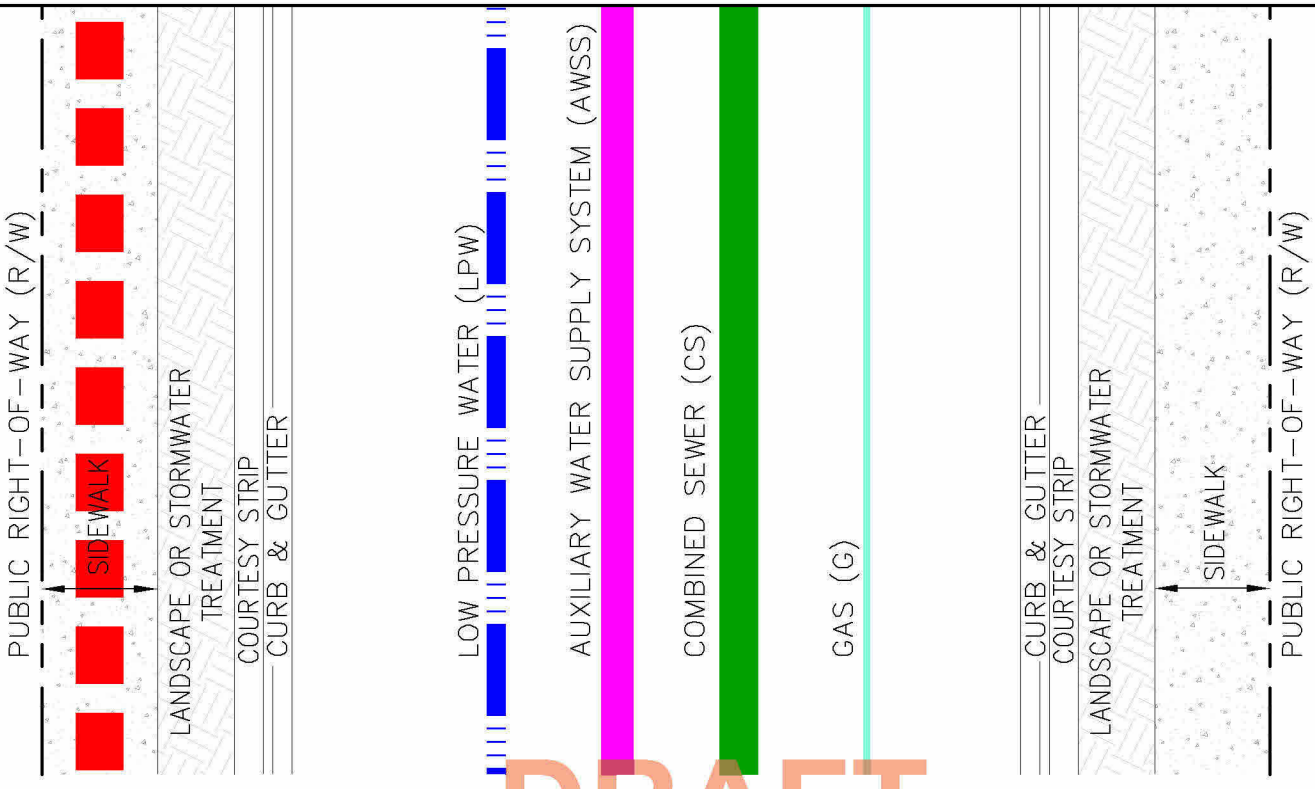
LOCATION MAP

Source: BKF ENGINEERS, 03/2019

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-PR-Util-Cross-Sections.dwg
PLOT DATE: 03-15-19 PLOTTED BY: chen



NORTH STREET TYPICAL UTILITY PLAN

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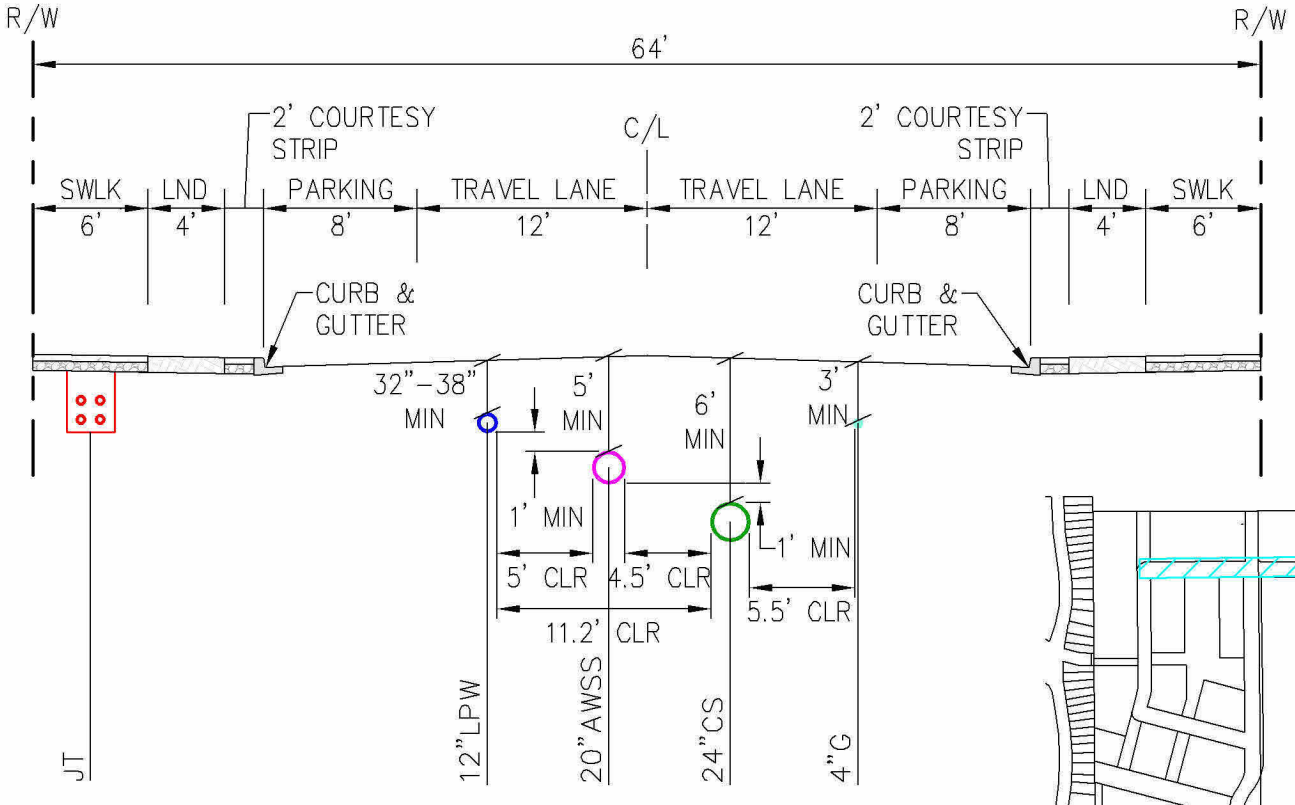

NORTH STREET TYPICAL UTILITY CROSS SECTION

NTS

LOCATION MAP

Source: BKF ENGINEERS, 03/2019

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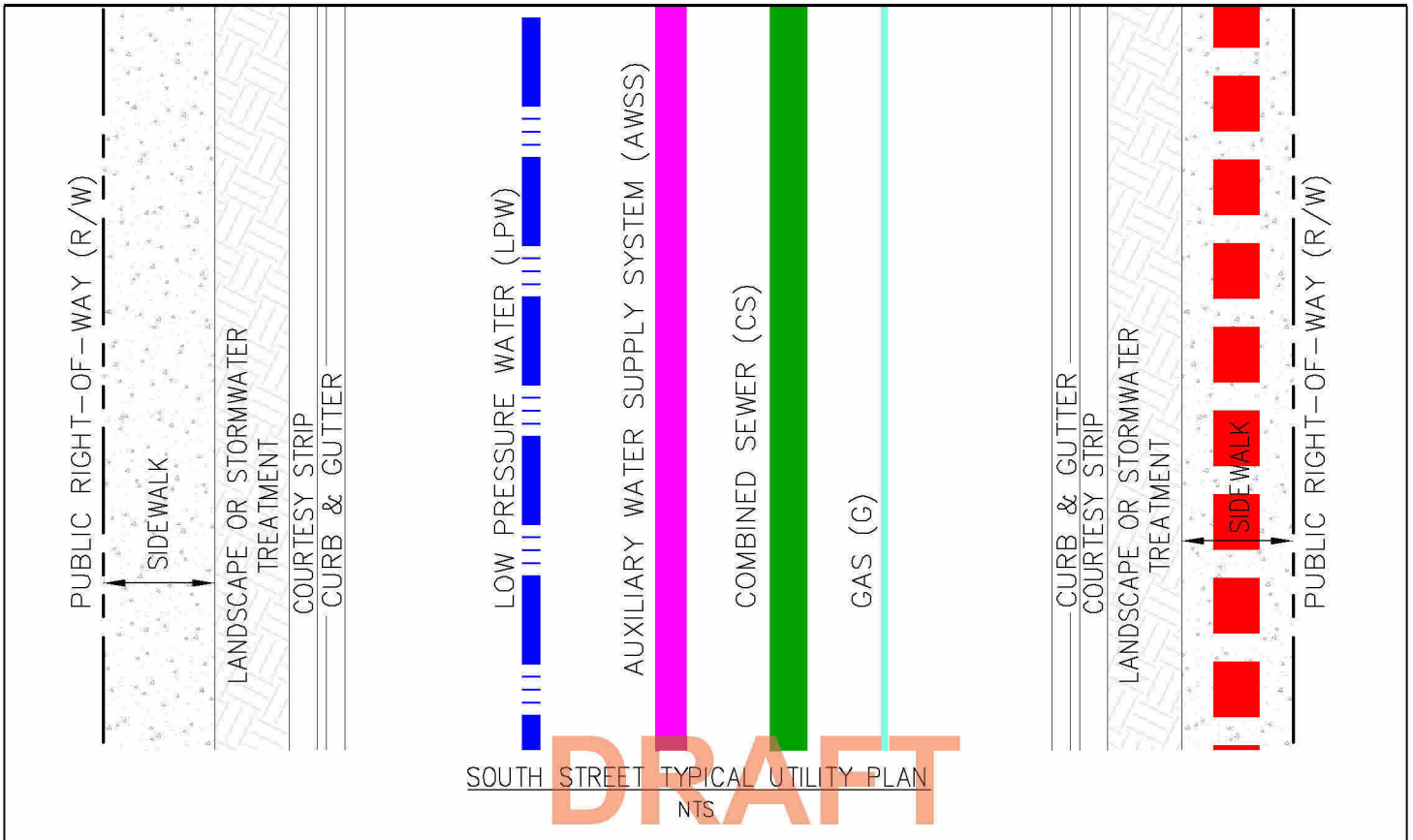

SOUTH STREET TYPICAL UTILITY PLAN
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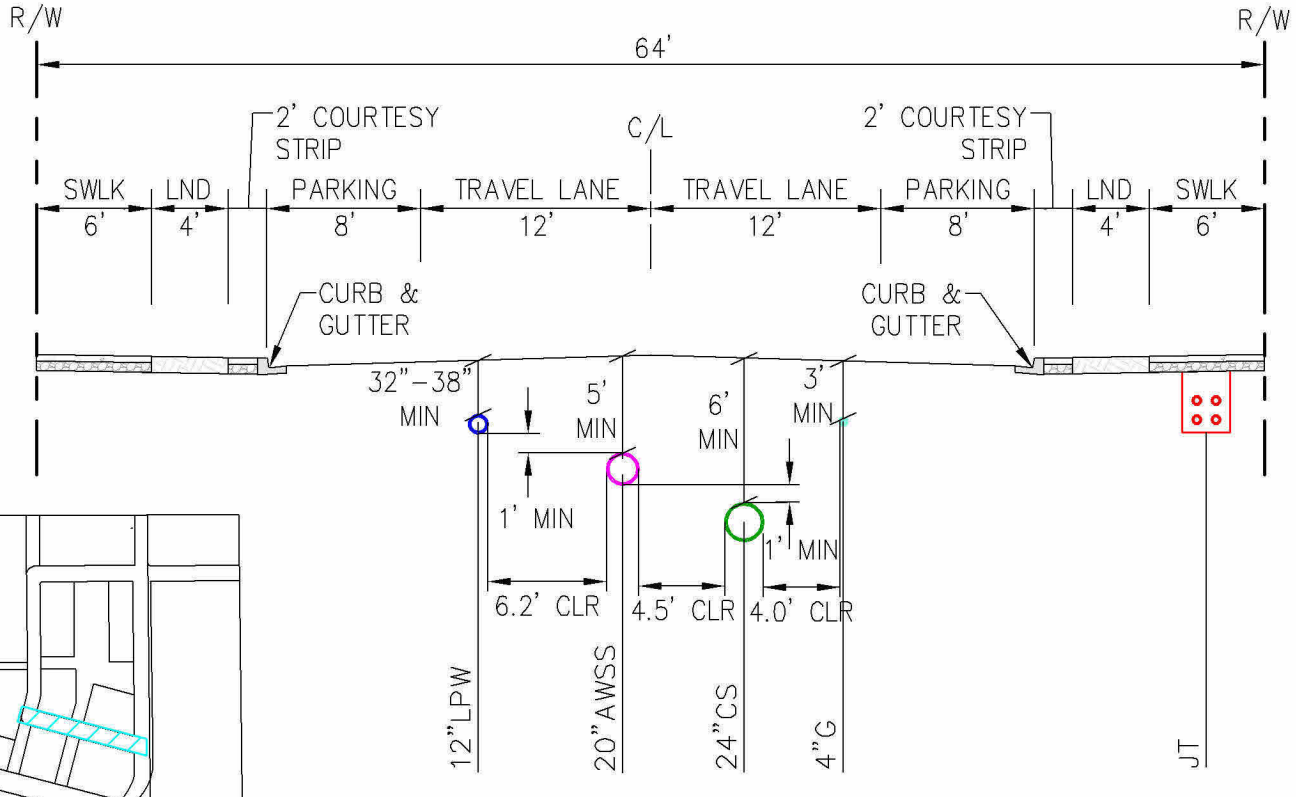

SOUTH STREET TYPICAL UTILITY CROSS SECTION
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LOCATION MAP

Source: BKF ENGINEERS, 03/2019

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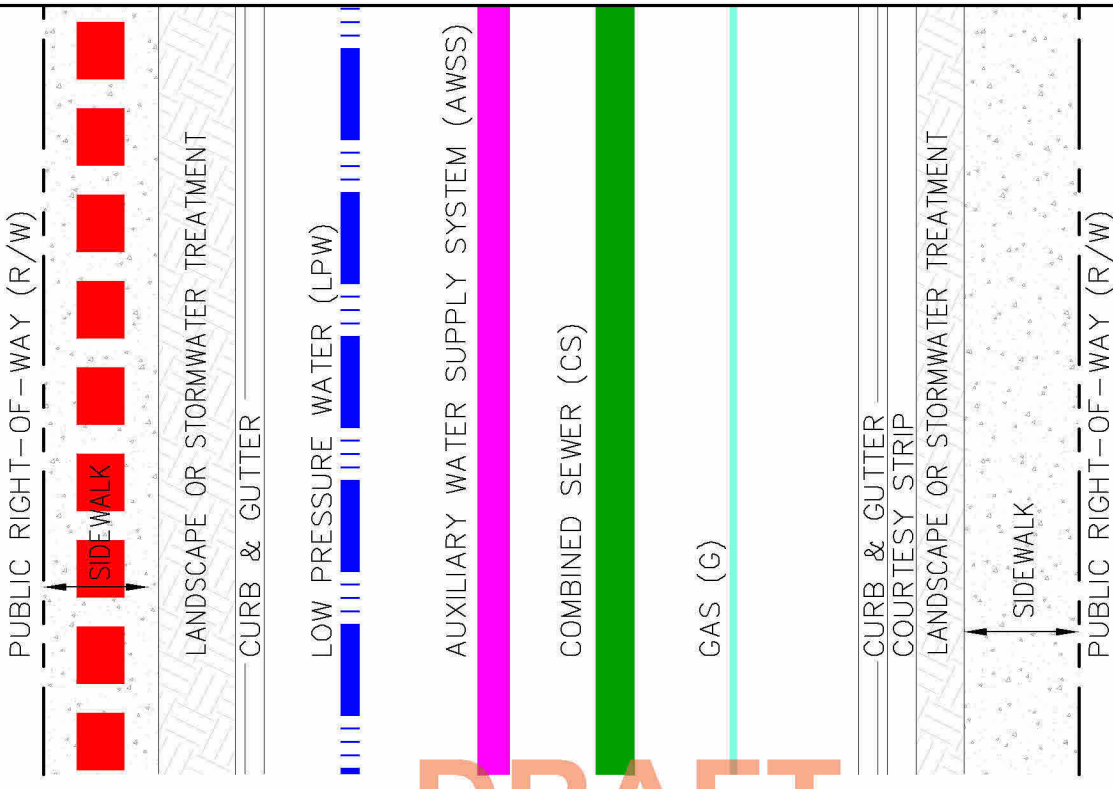

WEST STREET TYPICAL UTILITY PLAN
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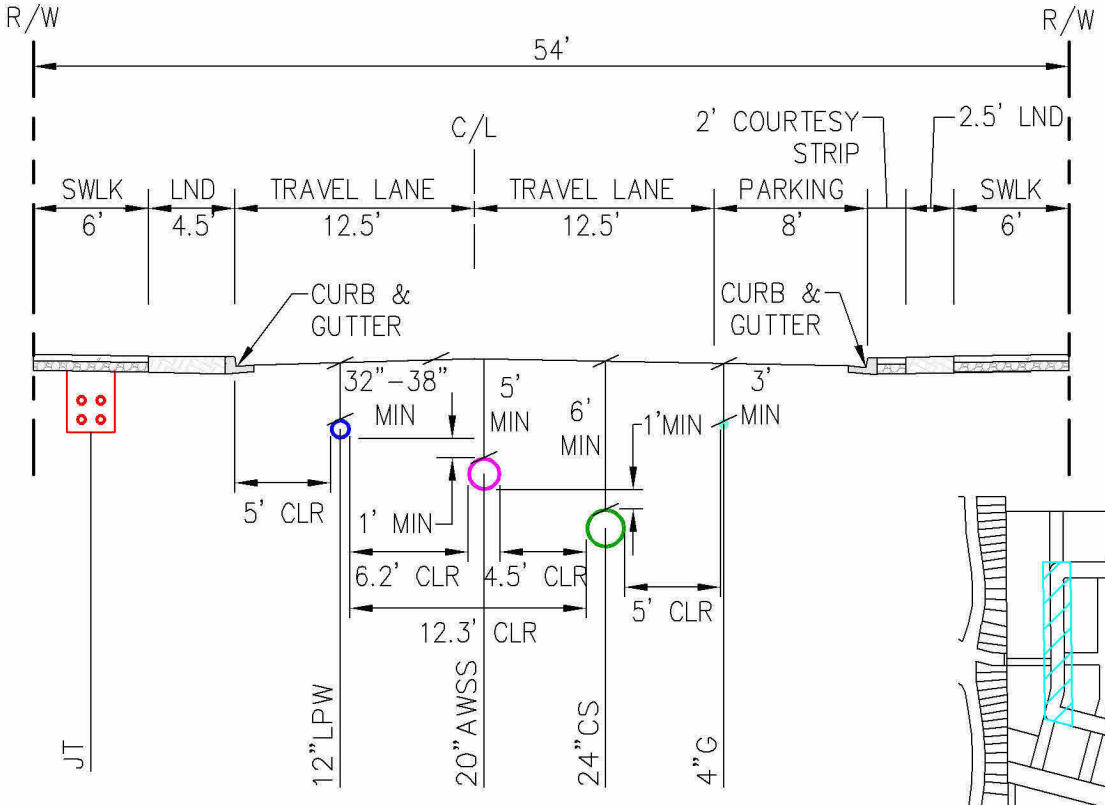

WEST STREET TYPICAL UTILITY CROSS SECTION
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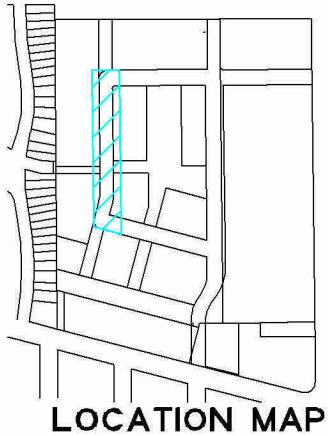

LOCATION MAP

Source: BKF ENGINEERS, 03/2019

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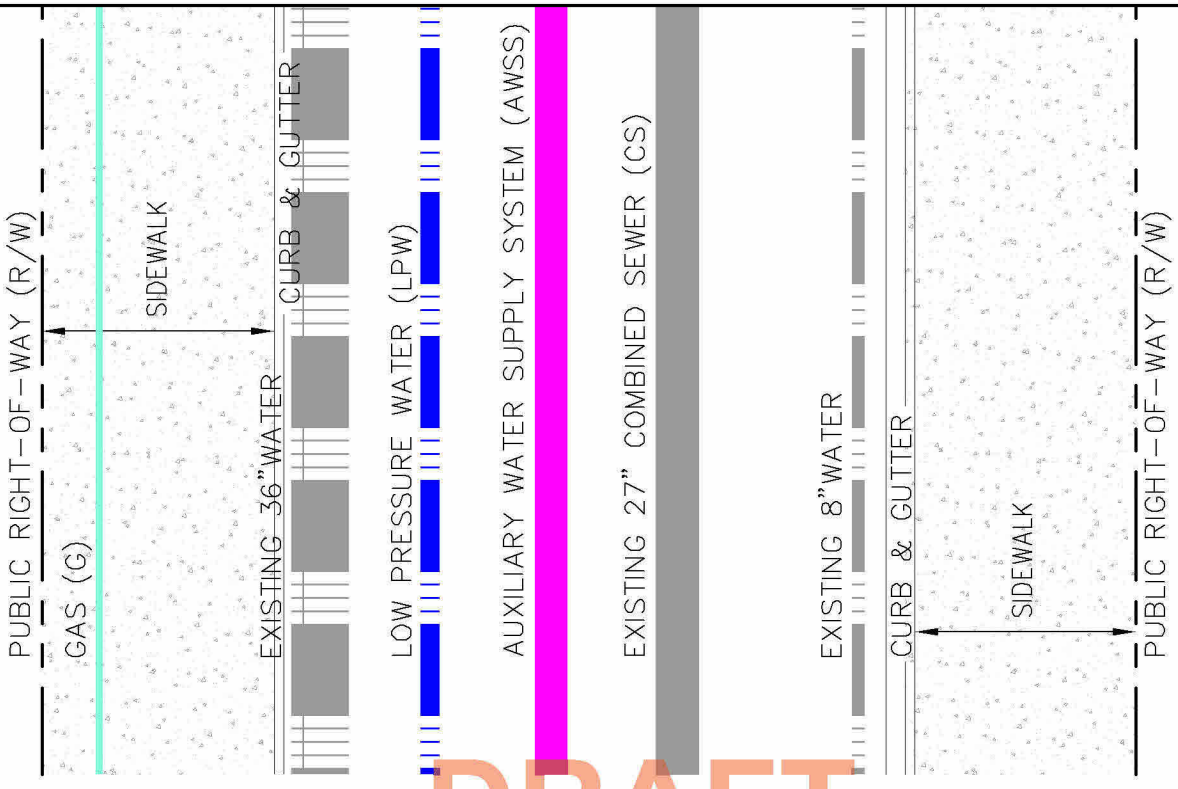

EXISTING LEE AVENUE TYPICAL UTILITY PLAN
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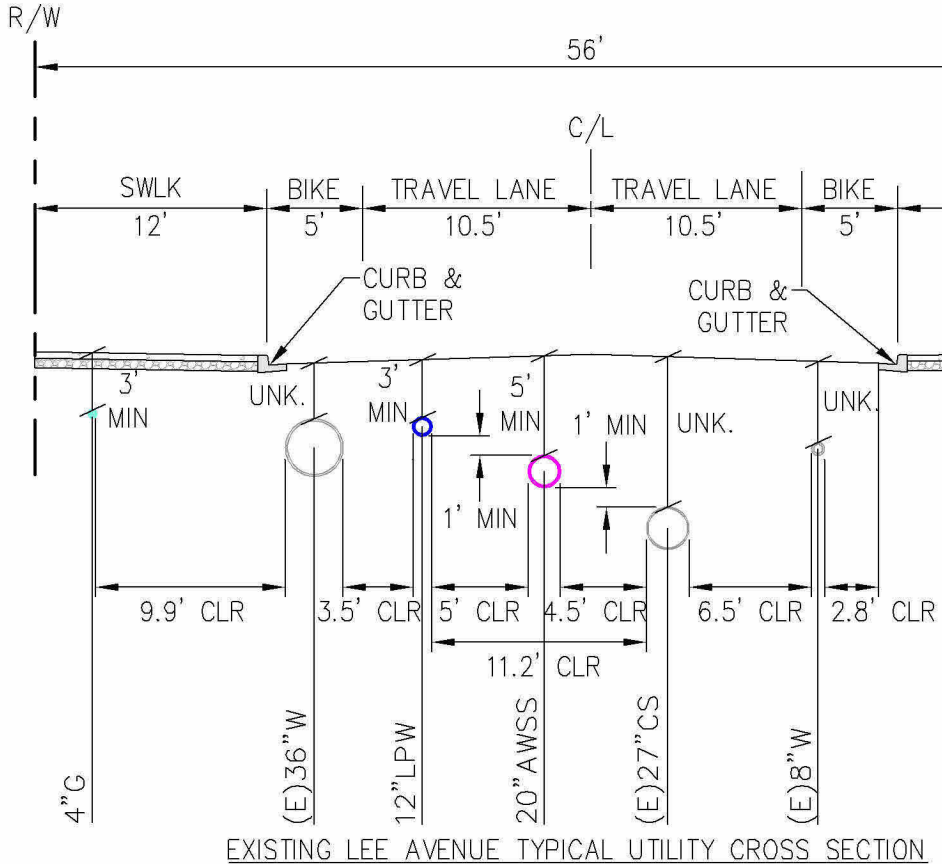

EXISTING LEE AVENUE TYPICAL UTILITY CROSS SECTION
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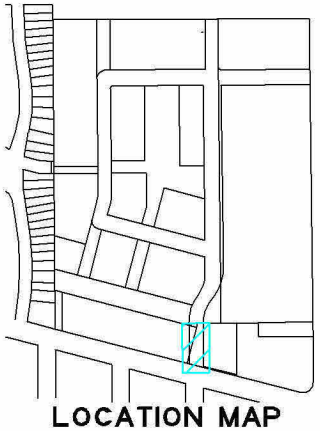

LOCATION MAP

Source: BKF ENGINEERS, 03/2019

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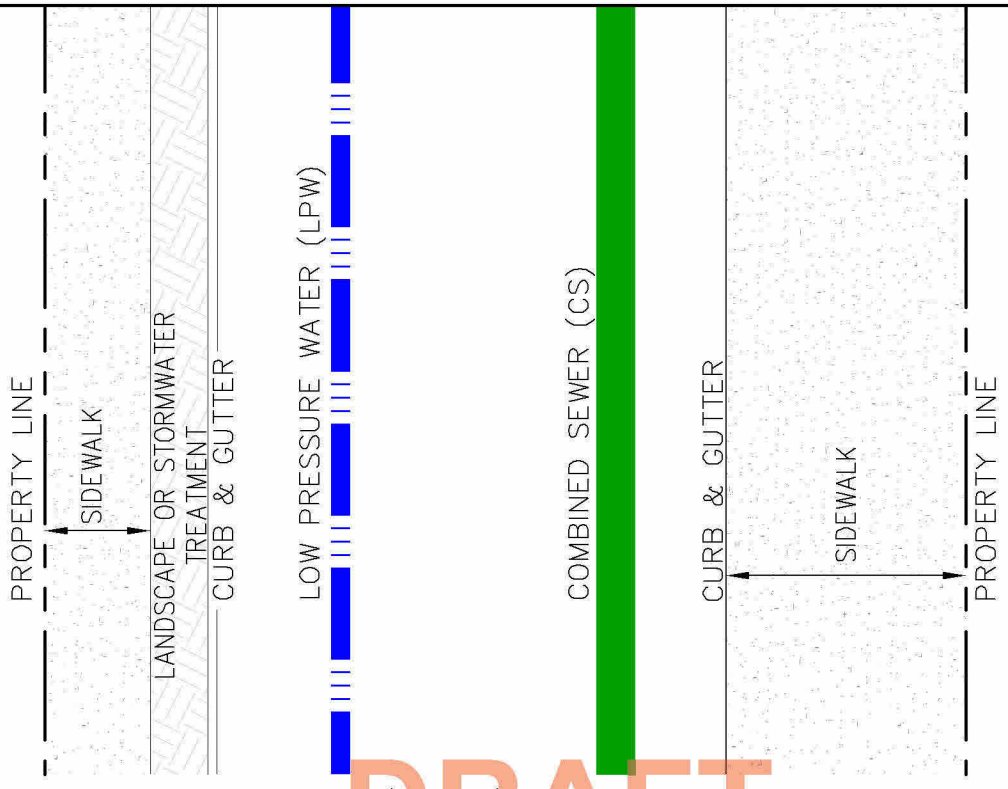
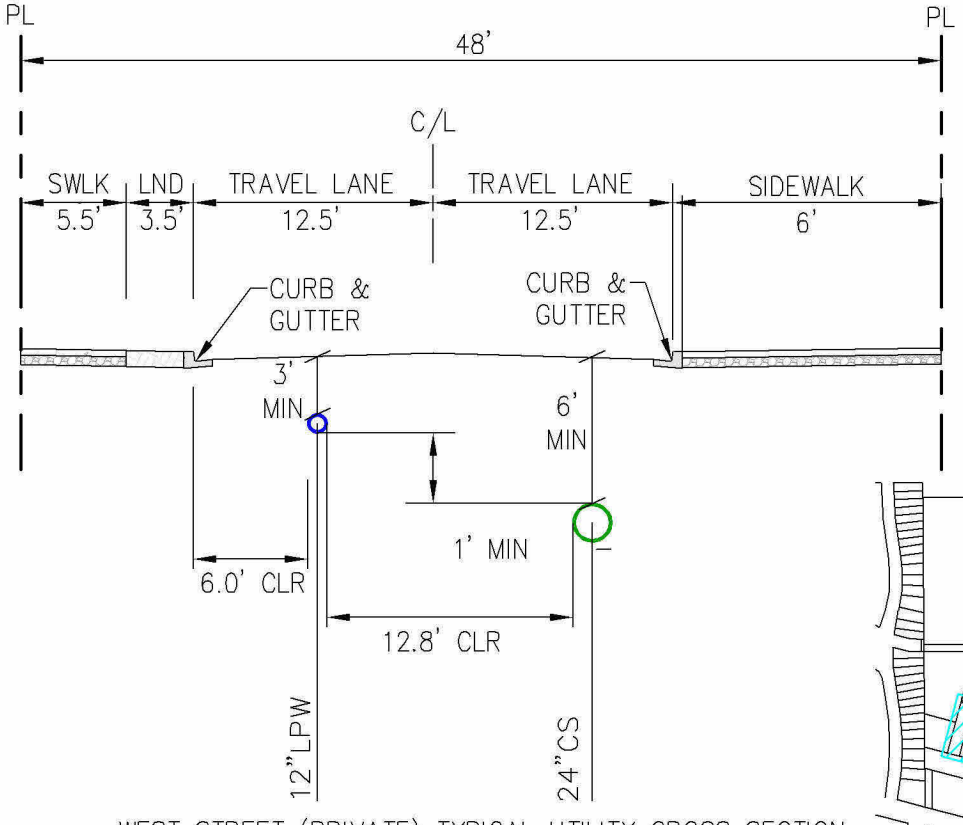
PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 8.2E – TYPICAL UTILITY CROSS SECTION (EXISTING LEE AVE)



WEST STREET (PRIVATE) TYPICAL UTILITY PLAN

NTS



WEST STREET (PRIVATE) TYPICAL UTILITY CROSS SECTION

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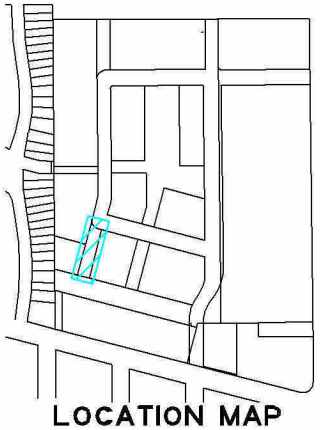

LOCATION MAP

Source: BKF ENGINEERS, 03/2019

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PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 8.2F – TYPICAL UTILITY CROSS SECTION (WEST STREET – PRIVATE)

9. LOW PRESSURE WATER SYSTEM

9.1 Existing Low Pressure Water System

Potable water service will be provided by a water supply, storage, transmission, and distribution system operated by the SFPUC. The proposed Project will connect to the SFPUC's Low Pressure Water (LPW) system for domestic supply and fire protection. The existing LPW system within the project vicinity includes 8 and 12-inch diameter distribution pipelines and low pressure fire hydrants within Frida Kahlo Way and Ocean Avenue. Existing potable water services and fire services to the Project Site are located along the Frida Kahlo Way frontage and on Lee Avenue.

Fire hydrant flow information was obtained for the 12-inch main in Ocean Avenue and the 8-inch main in Frida Kahlo Way. Both of these mains are located within the Sutro Pressure Zone.

	12-inch Main in Ocean Ave	8-inch Man in Frida Kahlo Way
Static Pressure (psi)	80	69
Residual Pressure (psi)	62	51
Observed Flow (gpm)	1,197	947
Available Flow at 20 psi (gpm)	2,290	1,630

9.2 Proposed Low Pressure Water System

9.2.1 Project Water Supply

In accordance with the California Water Code, SFPUC is preparing a Water Supply Assessment for the proposed Project. The approved Water Supply Assessment is anticipated to be completed in 2019.

9.2.2 Project Water Demands

The proposed Project water demands are summarized in Table 9.1 below and in the Non-Potable Water calculator output included in Appendix B. The Project's water demands have been calculated using the SFPUC's Non-Potable Water Program District Scale water calculator. The proposed Project will include building-based treatment plants in certain buildings that will divert, treat and reuse graywater (and potentially rainwater) for non-potable uses within the project.

9.2.2.1 Fire Flows

The required fire flows will be consistent with Appendix B of the California Fire Code and approved by SFFD. Fire flows are based on the building area and the type of construction. The proposed buildings will be Type I-A, II-A and V-A construction.

Table 9.1. Water Demands

Annual Potable Water Demand	39,543,600 gpy

Project Potable Water Demands	
Design Scenario	**Demand**
Domestic Average Day Demand (ADD)	108,300 gpd
Maximum Day Demand (MDD) = 1.2 x ADD	130,000 gpd
Peak-Hour Demand (PHD) = 2.65 x ADD	287,000 gpd
Required Fire-Flow[2] (FF) = 1,500 gpm x 4 hours	360,000 gpd
Maximum Potable Water Demand (Maximum Day Demand + Required Fire Flow)	490,000 gpd

9.2.3 Project Water Distribution System

The proposed Project will include the design and construction of the proposed LPW system by the Developer. The proposed LPW system will be owned and maintained by the SFPUC upon completion and acceptance of the improvements. The proposed LPW system is depicted on Figure 9.1. The proposed LPW system pipeline sizes will be verified by the PUC's review of the hydraulic modeling in the Low Pressure Water Master Plan (LPWMP) that will be prepared after Project approvals.

The proposed LPW system will connect to the existing LPW system within Ocean Avenue and Lee Avenue, and in Frida Kahlo Way and future North Street. The project will connect to the existing 12-inch LPW line in Ocean Avenue and Frida Kahlo Way. The Project will install new 12-inch LPW lines in the new proposed streets while meeting the necessary separation requirements to other utilities and proposed improvements as outlined in Section 10. The vertical and horizontal separation distances to other utilities will be consistent with the requirements outlined in Title 22 of the California Code of Regulations, the SFDPW 2015 Subdivision Regulations and the State of California Department of Health Services Guidance Memorandum 2003-02. The typical utility cross sections for each street are depicted on Figures 8.2A-G.

[2] *The required fire flow will be determined by SFFD based on final building areas and construction type.*

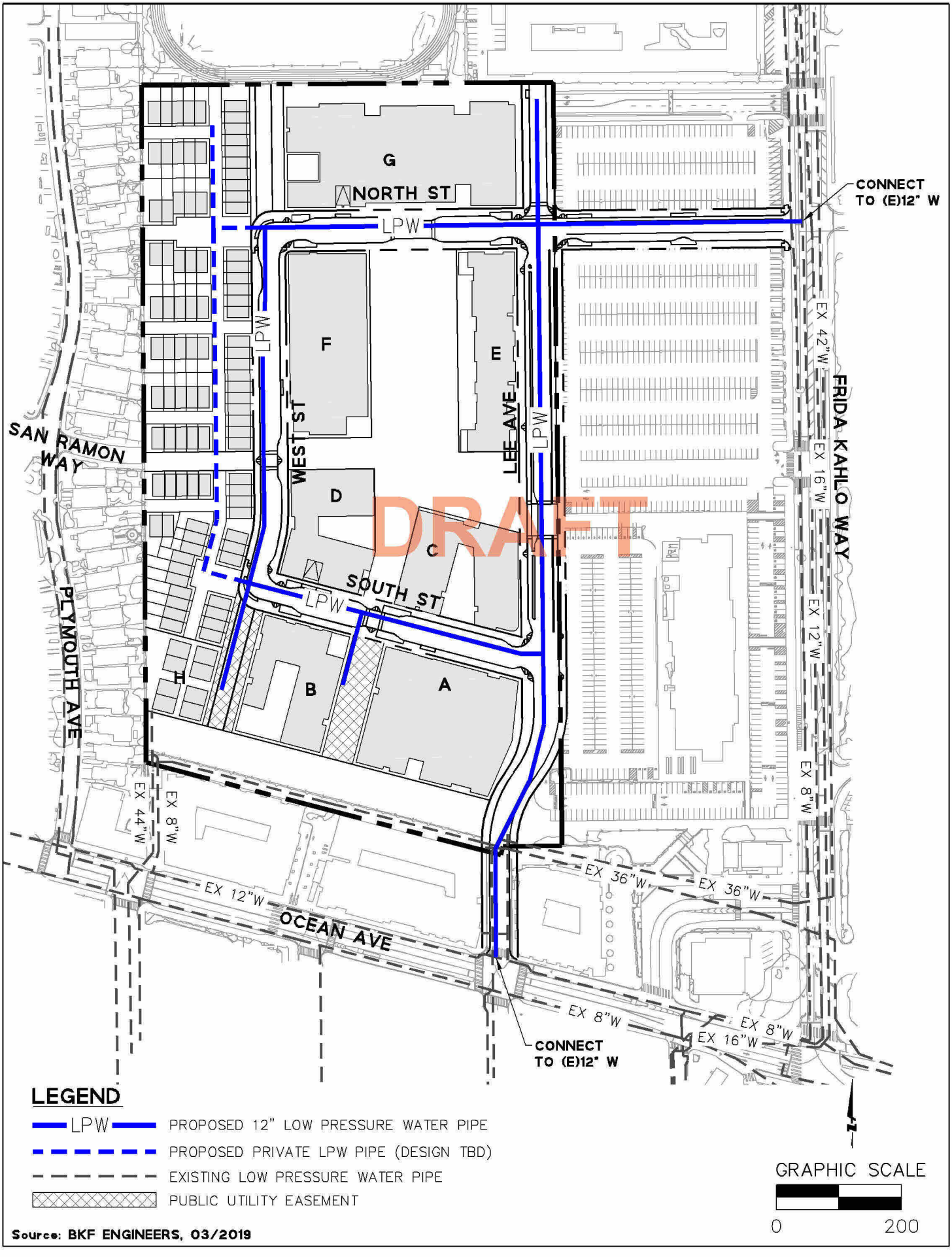
SFPUC will perform the required disinfections of new mains and connections to existing mains at the Developer's cost.

9.2.4 Low Pressure Water Design Criteria

The proposed LPW system will be designed to maintain a minimum system pressure of 20 psi and a maximum velocity of 14 fps during MDD plus Fire Flow design scenario. The LPW system will also maintain 40 psi minimum residual pressure and 8 fps maximum velocity during PHD. The proposed LPW system will be modeled in the LPWMP to confirm the proposed system meets the pressure and flow requirements in each design scenario.

9.2.5 Proposed Fire Hydrant Locations

The LPW system will be the secondary fire water supply for the Project Site. The proposed LPW fire hydrants will have a maximum radial separation of 300-feet between hydrants, or as specified in Appendix C of the California Fire Code. Additionally, the LPW hydrants will be placed within 100-feet of building fire department connections. The proposed LPW fire hydrant locations are depicted on Figure 9.2. The required fire flow will provide adequate fire protection for new and reuse construction per Appendix B of the California Fire Code. The project will coordinate with the SFFD for the final locations of new LPW fire hydrants within the Project.



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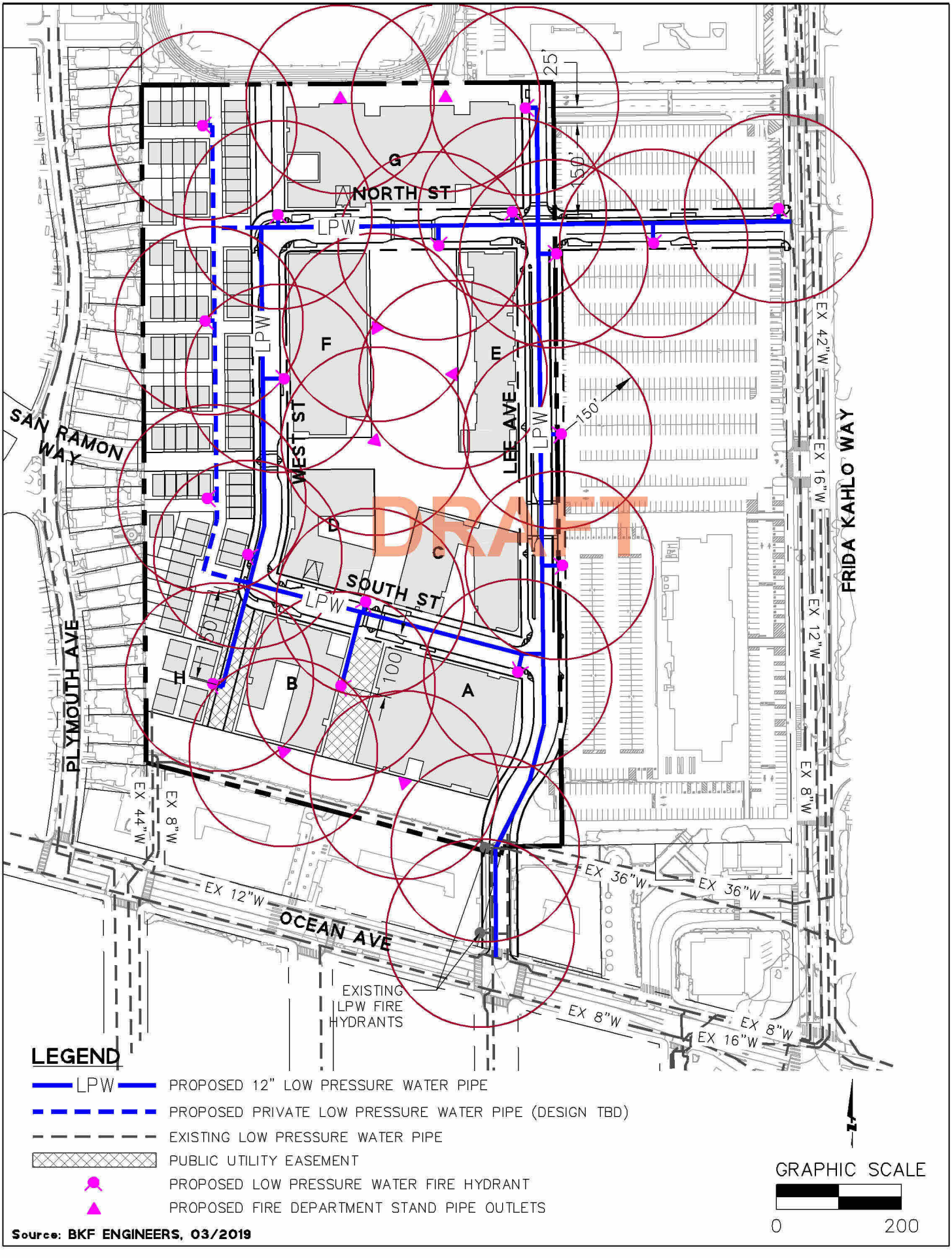
PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 9.1 – PROPOSED LOW PRESSURE WATER SYSTEM



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PLOT DATE: 03-15-19
PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 9.2 – PROPOSED FIRE HYDRANT LOCATIONS**

10. NON-POTABLE WATER SYSTEM

10.1 Existing Non-Potable Water System

The City's non-potable water system does not currently extend to or serve the Project Site. The City does not have existing non-potable water facilities within the vicinity of the Project Site.

(At this time, the Project is reviewing the applicability of the City's Non-Potable Water Ordinance for the proposed townhomes and below market-rate housing buildings. Since this is still being reviewed, we have made the conservative assumption for the project water demands that no buildings will capture and reuse graywater. These calculations will be updated as we receive information about the applicability of the ordinance.)

10.2 Proposed Non-Potable Water System

The Project proposes to install treatment systems in certain buildings to collect graywater (and possibly rainwater) for reuse for non-potable uses such as toilet flushing and/or irrigation water. *The final configuration of the graywater treatment systems and which buildings will contain these systems will be developed during the entitlement phase.*

10.3 Rainwater Harvesting

The project may potentially integrate rainwater harvesting into some of the Development Blocks. This is intended to achieve compliance with the City's Stormwater Management Requirements, specifically the required runoff flow and volume reduction within the combined sewer areas as discussed in Section 13.

11. AUXILIARY WATER SUPPLY SYSTEM (AWSS)

11.1 Existing AWSS Infrastructure

The SFPUC, in cooperation with the SFFD, owns and operates the Auxiliary Water Supply System (AWSS). The AWSS is a high pressure, non-potable water distribution system dedicated to fire suppression specifically designed for reliable operation after a major seismic event. The existing AWSS system within the vicinity of the project includes a 20-inch diameter main in Ocean Avenue.

11.2 AWSS Regulations and Requirements

The proposed Project will meet the fire protection requirements established by the SFFD to meet their City-wide objectives for fire protection following a seismic event. This includes the extension and installation of AWSS facilities to and within the Project. The proposed AWSS facilities will be located in the proposed streets that are within the public right-of-way, as approved by the SFPUC.

The AWSS facilities will be placed with vertical and horizontal separation distances to other utilities as shown in Section 8.

11.3 Proposed AWSS Infrastructure

The proposed Project will install new AWSS facilities within the Project, extending and connecting to the existing AWSS main in Ocean Avenue. The project studied two options to connect to the existing 20-inch AWSS main in Ocean Avenue.

Option 1

Option 1 studied two points of connection to the existing 20-inch AWSS line in Ocean Avenue. One point of connection would be installed via Lee Avenue and would run north on Lee Avenue, west on North Street, south on West Street, and continue through a private street, through the SFPUC property (Block 3180, Lot 192), and back to Ocean Avenue, thus creating a loop on the project site. Based on feedback from the SFPUC, this option was deemed not feasible since the Project does not have rights to install an AWSS line through the SFPUC property.

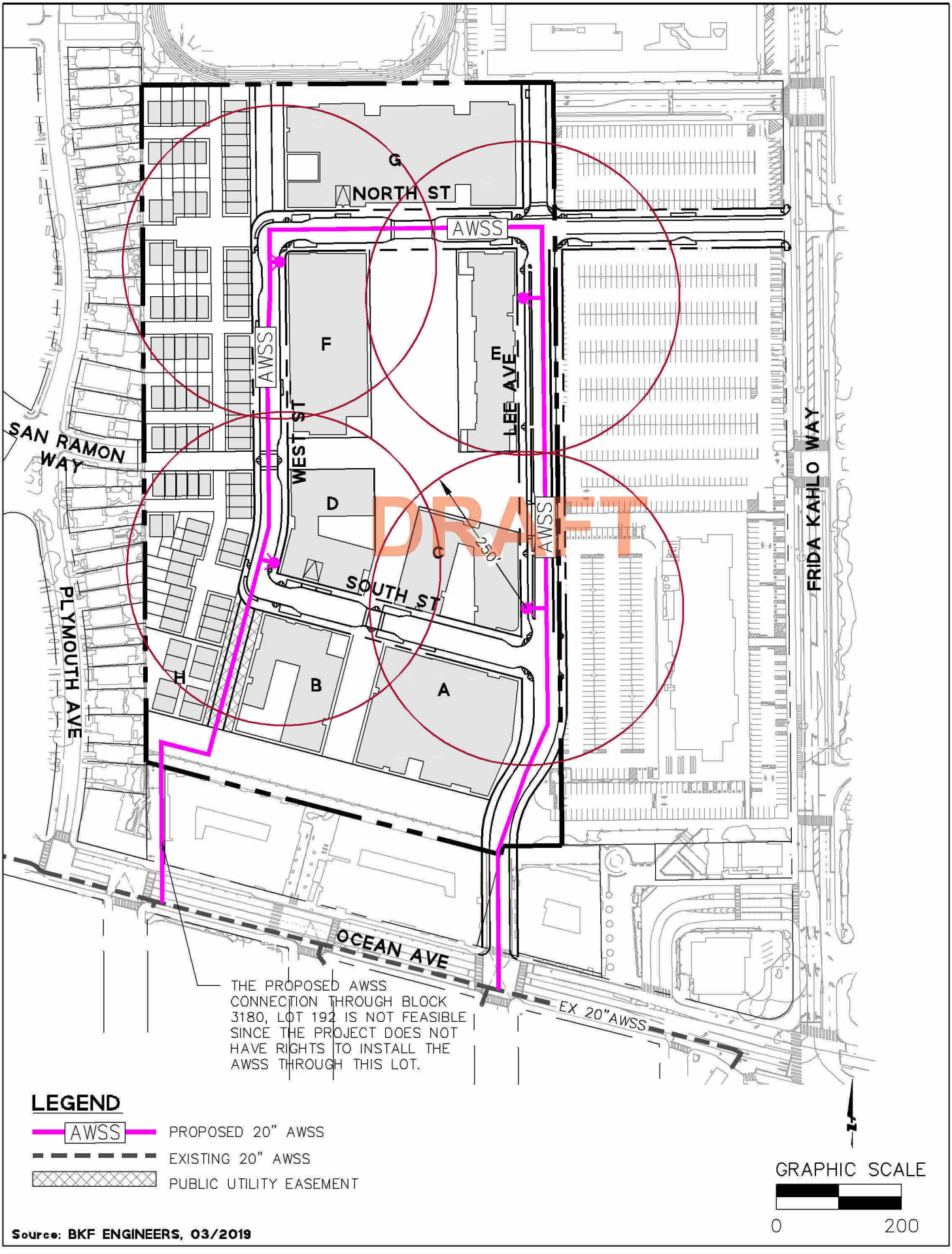
Option 2

Option 2 provides a single point of connection to the existing AWSS main in Ocean Avenue. The alignment will run north on Lee Avenue, west on North Street, south on West Street, and east on South

Street and connect back to the main in Lee Avenue creating a loop within the Project site. This option has been deemed the most feasible option to supply AWSS to the project site.

The proposed Project will design and install the new AWSS facilities in a single phase consistent with the Project Phasing Plan. The proposed 20-inch pipeline will be earthquake resistant ductile iron pipe material. The Project will also install AWSS fire hydrants, at a maximum spacing of 500 feet, at locations determined by the SFPUC and SFFD. The proposed AWSS facilities for both options, including proposed hydrant locations, are depicted on Figures 11.1A and B.

The SFPUC will be responsible for maintenance of existing AWSS facilities. The SFPUC will be responsible for the new AWSS facilities once construction of a new AWSS facility is complete and accepted by the SFPUC. Impacts to improvements installed with previously constructed portions of the Development due to the designs of subsequent blocks will be the responsibility of the Developer and will be addressed prior to approval of construction documents for each subsequent block. The SFPUC and SFFD will provide flow and pressure capacities of the existing AWSS that the proposed AWSS will connect to.



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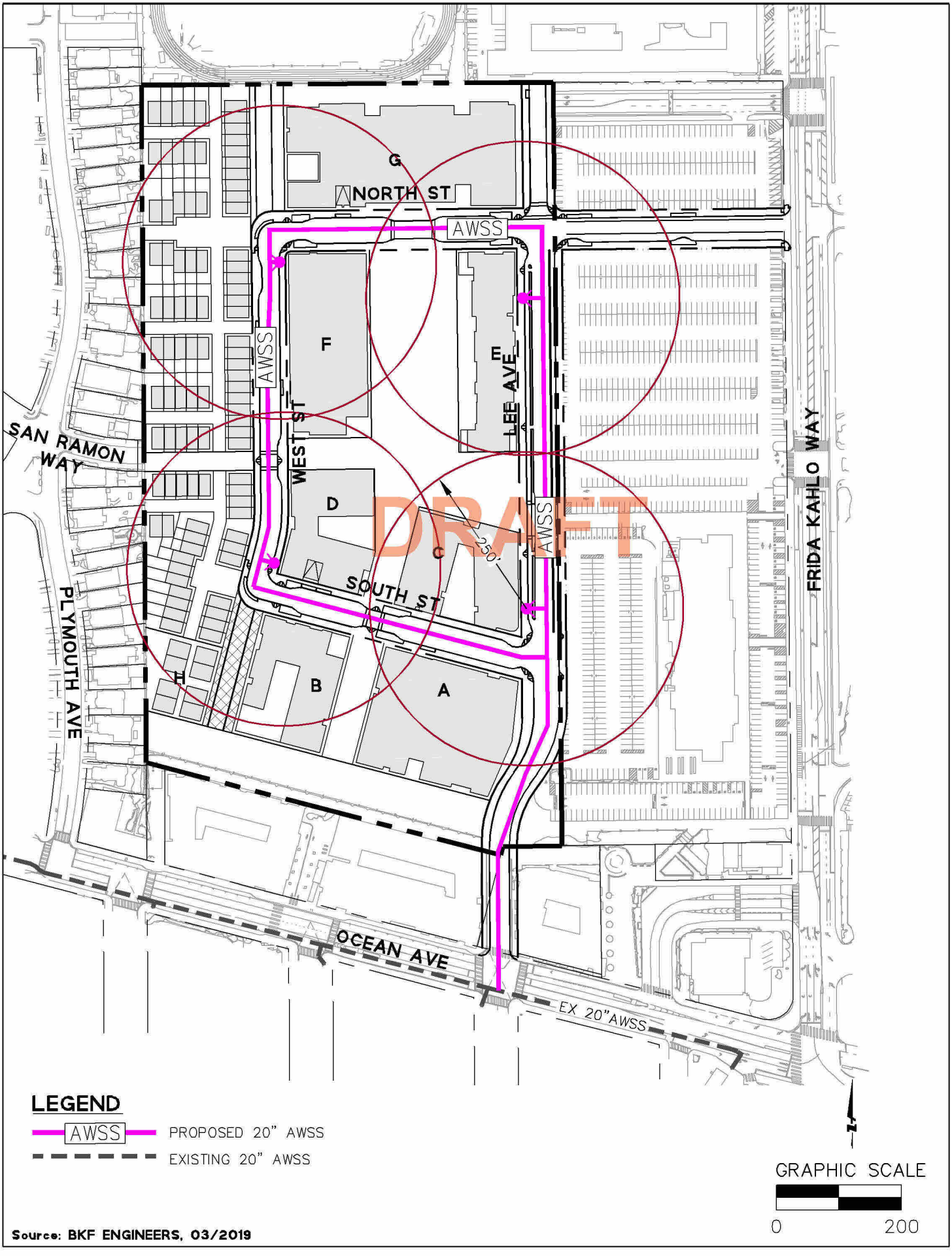
PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN **FIGURE 11.1A – PROPOSED AWSS SYSTEM (OPTION 1)**



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BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 11.1B – PROPOSED AWSS SYSTEM (OPTION 2)

12. COMBINED SEWER SYSTEM

12.1 Existing Combined Sewer

12.1.1 Existing Conditions

The existing conditions within the Project site consists of a parking lot that is used by CCSF which is enclosed by the old Balboa Reservoir embankments. The Project is roughly 75% impervious. The site is adjacent to the CCSF Multi-Use Building built in 2010 and has private sanitary sewer and stormwater pipelines that collects and discharges the wastewater into a 27-inch combined sewer gravity pipeline located at the dead end segment of Lee Avenue.

12.1.2 Existing Drainage Area

The Project is comprised of one stormwater watershed defined by the existing topography of the Project site. The stormwater runoff on the raised side of the East reservoir embankment is collected in the private storm drain inlets located behind the CCSF Multi-Use Building, and the lower parking lot drains to the South West corner of the site. See Figure 5.3 depicting the extent of the two existing stormwater watersheds within the Project.

12.1.3 Existing Sewer Demands

The existing sewer demands on the project site are at a minimum as there is only the existing CCSF building present in the nearby lot.

12.1.4 Existing Combined Sewer System

There is an existing 39-inch diameter combined sewer main along Frida Kahlo Way and flows south into a 3-foot by 4.5-foot concrete pipe and the intersection of Ocean Avenue. It then runs west along Ocean Avenue to the intersection of Lee Avenue, where it transitions to a 2-foot by 3-foot concrete pipe and continues west down Ocean Avenue. There is also a private 10-inch sewer line on the west side of the CCSF Multi-Use Building which connects to the 27-inch combined sewer in Lee Avenue and which discharges into the 2-foot by 3-foot pipe in Ocean Avenue.

12.2 Proposed Combined Sewer System

12.2.1 Proposed Sewer Demands

The proposed Project estimated sewer flow assumes a return of 95% on the indoor potable water demand and 100% on the indoor non-potable water for the Average Day Demands. The potable and non-potable water demand calculations associated with the proposed Project are estimated

using the SFPUC's Non-Potable Water Program District Scale Water Calculator. The output from the calculator is enclosed in Appendix B.

Project Sewage Generation	
Design Scenario	**Demand**
Average Dry Weather Flow (ADWF)	102,900 gpd
Peak Dry Weather Flow (PDWF) = 3 x ADWF	308,700 gpd

12.2.2 Proposed Stormwater Flows

Runoff from the Project site is divided in to two main watersheds as shown on Figure 12.2. Runoff from both of these watersheds will be conveyed by the new combined sewer system to the existing system in Ocean Avenue. The approximate 5-year peak flows at a 10-minute time of concentration for each watershed is listed below:

	Area (acre)	5-year Flow (cfs)
Western Watershed	13.10	22.19
Eastern Watershed	5.22	9.81

12.2.3 Proposed Combined Sewer Capacity and Design Criteria

Design criteria, pipe sizes and flow velocities will conform to the requirements of the 2015 San Francisco Subdivision Regulations.

12.2.4 Proposed Combined Sewer System

The wastewater and stormwater from the Project will be collected and conveyed by a proposed combined sewer system. The proposed combined sewer system is depicted on Figure 12.1. The combined sewer system will be designed and constructed by the Developer. The combined sewer design will be reviewed and approved by the SFPUC. The proposed combined system will consist of a 24-inch diameter pipe to convey sanitary sewer and stormwater by gravity to the existing combined sewer facilities in Ocean Avenue.

12.2.5 Pipe Material

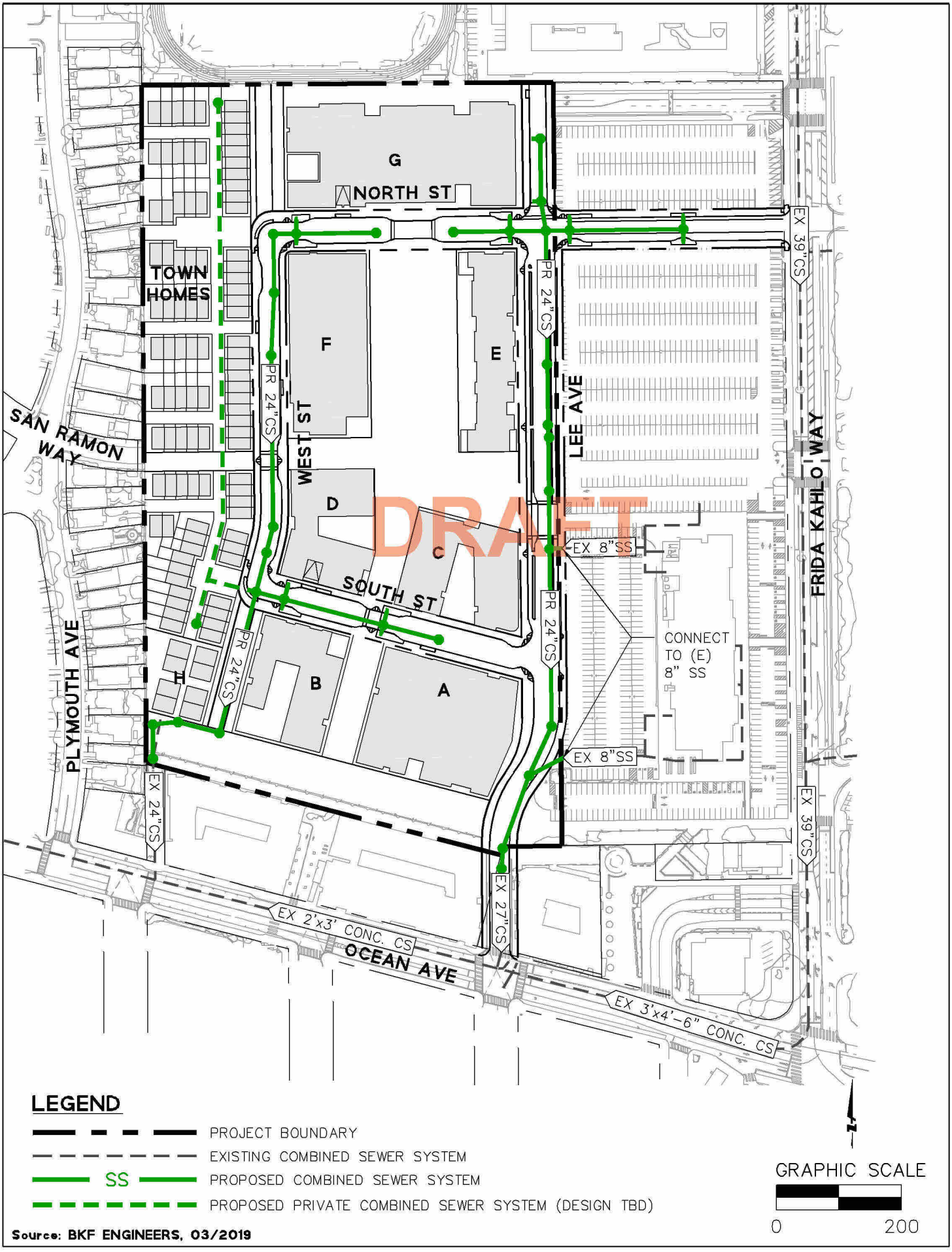
Pipe material will conform to the requirements of the 2015 San Francisco Subdivision Regulations or as approved by the SFPUC.

12.2.6 Freeboard and Cover

The combined sewer system will be designed in accordance with the Subdivision Regulations, maintaining four (4) feet of freeboard and designed to protect from flooding related to potential overland flows.

12.2.7 Combined Sewer Construction and Phasing

The new combined sewer system will be installed with Phase 1 of the improvements which includes the street improvements and infrastructure to serve the entire project.



LEGEND

- PROJECT BOUNDARY
- EXISTING COMBINED SEWER SYSTEM
- SS — PROPOSED COMBINED SEWER SYSTEM
- PROPOSED PRIVATE COMBINED SEWER SYSTEM (DESIGN TBD)

GRAPHIC SCALE

0 200

Source: BKF ENGINEERS, 03/2019

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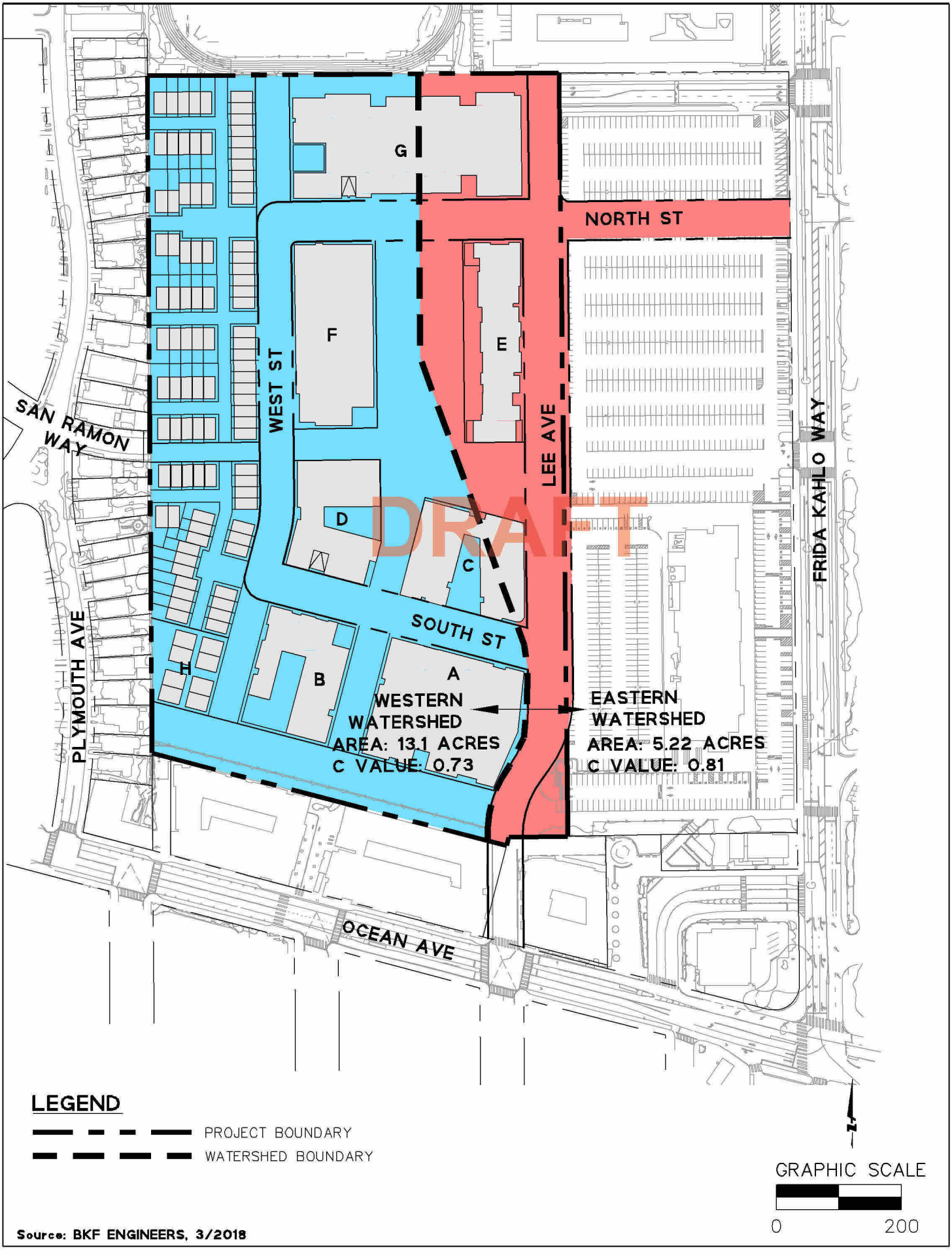
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 12.1 – PROPOSED COMBINED SEWER SYSTEM



Source: BKF ENGINEERS, 3/2018

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BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 12.2 – PROPOSED WATERSHED

13. STORMWATER MANAGEMENT SYSTEM

13.1 Existing Stormwater Management System

The existing site is approximately 76.2% impervious, mostly covered in asphalt pavement. The existing site drains to the City's combined sewer system that drains to the Oceanside Water Pollution Control Plant which discharges to the Pacific Ocean.

13.2 Proposed Stormwater Management System

13.2.1 San Francisco Stormwater Management Requirements and Design Guidelines

The Project is located in a combined sewer area and is subject to the Combined Sewer Area Performance Requirements of the San Francisco Stormwater Management Requirements (SMR). A Stormwater Management Master Plan will be provided prior to the submittal of the Basis of Design and the Improvement Plans. Since the site was previously more than 50% impervious, the Project must reduce from the existing condition the runoff rate and volume of stormwater going into the combined system for the 2-year, 24-hour design storm. The Developer's Infrastructure obligations include the design and construction of the proposed stormwater management system. Typically, the SMR require projects to reduce runoff rate and volume of stormwater by 25% each.

13.2.2 Proposed Site Conditions and Baseline Assumptions

The Project includes public streets, parks and plaza open space areas, and Private Development Parcels. The Project will be designed to integrate Low Impact Development (LID) elements with stormwater best management practices (BMPs) to create a sustainable environment at the site and achieve compliance with the SMR. Stormwater treatment BMPs considered for the Project include flow-through planters, bioretention areas, rain gardens and infiltration galleries to manage and reduce stormwater runoff prior to discharging to the public combined sewer system.

Public streets will consist of at-grade streets with a combination of landscape strips, tree wells, and flow-through planters. Reservoir Park will include landscape strips, tree wells, and centralized bioretention areas. Brighton Paseo, San Ramon Paseo, West Street North and South Paseo will likely include either bioretention areas or infiltration galleries, or a combination of both. Development parcels covered entirely with podium structures will include a combination of flow-through planters, landscape planters, tree wells, and pedestrian pathways.

13.2.3 Stormwater Management Design Concepts

The SMR requires the Project to implement BMPs to reduce the flow and volume of runoff from the Project site. To be included with the Stormwater Management Master Plan, a process flow diagram illustrating the limits of the drainage management areas (DMAs), location of runoff discharge to existing combined sewer system, and jurisdiction of existing combined sewer system will be developed to illustrate compliance with the SMR.

The conceptual stormwater management plan for the Project includes DMAs with either localized treatment or centralized treatment facilities. Localized treatment occurs in DMAs that are able to direct surface runoff to BMPs that are sized to treat stormwater runoff from impervious areas per the given design storm event. Private development parcels located within DMAs with localized treatment will allocate a space to implement BMP measures and treat stormwater for the design storm event prior to discharging into the adjacent public combined sewer system. Alternatively, Development Parcels also have the option to collect and reuse stormwater on-site.

Centralized treatment facilities will be implemented to collect runoff from larger site areas and from different properties to manage stormwater with a larger scale BMP. Runoff from the new public streets could be directed to a centralized BMP located on private property. This option will be explored and included in the Stormwater Master Plan.

It is anticipated that the public streets will be unable to meet the 25% reductions for rate and volume on their own due to lack of space for flow through planters. A centralized approach will provide stormwater management facilities on development parcels that will be sized to offset the public streets by providing reductions for rates and volume beyond the 25% required by the SMRs. Each phase of the Project, including the public right-of-way, private streets, development parcels, and open spaces, will meet the 25% rate and volume reductions.

13.2.4 Conceptual Stormwater Management Sizing

The conceptual stormwater management approach for the Project is presented in Figures 13.1 and 13.2. Figure 13.1 shows the large scale DMAs that are used for the conceptual BMP sizing calculations. For the Preliminary and Final SCPs, DMAs larger than two acres will be broken down into areas less than two acres.

Figure 13.2 presents the conceptual location and size of the BMPs for each DMA. The BMP sizes were determined using the SFPUC's BMP sizing calculator.

DMA	DMA area (acre)	Permeable Pavement (sf)	Bioretention or Infiltration Gallery (sf)	Lined Private Bioretention (sf)	Unlined Public Bioretention (sf)	Unlined Private Bioretention (sf)
1	2.01	3,500	0	5,100	0	0
2	7.64	12,600	7,400	5,800	0	7,200
3	2.56	6,000	2,000	4,300	0	7,700
4	1.66	0	0	0	4,300	0
5	3.42	12,400	0	0	0	7,400
6	1.02	16,100	0	0	0	0

13.3 Stormwater Control Plan

Based on the designs to be reviewed and approved by the SFPUC as part of the Stormwater Management Master Plan, the stormwater management strategies for the Project will be documented in a Stormwater Control Plan (SCP) in compliance with SFPUC stormwater management regulations and the requirements of the SMR. The selected modeling methodology will be per the SFPUC accepted hydrologic calculation methods. The Preliminary SCP for each phase will be submitted for review and approval before the 60% Improvement Plan milestone. The Final SCP will be submitted with the 95% Improvement Plan for that phase and prior to construction.

13.4 Phases for Stormwater Management System Construction

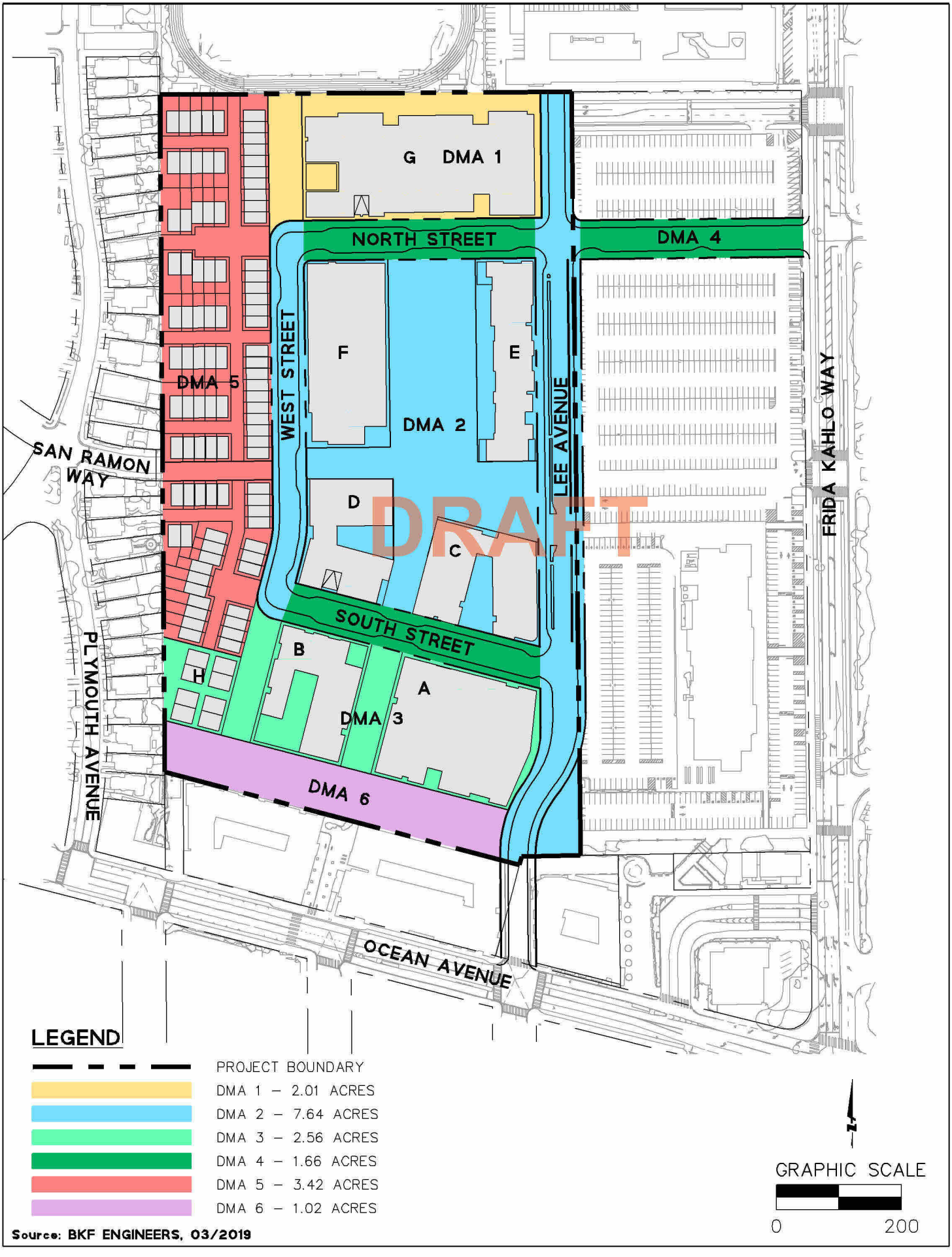
The Developer will design and install the new stormwater management system as-needed to facilitate a specific proposed Development Phase and consistent with the requirements of the DA and ICA. The amount and location of the proposed stormwater management systems installed will be the minimum necessary to support the Development Phase. The new Development Phase will connect to the existing systems as close to the edge of the Development Phase area as possible while maintaining the integrity of the existing system for the remainder of the Project. Development phasing with regard to stormwater treatment and storm drain system is conceptual and remains under design. The phasing and simplification of the stormwater treatment and drain systems will be further coordinated with the SFPUC prior to approval of the MUPs.

At all phases of the development, the Developer must provide functioning and adequate stormwater management in compliance with the SFPUC's post-construction stormwater management requirements and the SMR. The Developer will be required to complete the review process with SFPUC to seek approval

for the Preliminary SCP and Final SCP for each Development Phase. The street right-of-way must have Final SCP approval prior to issuance of the Street Improvement Permit (SIP). In addition, the Developer must complete the construction of the approved stormwater management and treatment improvements required for each development phase prior to receiving a Certification of Completion for the development phase.

Permanent or interim centralized stormwater management and treatment facilities necessary to achieve SMR compliance within a development phase will be constructed and operational prior to or in conjunction with that phase. As required by the SFPUC and Regional Water Quality Control Board (RWQCB), the Developer will be responsible for constructing and maintaining interim stormwater management and treatment infrastructure, and ensuring such interim treatment facilities remain online and operating continuously until permanent BMP infrastructure is fully functional and operating.

Stormwater management and treatment systems, which may include bioretention areas, street flow-through planters, infiltration galleries, and storage areas located on public or private property within the Project, will be constructed and maintained by the City Agency, Developer, or its Assignees, where applicable, per the terms of the DA or ICA.



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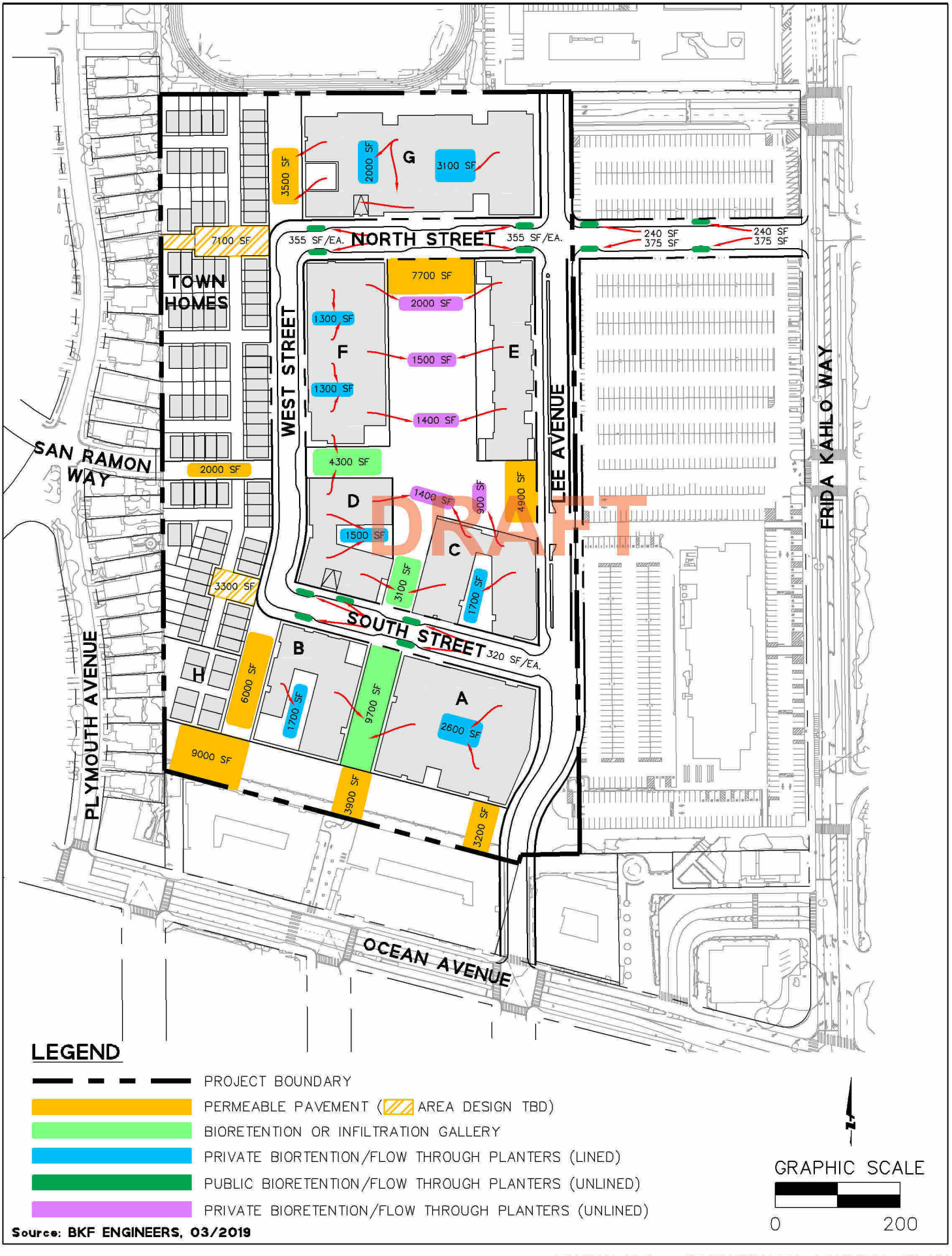
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 13.1 – STORMWATER DRAINAGE MANAGEMENT AREAS



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BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 13.2 – STORMWATER CONTROL PLAN

14. DRY UTILITY SYSTEMS

14.1 Existing Dry Utility Systems

14.1.1 Electric

Balboa Reservoir project area is surrounded by Ocean Ave. on the south, Plymouth Ave. on the west and across a parking lot to remain, Frida Kahlo Way on the east. According to record maps provided by PG&E, Ocean Ave. consists of 4kV and 12kV underground electrical distribution. On Plymouth Ave., overhead electrical lines run along the backyards of existing properties. Finally, underground electrical distribution has been established on Frida Kahlo Way as well.

14.1.2 Natural Gas

Per record maps provided by PG&E, there are existing high pressure distribution gas main line running along Ocean Ave on the near and far-side in relation to the Balboa Reservoir project. Additionally, the record maps show a deactivated gas line cutting through Ingleside branch of San Francisco Public Library near the intersection of Plymouth Ave. and Ocean Ave. On the west side, a high pressure distribution main line begins (capped with an electronic marker, EM) approximately 50' north off the corner of Plymouth Ave. and Ocean Ave. and runs along Plymouth Ave. Along Frida Kahlo Way, there is a high pressure distribution main line in the westerly side of the street.

14.1.3 Communications

Based on visual inspection at the project site, AT&T and Comcast operate existing communication facilities along Ocean Ave., Plymouth Ave. and Frida Kahlo Way. Ocean Ave. and Frida Kahlo Way consist of underground low voltage distribution systems while Plymouth Ave. consists of joint poles carrying the AT&T, Comcast, and San Francisco Department of Technology (DT) overhead lines along the backyards of the properties

14.2 Project Power Providers and Requirements

Pursuant to Chapter 99 of the San Francisco Administrative Code, all City departments, including departments located in or on non-City-owned facilities and properties, shall receive electric service from the PUC unless the PUC determines that such service is not feasible, or the City's lease or contract does not permit such service. All tenants in City facilities or on City property shall receive electric service from the PUC unless the PUC determines that such service is not feasible. Any lease, or sub-lease for a City

facility or City property shall include standard language identifying the PUC as the electric provider unless the PUC determines that such service is not feasible.

All City departments shall work with the PUC to plan for, design, and construct electric infrastructure to determine the most beneficial means of constructing and funding infrastructure needed for connection to the electric grid to maximize the long-term benefits and minimize costs to the City.

14.3 Proposed Joint Trench

The proposed joint trench for dry utilities (that lie in public streets and in the sidewalk area if at all possible) consists of trench excavation and installation of conduit ducts for gas, electric, voice / data, and fire and police alarm. Additionally, utility vaults, splice boxes, street lights and bases, wire and backfill are included. The utility owner/franchisee (voice / data companies) will be responsible for installing their own facilities such as transformers and wire.

All necessary and properly authorized public utility improvements for which franchises are authorized by the City shall be designed and installed in the public right-of way in accordance with governing codes, rules and regulations, and permits approved by San Francisco Public Works (SFPW). Joint trenches or utility corridors will be utilized wherever feasible. The location and design of joint trenches and utility corridors in the right-of way must be approved by SFPW during the street improvement review process. All subsurface vaults serving one building shall be placed behind the property line. If a subsurface vault serves the distribution system, it may be placed in the right of way. Other facilities (e.g., traffic signal controllers) shall be located above ground as necessary for operational reasons. The precise location of the joint trench in the right of way will be determined prior to recording the applicable final map and identified in the street improvement plans. Nothing in this Infrastructure Plan shall be deemed to preclude Owner from seeking reimbursement for or causing others to obtain consent for the utilization of such joint trench facilities where such reimbursement or consent requirement is otherwise permitted by law.

14.4 Street Lights

Secondary power for street lighting may be installed in the joint trench or separate trench with proper separation as a street light utility. *See Section 5.22 of the DSG for additional information regarding street lights.*

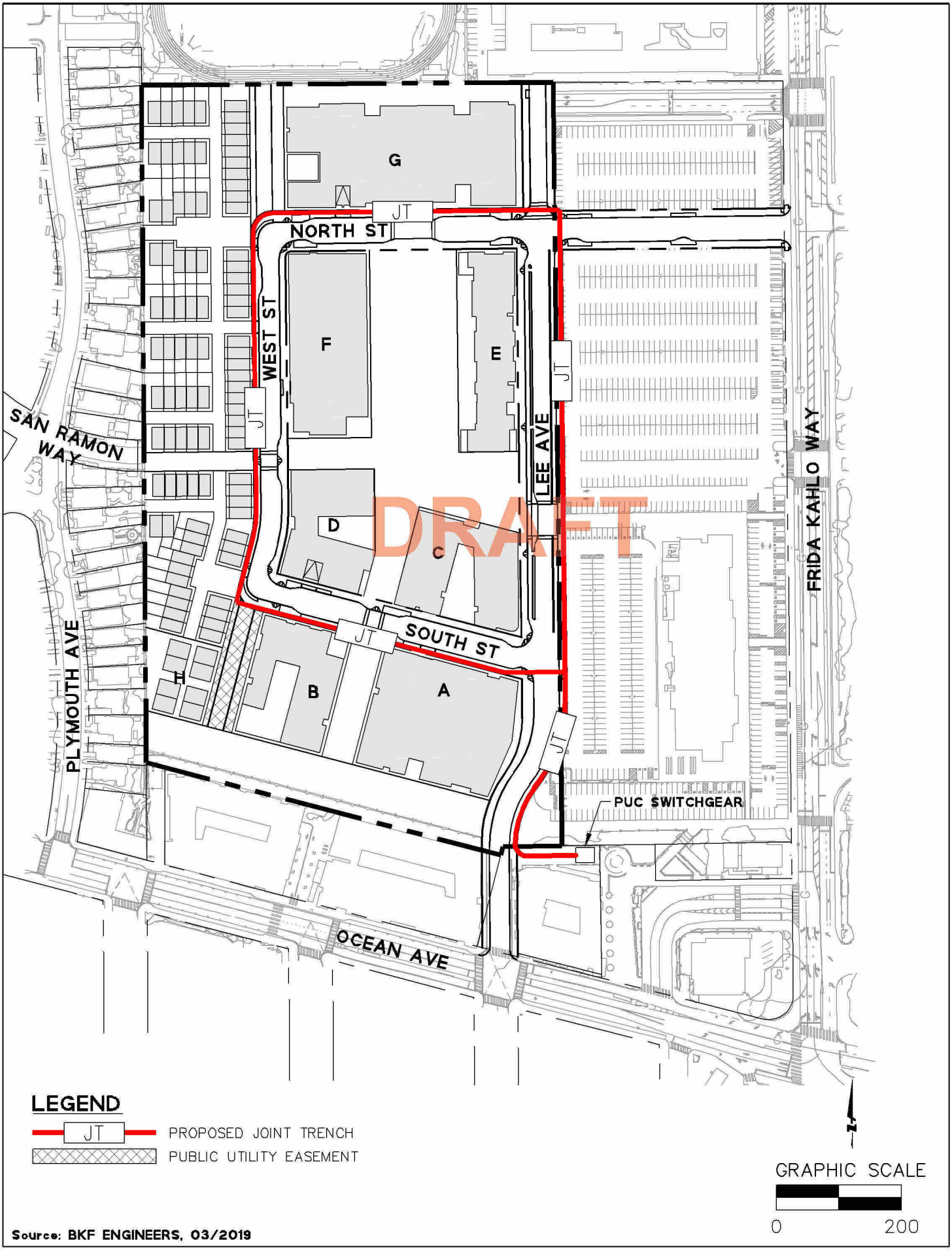
14.5 Public Utility Easements

Public utility easements will be allowed at other locations, including in the various right of ways. Utilities in these areas will be installed in accordance with the standards in this Infrastructure Plan and applicable City Regulations for public acquisition and acceptance within public utility easement areas, including provisions for maintenance, but such areas shall not be required to be dedicated as public right of ways or improved to public right of way standards but may including paving, street furnishings, lighting, landscaping and irrigation.

14.6 Phases for Dry Utility Systems Construction

Joint trench design and installation will occur in phases based on the principle of adjacency and as-needed to facilitate a specific proposed Development Phase and consistent with the requirements of the DA and ICA. The amount of existing system replaced, and new infrastructure installed along Lee Avenue, North Road, West Road, and South Road will be the minimum necessary to support the Development Phases. The new infrastructure will connect to the existing systems as close to the proposed development as possible while maintaining the integrity of the existing system. Repairs and/or replacement of the existing facilities necessary to serve the Development Phase will be designed and constructed by the Developer. Such phased dry utility installation will allow the existing utility services to remain in place as long as possible and reduce disruption of existing uses on the site and adjacent facilities. Temporary or interim electric or dry utility infrastructure may be constructed and maintained as necessary to support service to existing buildings.

The service providers will be responsible for maintenance of existing facilities until replaced by the Developer. In the interim, the service provider is responsible for any power facilities installed under any agreement with the Developer and City Agency. The service provider will also be responsible for any new power facilities once the horizontal improvements for the Development phase or the new power facility is complete and accepted by the City Agency.



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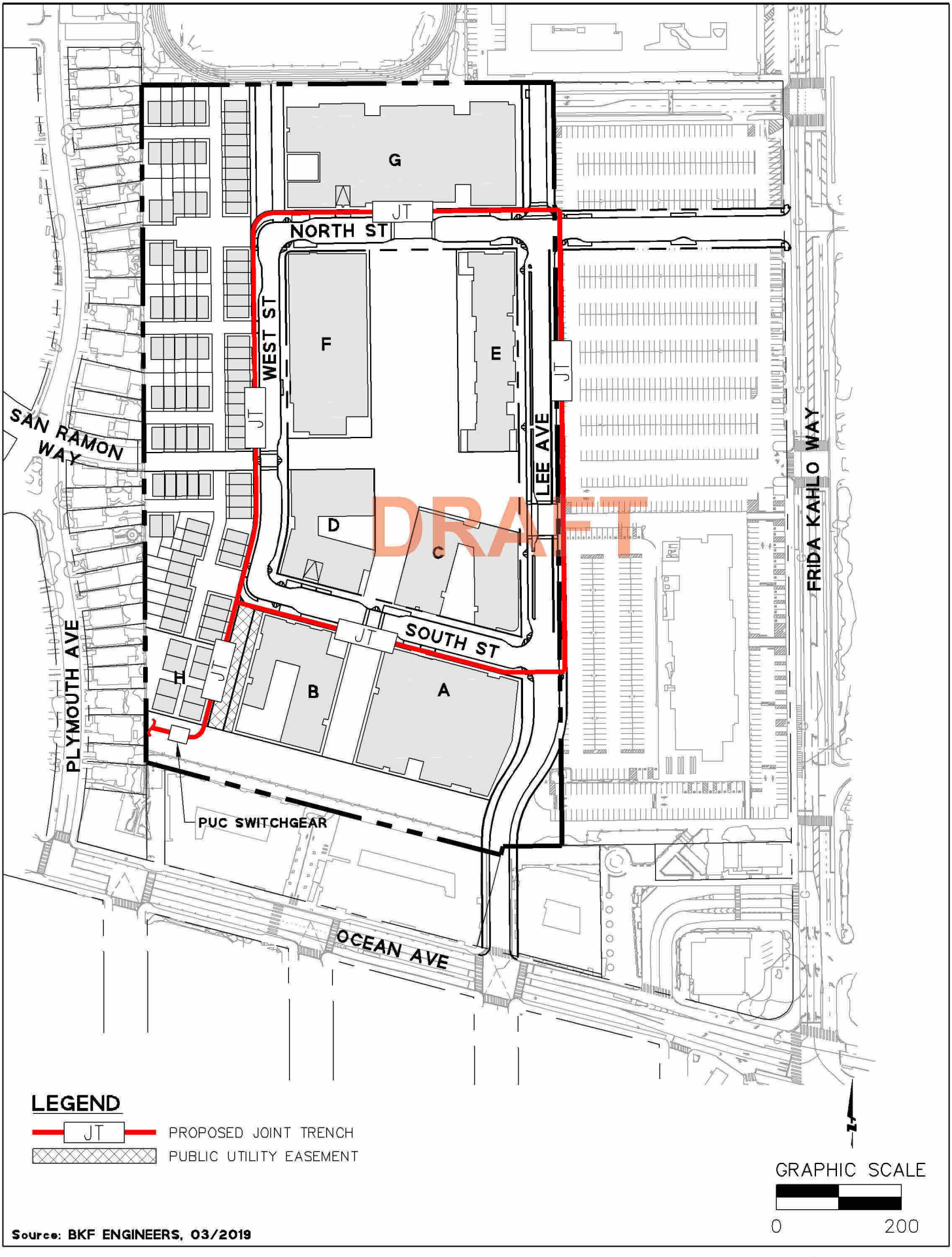
BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 14.1A – PROPOSED JOINT TRENCH SYSTEM (OPTION 1 – SFPUC)



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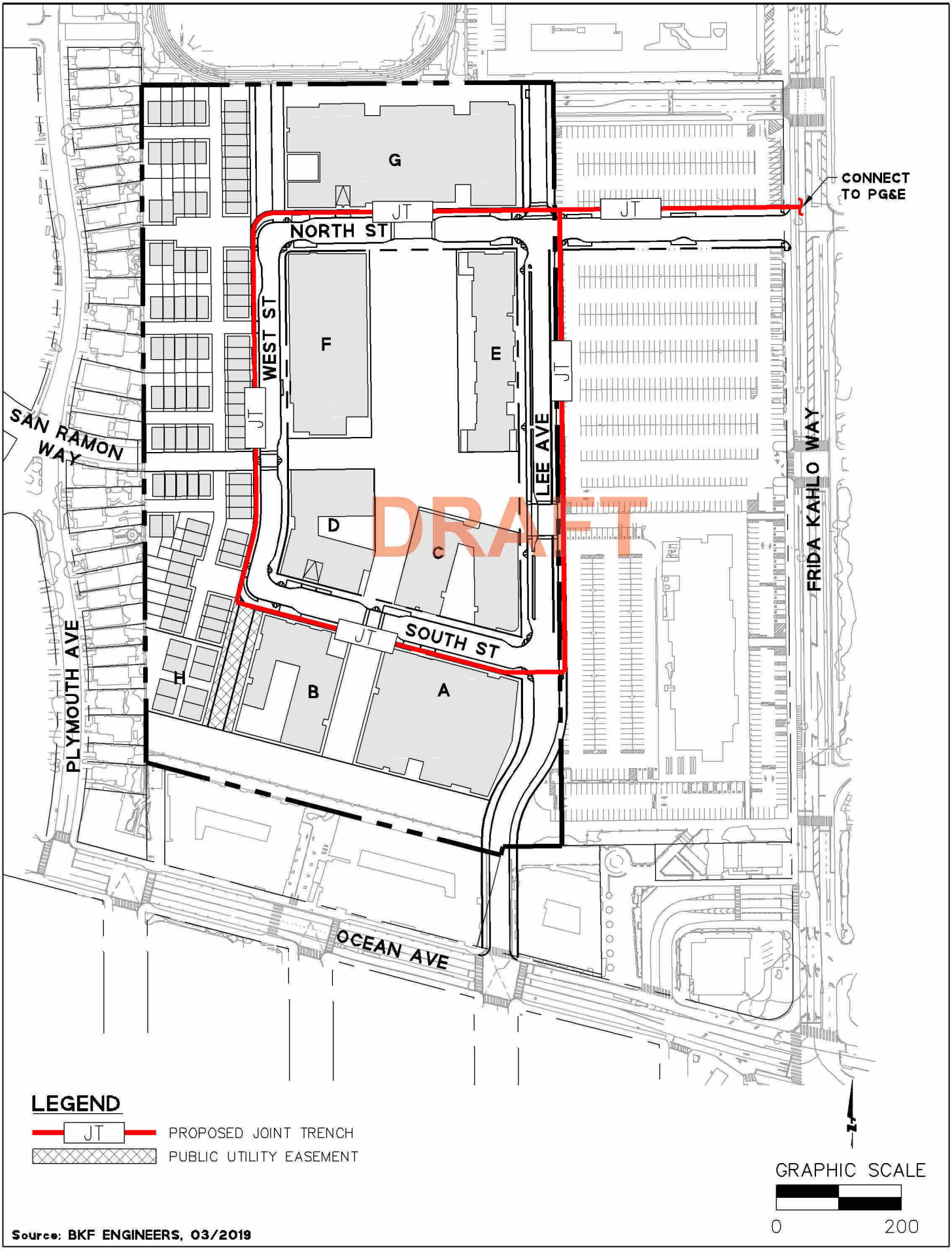
BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 14.1B – PROPOSED JOINT TRENCH SYSTEM (OPTION 2 – SFPUC)



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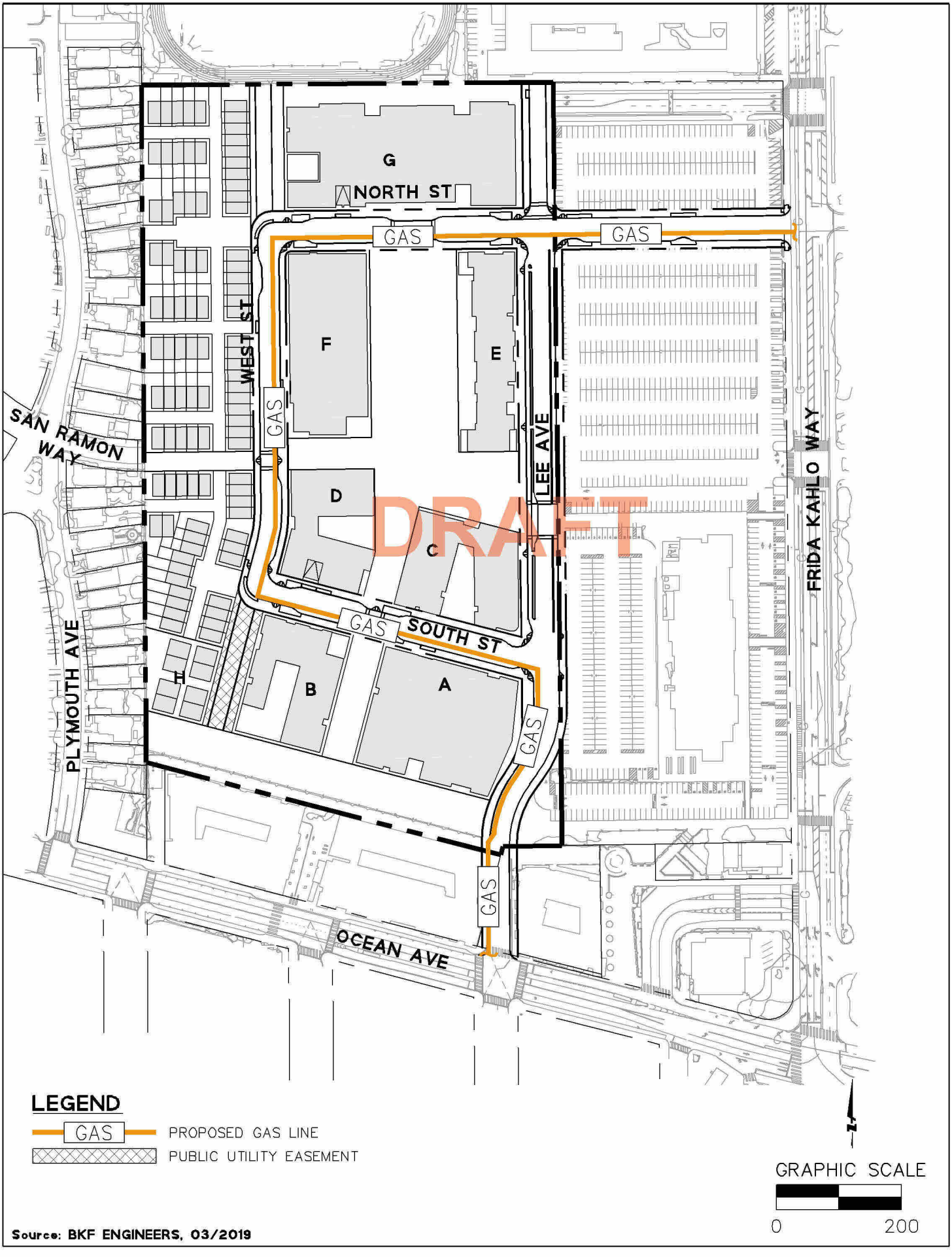
BALBOA RESERVOIR INFRASTRUCTURE PLAN FIGURE 14.1C – PROPOSED JOINT TRENCH SYSTEM (OPTION 3 – PG&E)



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BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 14.2 – PROPOSED GAS SYSTEM

15. EXISTING CITY COLLEGE OF SAN FRANCISCO UTILITIES

15.1 Existing Private Utilities

Within the proposed right-of-way of Lee Avenue, there are currently private utilities owned by the City College of San Francisco (CCSF). These utilities primarily serve CCSF's multi-use building, located east of the Project site.

15.1.1 Fire Water

There is an existing 8-inch private fire water line that runs in the proposed Lee Avenue right-of-way. This line has two points of connection to the City water system in Frida Kahlo Way. It serves several on site, private fire hydrants.

15.1.2 Sanitary Sewer

There is an existing 10-inch private sanitary sewer line that runs in the proposed Lee Avenue right-of-way. This line flows south and connects to the existing 27-inch City combined sewer line at the dead end of Lee Avenue.

15.1.3 Storm Drain

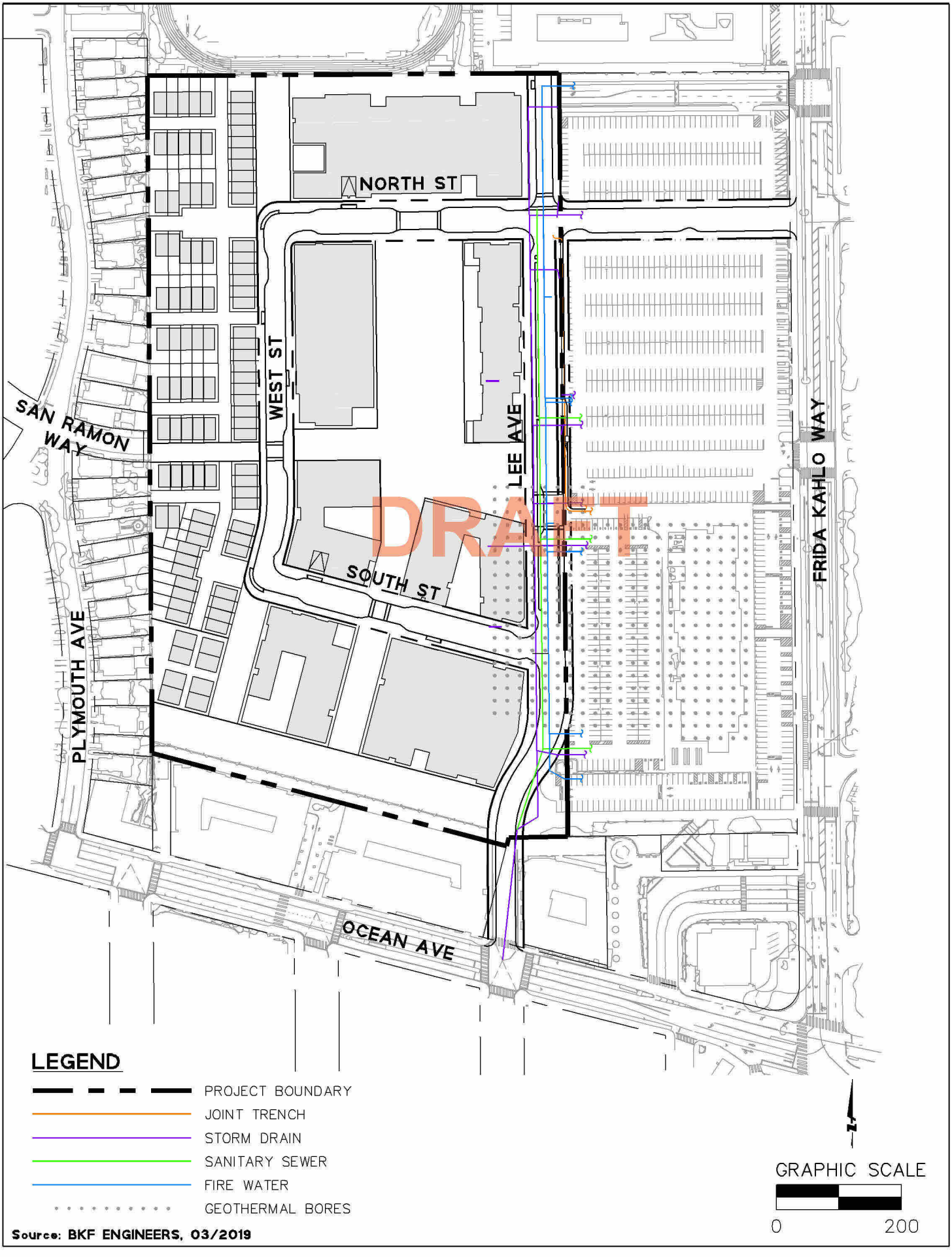
There are existing 18-inch and 72-inch private storm drain lines that run in the proposed Lee Avenue right-of-way. These lines collect storm water runoff and flow south towards Ocean Avenue. The 18-inch line collects runoff from the northern portion of the CCSF site and conveys it to the 72-inch line. The 72-inch line is a detention pipe that holds storm water and slowly releases it to the City's 27-inch combined sewer line in Lee Avenue. On the downstream end of the 72-inch line, there is a weir structure which controls the rate of discharge from the line.

15.1.4 Geothermal Wells

There is a field of geothermal wells that extend under a portion of the future Lee Avenue right-of-way and into the Project site. These wells are part of the heating and cooling system for the multi-use building which has a central plant that uses hydronic heating for climate control. Water is pumped through the wells and then returned to the building where it either heats or cools the building.

15.2 Relocation of Private Utilities

The private utilities will need to be relocated to construct Lee Avenue. At the time of this report, the exact design of the relocations is still being studied. The final plan for the utility relocations will be developed in 2019. This section of the report will be updated when the final design is determined.



Source: BKF ENGINEERS, 03/2019

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\DOCS\05-Planning_Entitlements\H-Infrastructure_Plan\Exhibits\BR-EX-CCSF-UTIL.dwg
PLOT DATE: 03-07-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

FIGURE 15.1 – EXISTING CCSF UTILITIES

ATTACHMENT A – BALBOA RESERVOIR DESIGN STANDARDS AND GUIDELINES
CHAPTER 5

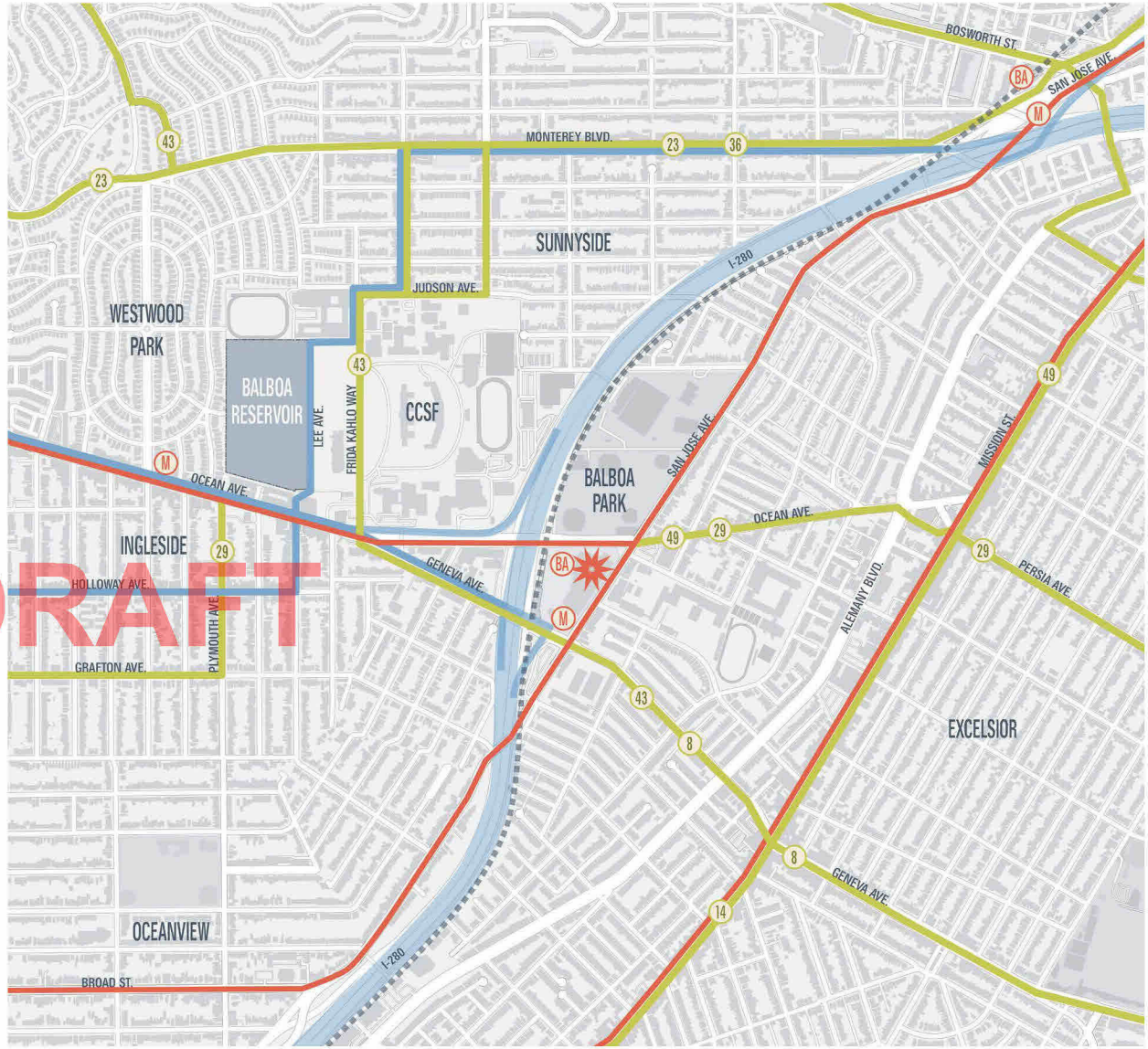
5

CIRCULATION & TRANSPORTATION

Street Grid and Circulation

5.1 OVERVIEW

Balboa Reservoir is ideally situated with multiple transit opportunities, including the Muni K Line on Ocean Avenue, bus connections at Phelan Loop and the Balboa BART Station. While the neighborhood is currently impacted by rush hour traffic with a freeway off ramp and confusing intersections which make pedestrian and bicycle circulation through the neighborhood difficult, Balboa Reservoir aims to be part of a larger solution. The transportation and mobility strategy for Balboa Reservoir seeks to enhance access to the rich existing transportation network in order to reduce reliance on private automobiles. In order to further develop and meaningfully contribute to an area-wide transportation strategy, continued coordination with SFMTA and CCSF is crucial to Balboa Reservoir's transportation strategy.



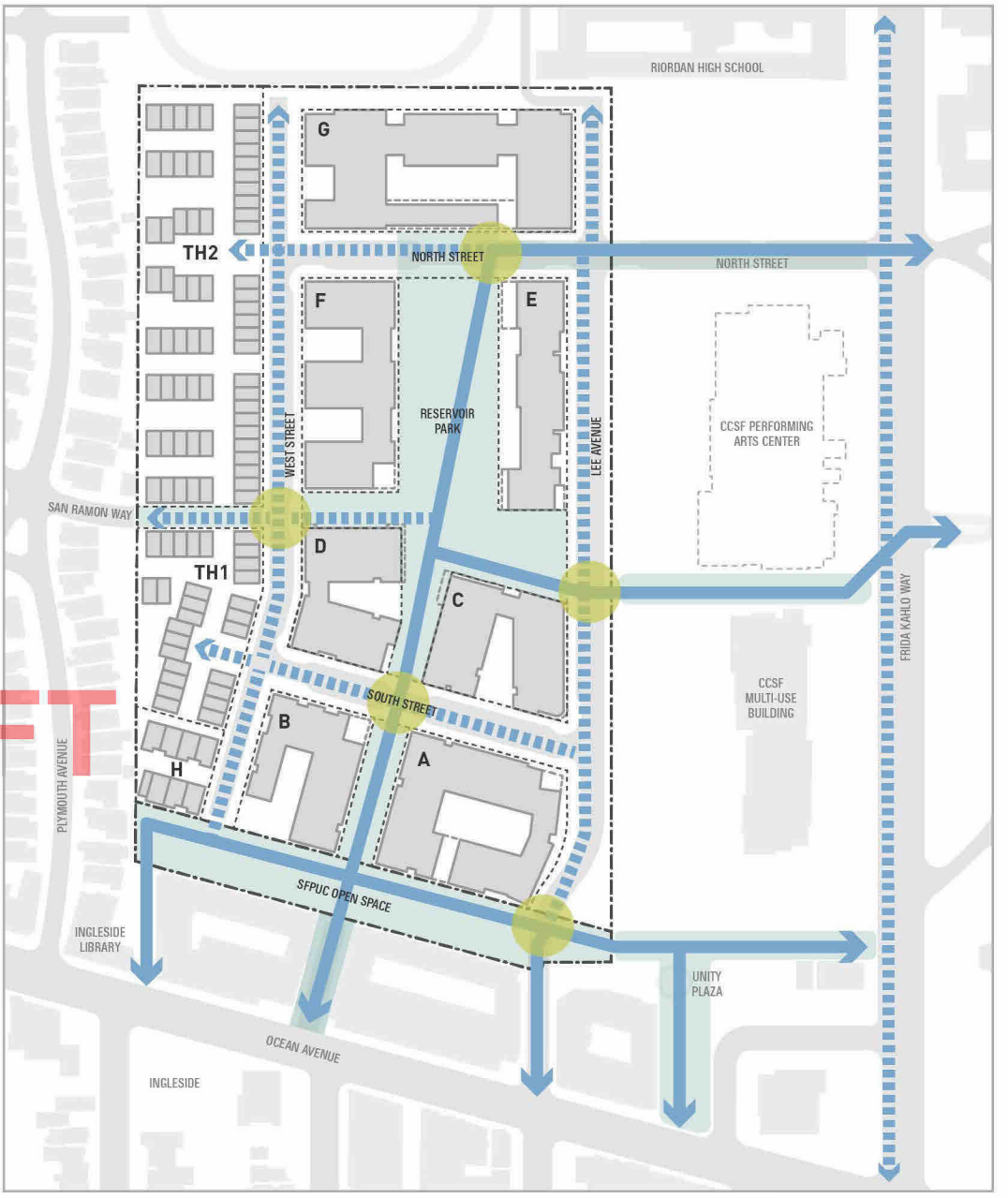
LEGEND

- Bus Connections
- Muni Connections
- Primary Auto Connections
- Muni Station
- BART Station
- Bus Line Number
- Balboa Park Transit Station

Figure 5.1 – 1: *Context Circulation Diagram*

5.2 PEDESTRIAN NETWORK

The Balboa Reservoir plan establishes a fundamental priority in favor of walking and biking, through urban design principles and enhanced connections. The surrounding street network determines the locations of direct access points for residents and neighbors into the central open space which in turn accommodate a family friendly pedestrian and bike network. There are many pathway options into and through the site, providing convenient access to community facilities, the childcare center, and resident amenity spaces located at activity nodes within the park. Additionally, there are multiple pedestrian connections linking outward to Ocean Avenue, transportation and neighborhood destinations.



LEGEND

- *Raised Pedestrian Crossings*
- *Primary Pedestrian Flow*
- *Secondary Pedestrian Flow*

Note: building footprints are conceptual, for reference only.

Figure 5.2 – 1: *Pedestrian Network Diagram*

5.3 BICYCLE NETWORK

The Balboa Reservoir bicycle network encourages the use of bicycles as a preferred alternative. The design provides dedicated bike lanes on Lee Avenue linking to the Holloway Avenue Bike Route and the bike lanes on Frida Kahlo Way. Class III bike lanes (sharrows) will be provided at the slower moving loop roads. In addition, multiple shared paths will circulate throughout the site with access points to Ocean Avenue and potentially to San Ramon Way.

Each building will provide direct access to bicycle storage, with secure exterior racks at key locations. A generous bike share station is proposed adjacent to Reservoir Park.

Refer to Chapter 8 TDM measures for additional information regarding bicycle storage.

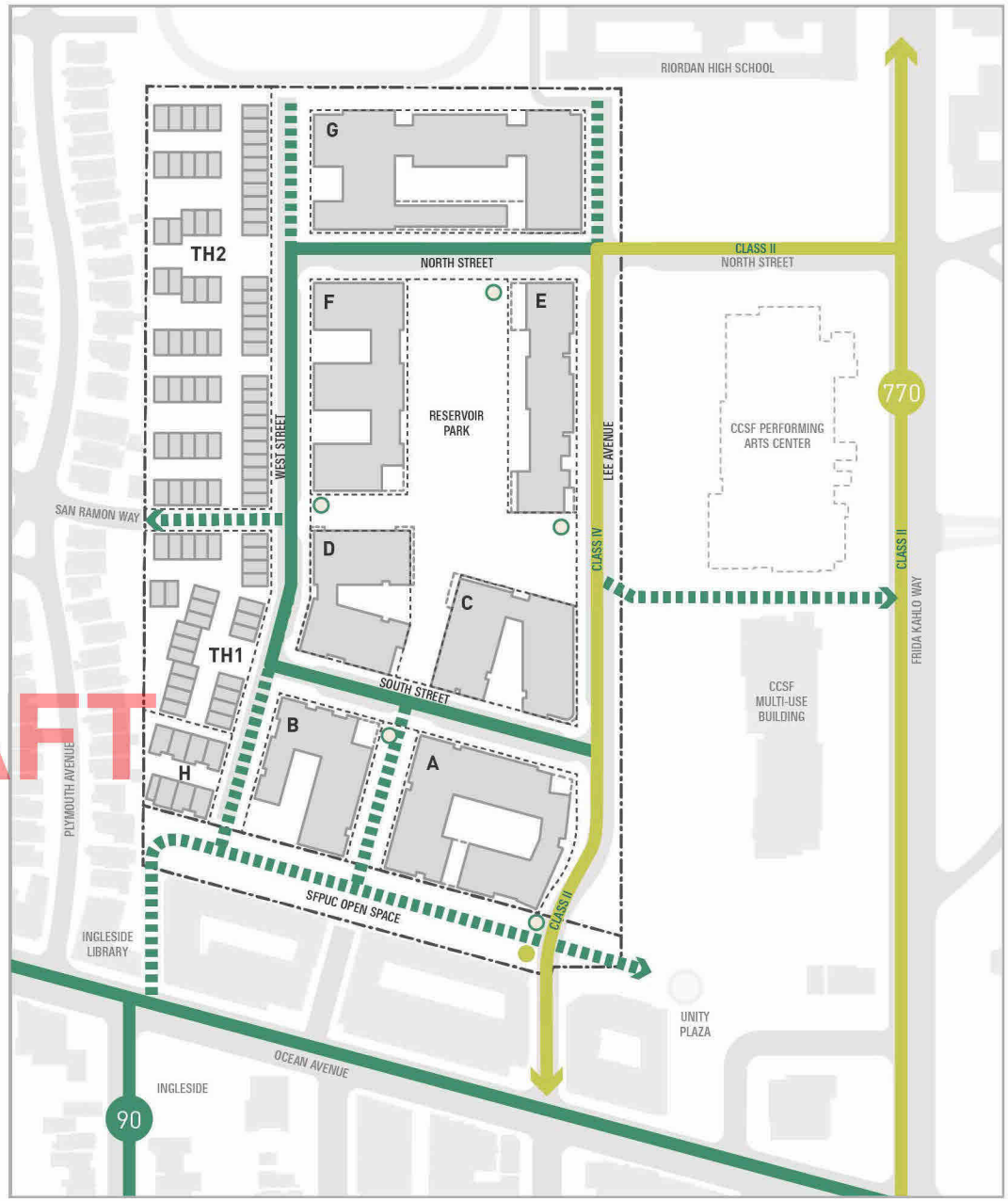


Figure 5.3 – 1: *Bicycle Network Diagram*

5.4 VEHICLE NETWORK (SFMTA / SFFD)

Vehicular connections to the site shall be located at two main access points. Lee Avenue will extend to the north and be developed as a shared neighborhood street, and will connect to Frida Kahlo Way to the east via North Street.

The limited traffic street loop of North, West and South Streets at the interior of the site provides vehicle access to each building entry, loading zones and garages. This simple loop allows each block to dedicate at least two sides solely to pedestrian and bicycle circulation. Streets are designed to slow vehicles and emphasize pedestrian and bicycle movement. Shared streets will provide access to townhome units. The arrangement of shared streets shown in **Figure 5.17 – 2** and **Figure 5.17 – 5** is illustrative. The final configuration of shared streets may vary. Refer to Chapter 7 for Standards and Guidelines related to townhomes.

A public parking garage may potentially be located at either the northern or southern block of the site as indicated in **Figure 5.6 – 1**.

Each of the streets and intersections are studied in detail in **Sections 5.14 - 5.18**.

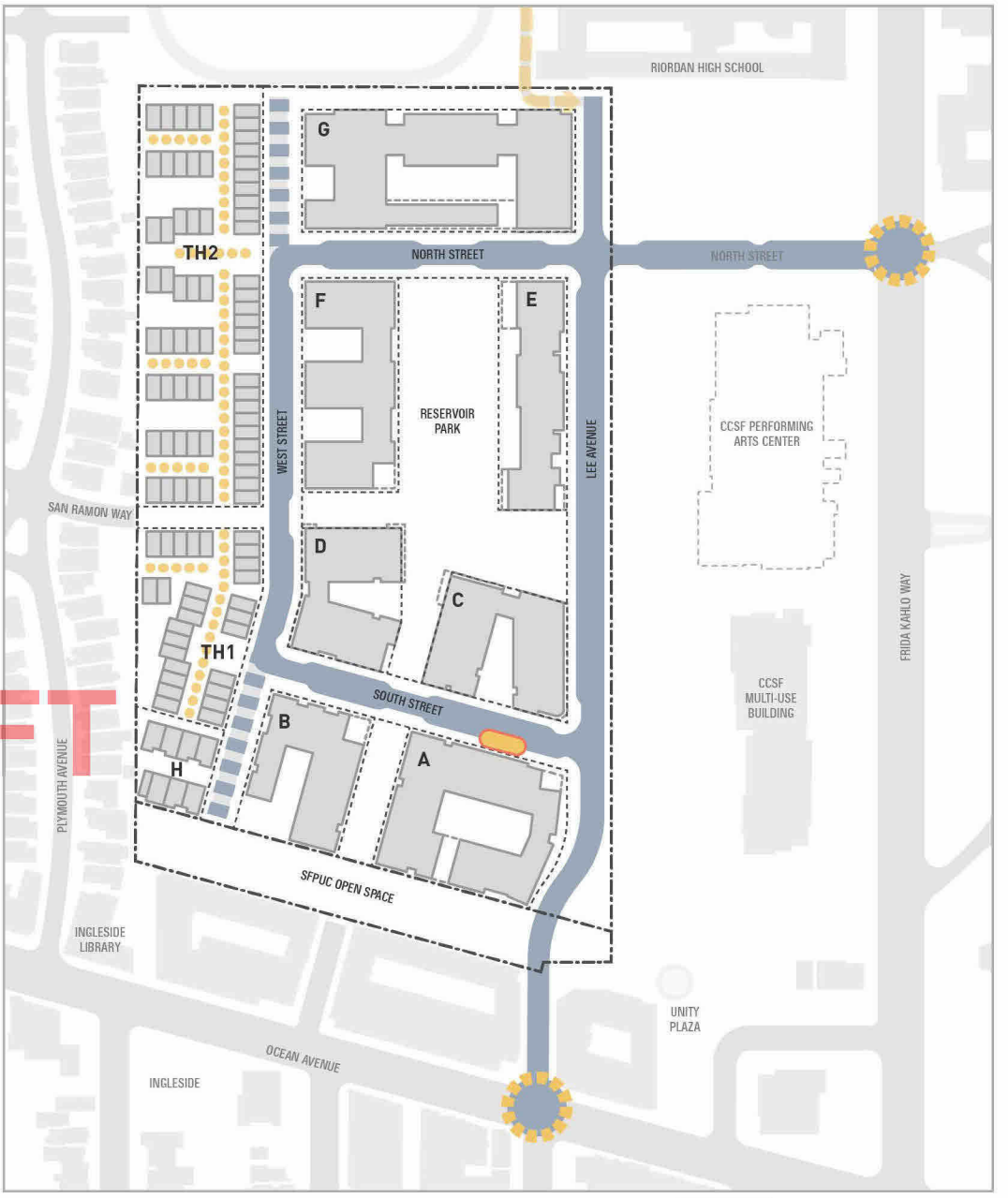


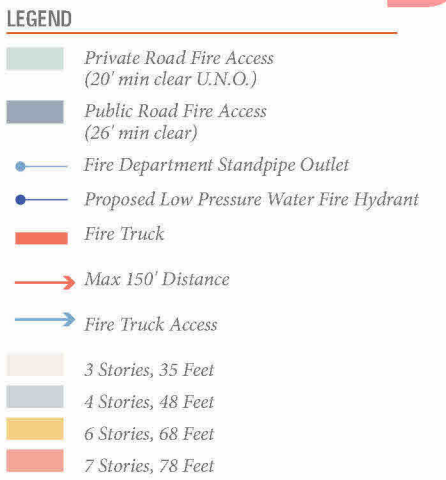
Figure 5.4 – 1: *Vehicle Network Diagram*

5.5 FIRE AND EMERGENCY VEHICLE ACCESS

Fire truck and emergency vehicle access to Balboa Reservoir will be provided via Lee Avenue and the North, West and South Street loop.

Aerial ladder truck access, with 26 foot clear roadways, will be provided to at least two sides of every building over 40 feet tall. Portions of these buildings further than 150 feet from the streets will be fitted with supplemental standpipes/Fire Department Connections.

The townhouse development on the west side of the site will be two and three stories (35 feet max) and will be accessed as shown in **Figure 5.5 – 1**.



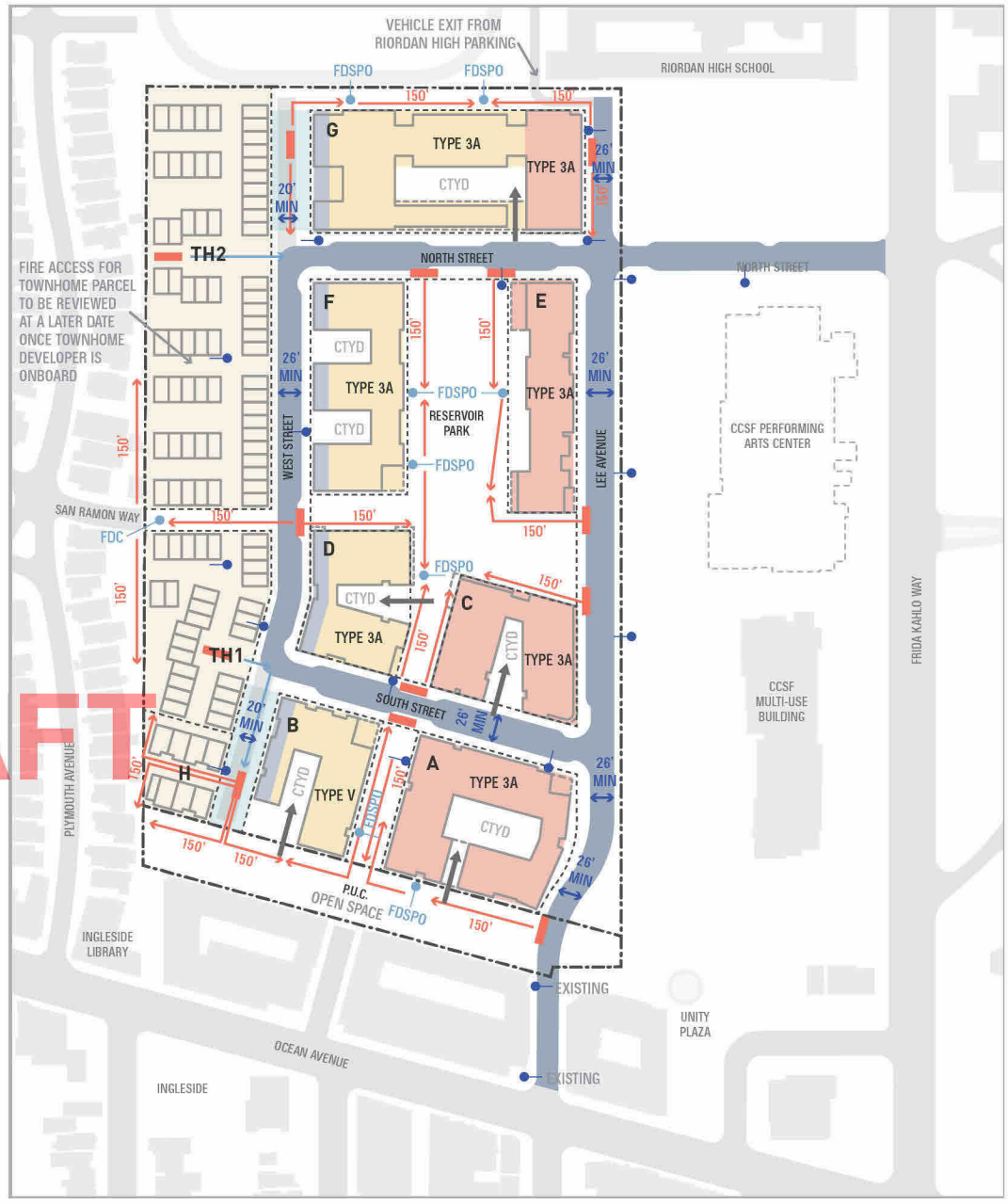


Figure 5.5 – 1: *Fire and Emergency Access Diagram*

5.6 PARKING, LOADING AND SERVICE

Parking and Loading

Particular care must be taken to coordinate parking and service entries, street passenger loading, and vehicular parking to minimize conflicts with pedestrians and bicyclists. Careful coordination of commercial loading, trash pickup, mail drop-off and residential move-in-move-outs is also essential to support an active pedestrian environment.

Bicycle Parking

Publicly accessible bike parking shall be located at the PUC open space, the Lee Avenue entrance to Reservoir Park, the publicly accessible community space and at the childcare center at shown in **Figure 5.6 – 1**.

Refer to Chapter 7 for buildings requiring private bicycle parking. Bicycle parking access to private residential buildings shall be conveniently located, preferably at the ground floor, but also potentially above the ground floor, provided that pathways to reach bicycle parking are designed specifically to accommodate bicycles, (e.g. elevator sizes, hallway widths, etc. shall be adequately sized for bicycles).

Vehicle Parking

Accessory private parking is allowed at all residences. Refer to **Section 7.17: Parking and Service Areas** for Standards. Access to accessory parking will be limited to a single ingress and egress point at each block at the locations indicated on **Figure 5.6 – 1**.

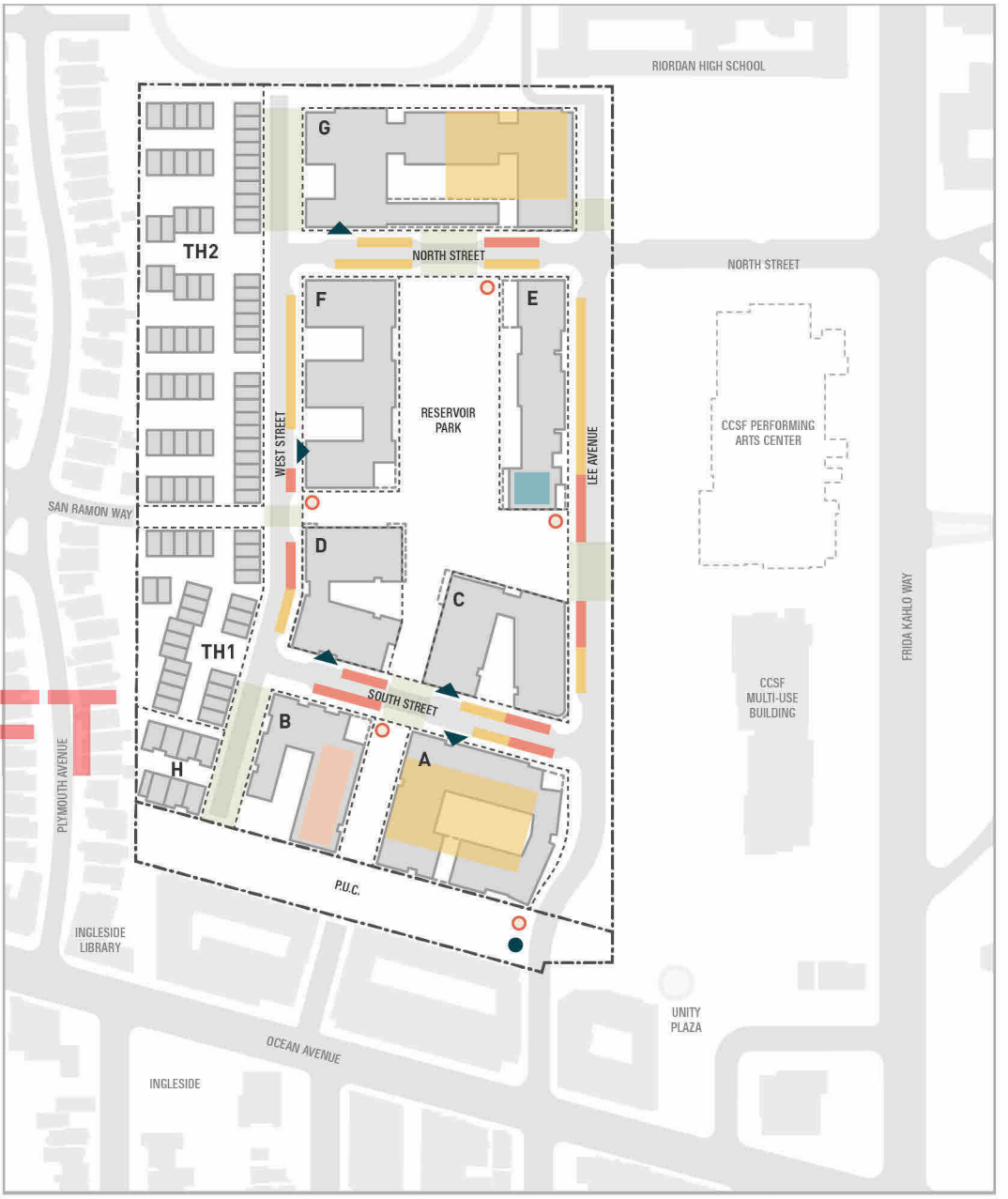


Figure 5.6 – 1: *Parking, Loading and Service Diagram*

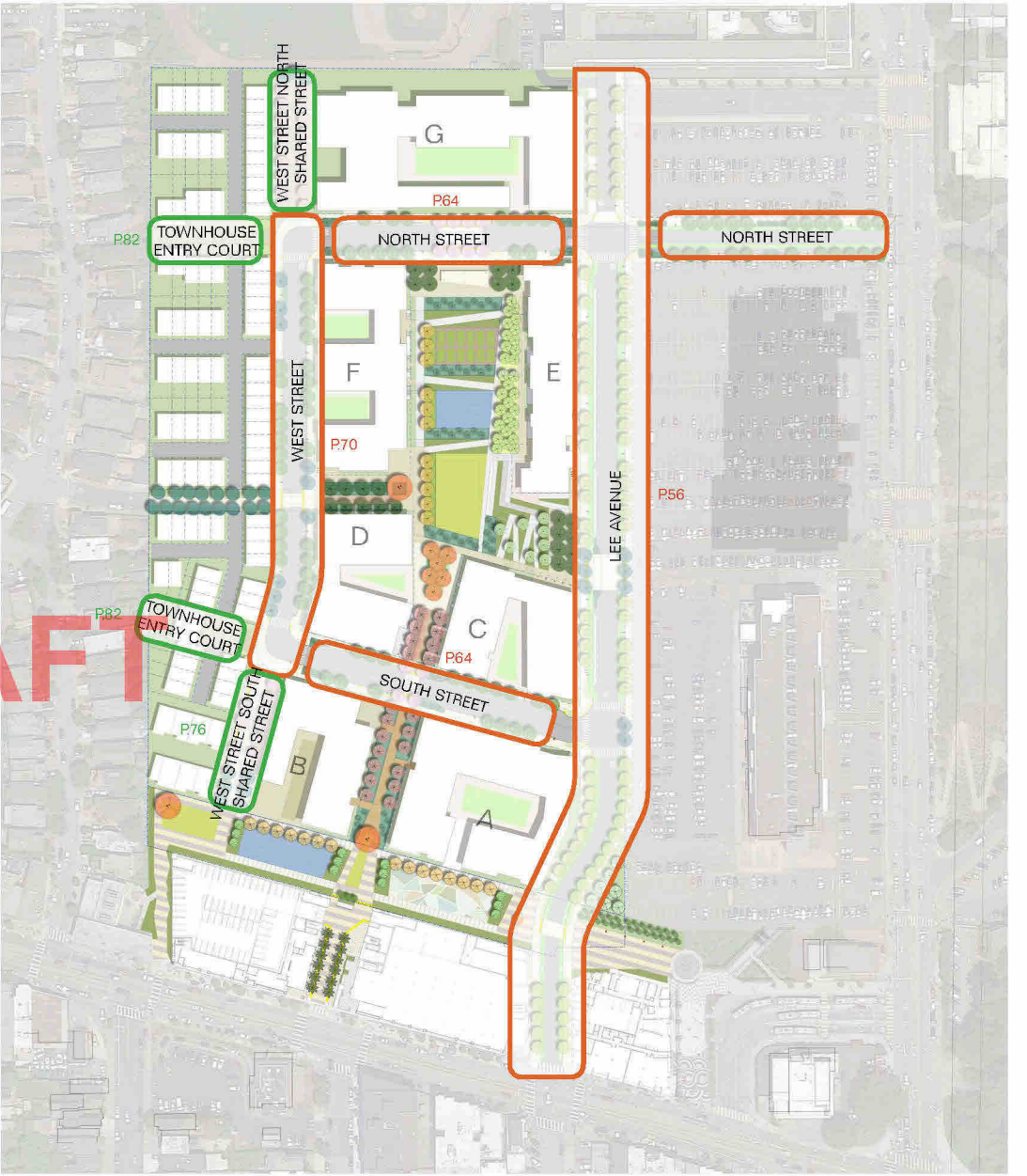
Streets and Streetscape

5.7 STREET DESIGN OBJECTIVES AND CONCEPTS

Given the number of unique conditions at Balboa Reservoir, maintaining simplicity and continuity on the streets is essential to providing a unifying framework for development over time. In order to ensure the coherent implementation of the Streetscape Design Guidelines, this chapter describes recommended material examples, details, and dimensions, as well as the requirements for parking, emergency vehicles, street lighting, trees, and furniture.

CONCEPT

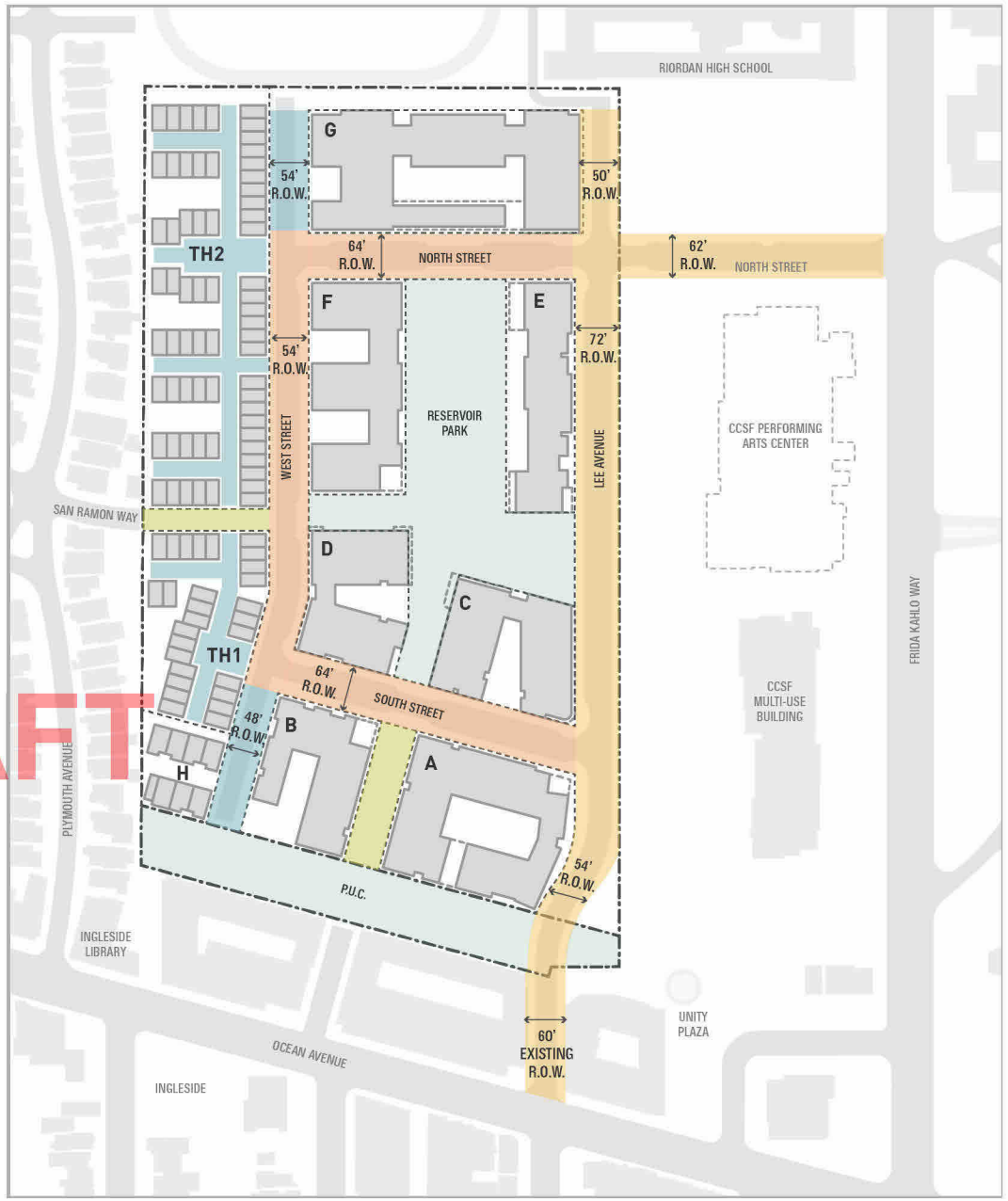
Streets within the project boundary will be designed according to the principles of the San Francisco Better Streets Plan (BSP). Street design must accommodate a comprehensive set of mobility, infrastructure, and streetscape elements, including facilities for pedestrians, bicyclists, disabled persons, vehicular access (cars, service, and emergency vehicles), utilities, stormwater management, furnishings, planting and traffic calming. The design will provide for street trees at regular intervals to encourage walking and cycling to adjacent public transit. Streets will be accessible to all modes of transportation via Lee Avenue, North Street, South Street and West Street. **Figure 5.7 – 2** illustrates the street type assignment for each street within the site boundary. Specific street designs and characteristics are described further in the Standards and Guidelines section.



LEGEND

- *Public Streets*
- *Private Streets*
- PXX *Page Number in Chapter 5*
- PXX *Page Number in Chapter 5*

Figure 5.7 – 1: *Streetscape Key Plan*



LEGEND

- *Mixed-Use Street*
- *Neighborhood Residential Lane*
- *Privately Owned / Maintained Street*
- *Public Open Space*
- *Paseo*

Figure 5.7 – 2: *Street Typology and Street Width*

Street	Width	Street Element
Lee Avenue (East of Block G)	50'	
Lee Avenue (Between North Street and South Street)	72'	
Lee Avenue (Between South Street and SFPUC Open Space)	Varied from 72' to 54'	
Lee Avenue (Between SFPUC Open Space and Ocean Ave)	56'	
North Street West (West of Lee Avenue)	64'	
North Street East (East of Lee Avenue)	62'	
West Street	54'	
South Street	64'	

SW Sidewalk
B Bicycle Lane
P Parking Lane
L Loading

Figure 5.7 – 3: *Street Widths*

Street Design Standards and Guidelines

5.8 OVERVIEW

Streetscape is defined as the zone between the faces of buildings, which includes the setback zones and publicly accessible right-of-way. There are six streetscape zones referenced throughout in the following Street Standards and Guidelines. Except for the drive lane zone, the rest of the categories are derived from the Better Streets Plan.

Frontage Zones

Frontage zones are the areas between the property line and the face of building where transitions between public use at the sidewalk and private use inside the building occur. The adjacent users may occupy this zone for outdoor display, seating, and planting with appropriate permits. Architectural elements that protrude into the street such as awnings, canopies and marquees may also occupy this zone. The width of frontage zones varies from 0 to 5 feet wide.

Throughway Zones

Throughway zones are intended for accessible pedestrian travel only and should be clear of obstacles, including driveway aprons or other changes to cross slope. The walking surface should be stable, firm and slip-resistant.

Furnishing Zones

Furnishing zones provide a buffer between pedestrian and vehicular traffic. They also contain street trees, planting and a variety of site furnishings such as benches, trash receptacles, and bike racks.

Edge Zones

The edge zone is the area intended to provide access to parallel parking from the sidewalk. The surface of the edge zone should be stable, firm and slip-resistant.

Extension Zones

The extension zone refers to specific conditions where the sidewalk extends into the parking lanes. Applications include curb extension, flexible use of parking lanes and bicycle parking, tree planting, and stormwater features in the parking lane.

Drive Lane Zones

The drive lane zone is allocated to vehicular travel. In this pedestrian and bicycle-prioritized neighborhood, the width of the vehicular drive lane should be minimized to provide fire access.

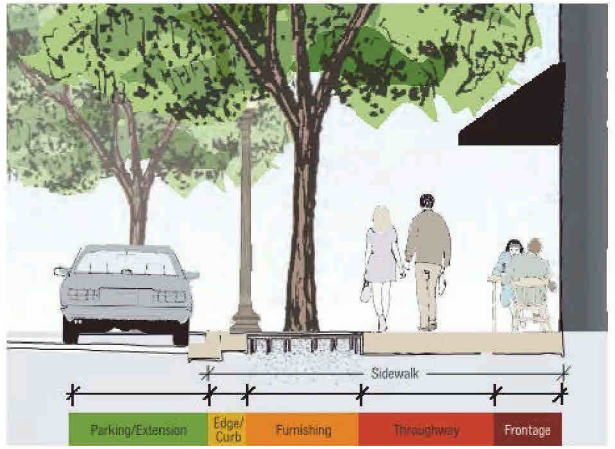


Figure 5.8 – 1: *Sidewalk Zones Section*
Source: SF Better Streets Plan

STANDARDS

S.5.8.1 Tree Size

Street trees shall be in a minimum 24-inch box at installation and spaced at 20 feet on center along the property street frontage. See **Figure 5.11 – 1** for additional tree planting requirements.

S.5.8.2 Tree Pits

Street trees shall have a minimum 500 cubic feet of growing medium to maximize tree growth. This may include structural soil or cell systems under the sidewalk. See **Figure 5.11 – 1** for more information on tree well design.

S.5.8.3 Extension Zones

The minimum width for an extension zone is 7 feet. Refer to specific street design Guidelines for extension zone design.

S.5.8.4 Visual / Tactile Cues

Provide visual/tactile cues to alert people with visual impairments to the shared nature of the space, including tactile warnings and paving texture changes.

S.5.8.5 Loading, Parking and Garage Entries

Locations per **Figure 5.6 – 1**.

GUIDELINES

G.5.8.1 Tree Spacing

Where regular tree spacing is not possible due to curb cuts, sub-grade utilities or other obstacles, regular spacing shall be maintained for as much of the street as possible. Careful utility planning and street tree layout shall be thoroughly coordinated to minimize tree gap. See **Figure 5.11 – 1** for more information on street trees.

G.5.8.2 Furnishing Zones

Furnishing zones shall be surfaced with cast-in-place concrete or accessible permeable paving to allow rainfall to supplement street tree irrigation. For furnishing zones located adjacent to parking, a minimum of a 4-foot-wide accessible pathway should be provided centered to the parking space.

G.5.8.3 Street Lights

Street lights are laid out conceptually based on preliminary photometric studies. Lights are spaced at 80 feet on center, are staggered on either side of the street, and have 20 foot tall poles. Lighting levels shall be provided at the lowest levels that are in accordance with either the Illumination Engineering Society of North America (IESNA) Lighting Guidelines and applicable codes or the SF Better Streets Plan, whichever specifies the lowest levels for the area. In later design phases, a lighting consultant will need to perform a more detailed photometric study.

G.5.8.4 Bike Racks

The project shall provide a minimum of 72 Class II bike parking spaces in the right-of-way or in the publicly accessible open space. The placement of bike racks shall be compliant with SFMTA Bicycle Parking Standards, Guidelines, and Recommendations.

G.5.8.5 Benches & Waste Receptacles

Benches and receptacles are clustered near intersections and spaced no greater than 250 feet apart. A minimum of one in five benches is provided with a seat back and armrests.

G.5.8.6 Parking Meters

SFMTA standard parking meters are used at each on-street parking stall.

G.5.8.7 Through Zones

Project through zones mainly use cast-in-place concrete that meet DPW's standards for accessibility, color and finish. The paving material should be firm, stable and slip-resistant. Special treatment shall be used at paseo/street intersections to emphasize the pedestrian and bike connection. The width of a through zone shall be maintained at the minimum of 6-foot-wide at all times and widened to 8 feet at least every 200 feet.

G.5.8.8 Vehicular Travel Zone

Paving patterns and texture changes shall be used to distinguish the vehicular travel zone from pedestrian crossings.

5.9 TYPICAL STREETSCAPE LAYOUT

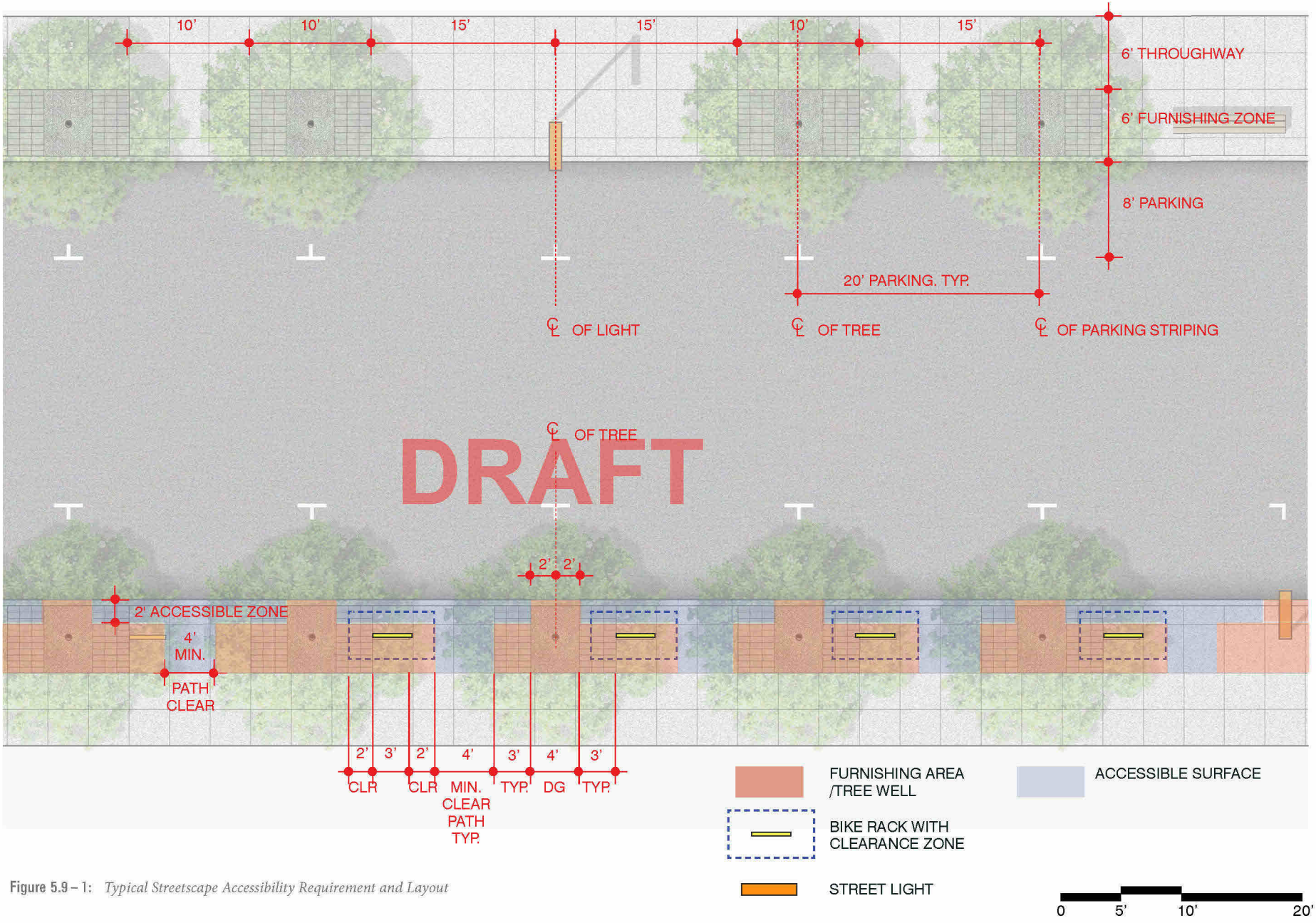


Figure 5.9 – 1: *Typical Streetscape Accessibility Requirement and Layout*

5.10 INTERSECTION VISIBILITY

Sight line clearance requirements for the placement of trees and plantings are based on the following criteria (Refer to 'Street Tree Planting' by SFPW) :

- Landscape material may be planted up to the crosswalk edge on sidewalks and medians if it does not exceed 3'-6" in height as measured from the street
- On the approach to any intersection as the traffic flows, trees shall be planted no closer than 25 feet from the corner of the property line.
- On the far side of any intersection as the traffic flows, trees shall be planted no closer than 10 feet from the corner of the property line.
- Trees should have a vertical clearance of 84 inches in height over the sidewalk measured from the lowest branch, and 14 feet of vertical clearance for any portion of the tree that overhangs the roadway.

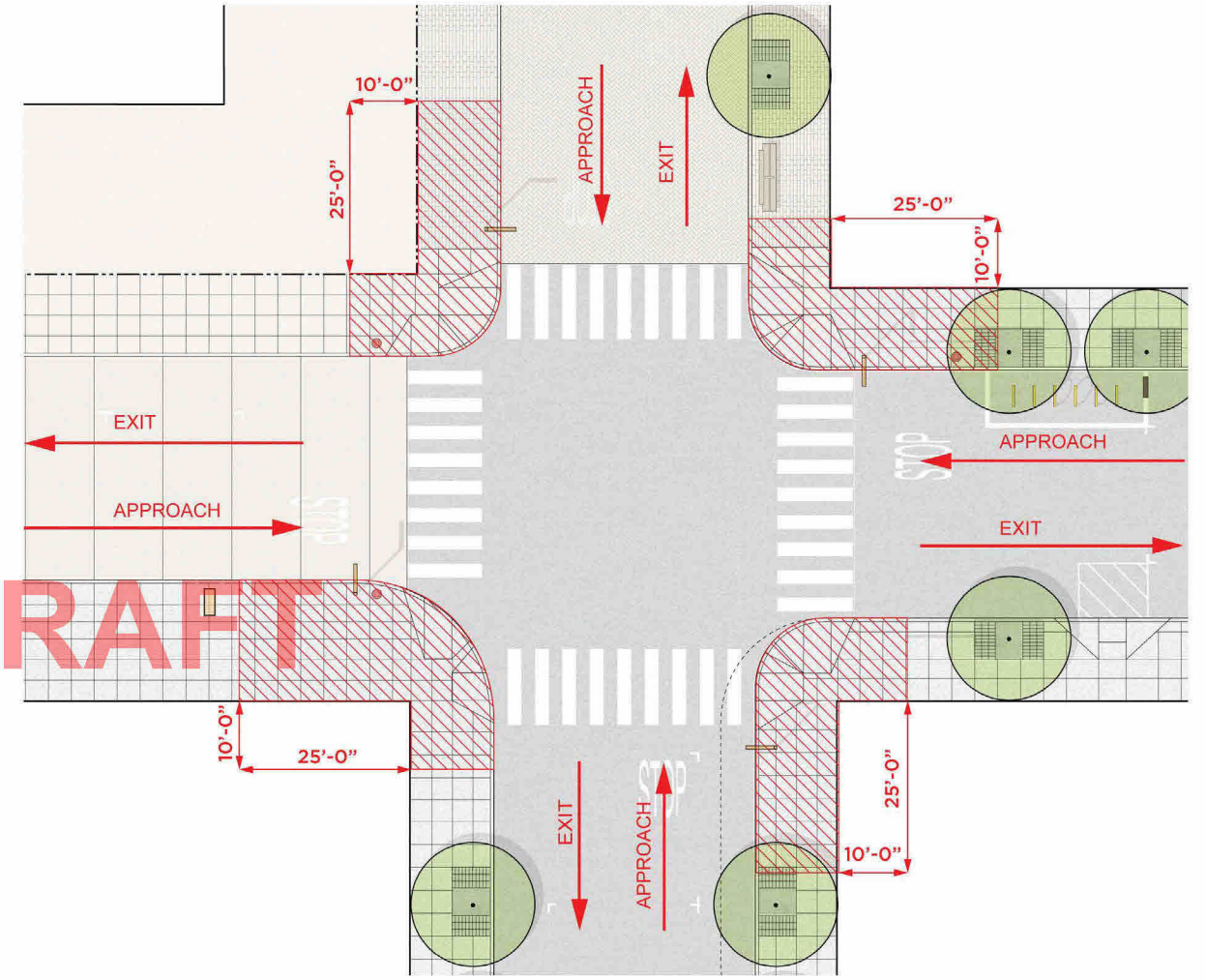


Figure 5.10 – 1: *Typical Intersection Sight Line Clearance*

5.11 STREET TREE PLANTING

Typical City Policies

As the Better Streets Plan describes, street trees offer benefits such as traffic calming, shading from the heat island effect, stormwater runoff reduction, ecological habitats, improvement to air quality, enhanced property values and retail activity, creation of a comfortable pedestrian environment, a sense of scale, and a reminder of natural cycles and changing seasons.

Generally, City Codes require that new development projects must plant a 24-inch box tree for every 20 feet along the property street frontage. The following City Codes apply to the Balboa Reservoir site:

- San Francisco Public Works Code
- Section 138.1 - Streetscape and Pedestrian Improvements
- Article 16: Urban Forestry Ordinance
- Section 806(d) - Required Street Trees for Development Projects
- San Francisco Administrative Code - Chapter 98: The Better Streets Policy
- San Francisco Environment Code - Chapter 12: Urban Forestry Council

Species

The selected street tree types are to withstand the environmental conditions anticipated on the site including fill soils, compaction and utilities. The street tree palette has referenced and expanded on the approved species list defined by SFPW and Friends of the Urban Forest specifically for the Balboa Reservoir project site conditions and unique character. The selections also complement the Ingleside Green Connection and San Francisco Plant Finder recommendations. Street trees within the project are a mix of leafy evergreen trees as is typical in coastal areas subject to wind and salt air, and deciduous trees for their seasonal character and color contrast. For each street, the trees may be uniform in size, or they may vary to emphasize the informal character of the district. For a complete a street tree species list, see **Section 5.19: Street Planting**.

Additional Requirements

In order to maintain healthy growing conditions, each tree must have at least 500 cubic feet of verified growing medium 3 feet deep. This can be achieved in several ways including with sand-based structural soil, structural cells placed under the sidewalk or in continuous trenches in the furnishing zone (**Figure 5.11 – 1**). Refer to **Section 5.14: Lee Avenue to Section 5.18: Townhouse Entry Court and Driveway** for street tree location and spacing for each street. Where trees are spaced at 20 feet on center, continuous trenches should be utilized to ensure enough soil volume for the healthy growth of street trees.

Tree Well Typologies

Type A — Sand-Based Structural Soil

Sand-based structural soil involves a blend of soil and sand, which is not "trademarked" and is uniformly graded. This blend provides structural strength and high levels of compaction, while allowing for high aeration, fertility, and good percolation. Where trees are spaced 20 feet on center, successive tree wells should be connected with a structural soil trench in the furnishing zone.

Type B — Structural Cell Systems

Structural cell systems contain planting soil in manufactured cells capable of supporting adjacent paving, while providing an increased volume of high-quality uncompacted planting soil available to tree roots. The use of structural cell systems will require SFPW review and coordination.

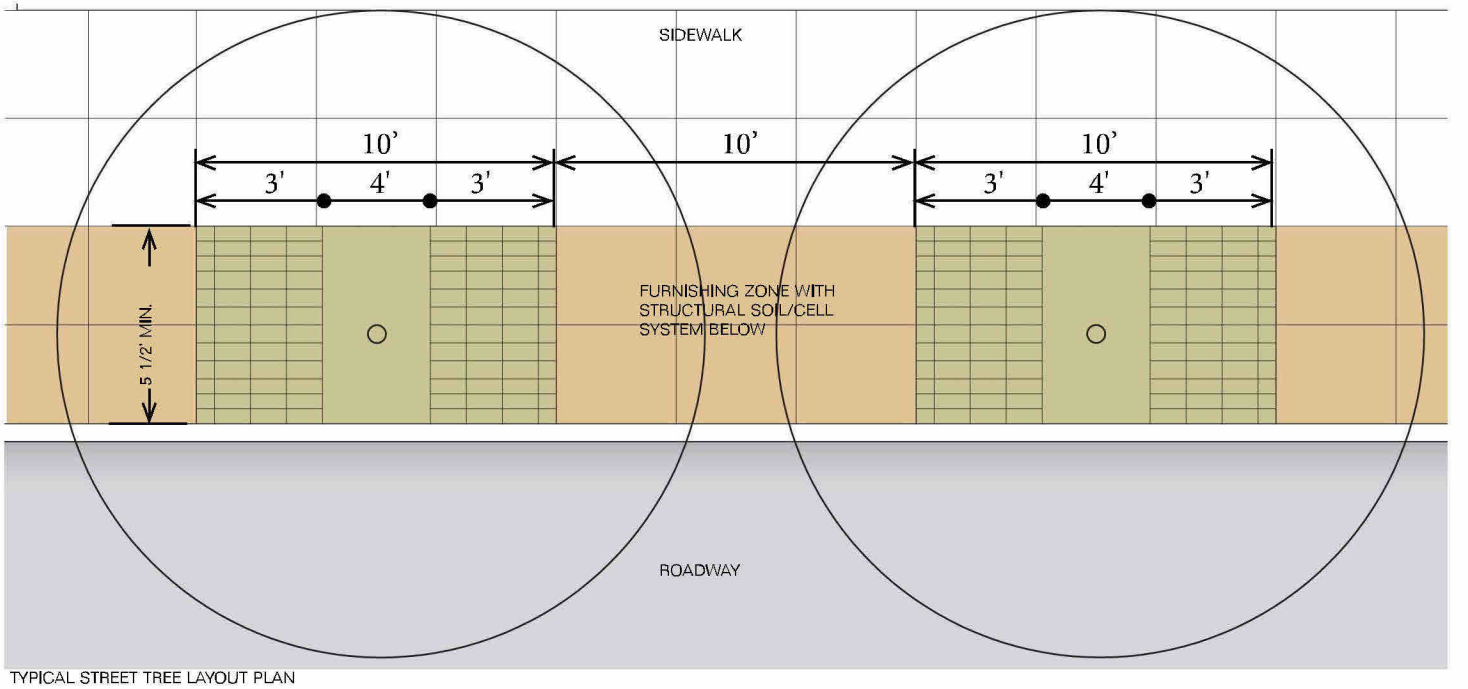


Figure 5.11 – 1: *Tree Well Diagram*

5.12 TRAFFIC CALMING STRATEGIES

As a transit-oriented development with low traffic volumes, the Balboa Reservoir site presents great opportunities to be a model for a pedestrian-oriented environment, and for implementation of the guidelines in the City's Better Streets Plan. The following strategies have been incorporated into this Plan where appropriate

Raised Crossing

Raised pedestrian crosswalks serve the purpose of prioritizing pedestrians in the vehicular traffic zone, as well as acting as a speed bumps to slow vehicles. A raised crosswalk will be provided at the locations shown on **Figure 5.2 – 1**.

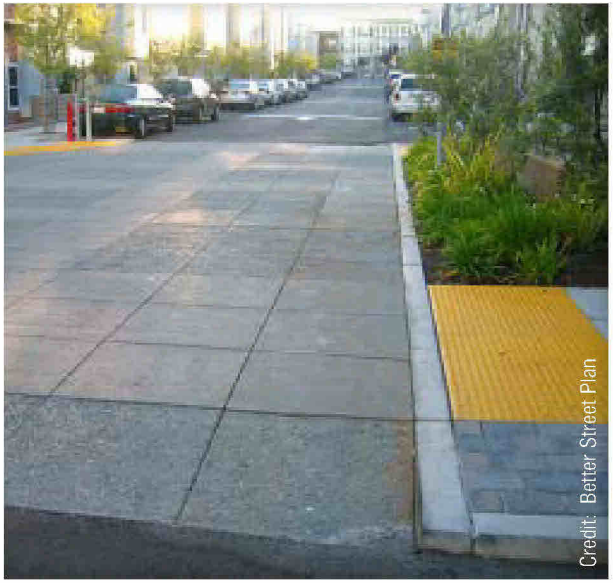


Figure 5.12 – 1: *Raised Street Precedent Image.*

Figure 5.12 – 2: *5th Street & Tehama Street, San Francisco.*

Figure 5.12 – 3: *Raised Street Precedent Image.*

Figure 5.12 – 4: *5th Street & Tehama Street, San Francisco.*

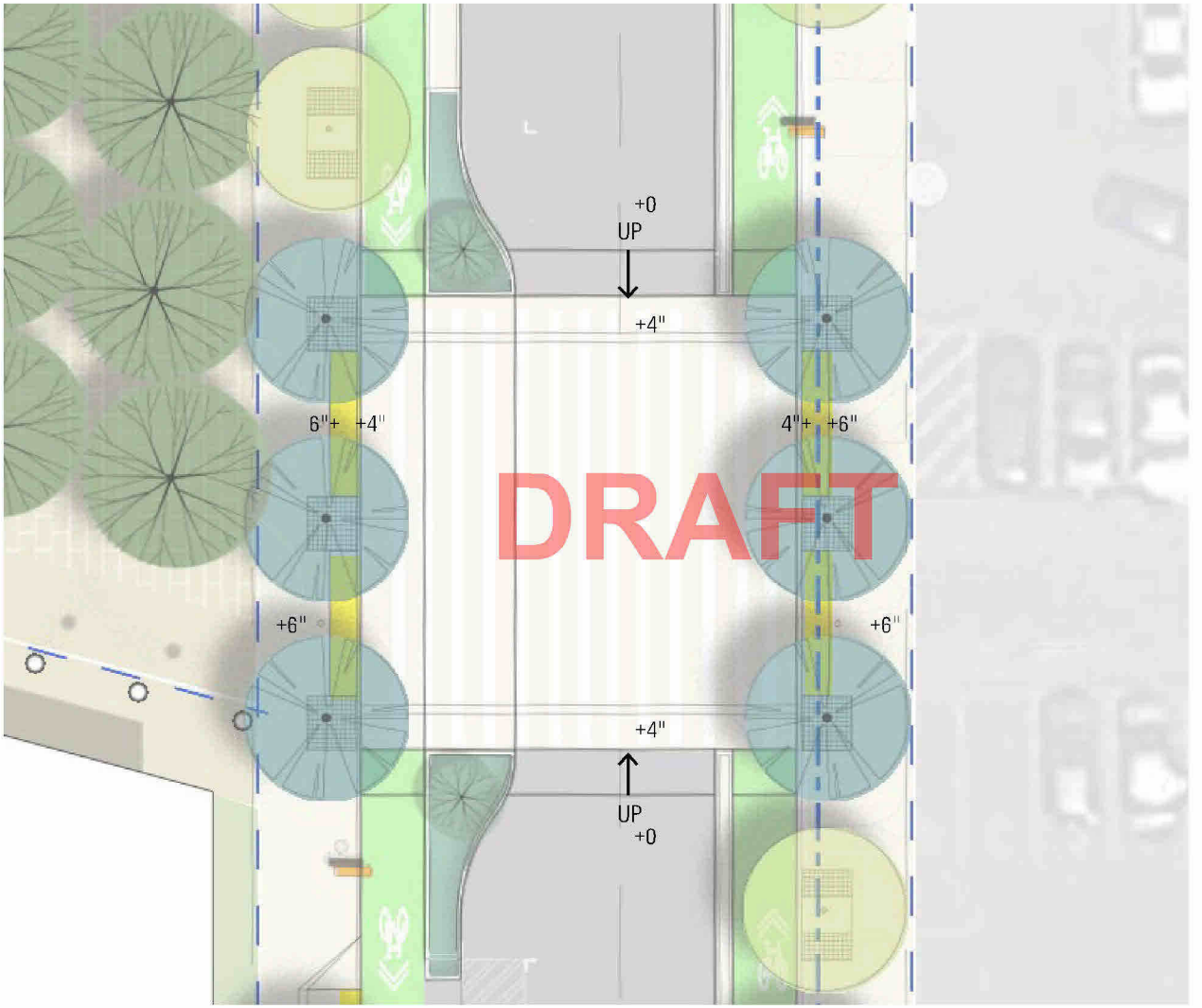


Figure 5.12 – 5: *Raised Crosswalk at Lee Avenue and Reservoir Park*

Bulb-outs

Bulb-outs (also known as curb extensions) are added at all pedestrian crossings. Since they reduce the vehicular area and slow down driving speed, bulb-outs will be added at all intersections and mid-block crossings.

Chicane

A chicane is a form of bulb-out added to the roadway to shift the alignment and slow vehicles. It provides an opportunity for additional landscaping at the street and visually reduces the width of drive lane. A chicane is one of the potential traffic calming measures that can be used at West Street.

Mountable Roundabout

A mountable roundabout can accommodate turning for typical passenger vehicles while allowing large vehicles such as firetrucks to roll over the raised central area, A mountable roundabout is an optional traffic calming measure that could to be used at the intersection of West Street and South Street, and at the intersection of West Street and North Street. Textured and traffic-rated paving material should be used as it provides an opportunity to create identity while facilitating the drop-off function for childcare at South Street.

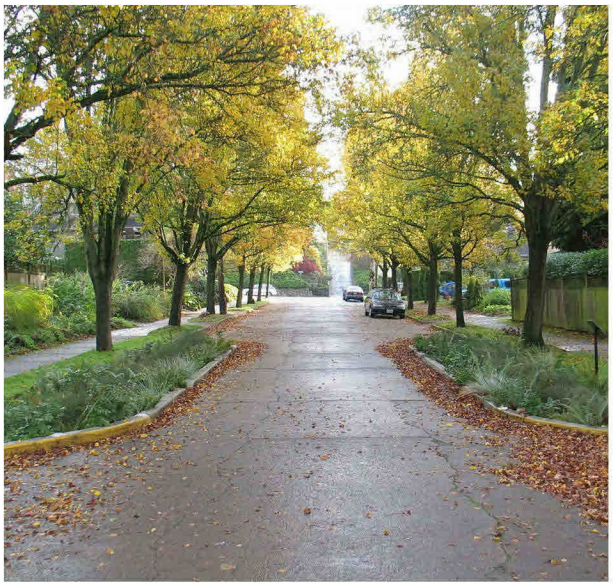


Figure 5.12 – 6: *Examples of Bulb-Out*

Figure 5.12 – 7: *Example of Mountable Roundabout*

5.13 STREET UTILITIES AND PARKING METERS (MTA/PUC)

The layout of street utilities and parking meters will be carefully coordinated with street tree placement to minimize street tree planting and street furniture conflict.

STANDARDS

S.5.13.1 Above-Grade Utilities Location

All above-grade utilities within the right-of-way shall be located within the furnishing zone and not interfere with the clear through way zone.

S.5.13.2 Parking Meters and Other Street Elements

All parking meter machines and other street elements, including pay and display machines and multi-space meters, shall be in the furnishing zone. Street elements shall be organized and consolidated where possible.

GUIDELINES

G.5.13.1 Location and Access

All utilities should be placed below grade wherever feasible or clustered around driveway curb cuts. When possible, utilities should be grouped and allow clear access to the throughway zone adjacent to any street furnishing elements.

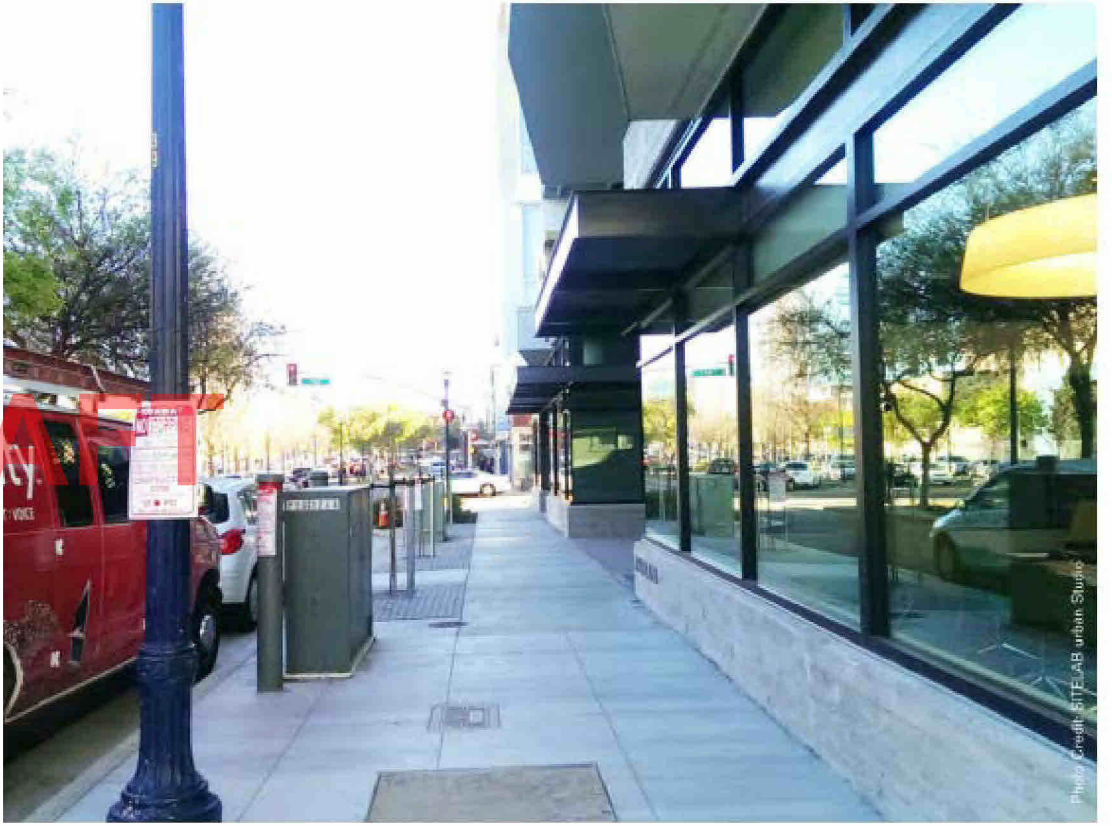


Figure 5.13 – 1: *Utility Placement Example*

Streetscape Design

5.14 LEE AVENUE

Lee Avenue is the primary neighborhood residential street that connects the project site to adjacent neighborhoods. Lee Avenue will serve residential and non-residential use including potential future housing uses on City College property and the Reservoir Park. Lee Avenue will also be the primary bicycle connection south to the Class III bike route to Holloway Avenue and to Frida Kahlo Way. The extension of Lee Avenue is a tree-lined bicycle boulevard that provides a gateway to the Reservoir Park and a complementary edge to the City College Master Plan. The treatment of Lee is divided into three segments. See **Figure 5.14 – 2**.

Lee North of North Street (Segment A)

The section of Lee at the north of North Street provides an exit route for Riordan High School, possible garage exits for Block G, and potential parking garage exits at City College property. This segment will be a conventional two-way street with a minimum 12-foot sidewalk on both sides. The right-of-way for this segment is 50 feet wide. (See **Figure 5.14 – 4**)

Lee at Central Block (Segment B & C)

Three street section options are currently under consideration for this segment between North Street and South Street within the 72-foot-wide-right-of-way. Option one which is the base option, will have an asymmetric profile. It will have one travel lane in each direction and a protected Class IV bike lane and a minimum of 12 foot wide sidewalk on both sides. Parallel parking and loadings are provided only at the Balboa Reservoir project side. (See **Figure 5.14 – 3**). To provide parallel parking on both sides of the street within the 72-foot right-of-way, protected Class IV bike lanes will be substituted with non-protected Class II bike lane as shown in option two. (See **Figure 5.14 – 3**)

Lee South of South Street (Segment D & E)

Lee Avenue, south of South Street will taper from a 72-foot-wide right-of-way to a 56-foot-wide right-of-way to match the existing width between 1110 and 1150 Ocean Ave. At this segment, there will not be parallel parking on both sides of the street but one travel lane and Class II bike lane in both directions. There will be bulb-outs at intersections and mid-block crossings at the Central Park and PUC Open Space to emphasize pedestrian priority and traffic calming. (See **Figure 5.14 – 4**)

STANDARDS

S.5.14.1 Street Zone Dimensions

Right-of-way cross-section dimensions shall be as shown in **Figure 5.14 – 3** and **Figure 5.14 – 4.**

S.5.14.2 Element and Material Specification

Elements per **Figure 5.14 – 2**. All elements shown shall be included. Dimensions vary.

S.5.14.3 Street Trees

Street trees are required and shall be placed at a maximum of 20 feet on center.

S.5.14.4 Raised Crosswalk

Crosswalk at intersection of Lee Avenue and Reservoir Park entry and Lee Ave and PUC open Space shall be raised.

S.5.14.5 Loading

Loading per **Figure 5.6 – 1.**

S.5.14.6 Planting Zone

Planting zone to contain 500 cubic feet of verified growing media at a 3 foot depth per street tree.

GUIDELINES

G.5.14.1 Stormwater Management

Some of the Lee Avenue stormwater requirements will be fulfilled in the open space. This enables flexibility in the design of Lee Avenue including managing challenging grading, potential inclusion of protected bike ways, and other pedestrian amenities. The open space stormwater management area will be sized over the 25% requirement to offset the Lee Avenue stormwater requirement.

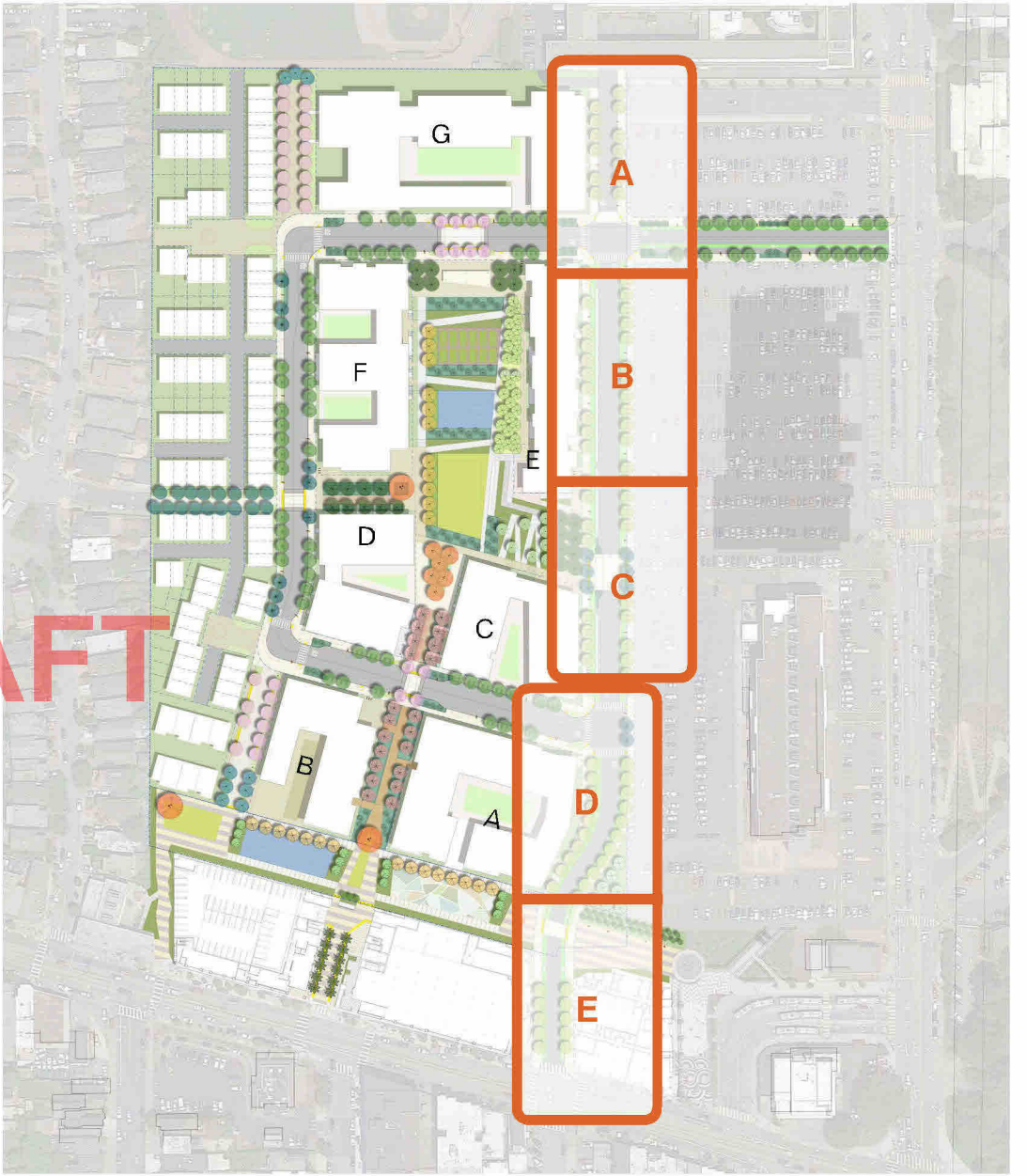


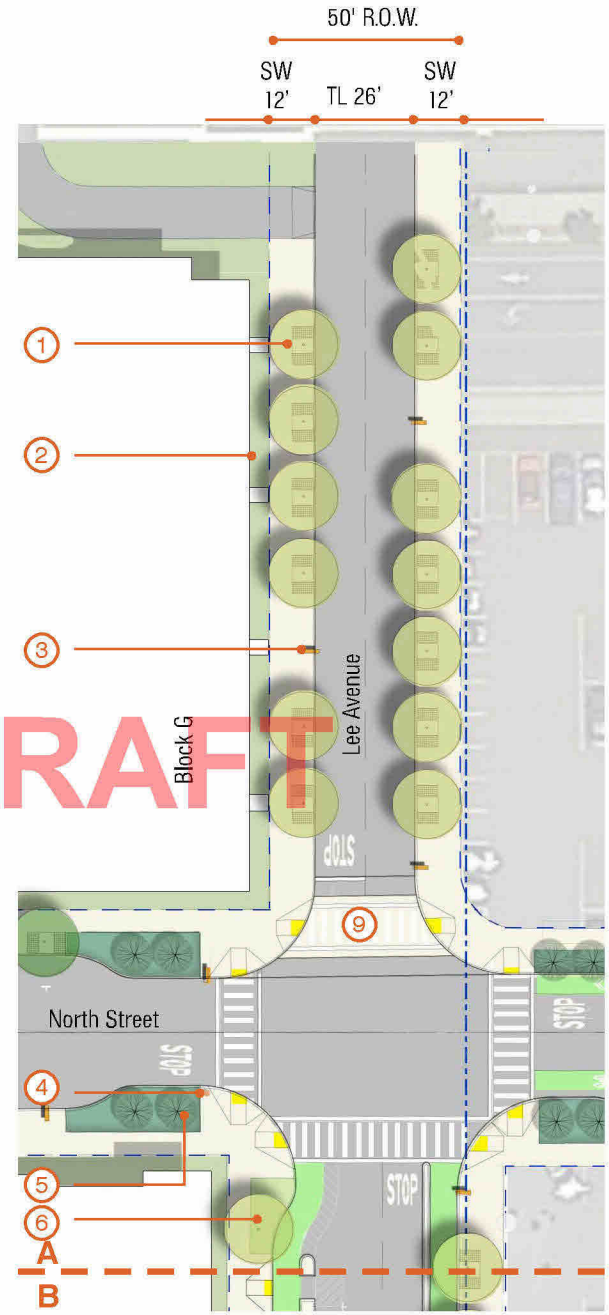
Figure 5.14 – 1: *Lee Avenue, Key Map*

LEGEND

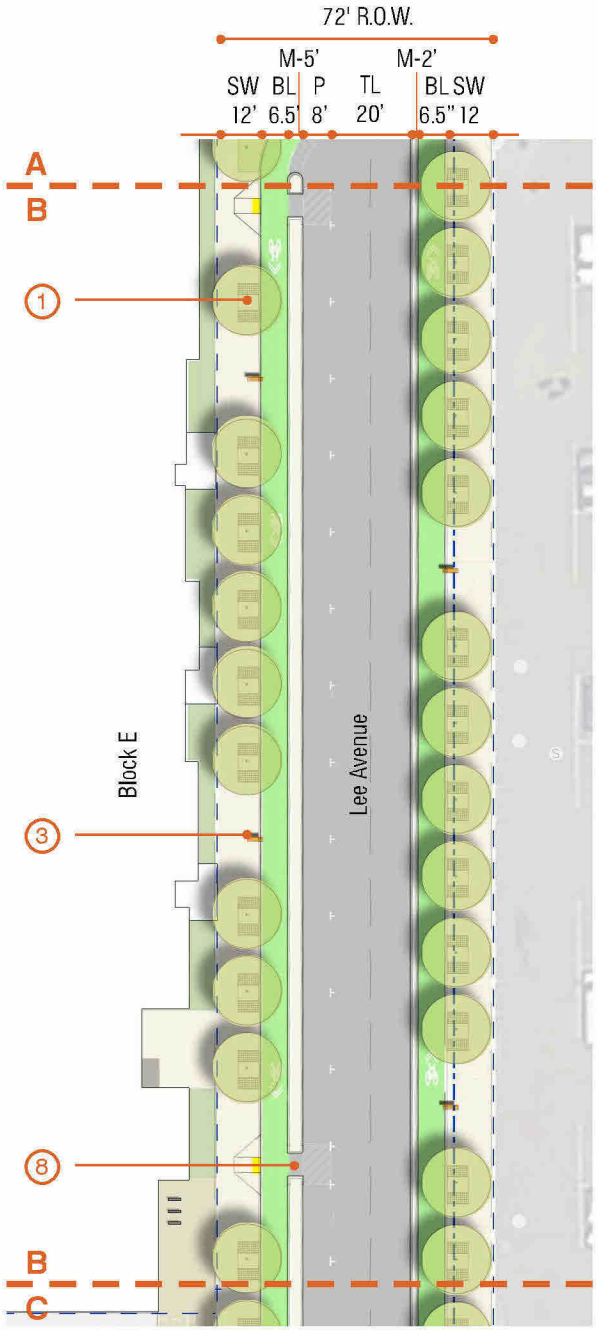
1. *Tree Well*
2. *Concrete Sidewalk*
3. *Street Light*
4. *Litter + Recycling Receptacle*
5. *Bioretention Planting*
6. *Regular Planting*
7. *Warning Paver*
8. *Curb Cut for Accessible Loading/Parking*
9. *Raised Crosswalk*
10. *Traffic Island*
11. *Curb Cut for Garage*
12. *Bike Rack*
13. *Bench*
14. *Bollard*
15. *Concrete Unit Pavers*
16. *Roadway - Asphalt*
17. *Curb Cut for Driveway*

BL *bike lane*
P *parking*
SW *sidewalk*
TL *travel lane*
M *median*
BO *bulb-out*

Key Map

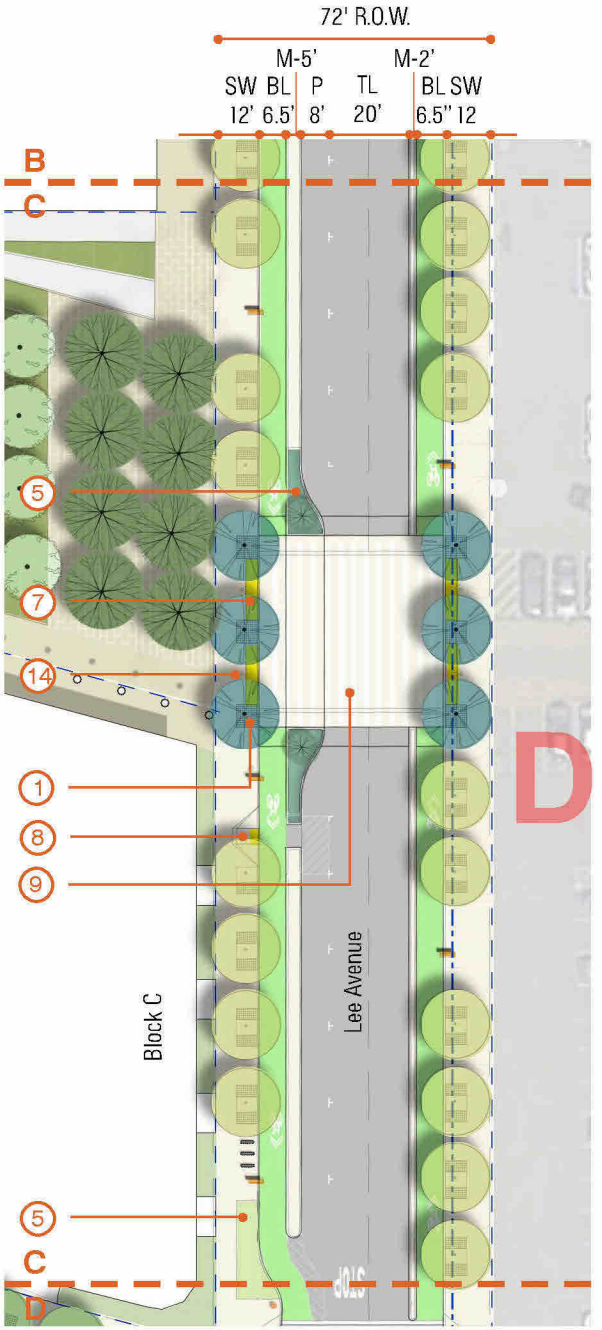


Enlargement A

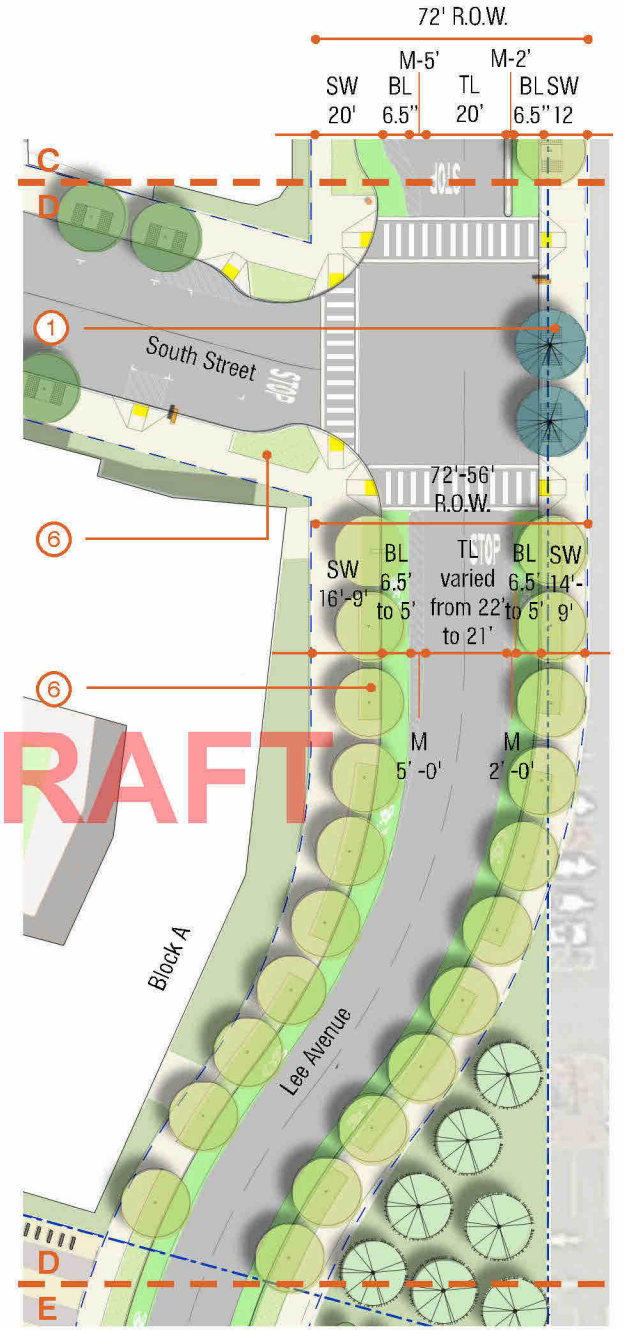


Enlargement B

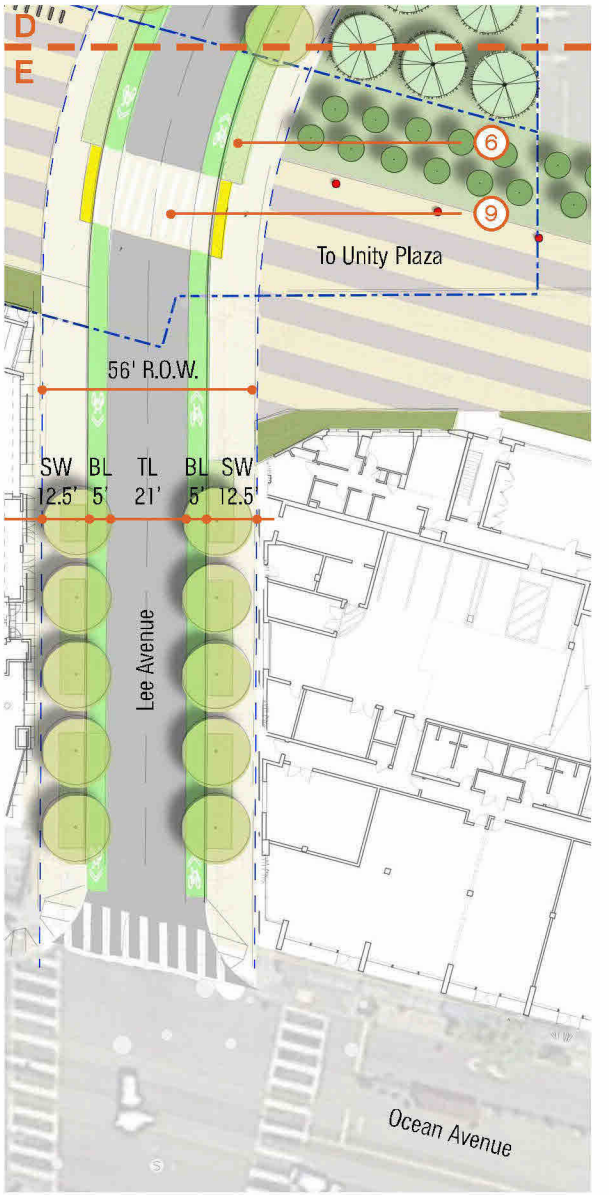
Figure 5.14 – 2: *Lee Avenue, Plan Enlargements*



Enlargement C



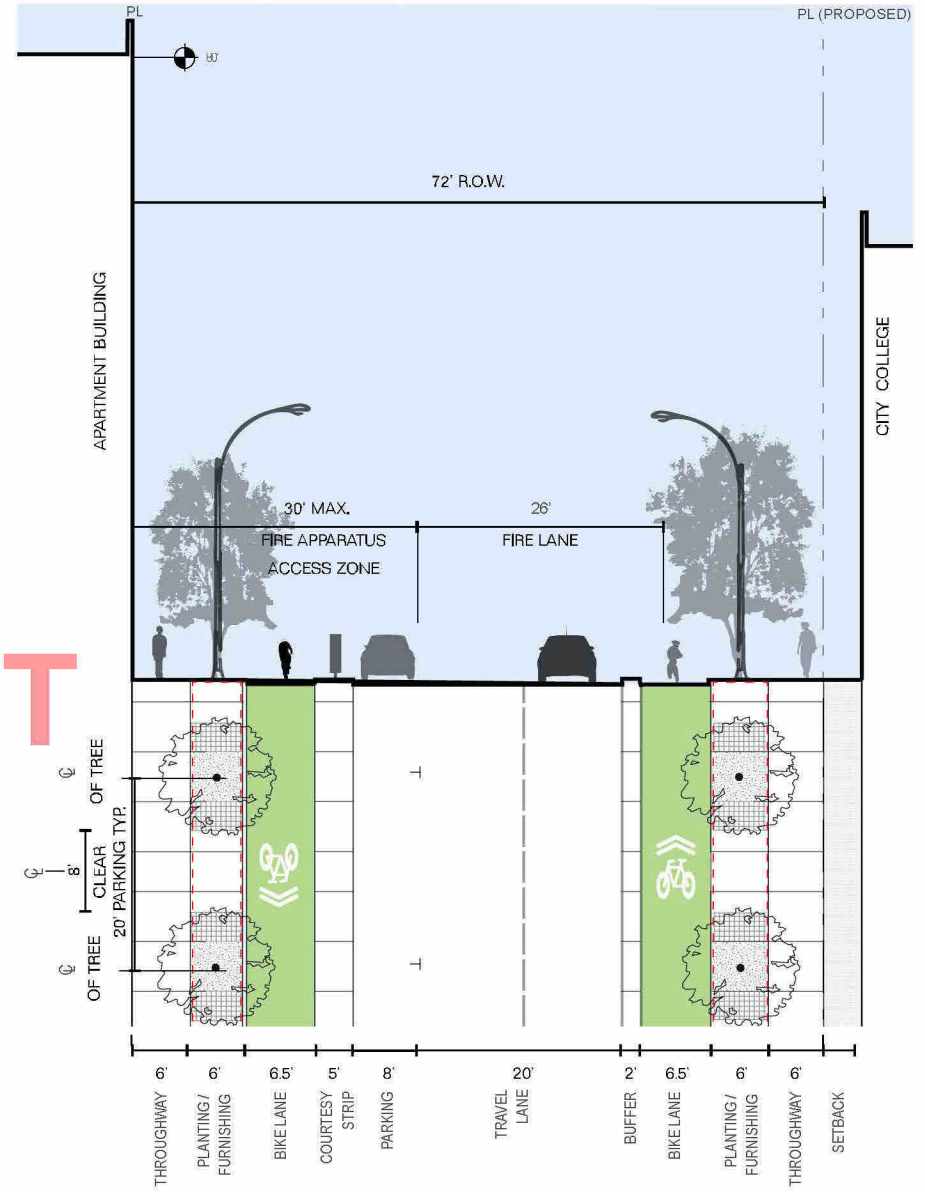
Enlargement D



Enlargement E

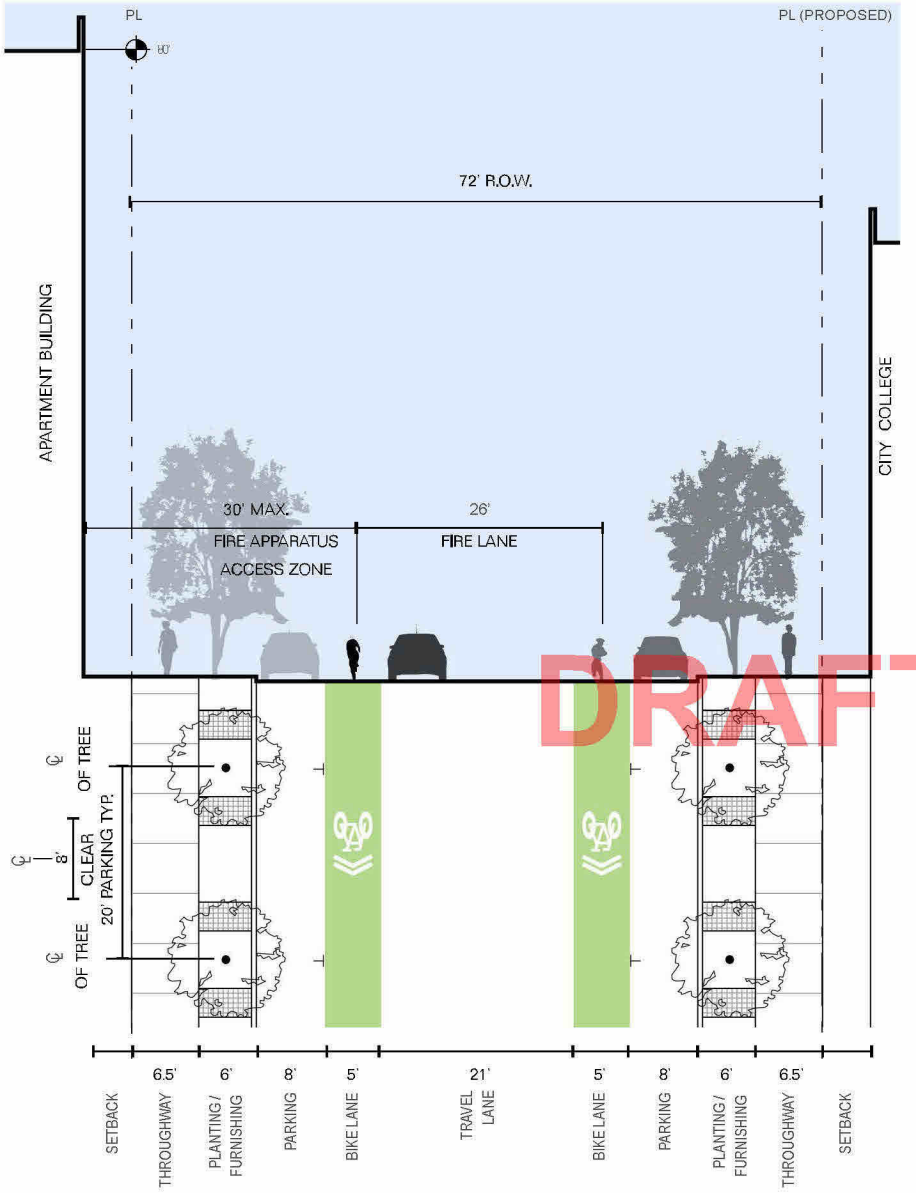
0 25' 50' 100'

Keymap

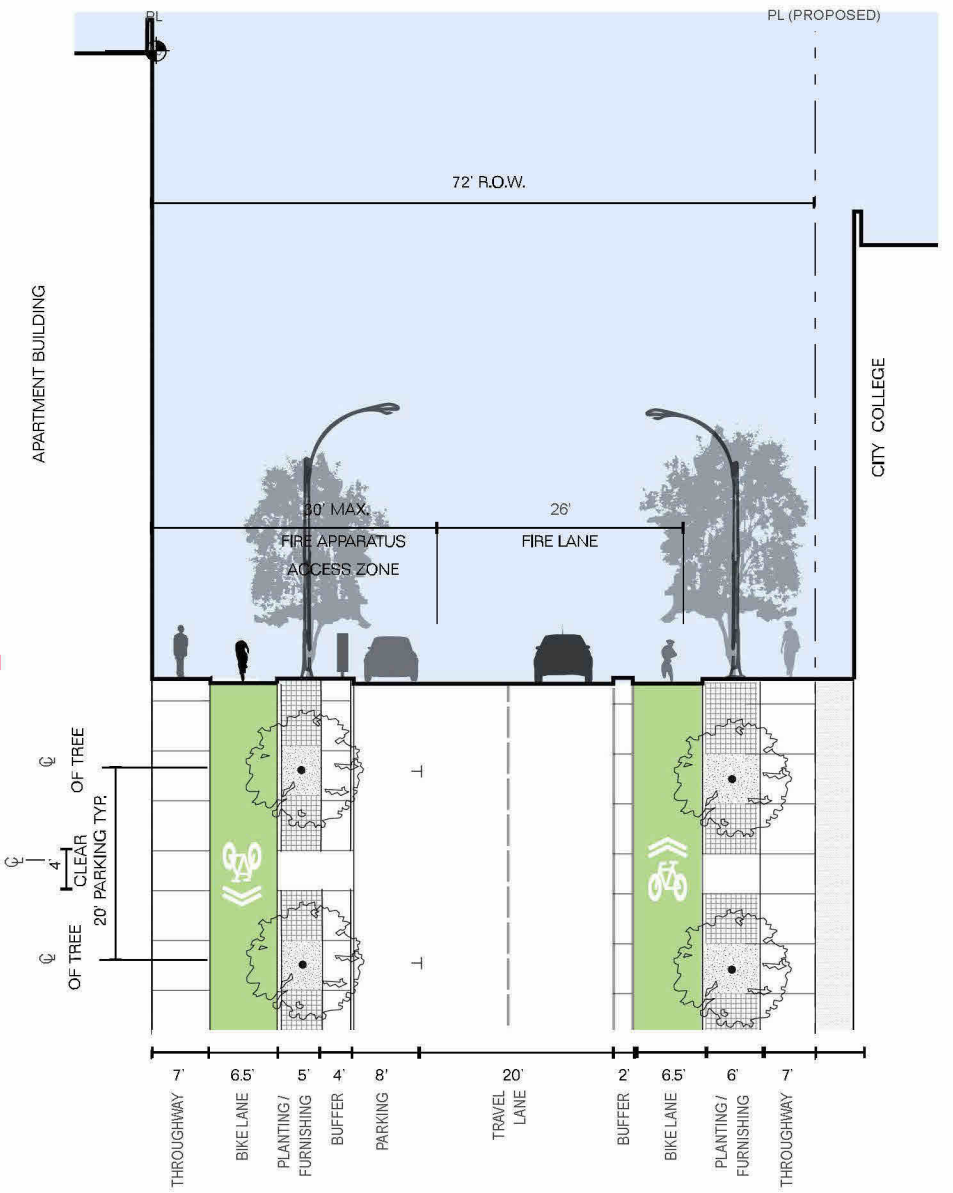


Section 1 Option 1

Figure 5.14 – 3: *Lee Avenue, Sections*

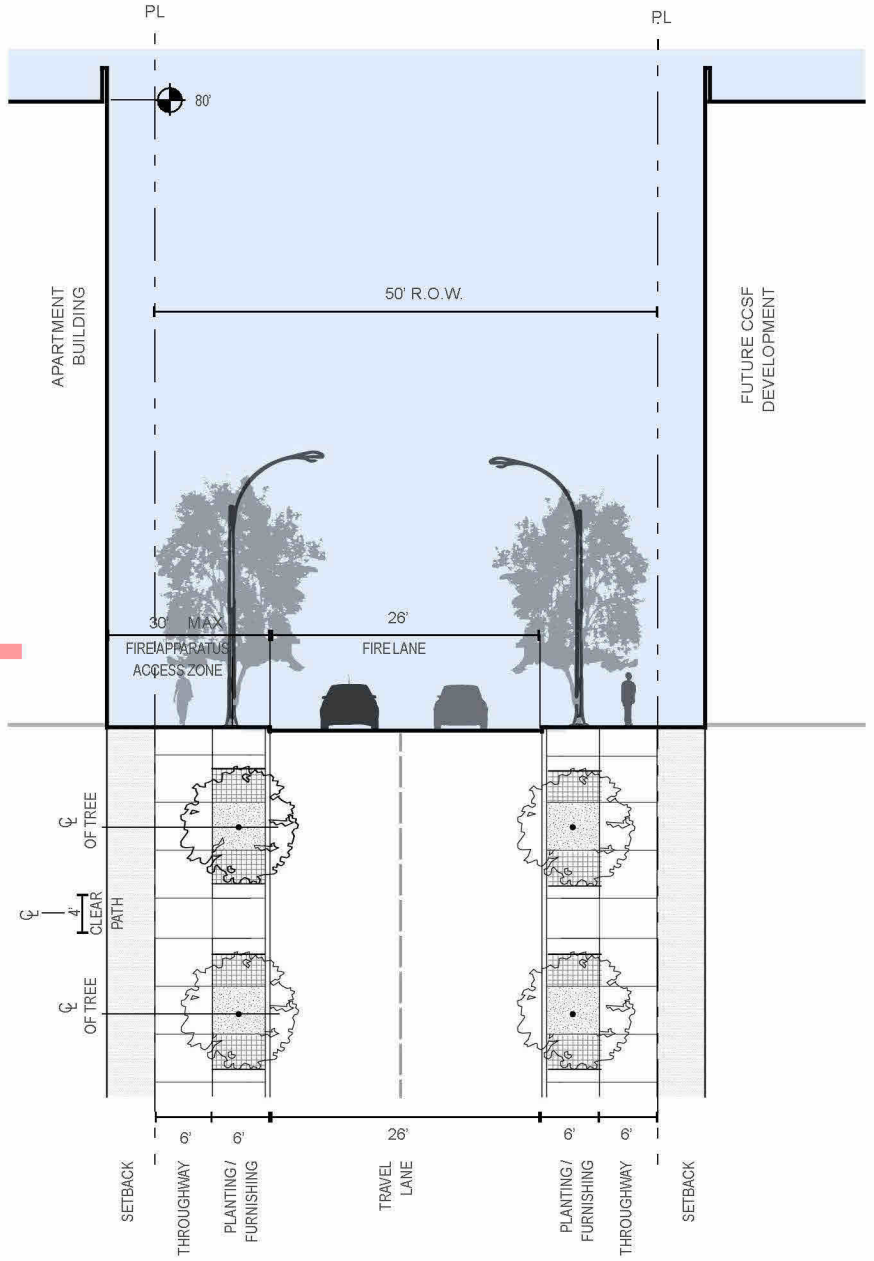


Section 1 Option 2



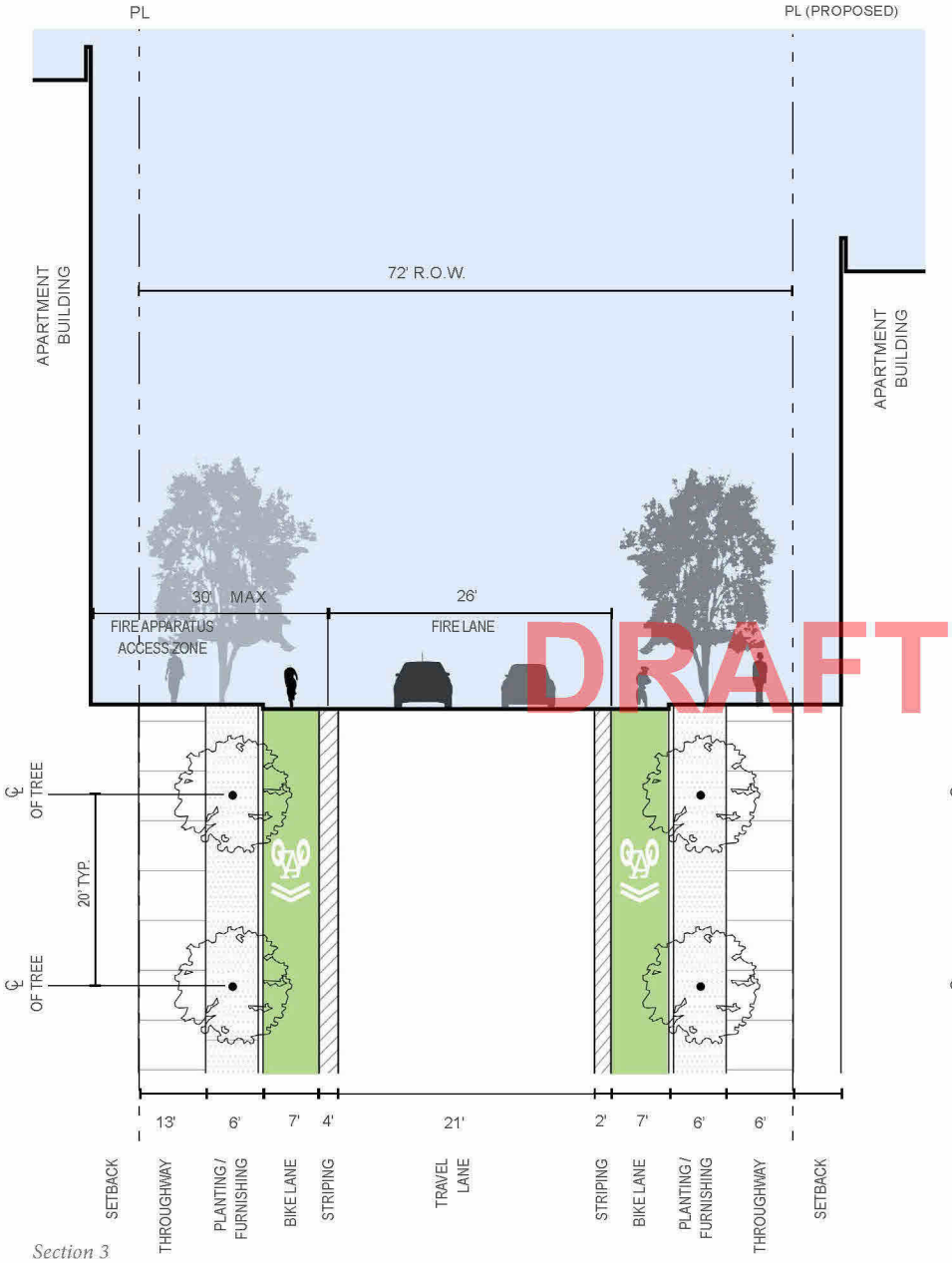
Section 1 Option 3

Keymap

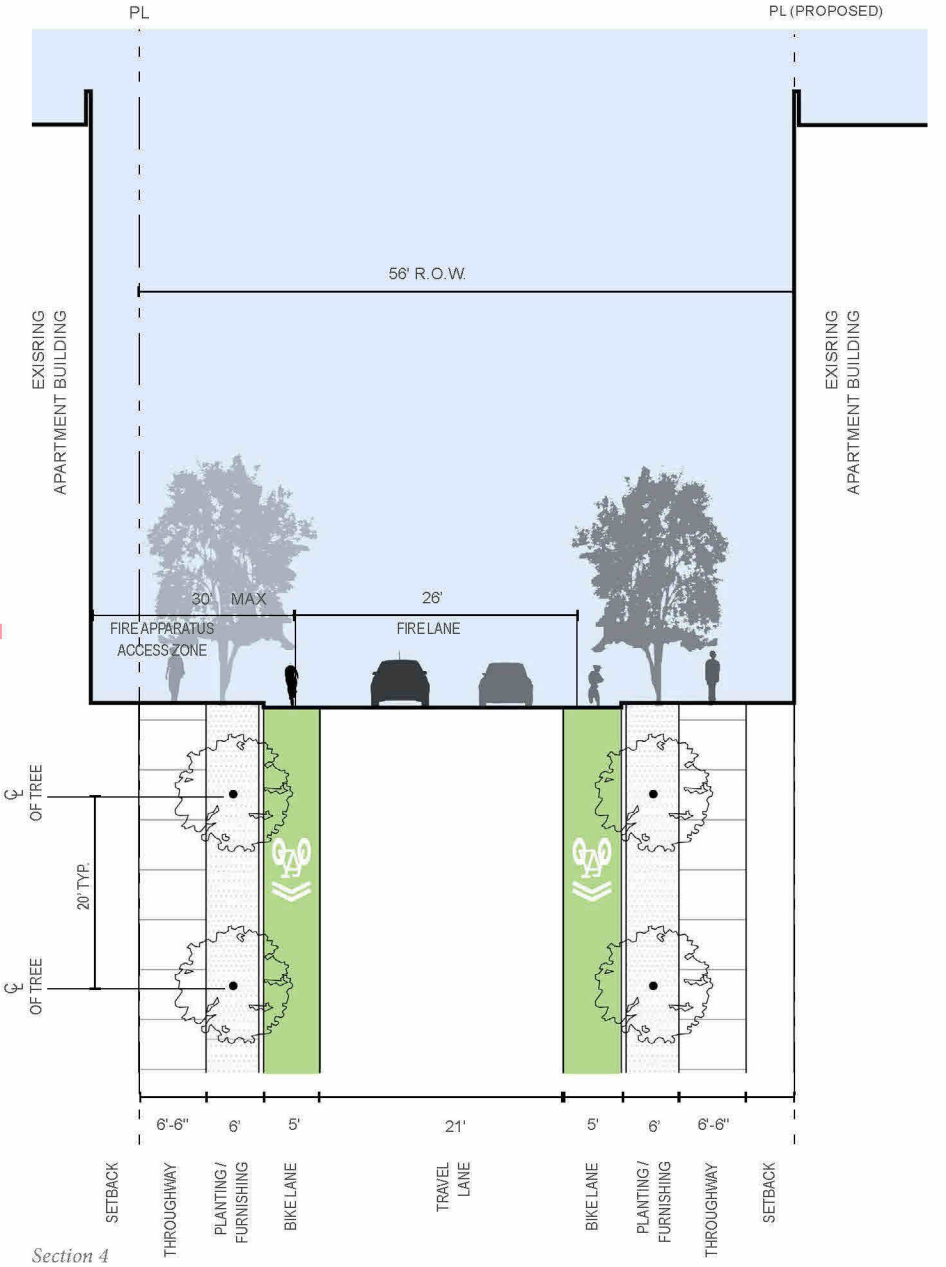


Section 2

Figure 5.14 – 4: *Lee Avenue, Sections*



Section 3



Section 4

5.15 NORTH STREET AND SOUTH STREET

North Street

North Street will be the east-west neighborhood residential lane with a 64-foot-wide right-of-way providing vehicular, bike, pedestrian and service access to buildings and park. Class III bike lanes (sharrows), parallel parking, and 12-foot-wide sidewalks are provided on both sides of the street. North Street will also extend eastward connecting Lee Ave to the existing Frida Kahlo Way and provide access to the future Performing Art Education Center at the City College property. The portion of North Street between Lee Avenue and Frida Kahlo Way will be narrowed to a 62-foot-wide right-of-way to accommodate designated Class II bike lanes on both sides of the street and parallel parking at the south side of North Street. There will be bulb-outs at intersections and a mid-block raised crossing at the Reservoir Park to emphasize the pedestrian priority and to calm traffic. Street stormwater will be treated with rain gardens in bulb-outs or pervious vehicular paving. Large evergreen trees will be planted on this street.

South Street

South Street will be the east/west neighborhood residential lane with a 64-foot-wide right-of-way and will provide vehicular, pedestrian and bike access to individual buildings, childcare drop off, Brighton Paseo, and the Reservoir Park. Parallel parking and 12-foot sidewalks are provided on both sides of the street. South Street will have slower traffic and Class III bike lanes (sharrows). There will be bulb-outs at intersections and a mid-block raised crossing at Reservoir Park and Brighton Paseo to emphasize the pedestrian priority and to calm traffic. Street stormwater will be treated with bioswales in bulb-outs or pervious vehicular paving. Large evergreen trees will be planted on this street.

STANDARDS

S.5.15.1 Street Zone Dimensions

Right-of-way cross-section dimensions shall be as shown in **Figure 5.15 – 2** and **Figure 5.15 – 4**.

S.5.15.2 Element and Material Specification

Elements shall be included per **Figure 5.15 – 3 and Figure 5.15 – 5**. All elements shown shall be included.

S.5.15.3 Raised Crosswalk

Crosswalk at intersection of North Street and Reservoir Park entry, and South Street and Reservoir Park entry shall be raised.

GUIDELINES

G.5.15.1 Stormwater Management

To the extent possible, stormwater generated within North Street and South Street right-of-way shall be treated within the right-of-way in centralized linear bioretention treatment areas adjacent to the sidewalk. These bioretention planters adjacent to sidewalk shall have a 6 inch high curb around for fall protection. An alternate option is to route North Street and South Street stormwater to the Reservoir Park. A Brighton Paseo stormwater area is also under consideration.

G.5.15.2 Mountable Roundabout

A mountable roundabout at the intersection of North Street and West Street and at the intersection of South Street and West Street shall be considered for traffic calming if four way traffic is desirable at these intersections. See **Figure 5.16 – 4** for details.

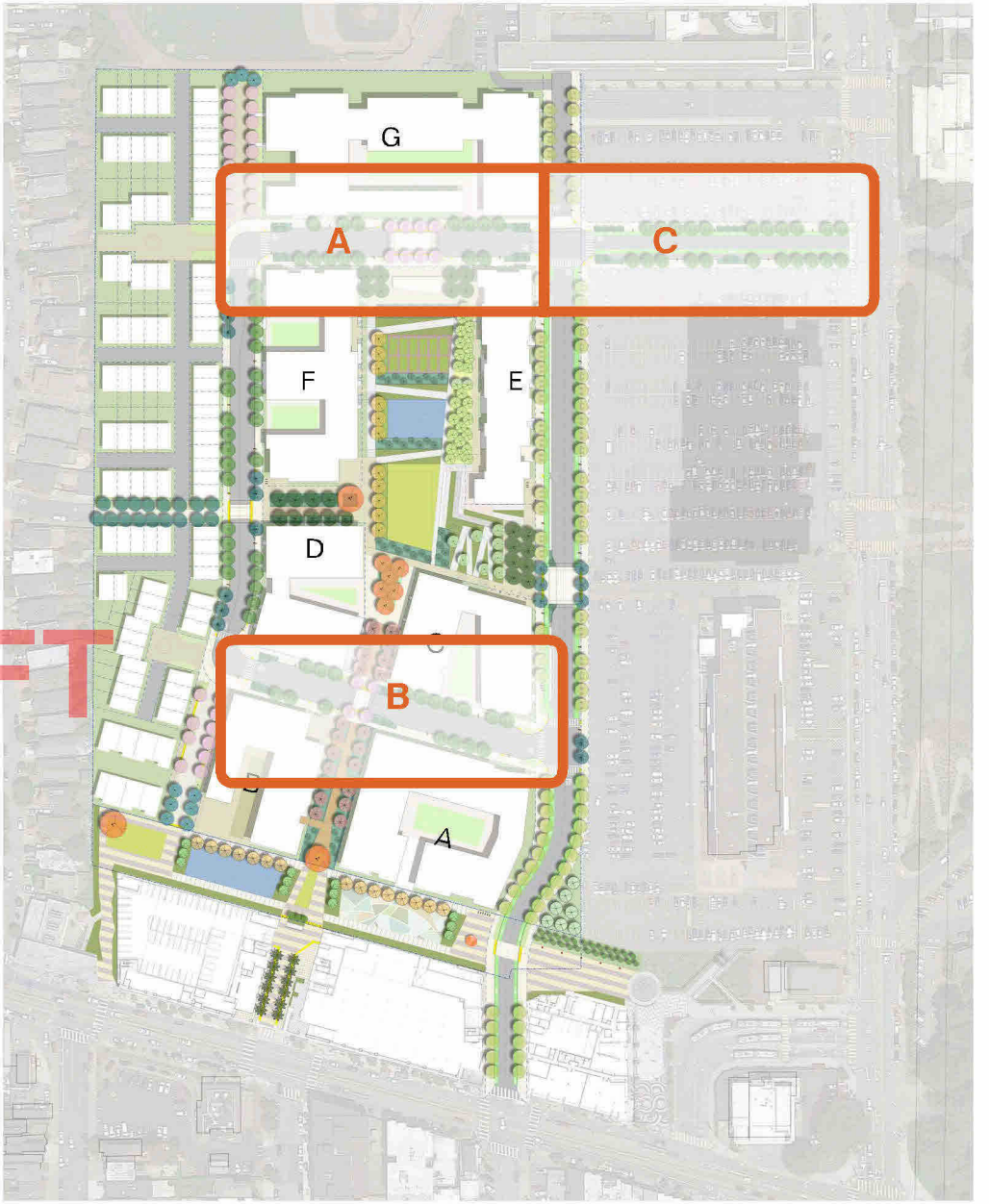
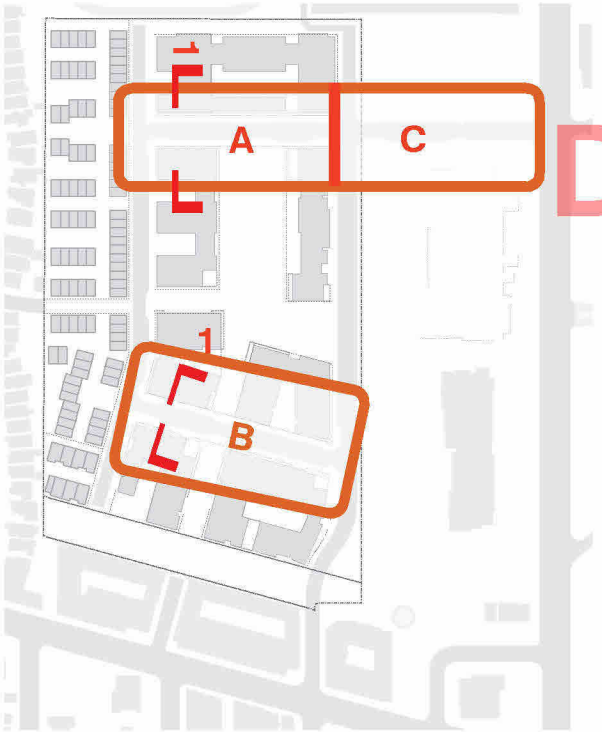


Figure 5.15 – 1: *North & South Street, Key Map*

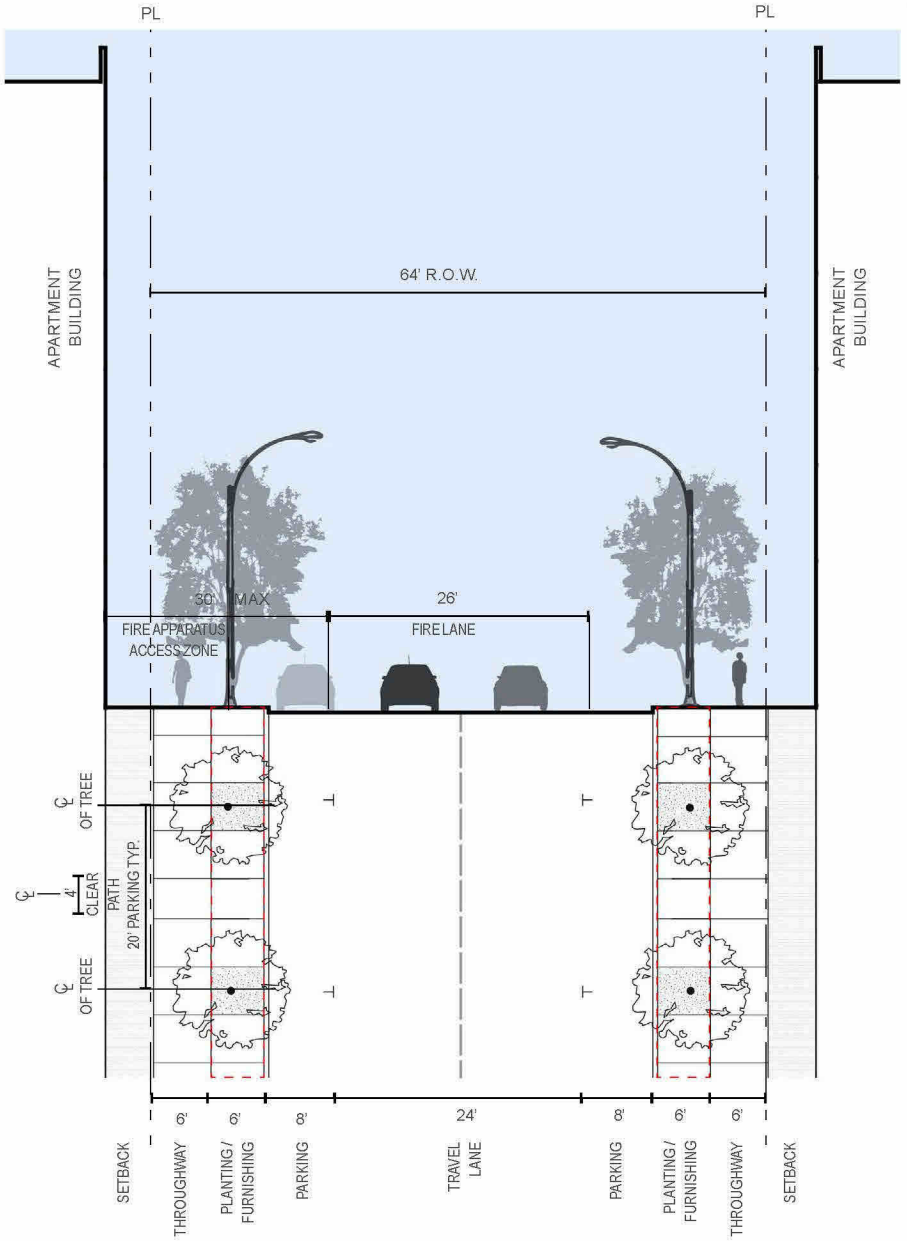
LEGEND

1. *Tree Well*
2. *Concrete Sidewalk*
3. *Street Light*
4. *Litter + Recycling Receptacle*
5. *Bioretention Planting*
6. *Regular Planting*
7. *Warning Paver*
8. *Curb Cut for Accessible Loading/Parking*
9. *Raised Crosswalk*
10. *Traffic Island*
11. *Curb Cut for Garage*
12. *Bike Rack*
13. *Bench*
14. *Bollard*
15. *Concrete Unit Pavers*
16. *Roadway - Asphalt*
17. *Curb Cut for Driveway*

BL *bike lane*
P *parking*
SW *sidewalk*
TL *travel lane*
M *median*
BO *bulb-out*

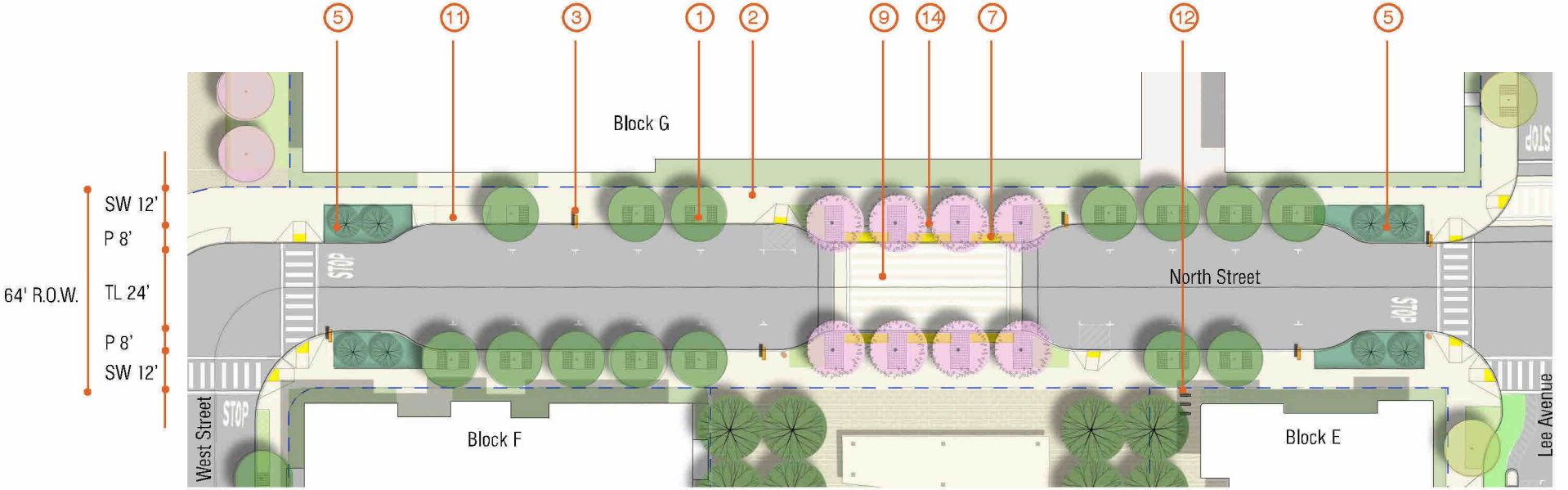


Keymap

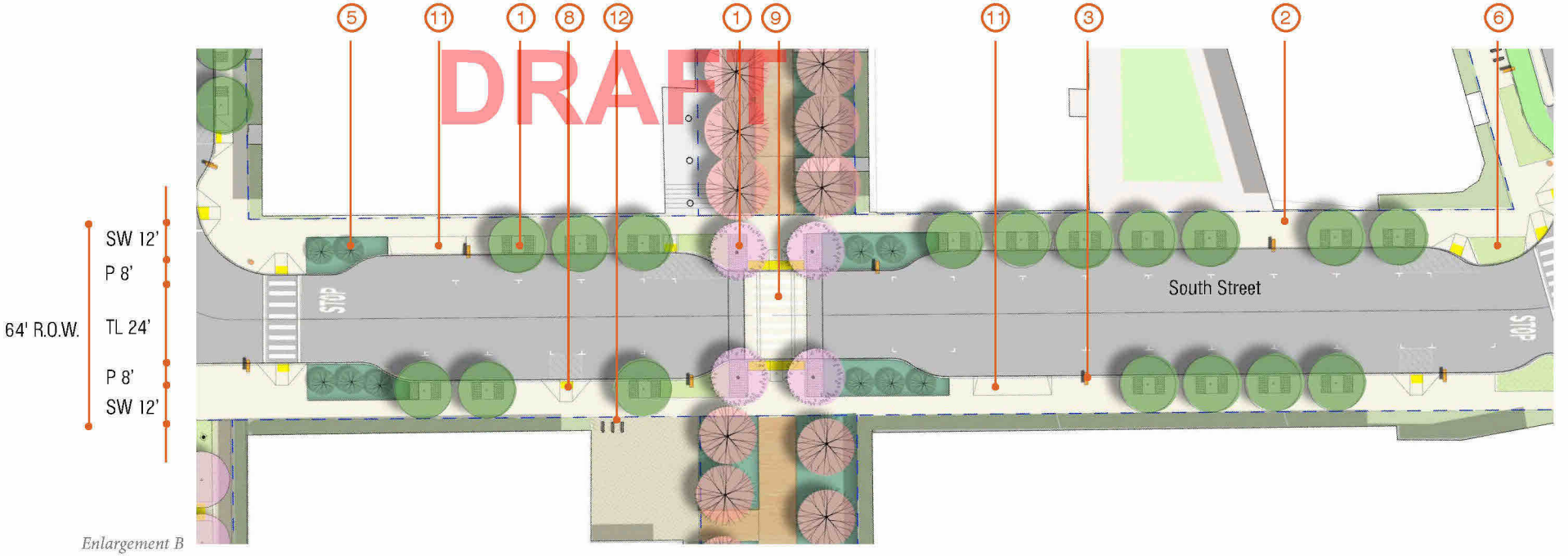


Section 1

Figure 5.15 – 2: *North & South Street, Section*



Enlargement A



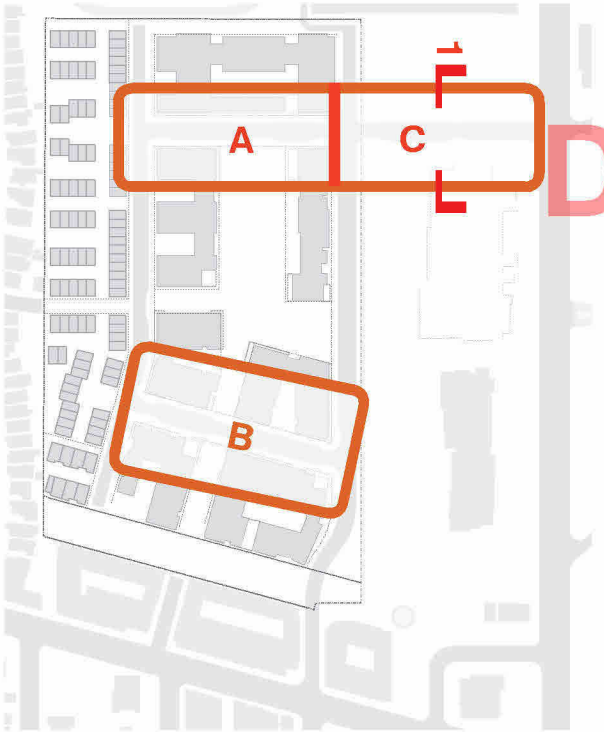
Enlargement B

Figure 5.15 – 3: *North & South Street, Plan Enlargements*

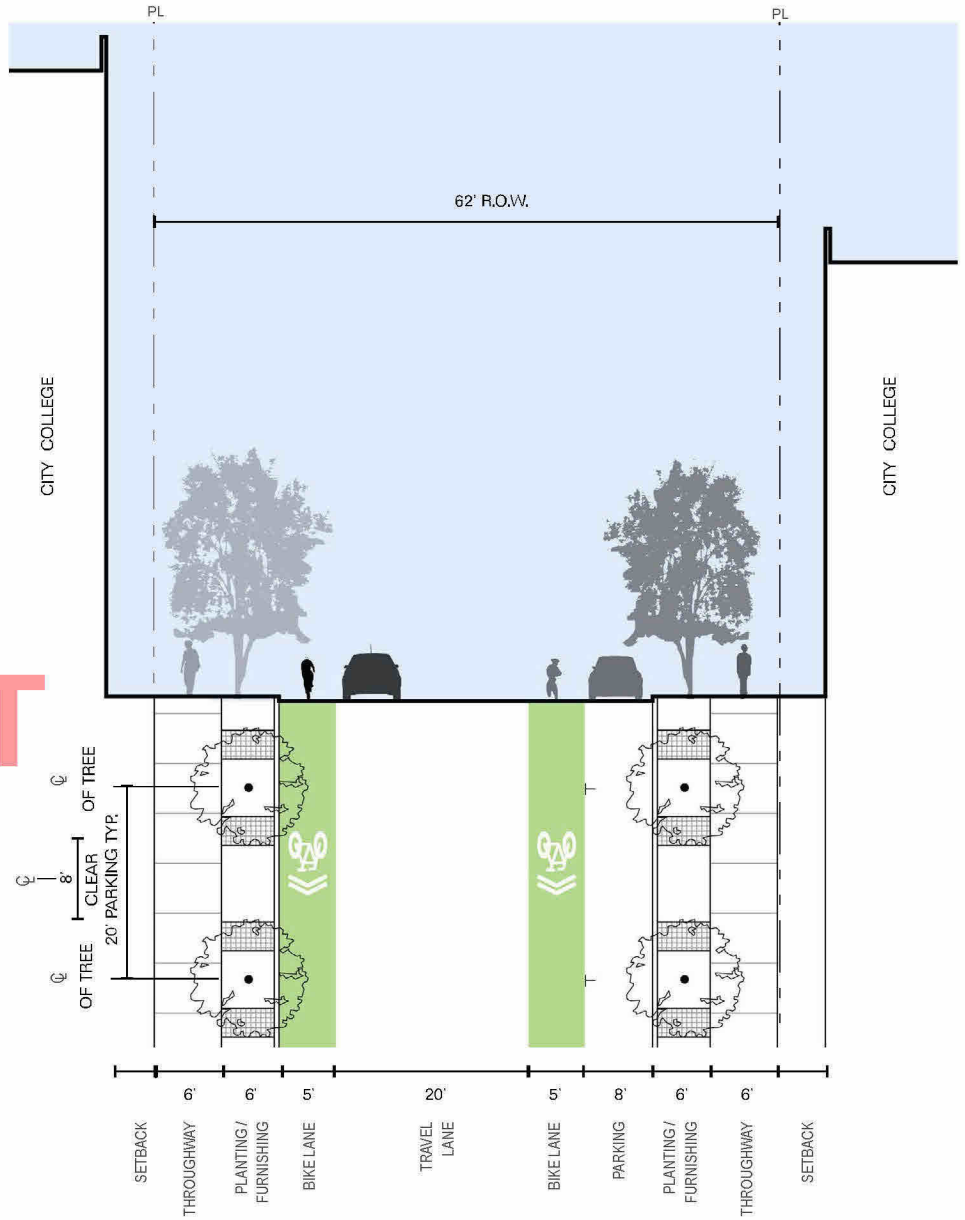
LEGEND

1. *Tree Well*
2. *Concrete Sidewalk*
3. *Street Light*
4. *Litter + Recycling Receptacle*
5. *Bioretention Planting*
6. *Regular Planting*
7. *Warning Paver*
8. *Curb Cut for Accessible Loading/Parking*
9. *Raised Crosswalk*
10. *Traffic Island*
11. *Curb Cut for Garage*
12. *Bike Rack*
13. *Bench*
14. *Bollard*
15. *Concrete Unit Pavers*
16. *Roadway - Asphalt*
17. *Curb Cut for Driveway*

BL *bike lane*
P *parking*
SW *sidewalk*
TL *travel lane*
M *median*
BO *bulb-out*

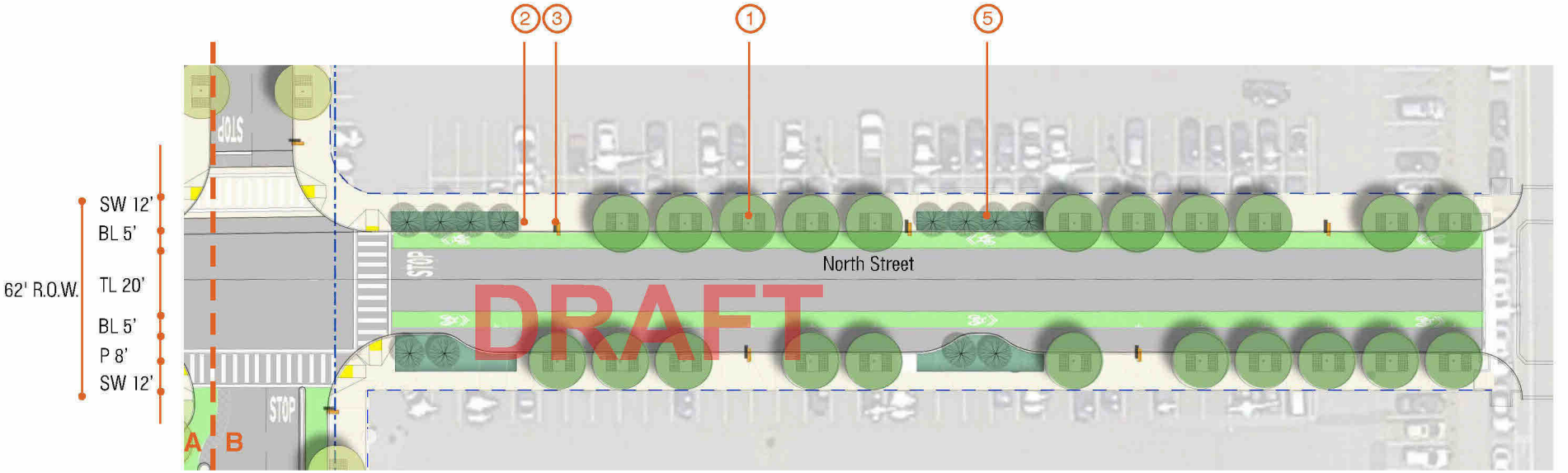


Key Map



Section 1

Figure 5.15 – 4: *North Street, Section*



Enlargement C

Figure 5.15 – 5: *North Street, Plan Enlargement*

5.16 WEST STREET

West Street will be the north/south neighborhood residential lane with 54-foot-wide right-of-way providing vehicular, pedestrian, and bike access to individual buildings, townhouses, San Ramon Paseo and the Reservoir Park. This street will have an asymmetrical section with parallel parking at the east side. There will be one travel lane for each direction with a 10.5-foot-wide sidewalk on both sides of the street. Since there will be no parallel parking at the townhouse side of the street, a continuous 4-foot-wide tree and planting buffer with 8-foot-wide breaks every 60 feet will be provided along the townhouse frontage. Traffic calming measures shall be provided at West Street. The base option is to provide a chicane and mid-block raised crossing. The alternate option is to provide a mountable roundabout in lieu of a chicane. This option is preferred where vehicle access is provided in four directions.

STANDARDS

S.5.16.1 Street Zone Dimensions

Right-of-way cross-section dimensions shall be as shown in **Figure Figure 5.16 – 3.**

S.5.16.2 Element and Material Specification

Elements per **Figure 5.16 – 2**. All elements shown shall be included. Dimensions vary.

S.5.16.3 Raised Crosswalk

The crosswalk at the intersection of West Street and the Reservoir Park entry shall be raised.

GUIDELINES

G.5.16.1 Stormwater Management

Due to grading challenges and spacial constraints, West Street will not be able to meet the 25% reduction in stormwater rate and volume. The open space stormwater management area will be oversized beyond 25% requirement to offset the West Street Stormwater requirement.

G.5.16.2 Mountable Roundabout

A mountable roundabout at the intersection of North Street and West Street and at the intersection of South Street and West Street may be used for traffic calming in lieu of a chicane. Further study is needed. See **Figure 5.16 – 4**.

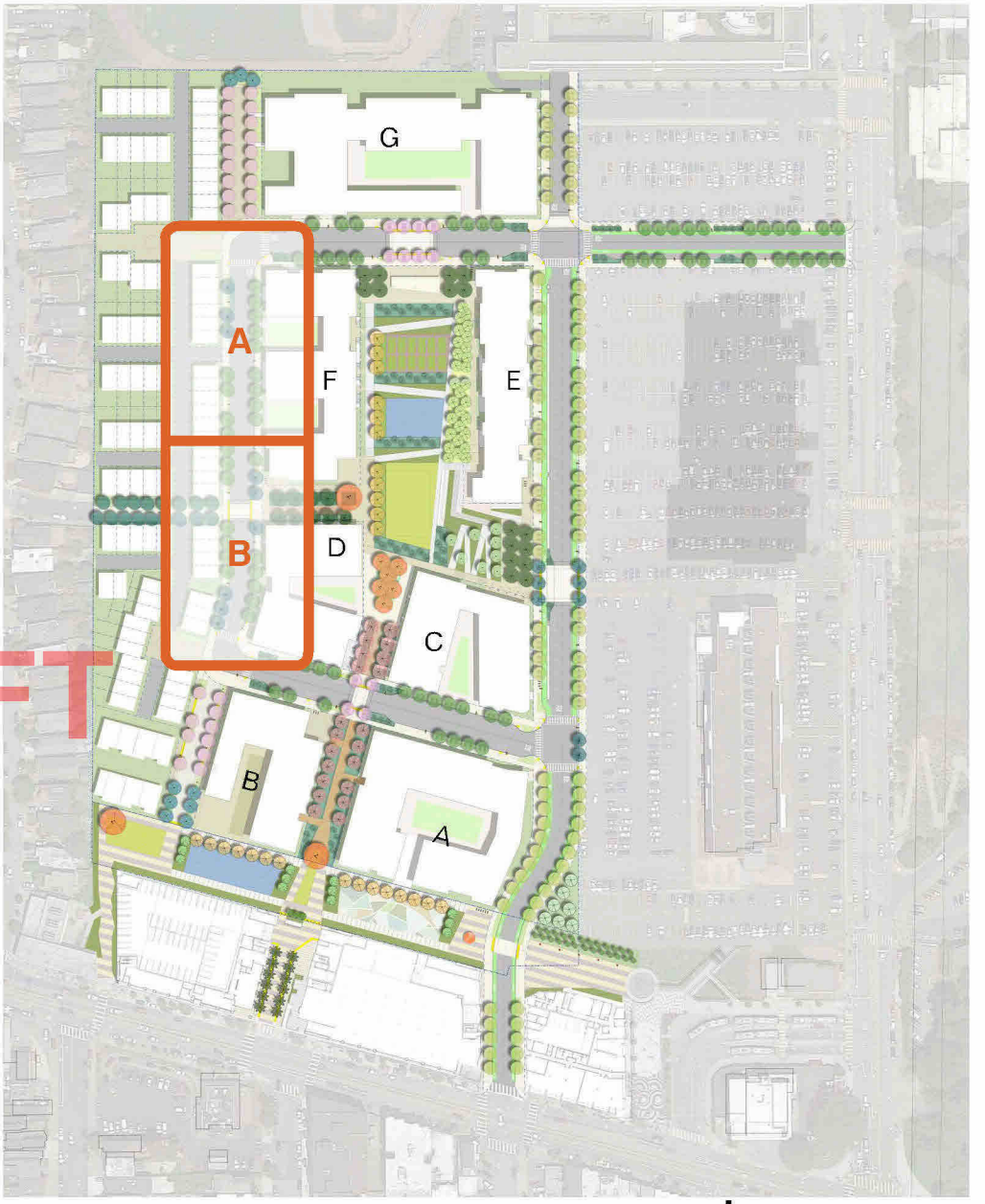
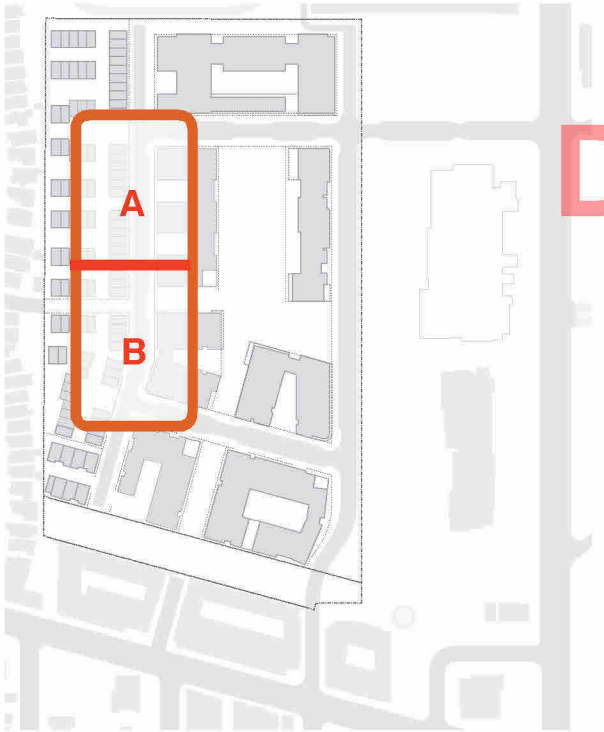


Figure 5.16 – 1: *West Street, Key Map*

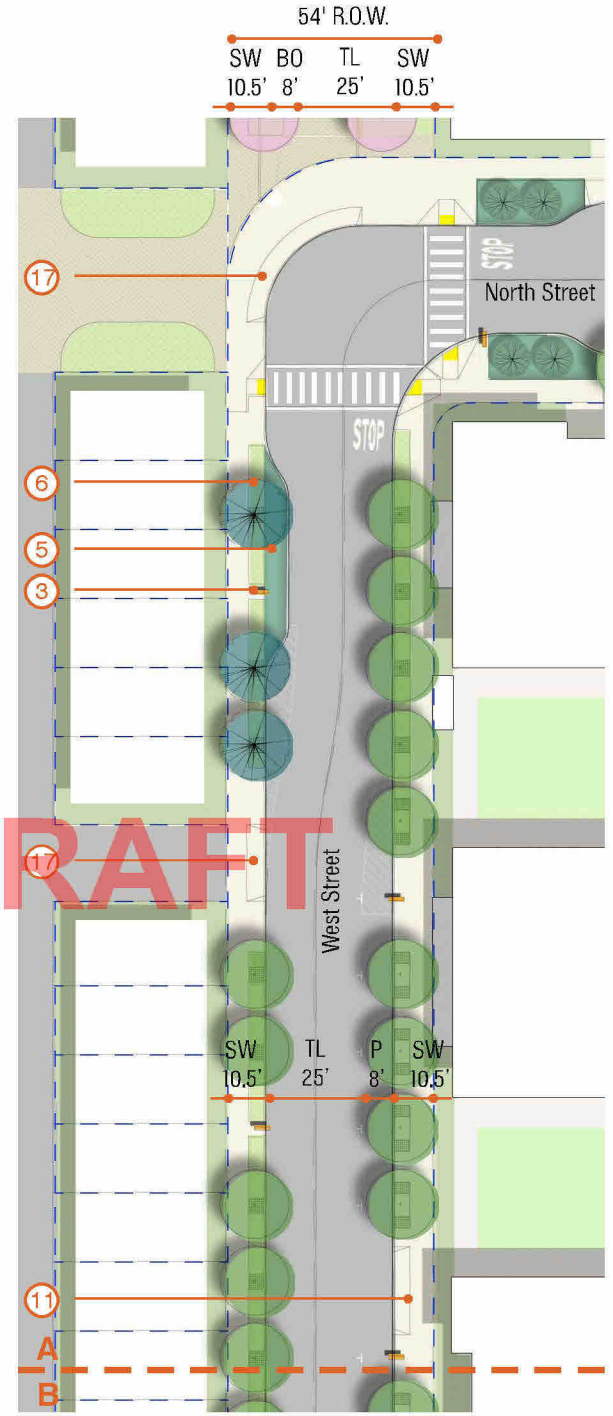
LEGEND

1. *Tree Well*
2. *Concrete Sidewalk*
3. *Street Light*
4. *Litter + Recycling Receptacle*
5. *Bioretention Planting*
6. *Regular Planting*
7. *Warning Paver*
8. *Curb Cut for Accessible Loading/Parking*
9. *Raised Crosswalk*
10. *Traffic Island*
11. *Curb Cut for Garage*
12. *Bike Rack*
13. *Bench*
14. *Bollard*
15. *Concrete Unit Pavers*
16. *Roadway - Asphalt*
17. *Curb Cut for Driveway*

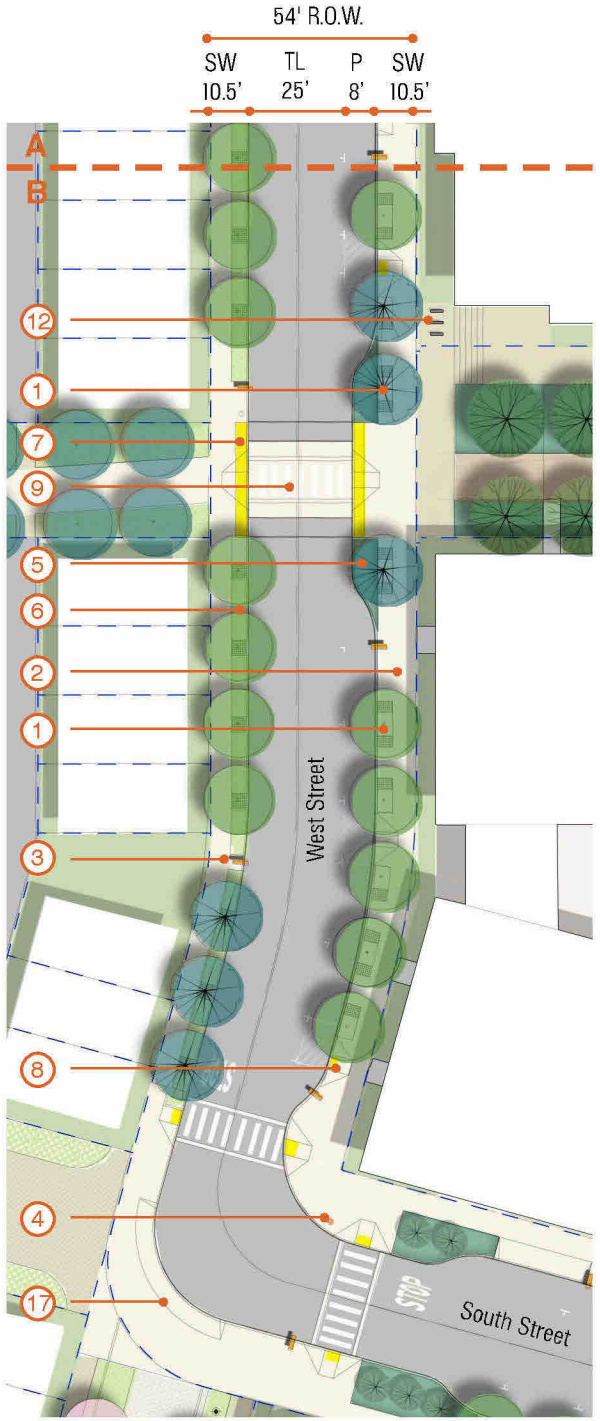
BL *bike lane*
P *parking*
SW *sidewalk*
TL *travel lane*
M *median*
BO *bulb-out*



Key Map



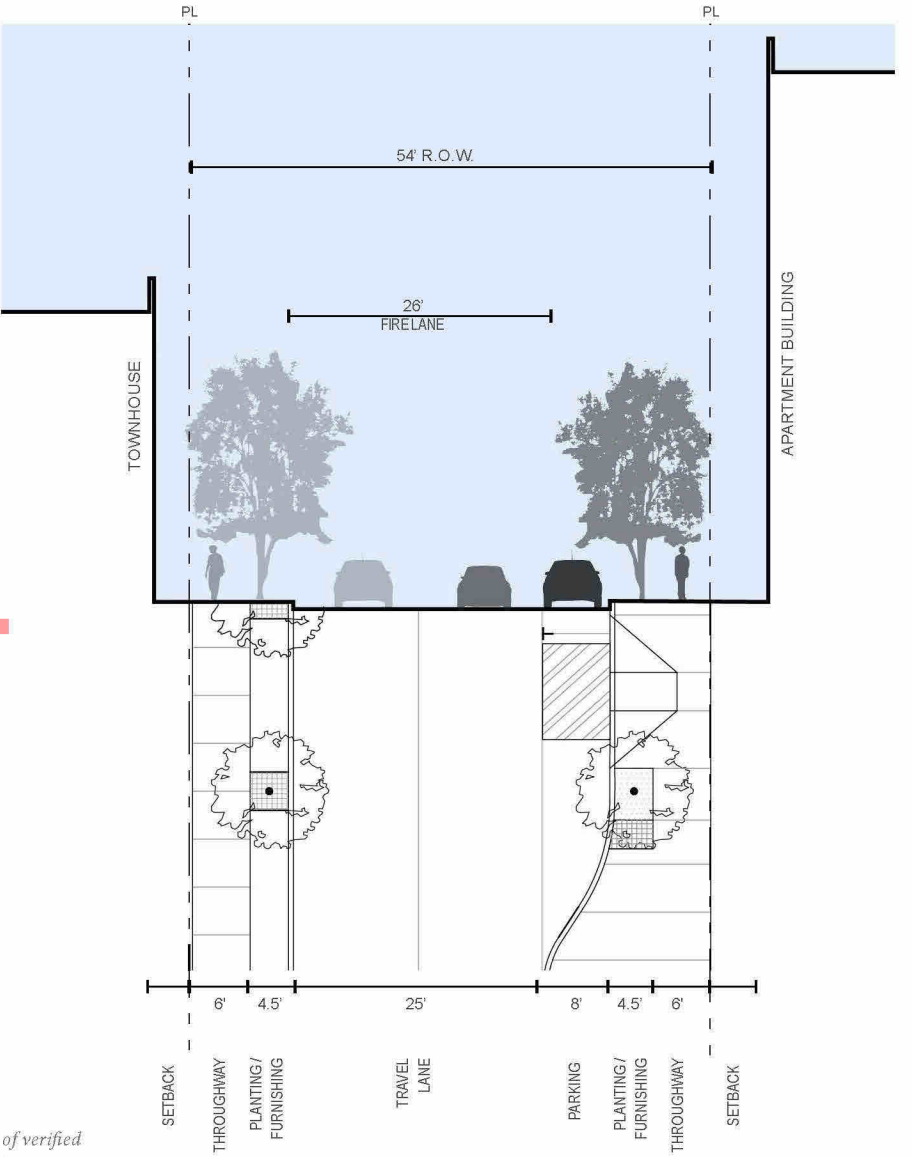
Enlargement A



Enlargement B

Figure 5.16 – 2: *West Street, Plan Enlargements*

Key Map



**Planting zone to contain 500 cubic feet of verified growing media at a 3' depth per street tree*

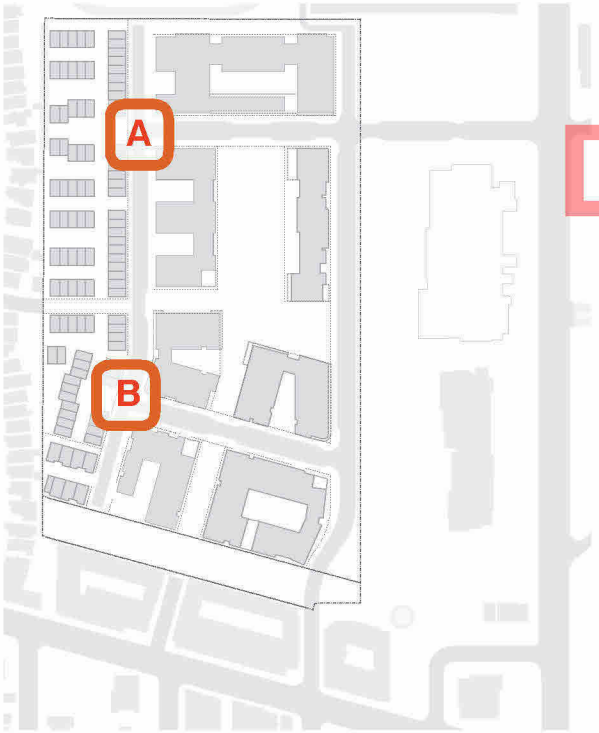
Section 1

Figure 5.16 – 3: *West Street, Section*

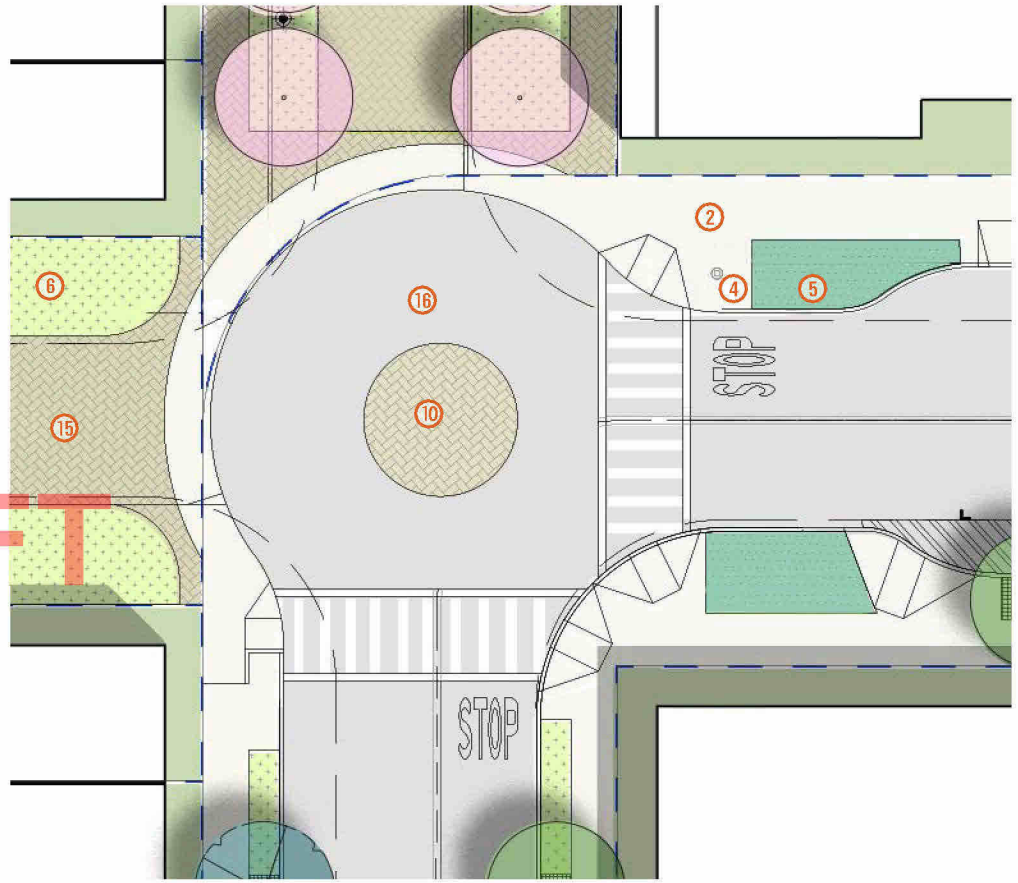
LEGEND

1. *Tree Well*
2. *Concrete Sidewalk*
3. *Street Light*
4. *Litter + Recycling Receptacle*
5. *Bioretention Planting*
6. *Regular Planting*
7. *Warning Paver*
8. *Curb Cut for Accessible Loading/Parking*
9. *Raised Crosswalk*
10. *Traffic Island*
11. *Curb Cut for Garage*
12. *Bike Rack*
13. *Bench*
14. *Bollard*
15. *Concrete Unit Pavers*
16. *Roadway - Asphalt*
17. *Curb Cut for Driveway*

BL *bike lane*
P *parking*
SW *sidewalk*
TL *travel lane*
M *median*
BO *bulb-out*

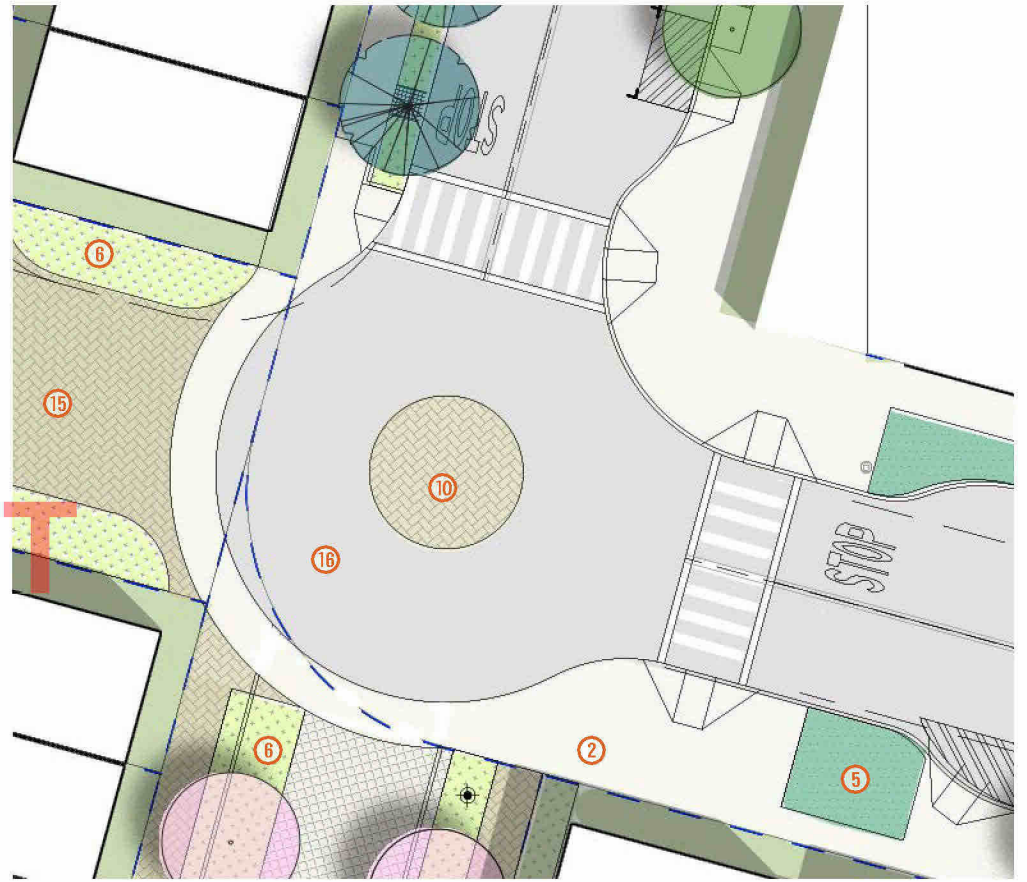


Key Map



Enlargement A

Figure 5.16 – 4: *West Street, Mountable Roundabout Option*



Enlargement B

5.17 WEST STREET NORTH SHARED STREET & SOUTH SHARED STREET

WEST STREET NORTH SHARED STREET

The private pedestrianized raised street at the north end of West Street has a 54-foot-wide right of way. 28 feet outside the fire lane will serve as a usable open space with attractive paving that can support fire access and signify pedestrian priority, and at the seating area with large trees at the end of the street to terminate the view. The streets will be flanked by townhouse entries at the west side and stoops at the east side.

WEST STREET SOUTH SHARED STREET

West Street South Shared Street will be a private street. The south end of West Street provides fire and vehicular access and loading to the Habitat For Humanity parcel. The street will be flanked by planting and stoops on both sides, and will be curbless with warning pavers, permeable paving as required, and furnishings to emphasize the pedestrian nature of the street.

STANDARDS

S.5.17.1 Street Zone Dimensions

Right-of-way cross-section dimensions shall be as shown in **Figure 5.17 – 3 and Figure 5.17 – 6.**

S.5.17.2 Element and Material Specification

Elements per **Figure 5.17 – 2 and Figure 5.17 – 5.** All elements shown shall be included. Dimensions vary.

S.5.17.3 Street profile

The street shall be curbless and paved with ADA accessible, H20-load-bearing special paving to emphasize pedestrian priority.

S.5.17.4 Fire Access

20-foot-clear fire access and fire apparatus zones shall be provided. See **Section 5.5: Fire and Emergency Vehicle Access** for more detail.

GUIDELINES

G.5.17.1 Vehicular Access

Vehicular access shall be limited to 2/3 of the street so a mini park can be accommodated at the end of the street to serve as a gateway to the SFPUC open space and provide a visual terminus at the end of street. Special paving shall be used for the entire roadway to distinguish the shared zone from vehicular driveway in public streets.

G.5.17.2 Planting

Planting shall maximize habitat creation and stormwater management. See **Section 5.19: Street Planting.**

G.5.17.3 Stormwater Management

Stormwater generated within West Street South Shared Street right-of-way should be treated within the right of way. The use of permeable paving is encouraged.

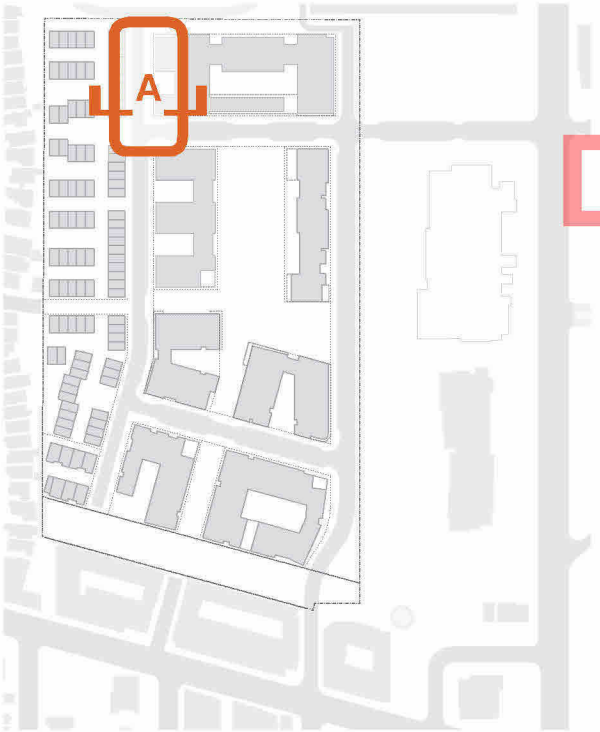
Figure 5.17 – 1: *West Street, Shared Streets Key Map*

WEST STREET NORTH SHARED STREET

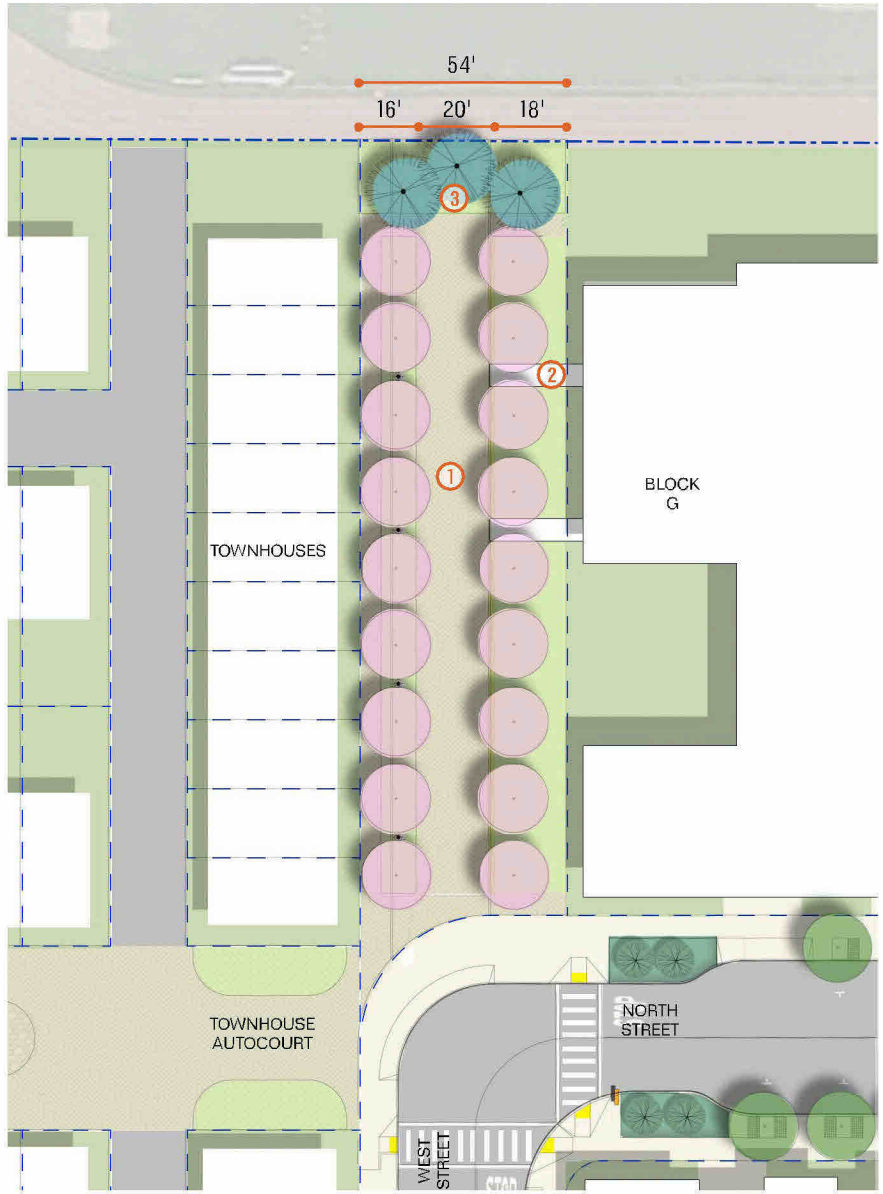
LEGEND

① *Firelane*
② *Stoop Entrances*
③ *Garden Grove/ Focal Point/ Seating*

P *parking*
SW *sidewalk*
TL *travel lane*
BL *bike lane*
M *median*
BO *bulb-out*
FL *fire lane*



Key Map



Enlargement A

Figure 5.17 – 2: *West Street North, Plan Enlargement*

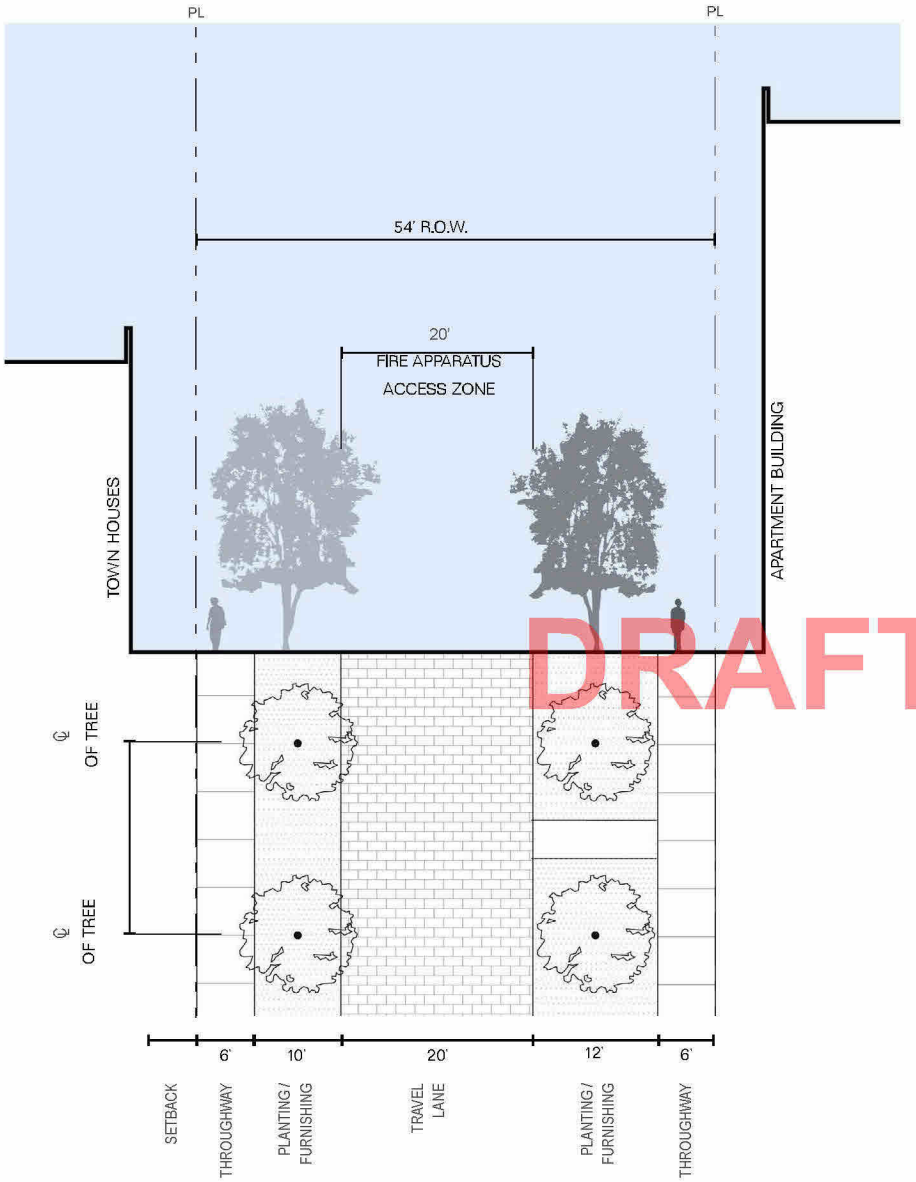


Figure 5.17 – 3: *West Street North, Section*

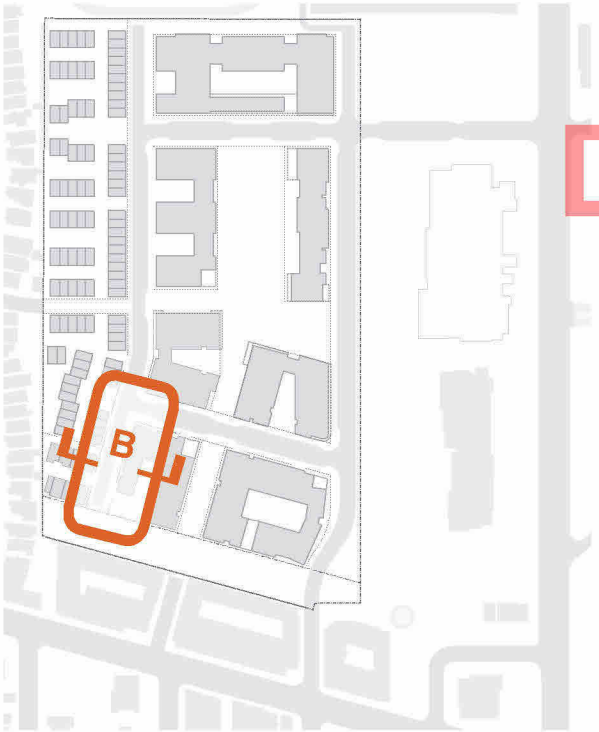
Figure 5.17 – 4: *Shared street precedent. Fire access service as pedestrian pathway*

WEST STREET SOUTH SHARED STREET

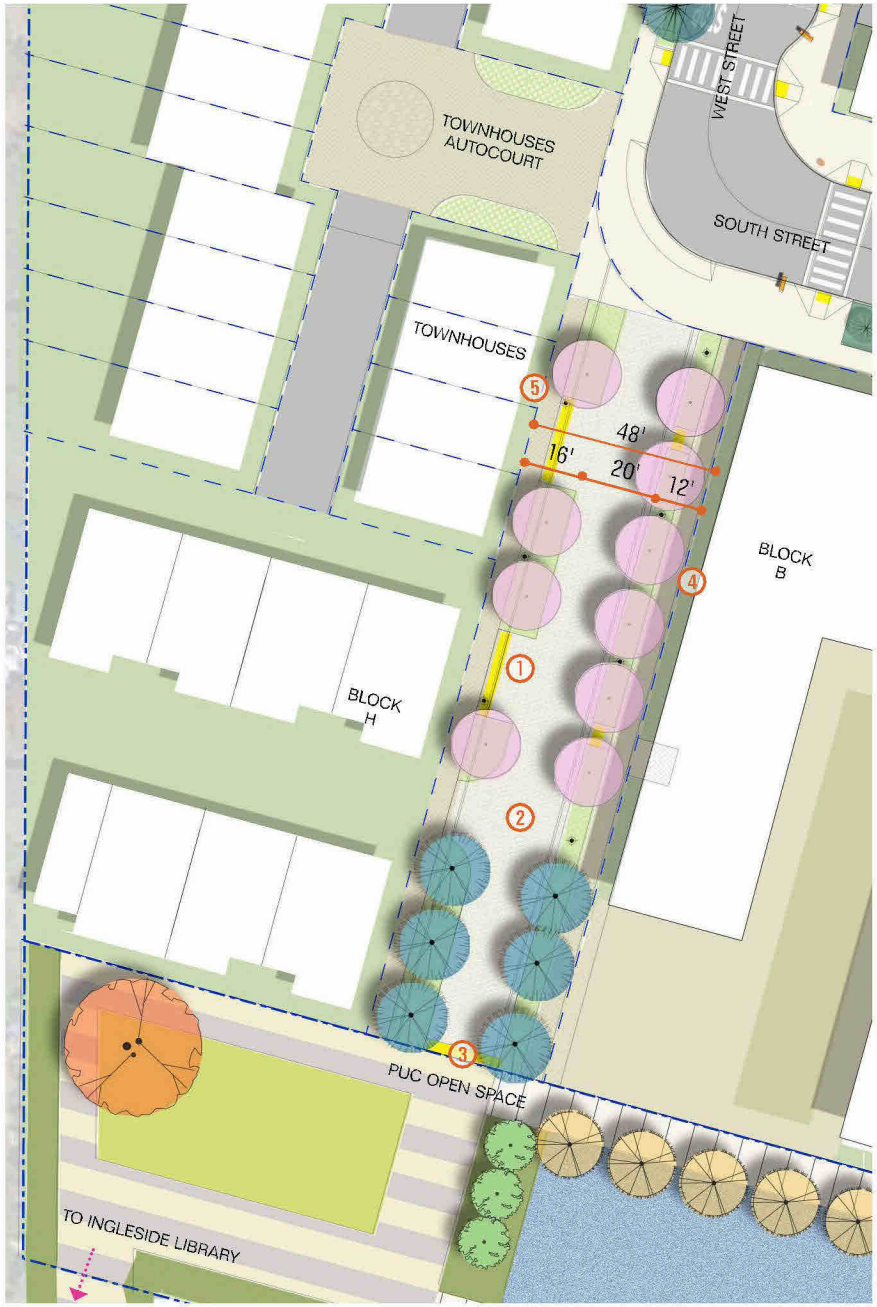
LEGEND

1. *Passenger Loading*
2. *Raised Street /Fire Lane With Permeable Paving*
3. *Warning Paving*
4. *Stoop Entrances*

BL *bike lane*
P *parking*
SW *sidewalk*
TL *travel lane*
M *median*
BO *bulb-out*

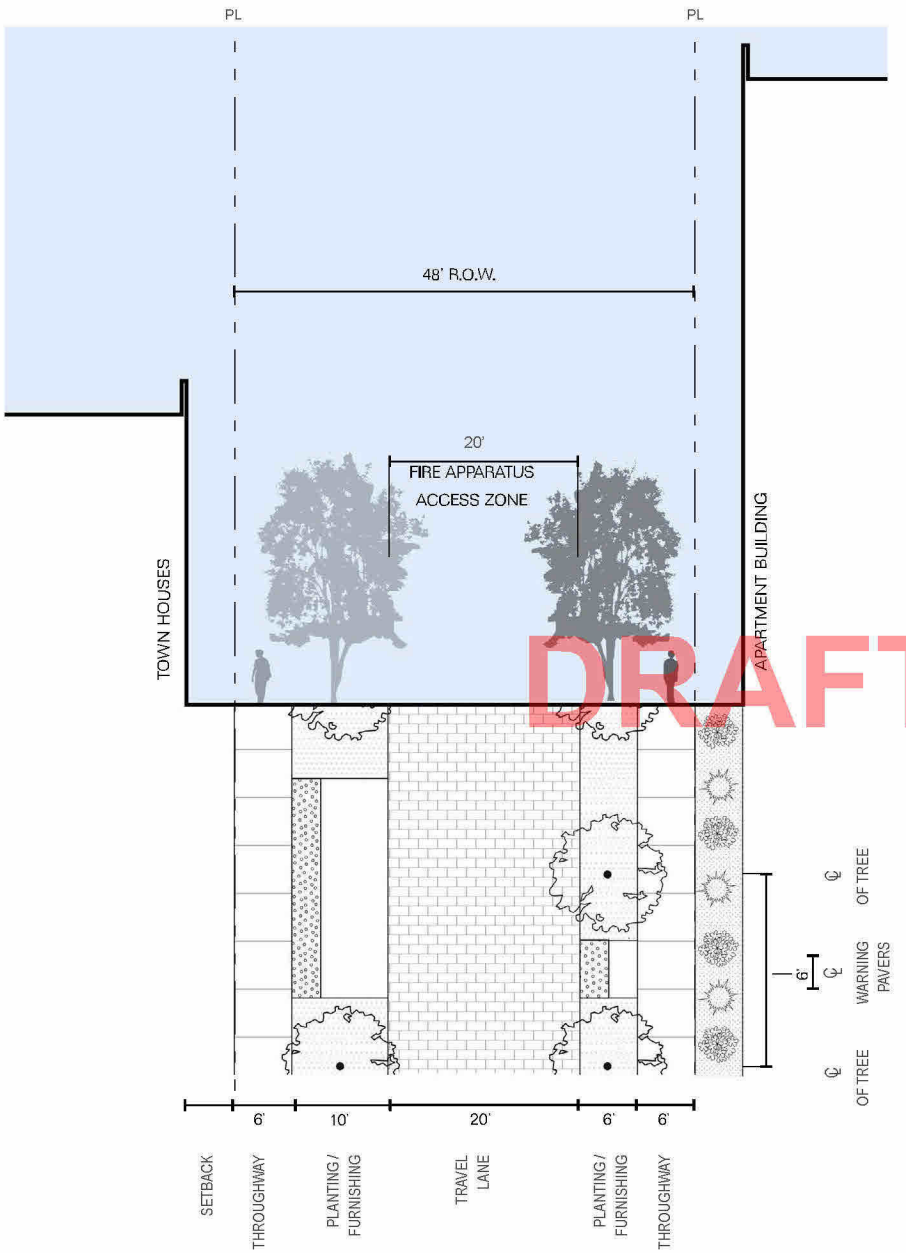


Key Map



Enlargement B

Figure 5.17 – 5: *West Street South, Plan Enlargement*



Section 1
Figure 5.17 – 6: *West Street South, Section*

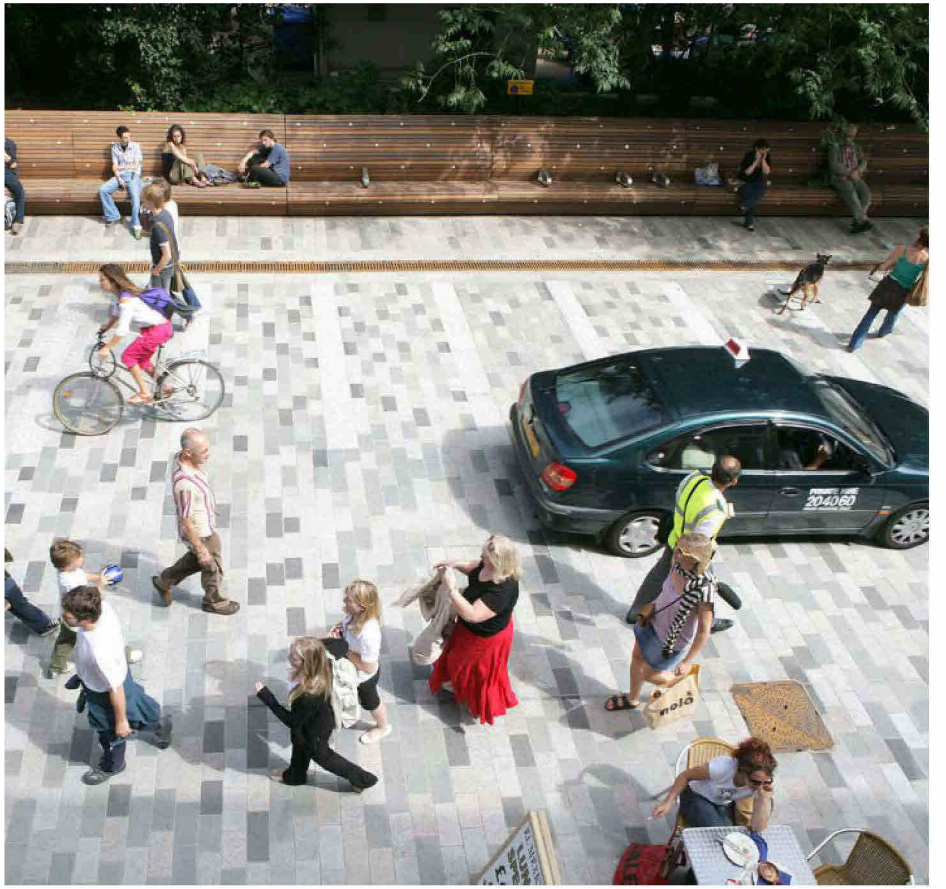


Figure 5.17 – 7: *Shared Street Precedent Image*

5.18 TOWNHOUSE ENTRY COURT AND DRIVEWAY

The intent of the townhouse entry court is to provide a strong visual termination to North and South Streets, and to integrate townhomes with the larger developments. Townhouse entry courts can provide vehicle access or be limited to only bikes and pedestrians. Townhouse driveways are private shared streets for low speed vehicular and pedestrian access to the townhouse development.

STANDARDS

S.5.18.1 Auto Court

Auto courts that serve as the entry point to the townhouse development shall be located at the end of North Street and South Street. Special paving and curbless treatment shall be used to emphasize pedestrian priority. No gates or fences are allowed at the auto court entries.

S.5.18.2 Driveway

Curbless treatment and special paving should be used, and planting should be maximized wherever possible to scale down the width of the driveway for traffic calming.

S.5.18.3 Entry court

Minimum size of 40 feet in width by 80 feet in depth, if providing only pedestrian and bike access.

GUIDELINES

G.5.17.1 Planting

Planting shall maximize habitat creation and stormwater management. See **Section 5.19: Street Planting.**

G.5.17.2 Stormwater Management

Stormwater that is generated within the right-of-way of townhouse driveways will be treated within the townhouse development parcel. Permeable paving is encouraged to be used at the driveways and auto courts to reduce impervious surface area.

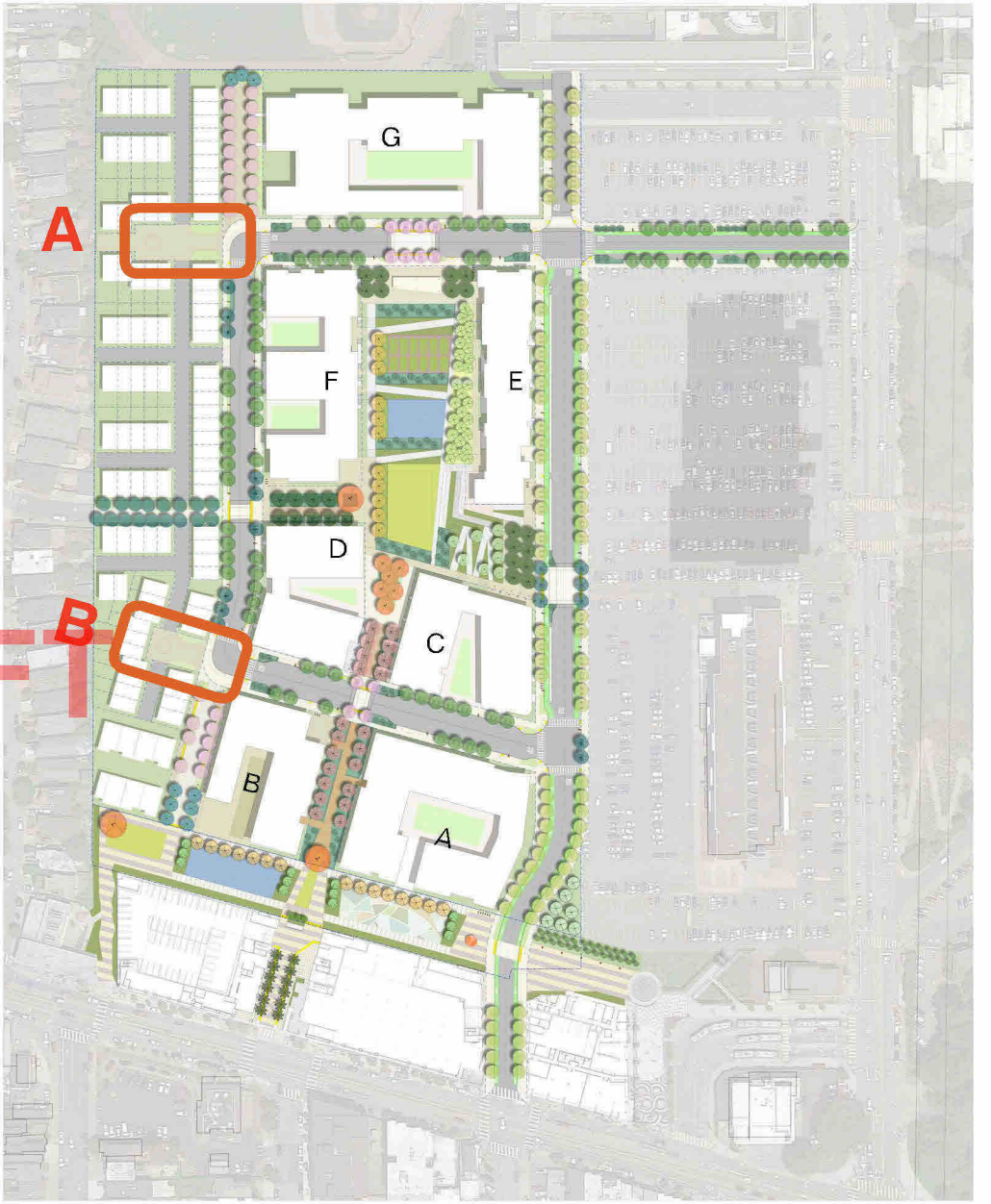


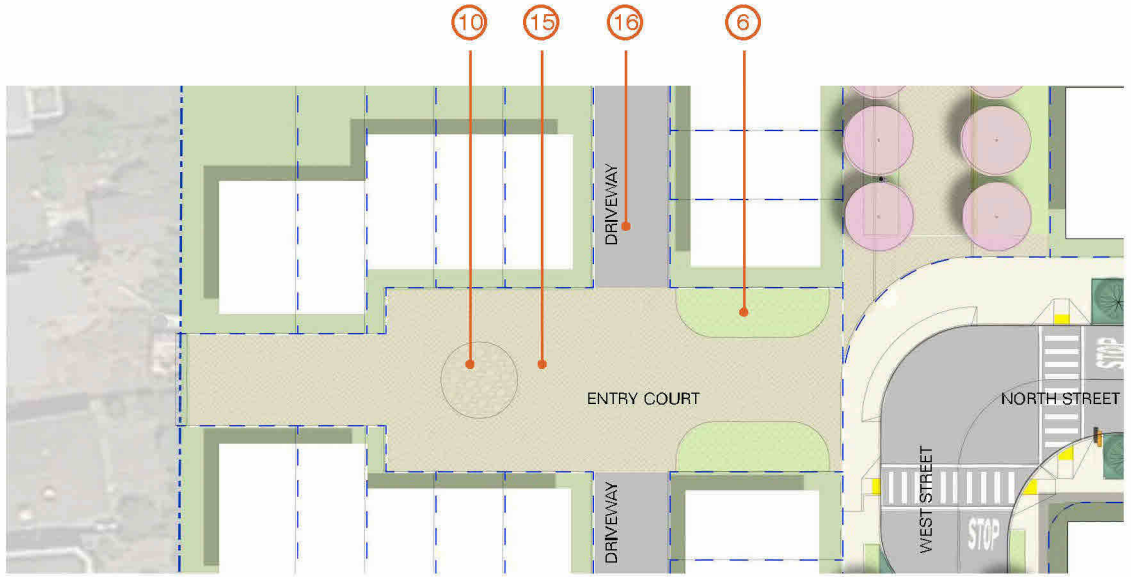
Figure 5.18 – 1: *Townhouse Entry Courts, Key Map*

LEGEND

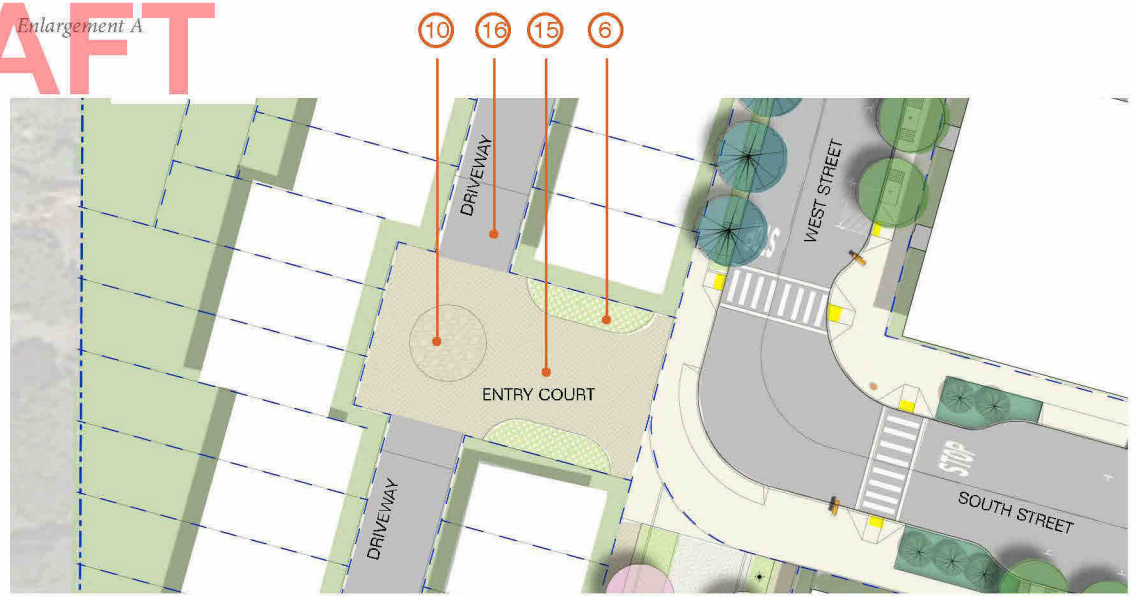
1. *Tree Well*
2. *Concrete Sidewalk*
3. *Street Light*
4. *Litter + Recycling Receptacle*
5. *Bioretention Planting*
6. *Regular Planting*
7. *Warning Paver*
8. *Curb Cut for Accessible Loading/Parking*
9. *Raised Crosswalk*
10. *Traffic Island*
11. *Curb Cut for Garage*
12. *Bike Rack*
13. *Bench*
14. *Bollard*
15. *Concrete Unit Pavers*
16. *Roadway - Asphalt*
17. *Curb Cut for Driveway*

BL *bike lane*
P *parking*
SW *sidewalk*
TL *travel lane*
M *median*
BO *bulb-out*

Key Map



Enlargement A



Enlargement B

Figure 5.18 – 2: *Townhome Entry Court, Enlargements*

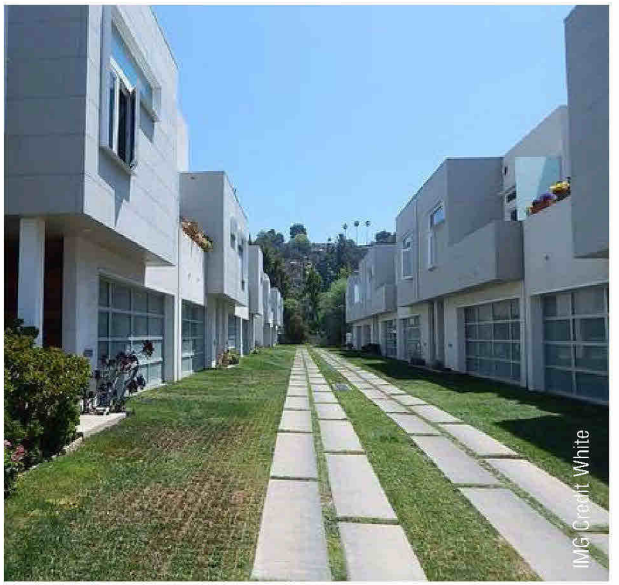


Figure 5.18 – 3: *Permeable and vehicular rated paving is used to maximize pervious surface for stormwater management*

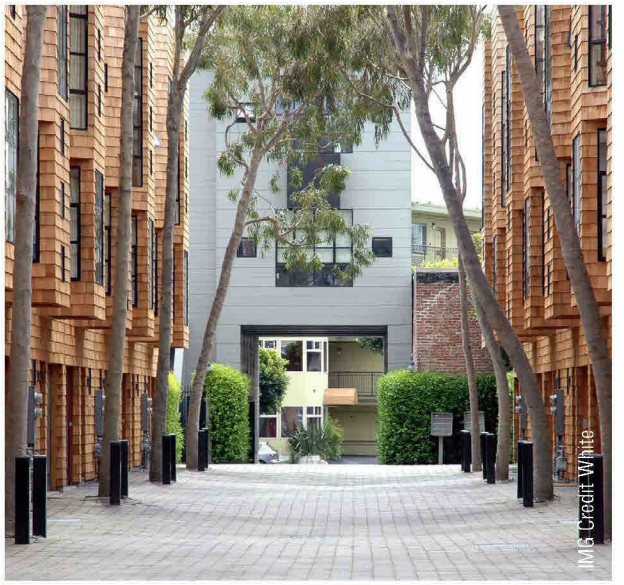


Figure 5.18 – 4: *Planting is maximized wherever possible to scale down the width of driveway for traffic calming.*

Figure 5.18 – 5: *High quality paving material, planting and accent lighting create a pedestrian prioritized environment.*

Street Material Palette

5.19 STREET PLANTING

There are three categories of street plantings: street trees, dry planting, and stormwater planting in bulb-outs.

I. Street Trees

Street trees are chosen for their ability to maintain their form in strong wind, to withstand San Francisco's summer fog, and to survive compaction, limited soil volumes, and the harsh alkaline soil conditions found in urban settings. All of the trees, except the Southern California native Catalina Ironwood, are from Australia where growing conditions are harsh, and approximate urban conditions in California. See **Figure 5.19 – 1 and Figure 5.19 – 2.**

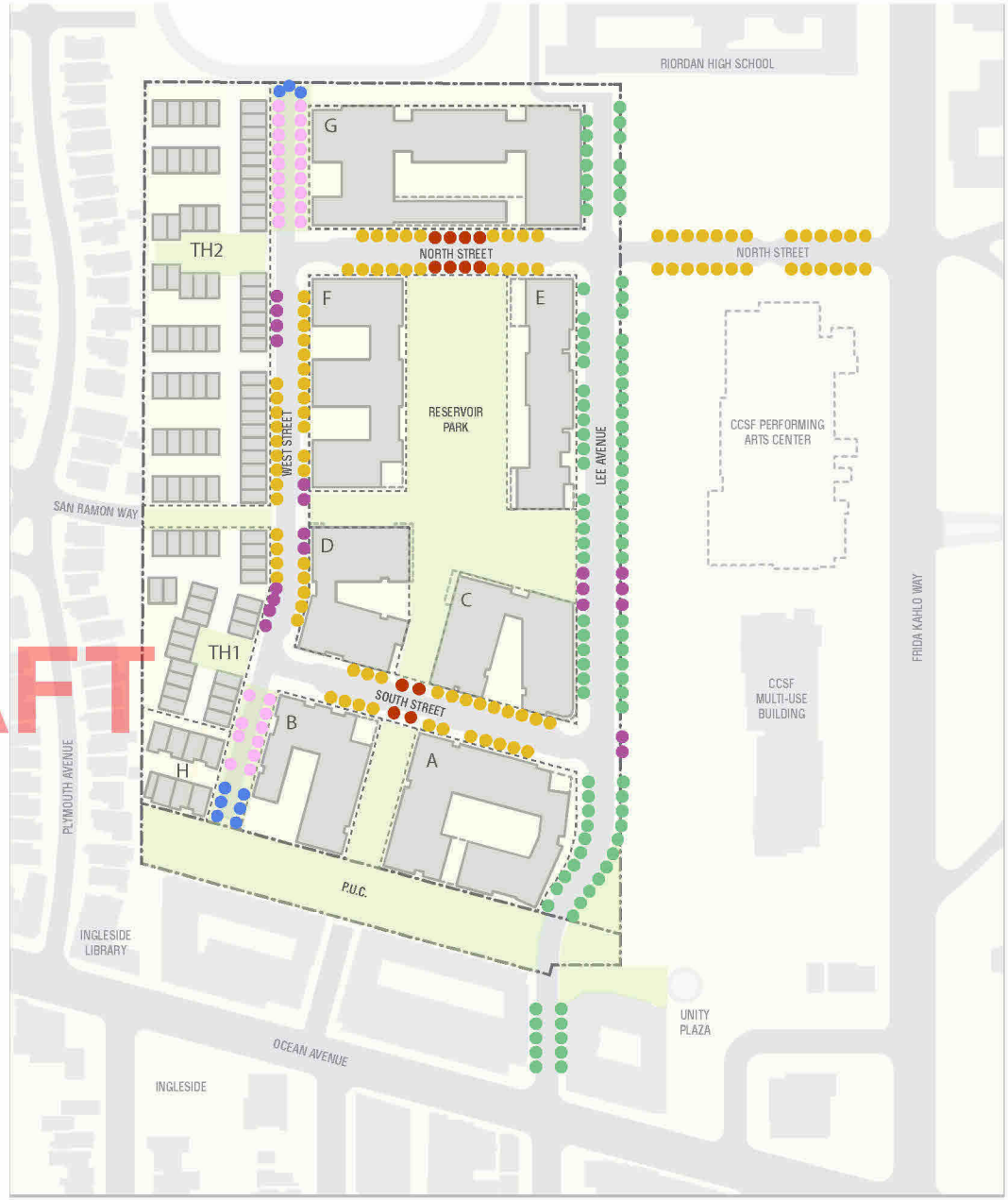


Figure 5.19 – 1: *Street Trees Type Diagram*

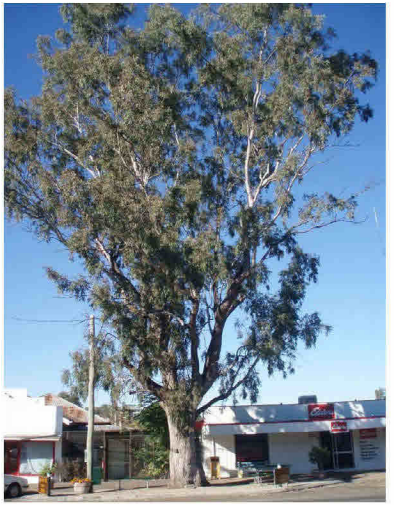
PREFERRED SPECIES

Catalina Ironwood
Lyonothamnus

Native Frangipani
Hymenosporum flavum

Primrose Tree
Lagunaria patersonii

Atlas Cedar
Cedrus atlantica



Coolibah
Eucalyptus microtheca

Willow Peppermint
Eucalyptus nicholii

Water Gum
Tristaniopsis laurina

Mountain Lilac
Ceanothus 'Ray Hartman'

Figure 5.19 – 2: *Street Trees Preferred Species*

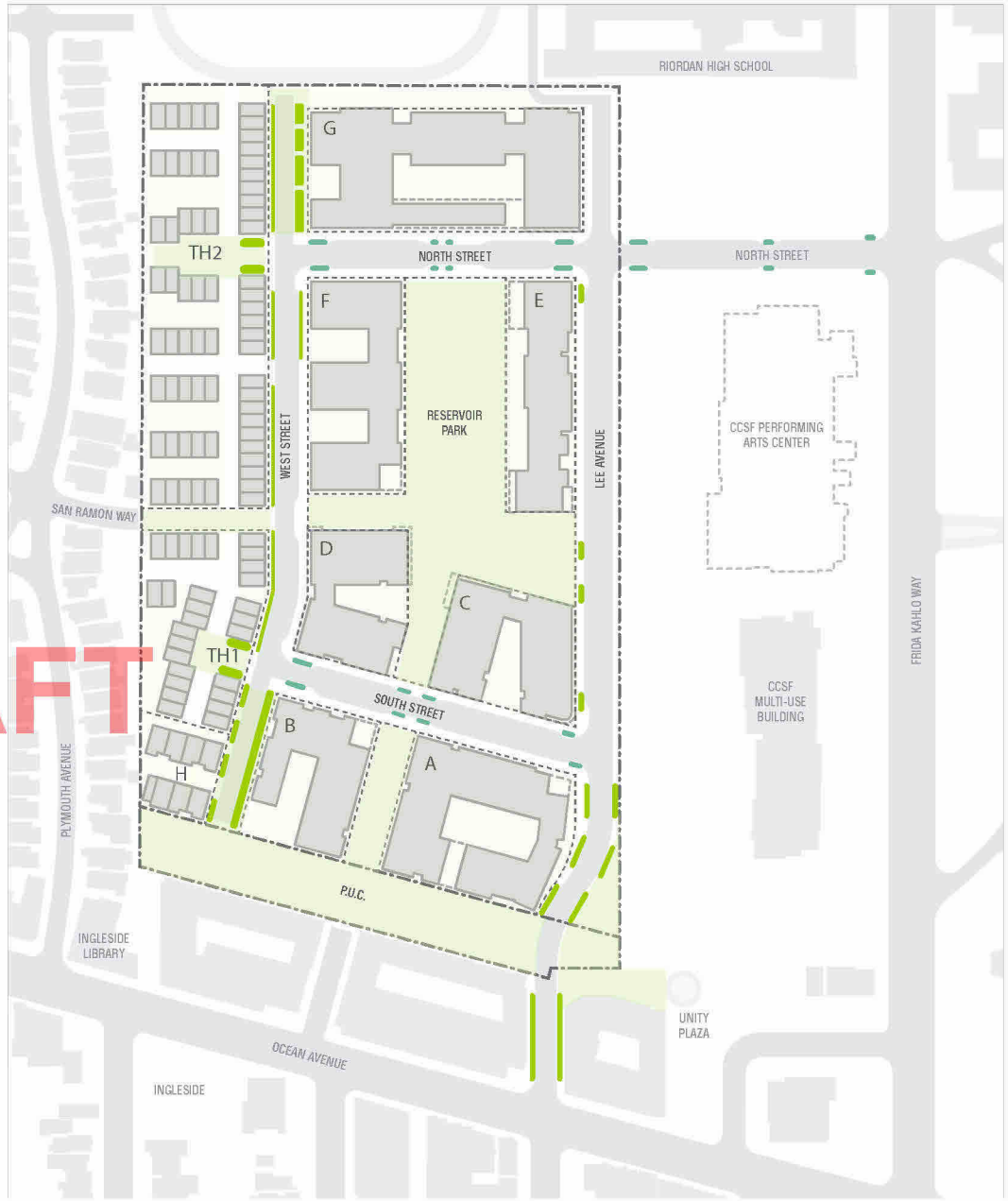


Figure 5.19 – 3: *Stormwater Planting and Regular Planting Diagram*

II. Regular Plantings in Bulbout and Sidewalk

Right-of-Way plantings and the required irrigation is encouraged when maintenance and replacement can be provided regularly by the adjacent property owner, as it presents a special challenge due to their vulnerability to people and pets. Therefore, plantings should be resistant to trampling and aggressive enough to withstand urban conditions. Plants that are proven to do well as the backbone are monocots that withstand a wide range of soil conditions and are crush resistant and drought tolerant, such as Dietes and Lomandra. Those plantings can be supplemented with climate adapted desert and subtropical succulent species, which work well as accents plants such as Beschorneria, Agave, Muhlenbergia lindheimeri, Muhlenbergia emerslyii, Yucca, Aloe arborescens, and Dymondia. These right-of-way shrubs and ground covers will have some overlap with those used in the open space in order to establish continuity.

PREFERRED SPECIES

Giant Red Aeonium
Aeonium 'Cyclops'

Parry's Agave
Agave parryi

Myrtle Spurge
Euphorbia myrsinites

Torch Aloe
Aloe arborescens

Matt Rush
Lomandra longifolia

Lindheimer's Muhly
Muhlenbergia lindheimeri

Amole
Beschorneria yuccoides

Smooth Agave
Agave desmettiana

Butterfly Iris
Dietes bicolor

Figure 5.19 – 4: *Planting Palette for Bulb-outs and Sidewalk*

III. Stormwater Planting in Bulb-out

Stormwater plantings are selected to withstand all of the above conditions in addition to seasonal flooding. Both planting palette options then are relatively limited. A preliminary list of stormwater plantings are:

- Elymus glaucus
- Cornus stolonifera
- Chondrapetalum elephantinum
- Carex tumulicola
- Muhlenbergia emersleyi
- Fragaria chiloensis
- Corylus cornuta

PREFERRED SPECIES

Blue Wild Rye
Elymus glaucus

Red Stem Dogwood
Cornus sericea

Large Cape Rush
Chondropetalum elephantinum

Berkeley Sedge
Carex. tumulicola

Gooding's muhly
Muhlenbergia emersleyi

Beach strawberry
Fragaria chiloensis

Beaked hazelnut
Corylus cornuta

Figure 5.19 – 5: *Planting Palette for Stormwater*

5.20 STREET PAVING MATERIALS

As the primary spaces for daily pedestrian life and vehicular circulation throughout the project site, the paving materials are designed to withstand extensive use, wear and tear, truck loading and emergency vehicle access. The street network in Balboa Reservoir consists of public and private streets which will be maintained by DPW and private developers respectively and will have different Standards and Guidelines.

I Public Streets (DPW Standard Materials)

Public streets will be designed in conjunction with DPW and will employ the newly approved list of expanded materials.

STANDARDS

S.5.20.1 DPW Specification

All the paving material used in the public right of way sidewalk and roadway shall be compliant with DPW standard specification.

S.5.20.2 Roadway

Standard roadway asphalt shall be used on roadways. Vehicular concrete paving shall be used at key raised crosswalks to prioritize pedestrians and enhance open space network connections.

S.5.20.3 Sidewalk

As the primary spaces for daily pedestrian life at the site, the materials used for sidewalks shall be able to withstand extensive use, wear-and-tear, and load-bearing requirements. The materials shall be able to provide level surfaces onto which furnishings, stages and elements can be secured. Where a sidewalk abuts a plaza, sidewalk paving materials shall be coordinated with the plaza paving to create a contiguous public space.

S.5.20.4 Warning Paving

City standard detectable warning paving shall be used at raised crosswalks and curb ramps.

SIDEWALK PEDESTRIAN THROUGHWAY

CIP Concrete
Natural Gray with Silica Carbide & Water Jet Finish

TRAFFIC LANE

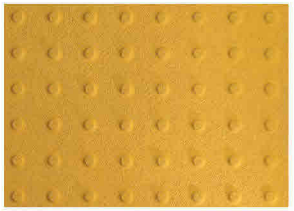
City Standard
Asphalt

CROSSWALKS

Thermo Plastic with Bar

Thermo Plastic with Bar with Custom Pattern

WARNING PAVERS



Warning Pavers
CASTinTACT

TREE WELL SURFACING

Cobble Stone with Flammed Finish

Gravel Mulch at opening

PROTECTED BIKE LANE MEDIAN

CIP Concrete
Natural Gray with Silica Carbide & Water Jet Finish

Figure 5.20 – 1: *Street Material Palette*

II. Privately Owned/Maintained Streets Standard Material

In privately owned and maintained streets, paving materials are not limited to the DPW standard paving palette. Therefore privately owned streets provide an opportunity to use unique materials and details to provide variation within the larger goal of creating a coherent public realm environment.

STANDARDS

S.5.20.5 Sidewalk and Roadway

The materials used for sidewalk and roadway in shared streets shall be able to withstand extensive use, wear-and-tear, and load-bearing requirements for all types of vehicles. Materials, colors and finishes used for both pedestrian and vehicular zones can be used to create a unified pedestrian priority auto space.

S.5.20.6 Warning Paving

Non city standard detectable warning paving shall be used at shared streets to create a pedestrian priority environment. Cast iron or white precast detectable warning pavers are recommended for durability and aesthetic quality and variation.

S.5.20.7 Vehicular Unit Paving

When unit pavers are used for roadway applications, smaller unit pavers and a bituminous setting bed shall be used to withstand heavy loads and extend longevity of the paving system.

GUIDELINES

G.5.20.1 Permeable Paving

Permeable paving should be used to reduce pervious surface for stormwater management and should be SFPUC stormwater management requirement.

G.5.20.2 Paving Pattern

Special paving pattern designs and material variations are encouraged to create spatial identity.

CONCRETE UNIT PAVING

6x12 Concrete Unit Paver, Ground and Blasted Finish

PERMEABLE PAVING

Pedestrian Permeable Paving

Vehicular Permeable Paving

SIDEWALK

CIP Concrete
Natural Gray with Silica Carbide & Water Jet Finish

WARNING PAVING

Warning Pavers
Cast Iron

Warning Pavers Alt 1
Precast Concrete

TREE WELL SURFACING

4x4 Cobble Stone with Flamed Finish

TREE TRUNK OPENING MULCH

Gravel Mulch

Figure 5.20 – 2: *Street Material Palette*

5.21 STREET FURNISHINGS

Seating, Receptacles, Bike Racks, Other Amenities

Furnishings are intended to be amenities which support a wide variety of activities. The primary materials for furnishings are steel and wood—for durability and comfort.

Pictured to the right are suggested site furnishings that show the recommended character consisting of naturally weathered materials and finishes which should be coordinated across the site to ensure continuity.

STANDARDS

S.5.21.1 Locations

Site furnishings shall be located within the furnishing zones parallel to the curb per BSG.

S.5.21.2 Bike Rack

Selected bike racks shall not have circular tubes, shall provide secure mounting, employ durable materials that do not require maintenance and shall meet additional requirements in the SFMTA Bicycle Rack Specifications.

GUIDELINES

G.5.21.1 Litter & Recycling Receptacles

Litter & recycling receptacles shall be provided when regular maintenance and cleaning is available. They shall be attractive site furnishings which contribute to the quality of the street and provide options for landfill, recycling and compost. They should also be able to open from the side to allow easy access for maintenance. Waste receptacles shall be located at areas of high pedestrian traffic, such as near pedestrian crossings.

Figure 5.21 – 1: *Street Furnishing Palette*

BENCHES

Manufactured Bench with Back Metal and Wood Finish or Similar

Manufactured Bench without Back, Metal and Wood Finish or Similar

BOLLARD

*Bollard, **Metal Finish** or Similar*

BIKE RACK

Square Stainless or Galvanized Steel Tube Section or Similar

LITTER + RECYCLING RECEPTACLES

***Trash and Recycling Receptacles, Metal Finish** or Similar*

5.22 STREET LIGHTING

Street lighting at the Balbao Reservoir site is an important component of the streetscape design. It is an important site furnishing which helps to establish a sense of continuity and cohesivenesses of the neighborhood and a heirarchy of primary and secondary streets. The quality and intensity of the light provides neighborhood character, as well as a sense of safety and security.

STANDARDS

S.5.22.1 Light Level

Light levels shall meet SFPUC standards and comply with Illuminating Engineering Society Standards appropriate to the subject street type.

S.5.22.2 Fixtures

Light fixtures within the ROW shall comply with SPFUC guidelines and shall be selected from the SFPUC catalogue of acceptable fixtures.

S.5.22.3 Lighting Design Intent

A hierarchy of street lights shall be used to create ambient light, visual rhythm and to highlight key pedestrian routes and connections. Metal finishes and colors shall be coordinated with other site furnishings and building color palette.

S.5.22.4 Locations

All street lights shall be located within the furnishing zones per BSG.

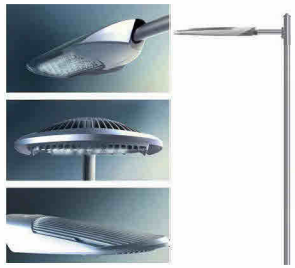
S.5.22.5 Scale of Light Fixtures

Lighting shall satisfy functional needs of auto circulation but also be scaled to the pedestrian and bicycle experience. Lighting shall be coordinated with the design of the open space lighting, and glare shall not be created at eye level.

PEDESTRIAN LIGHT

Manufactured Pedestrian Light, Metal Finish or Similar

POLE LIGHT



Manufactured Pole Light from DPW Light Fixture List, Metal Finish or Similar

Pole Light: Hess 'Linea 600 LED' or similar

Figure 5.22 – 1: *Street Lighting Palette*

APPENDIX A – PRELIMINARY GEOTECHNICAL REPORT

DRAFT

ROCKRIDGE GEOTECHNICAL

Prepared for **BRIDGE Housing Corporation**

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT AT BALBOA RESERVOIR
PHELAN AND OCEAN AVENUES
SAN FRANCISCO, CALIFORNIA

January 22, 20118
Project No. 17-1425

270 Grand Avenue
Oakland, CA 94610

www.rockridgegeo.com

510 420-5738 tel
510 652-3096 fax

DRAFT

ROCKRIDGE GEOTECHNICAL

January 22, 2018
Project No. 17-1425

Mr. Justin Lai
Investment Analyst
BRIDGE Housing Corporation
600 California Street, Suite 900
San Francisco, California 94108

Subject: Preliminary Geotechnical Investigation
Proposed Residential Development at Balboa Reservoir Site
Phelan and Ocean Avenues
San Francisco, California

Dear Mr. Lai:

We are pleased to present the results of our preliminary geotechnical investigation for the proposed residential development to be constructed at the Balboa Reservoir site in San Francisco. Our services were provided in accordance with our proposal dated October 26, 2017 and a Budget Increase Request dated January 2, 2018.

The project site consists of a rectangular-shaped, 17-acre lot on the western side of Phelan Avenue, north of its intersection with Ocean Avenue. The site is bordered by Riordan High School to the north, single-family residential developments to the west, multi-story mixed-used buildings to the south, and a parking lot and multi-use building for the City College of San Francisco (CCSF). The site, which was previously excavated up to 15 feet below original grades for a planned reservoir, is currently an asphalt-paved parking lot used for CCSF student parking.

Current plans are to construct a 1,100-unit residential development which will consist of clusters of residential buildings separated by landscaped areas, walkways and parks. The buildings will be constructed near the existing grades and will consist of residential units of Type 5 construction over one-story concrete (Type I) podiums.

From a geotechnical standpoint, we conclude the site can be developed as planned, provided the recommendations presented in this report are incorporated into the project plans and specifications and implemented during construction. The primary geotechnical issues affecting the proposed development include site grading and support of the proposed structures. We preliminarily conclude the proposed buildings should be supported on conventional spread footings that gain support on undisturbed native soil or engineered fill.

This report presents our preliminary conclusions and recommendations regarding foundation design, earthwork and grading, seismic design, and other geotechnical aspects of the project. The recommendations contained in our report are based on limited subsurface exploration and review of available data for the site, and are not intended for final design. Final geotechnical design values should be confirmed by a detailed geotechnical investigation. In addition, variations between expected and actual soil conditions may be found in localized areas during construction. Therefore, we should be engaged to observe shoring and foundation installation, and fill placement, during which time we may make changes in our recommendations, if deemed necessary.

We appreciate the opportunity to provide our services to you on this project. If you have any questions, please call.

Sincerely,
ROCKRIDGE GEOTECHNICAL, INC.

DRAFT

Clayton J. Proto, P.E.
Project Engineer

DRAFT

Craig S. Shields, P.E., G.E.
Principal Engineer

Enclosure

ROCKRIDGE GEOTECHNICAL

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ROCKRIDGE GEOTECHNICAL

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT AT BALBOA RESERVOIR
PHELAN AND OCEAN AVENUES
San Francisco, California

1.0 INTRODUCTION

This report presents the results of the preliminary geotechnical investigation performed by Rockridge Geotechnical, Inc. (Rockridge) for the proposed residential development to be constructed at the Balboa Reservoir site in San Francisco, California.

The project site consists of a rectangular-shaped, 17-acre lot on the western side of Phelan Avenue, north of its intersection with Ocean Avenue, as shown on Figure 1, Site Location Map. The site is bordered by Riordan High School to the north, single-family residences to the west, multi-story mixed-used buildings to the south, and a parking lot and multi-use building for the City College of San Francisco (CCSF) to the east. The site is currently an asphalt-paved parking lot used for CCSF student parking. The central portion of the site was previously excavated up to 15 feet below original grades for a planned reservoir, and an embankment up to about 30 feet tall was constructed along the western portion of the site.

Plans are to construct a 1,100-unit residential development which will consist of clusters of residential buildings separated by landscaped areas, walkways and parks. The buildings will consist of residential units of Type 5 construction over one-story concrete (Type I) podiums.

2.0 SCOPE OF SERVICES

Our investigation was performed in accordance with our Proposal for Preliminary Geotechnical Investigation with BRIDGE Housing, dated October 27, 2017, and a subsequent Budget Increase Request dated January 2, 2018. Our scope of services consisted of reviewing available geologic maps and geotechnical reports of the site and vicinity, exploring subsurface conditions at the site by performing six cone penetration tests (CPTs), advancing four exploratory borings, and performing engineering analyses to develop preliminary conclusions and recommendations regarding:

- site seismicity and seismic hazards, including the potential for liquefaction and liquefaction-induced ground failure
- the most appropriate foundation type(s) for the proposed structures
- preliminary design criteria for the recommended foundation type(s)
- estimates of foundation settlement
- 2016 San Francisco Building Code (SFBC) site class and design spectral response acceleration parameters
- construction considerations.

3.0 FIELD INVESTIGATION

Prior to performing the subsurface field investigation, we obtained a permit from the San Francisco Department of Public Health (SFDPH) and contacted Underground Service Alert (USA) to notify them of our work, as required by law. We also retained Precision Locating LLC, a private utility locator, to minimize the likelihood that an underground utility was encountered during our investigation. Details of the field exploration are described below.

3.1 Test Borings

Four borings, designated B-1 through B-4, were drilled on January 3, 2018 by Benevent Building of Concord, California at the approximate locations shown on Figure 2. Borings B-1, B-2, B-3, and B-4 were drilled to depths of about 26, 26, 11, and 6 feet bgs, respectively, using a limited-access drill rig equipped with solid flight augers. During drilling, our field engineer logged the soil encountered and obtained representative samples for visual classification and laboratory testing. The logs of the borings are presented on Figures A-1 through A-4 in Appendix A. The soil encountered in the borings was classified in accordance with the classification chart shown on Figure A-5.

Soil samples were obtained using a Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside and 1.5-inch inside diameter, without liners. The sampler was driven with an above-ground, 140-pound, hammer falling 30 inches per drop using a rope and cathead. The samplers were driven up to 18 inches and the hammer blows required to drive the samplers were

recorded every six inches and are presented on the boring logs. A "blow count" is defined as the number of hammer blows per six inches of penetration or 50 blows for six inches or less of penetration. The blow counts required to drive the SPT samplers were converted to approximate SPT N-values using factors of 1.2, respectively, to account for approximate hammer energy and the fact that the sampler was sized to accommodate liners, but was driven without liners. The blow counts used for this conversion were: (1) the last two blow counts if the sampler was driven more than 12 inches, (2) the last one blow count if the sampler was driven more than six inches but less than 12 inches, and (3) the only blow count if the sampler was driven six inches or less. The converted SPT N-values are presented on the boring logs.

Upon completion of drilling, the boreholes were backfilled with cement grout in accordance with SFDPH standards. The soil cuttings generated by the borings were spread in landscaping areas.

3.2 Cone Penetration Tests

Six CPTs, designated CPT-1 through CPT-6, were advanced on January 3, 2017 by Middle Earth GeoTesting of Orange, California at the approximate locations shown on the Site Plan, Figure 2. The CPTs were advanced until practical refusal was met in very dense sand, which occurred at depths ranging from approximately 5 to 46 feet below ground surface (bgs). The CPTs were performed with a truck-mounted rig hydraulically pushing a 1.7-inch-diameter cone-tipped probe into the ground. The probe measured tip resistance, pore water pressure, and frictional resistance on a sleeve behind the cone tip. Electrical sensors within the cone continuously measured these parameters for the entire depth advanced, and the readings were digitized and recorded by a computer. Accumulated data were processed by computer to provide engineering information such as soil behavior types, correlated strength characteristics, and estimated liquefaction resistance of the soil encountered. The CPT logs, showing tip resistance, friction ratio, pore water pressure, and soil behavior type, are shown on Figures A-6 through A-12 in Appendix A. Upon completion, the CPT holes backfilled with neat cement grout in accordance with SFDPH requirements.

4.0 SITE AND SUBSURFACE CONDITIONS

We understand the site is currently owned by the San Francisco Public Utilities Commission, and was originally planned for use as a municipal water reservoir. Although the site was never used as a reservoir, the central portion of the site was excavated down approximately 15 feet and an embankment approximately 30 feet tall was constructed along the western and southern boundary. The southern embankment was removed in 2008, and a new embankment was constructed along the eastern site boundary between 2008 and 2009. The central, depressed portion of the site is currently occupied by an asphalt parking lot.

As presented on the Regional Geologic Map (Figure 3), the site is mapped in a zone of early-Pleistocene alluvium (Qoa) (Graymer, 2006). Based on the results of our investigation and our understanding of the site history, we conclude the non-embankment portion of the site is underlain by a deposit of medium dense to very dense silty sand with occasional clay interbeds, known locally as the Colma formation. The Colma formation extends to a depth of at least 46 feet bgs at location CPT-6, the maximum depth explored. The embankment consists of sand fill which was likely excavated onsite and re-worked. Documentation of the embankment construction was not available; however, the results of our investigation indicates that the fill appears to have been well-compacted and is generally dense to very dense in consistency.

Free groundwater was not observed in our borings. We reviewed the results of a 2010 geotechnical investigation performed by Fugro, Inc for a development on Phelan Loop immediately southeast of the site. In this investigation, groundwater was encountered in one boring at a depth of about 22 feet bgs, while a second boring drilled to 40 feet did not encounter groundwater. To better estimate the highest potential groundwater level at the site, we also reviewed information on the State of California Water Resources Control Board GeoTracker website (http://geotracker.waterboards.ca.gov/). The closest site with groundwater information on the GeoTracker website is at 1490 Ocean Avenue, which is about 600 feet west of the subject property. Recorded depths to groundwater at the 1490 Ocean Avenue site has fluctuated from about 18 to 33 feet bgs during the time period of 2002 to 2012. Ground surface elevations at 1490 Ocean Avenue are approximately 20 feet below existing grades at the Balboa Reservoir

site. The groundwater level at the site is expected to fluctuate several feet seasonally with potentially larger fluctuations annually, depending on the amount of rainfall. Based on available data, we conclude a design high groundwater level of 20 feet bgs could be used for preliminary design.

5.0 SEISMIC CONSIDERATIONS

The San Francisco Bay Area is considered to be one of the more seismically active regions in the world. We preliminarily evaluated the potential for earthquake-induced geologic hazards including ground shaking, ground surface rupture, liquefaction,[1] lateral spreading,[2] and cyclic densification[3]. The results of our evaluation regarding seismic considerations for the project site are presented in the following sections.

5.1 Regional Seismicity and Faulting

The major active faults in the area are the Hayward, San Andreas, and Calaveras faults. These and other faults of the region are shown on Figure 4. The fault systems in the Bay Area consist of several major right-lateral strike-slip faults that define the boundary zone between the Pacific and the North American tectonic plates. Numerous damaging earthquakes have occurred along these fault systems in recorded time. For these and other active faults within a 50-kilometer radius of the site, the distance from the site and estimated mean characteristic moment magnitude[4] [Working Group on California Earthquake Probabilities (WGCEP, 2008) and Cao et al. (2003)] are summarized in Table 2.

---

1 Liquefaction is a phenomenon where loose, saturated, cohesionless soil experiences temporary reduction in strength during cyclic loading such as that produced by earthquakes.

2 Lateral spreading is a phenomenon in which surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. Upon reaching mobilization, the surficial blocks are transported downslope or in the direction of a free face by earthquake and gravitational forces.

3 Cyclic densification is a phenomenon in which non-saturated, cohesionless soil is compacted by earthquake vibrations, causing ground-surface settlement.

4 Moment magnitude is an energy-based scale and provides a physically meaningful measure of the size of a faulting event. Moment magnitude is directly related to average slip and fault rupture area.

TABLE 2
Regional Faults and Seismicity

Fault Segment	Approximate Distance from Site (km)	Direction from Site	Mean Characteristic Moment Magnitude
N. San Andreas - Peninsula	5	West	7.20
N. San Andreas (1906 event)	5	West	8.05
San Gregorio Connected	12	West	7.50
N. San Andreas - North Coast	12	West	7.51
Total Hayward	24	Northeast	7.00
Total Hayward-Rodgers Creek	24	Northeast	7.33
Monte Vista-Shannon	37	Southeast	6.50
Mount Diablo Thrust	40	East	6.70
Rodgers Creek	40	North	7.07
Total Calaveras	41	East	7.03
Point Reyes	41	Northwest	6.90
Green Valley Connected	45	East	6.80

Since 1800, four major earthquakes (i.e., Magnitude > 6) have been recorded on the San Andreas fault. In 1836, an earthquake with an estimated maximum intensity of VII on the Modified Mercalli (MM) Intensity Scale occurred east of Monterey Bay on the San Andreas fault (Toppozada and Borchardt 1998). The estimated moment magnitude, M_w, for this earthquake is about 6.25. In 1838, an earthquake occurred on the Peninsula segment of the San Andreas fault. Severe shaking occurred with an MM of about VIII-IX, corresponding to an M_w of about 7.5. The San Francisco Earthquake of 1906 caused the most significant damage in the history of the Bay Area in terms of loss of lives and property damage. This earthquake created a surface rupture along the San Andreas fault from Shelter Cove to San Juan Bautista approximately 470 kilometers in length. It had a maximum intensity of XI (MM), an M_w of about 7.9, and was felt 560 kilometers away in Oregon, Nevada, and Los Angeles. The Loma Prieta Earthquake of

October 17, 1989 had an M_w of 6.9 and occurred about 92 kilometers southeast of the site. On August 24, 2014 an earthquake with an estimated maximum intensity of VIII (severe) on the MM scale occurred on the West Napa fault. This earthquake was the largest earthquake event in the San Francisco Bay Area since the Loma Prieta Earthquake. The M_w of the 2014 South Napa Earthquake was 6.0.

In 1868, an earthquake with an estimated maximum intensity of X on the MM scale occurred on the southern segment (between San Leandro and Fremont) of the Hayward fault. The estimated M_w for the earthquake is 7.0. In 1861, an earthquake of unknown magnitude (probably an M_w of about 6.5) was reported on the Calaveras fault. The most recent significant earthquake on this fault was the 1984 Morgan Hill earthquake (M_w = 6.2).

The U.S. Geological Survey's 2014 Working Group on California Earthquake Probabilities has compiled the earthquake fault research for the San Francisco Bay area in order to estimate the probability of fault segment rupture. They have determined that the overall probability of moment magnitude 6.7 or greater earthquake occurring in the San Francisco Region during the next 30 years (starting from 2014) is 72 percent. The highest probabilities are assigned to the Hayward fault, Calaveras fault, and the northern segment of the San Andreas fault. These probabilities are 14.3, 7.4, and 6.4 percent, respectively.

5.2 Geologic Hazards

During a major earthquake on a segment of one of the nearby faults, strong to very strong ground shaking is expected to occur at the project site. Strong shaking during an earthquake can result in ground failure such as that associated with soil liquefaction, lateral spreading, and cyclic densification. We used the results of the CPTs and borings performed for this investigation to evaluate the potential of these phenomena occurring at the project site.

5.2.1 Ground Shaking

The ground shaking intensity felt at the project site will depend on: 1) the size of the earthquake (magnitude), 2) the distance from the site to the fault source, 3) the directivity (focusing of

earthquake energy along the fault in the direction of the rupture), and 4) site-specific soil conditions. The site is 5 kilometers from the San Andreas fault. Therefore, the potential exists for a large earthquake to induce strong to violent ground shaking at the site during the life of the project.

5.2.2 Liquefaction and Liquefaction-Induced Settlement

When a saturated, cohesionless soil liquefies, it experiences a temporary loss of shear strength created by a transient rise in excess pore pressure generated by strong ground motion. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits. Flow failure, lateral spreading, differential settlement, loss of bearing strength, ground fissures and sand boils are evidence of excess pore pressure generation and liquefaction. The site mapped outside of a liquefaction hazard zone, as shown on Figure 5 from the map titled *State of California, Seismic Hazard Zones, City and County of San Francisco, Official Map*, prepared by the California Geological Survey (CGS) and dated November 17, 2000.

Liquefaction susceptibility was assessed using the software CLiq v2.1 (GeoLogismiki, 2017). CLiq uses measured field CPT data and assesses liquefaction potential, including post-earthquake vertical settlement, given a user-defined earthquake magnitude and peak ground acceleration (PGA). We performed a liquefaction triggering analysis using our CPT data in accordance with the methodology by Boulanger and Idriss (2014).

Our analyses were performed using a "during earthquake" groundwater depth of 20 feet bgs. In accordance with the 2016 San Francisco Building Code (SFBC), we used a peak ground acceleration of 0.76 times gravity (g) in our liquefaction evaluation; this peak ground acceleration is consistent with the Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration adjusted for site effects (PGA_M). We also used a moment magnitude of 8.05, corresponding to the mean characteristic moment magnitude of the San Andreas fault (Table 2).

The results of our liquefaction analysis indicate the soil at the site is sufficiently dense to resist liquefaction. Therefore, we preliminarily conclude that the potential for liquefaction and associated surface manifestations, such as settlement, loss of bearing capacity, sand boils, and lateral spreading, are nil.

5.2.3 Cyclic Densification

Cyclic densification (also referred to as differential compaction) of non-saturated sand (sand above groundwater table) can occur during an earthquake, resulting in settlement of the ground surface and overlying improvements. The CPTs indicate that the soil above the groundwater table at the site consists predominantly of dense to very dense silty sand, which is not susceptible to cyclic densification. Therefore, we preliminarily conclude that the potential for cyclic densification is nil.

5.2.4 Ground Surface Rupture

Historically, ground surface displacements closely follow the trace of geologically young faults. The site is not within an Earthquake Fault Zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Act, and no known active or potentially active faults exist on the site. We therefore conclude the risk of fault offset at the site from a known active fault is very low. In a seismically active area, the remote possibility exists for future faulting in areas where no faults previously existed; however, we conclude the risk of surface faulting and consequent secondary ground failure from previously unknown faults is also very low.

6.0 PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our engineering analyses using the data from the CPTs, we conclude there are no major geotechnical or geological issues that would preclude development of the site as proposed. The primary geotechnical issues affecting the proposed development include site grading and support of the proposed structures. These issues, as well as construction considerations and seismic design, are discussed in more detail in the following sections.

6.1 Foundations and Settlement

The results of borings and CPTs performed at the site indicate the central portion of the site is underlain by dense to very dense silty sand of the Colma formation. The western portion of the site is currently occupied by an embankment which measures approximately 30 feet high and has a footprint approximately 180 feet wide (east-west) and 1000 feet long (north-south). The embankment was likely constructed using soil excavated from the central portion of the site. We understand that current plans are to remove the western embankment and use the material to raise grades across the site. If spread uniformly, we estimate that this grading would raise site grades by approximately 4 to 5 feet; therefore, it is likely that some or all of the proposed structures will bottom in the newly placed fill. Provided that this fill is properly placed and well-compacted, we conclude conventional spread footings are appropriate for foundation support.

We preliminarily recommend that spread footings be designed using an allowable bearing pressure of 7,000 pounds per square foot (psf) for dead-plus-live loads; this pressure may be increased by one-third for total design loads, which include wind or seismic forces. Estimated total settlements will be on the order of 3/4 inch and differential settlement will be on the order of 1/2 inch over a 30-foot horizontal distance. Continuous footings should be at least 18 inches wide and isolated spread footings should be at least 36 inches wide. Footings should extend at least 18 inches below the lowest adjacent soil subgrade.

Lateral loads may be resisted by a combination of friction along the base of the footing and passive resistance against the vertical faces of the footing. To compute lateral resistance, we recommend using an equivalent fluid weight of 330 pounds per cubic foot (pcf); the upper foot

of soil should be ignored unless confined by a slab or pavement. Frictional resistance should be computed using a base friction coefficient of 0.40 where the footing is in direct contact with soil. The passive pressure and frictional resistance values include a factor of safety of at least 1.5 and may be used in combination without reduction.

6.2 Construction Considerations

Site demolition should include the removal of all existing improvements, including pavements, underground utilities, and buried foundations. In general, abandoned underground utilities should be removed to the property line or service connections and properly capped or plugged with concrete. Where existing utility lines are outside of the proposed building footprint and will not interfere with the proposed construction, they may be abandoned in-place provided the lines are filled with lean concrete or cement grout to the property line. Voids resulting from demolition activities should be properly backfilled with compacted fill following the recommendations provided later in this section.

The exposed soil subgrade is expected to generally consist of dense to very dense sand. However, if loose sand or weak clay is encountered, those materials should be removed and replaced with either properly compacted fill or lean concrete.

In areas that will receive fill, the soil subgrade exposed should be scarified to a depth of at least eight inches, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction[5]. The soil subgrade should be compacted to at least 95 percent relative compaction if the soil consists of clean sand or gravel (defined as soil with less than 10 percent fines passing the No. 200 sieve). The soil subgrade should be kept moist until it is covered by fill.

Fill should consist of on-site soil or imported soil (select fill) that is free of organic matter, contains no rocks or lumps larger than three inches in greatest dimension, has a liquid limit of

[5] Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same material, as determined by the ASTM D1557 laboratory compaction procedure.

less than 40 and a plasticity index lower than 12, and is approved by the Geotechnical Engineer. It is anticipated that the embankment material will meet these criteria. Samples of proposed imported fill material should be submitted to the Geotechnical Engineer at least three business days prior to use at the site. The grading contractor should provide analytical test results or other suitable environmental documentation indicating the imported fill is free of hazardous materials at least three days before use at the site. If this data is not available, up to two weeks should be allowed to perform analytical testing on the proposed imported material.

Fill should be placed in horizontal lifts not exceeding eight inches in uncompacted thickness, moisture-conditioned to above optimum moisture content, and compacted to at least 90 percent relative compaction. Fill consisting of clean sand or gravel (defined as soil with less than 10 percent fines by weight) should be compacted to at least 95 percent relative compaction. Fill greater than five feet in thickness, fill placed below proposed foundations, or fill placed within the upper foot of vehicular pavement soil subgrade should also be compacted to at least 95 percent relative compaction.

6.3 Soil Corrosivity

Corrosivity analyses were performed by Project X Corrosion Engineering on a sample of the native soil from boring B-2 at a depth of 15 feet bgs. The results of the tests are presented in Appendix B of this report. Based on the results of the laboratory corrosivity analyses performed on the samples, we conclude the soil is "negligibly corrosive" to metal with respect to resistivity, sulfate ion concentration, and pH. The chloride ion concentration classifies as "mildly corrosive". Accordingly, all buried metallic structures and reinforcing steel in concrete structures should be protected against corrosion depending upon the critical nature of the structure. If it is necessary to have metal in contact with soil, a corrosion engineer should be consulted to provide recommendations for corrosion protection.

6.4 Seismic Design

We anticipate the proposed building will be designed using the seismic provisions in the 2016 San Francisco Building Code (SFBC). We preliminarily conclude a Site Class D designation should be used for seismic design. The latitude and longitude of the site are 37.7238° and -122.4553°, respectively. In accordance with the 2016 CBC, we recommend the following:

- S_S = 1.937g, S_1 = 0.907g
- S_{MS} = 1.937g, S_{M1} = 1.361g
- S_{DS} = 1.291g, S_{D1} = 0.907g
- Seismic Design Category E for Risk Categories I, II, and III.

7.0 ADDITIONAL GEOTECHNICAL SERVICES

The preliminary conclusions and recommendations presented within are based on a preliminary field investigation and not intended for final design. Prior to final design, we should be retained to provide a final geotechnical report based on a supplemental field investigation. Additional borings and CPTs will be required to further evaluate the subsurface conditions beneath the site and develop final foundation design recommendations. After our final report has been completed and the design team has selected a foundation system, we should review the project plans and specifications prior to construction to check their conformance with the intent of our final recommendations. During construction, we should observe site preparation, foundation installation, and the placement and compaction of backfill. These observations will allow us to compare the actual with the anticipated soil conditions and to check if the contractor's work conforms with the geotechnical aspects of the plans and specifications.

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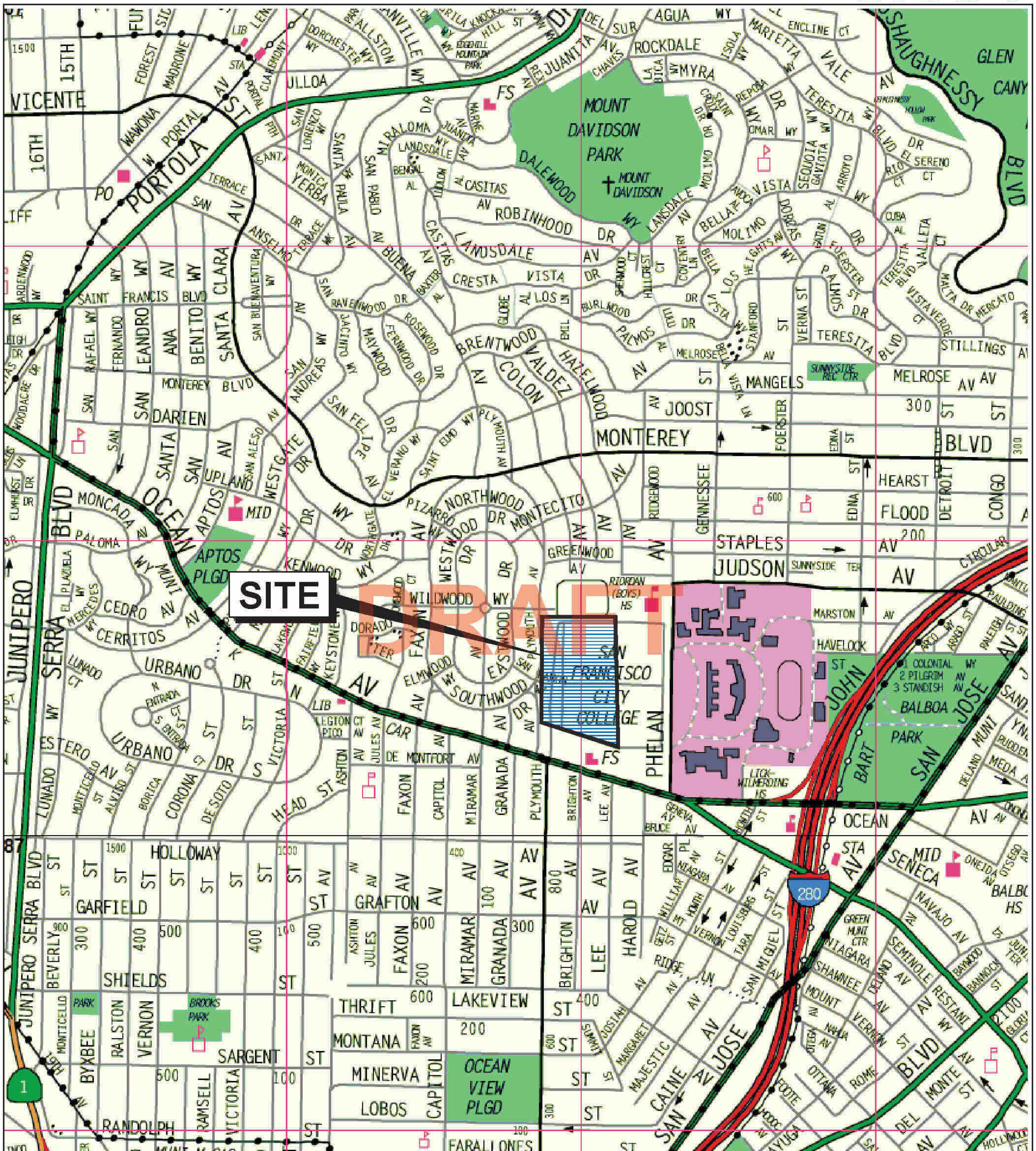
ROCKRIDGE GEOTECHNICAL

FIGURES

DRAFT



Base map: The Thomas Guide
San Francisco County
2002

0 1/4 1/2 Mile
Approximate scale

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE GEOTECHNICAL

SITE LOCATION MAP

Date 01/05/18	Project No. 17-1425	Figure 1

DRAFT

EXPLANATION

B-1 Approximate location of boring by Rockridge Geotechnical Inc., January 3, 2018

CPT-1 Approximate location of cone penetration test by Rockridge Geotechnical Inc., January 3, 2018

Project limits

N

0 150 Feet

Approximate scale

Base map: Google Earth, 2017.

BALBOA RESERVOIR
San Francisco, California

SITE PLAN

Date 01/10/18	Project No. 17-1425	Figure 2

ROCKRIDGE GEOTECHNICAL

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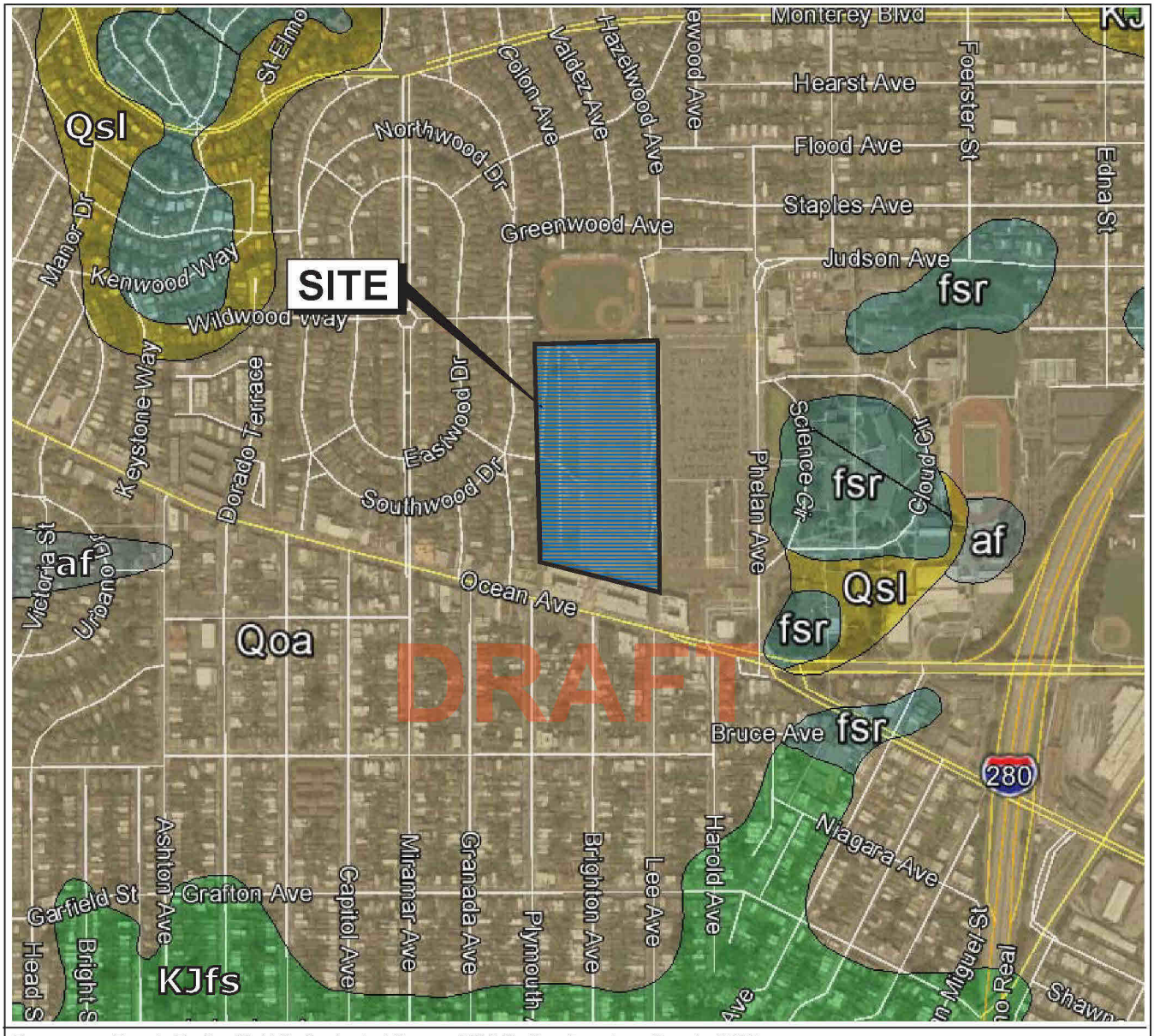

Base map: Google Earth with U.S. Geological Survey (USGS), San Francisco County, 2016.

EXPLANATION

af	Artificial Fill
Qsl	Hillslope Deposits (Quaternary)
Qoa	Alluvium (early Pleistocene)
KJfs	Franciscan Complex sedimentary rocks (Early Cretaceous and (or) Late Jurassic)
fsr	Franciscan Complex melange (Eocene, Paleocene, and (or) Late Cretaceous)

Geologic contact: dashed where approximate and dotted where concealed, queried where uncertin

N

0 800 1600 Feet

Approximate Scale

BALBOA RESERVOIR
San Francisco, California

REGIONAL GEOLOGIC MAP

ROCKRIDGE GEOTECHNICAL

Date 01/05/18 | Project No. 17-1425 | Figure 3

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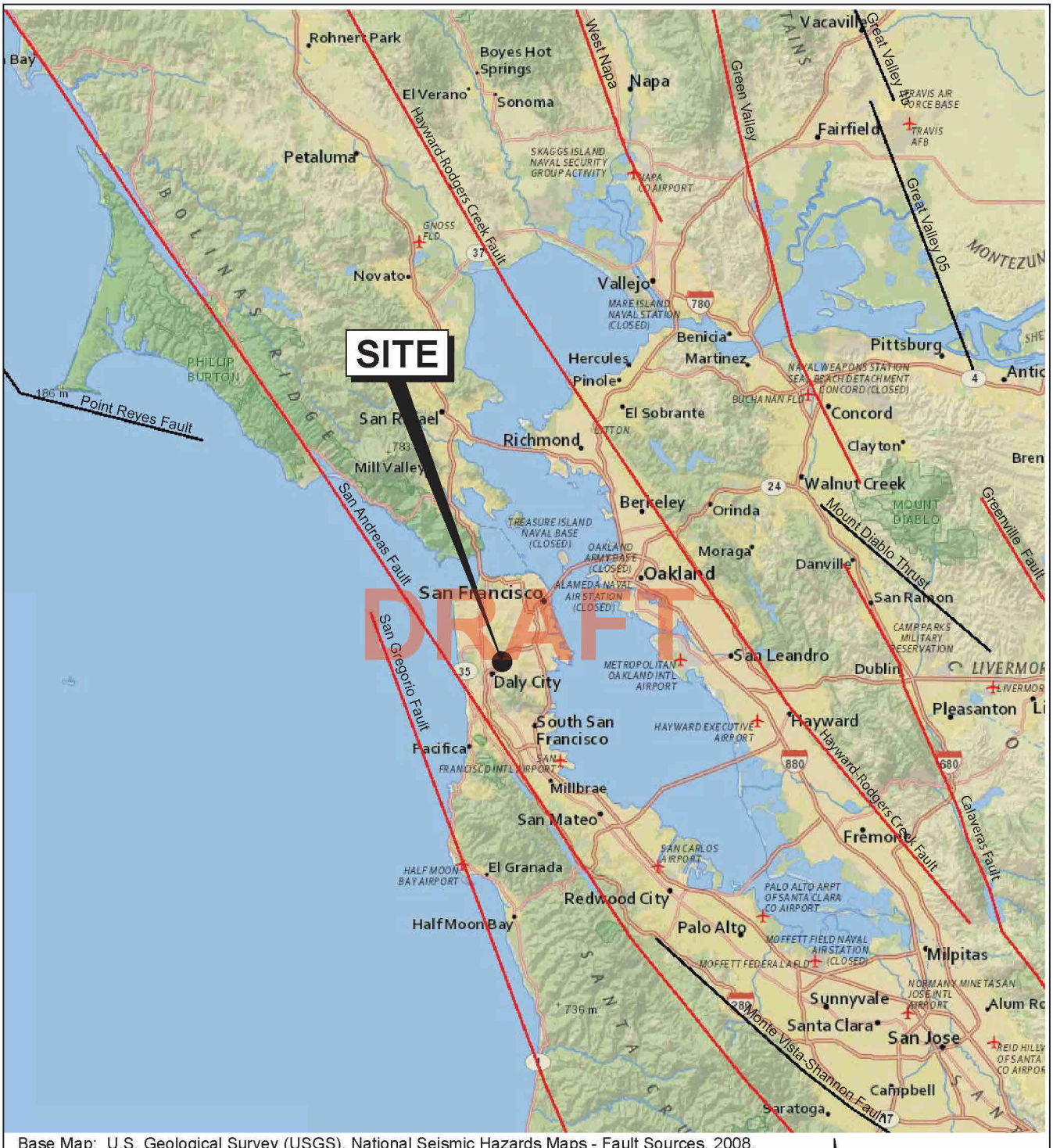


Base Map: U.S. Geological Survey (USGS), National Seismic Hazards Maps - Fault Sources, 2008.

EXPLANATION

- Strike slip
- Thrust (Reverse)
- Normal

0 5 10 Miles

Approximate scale

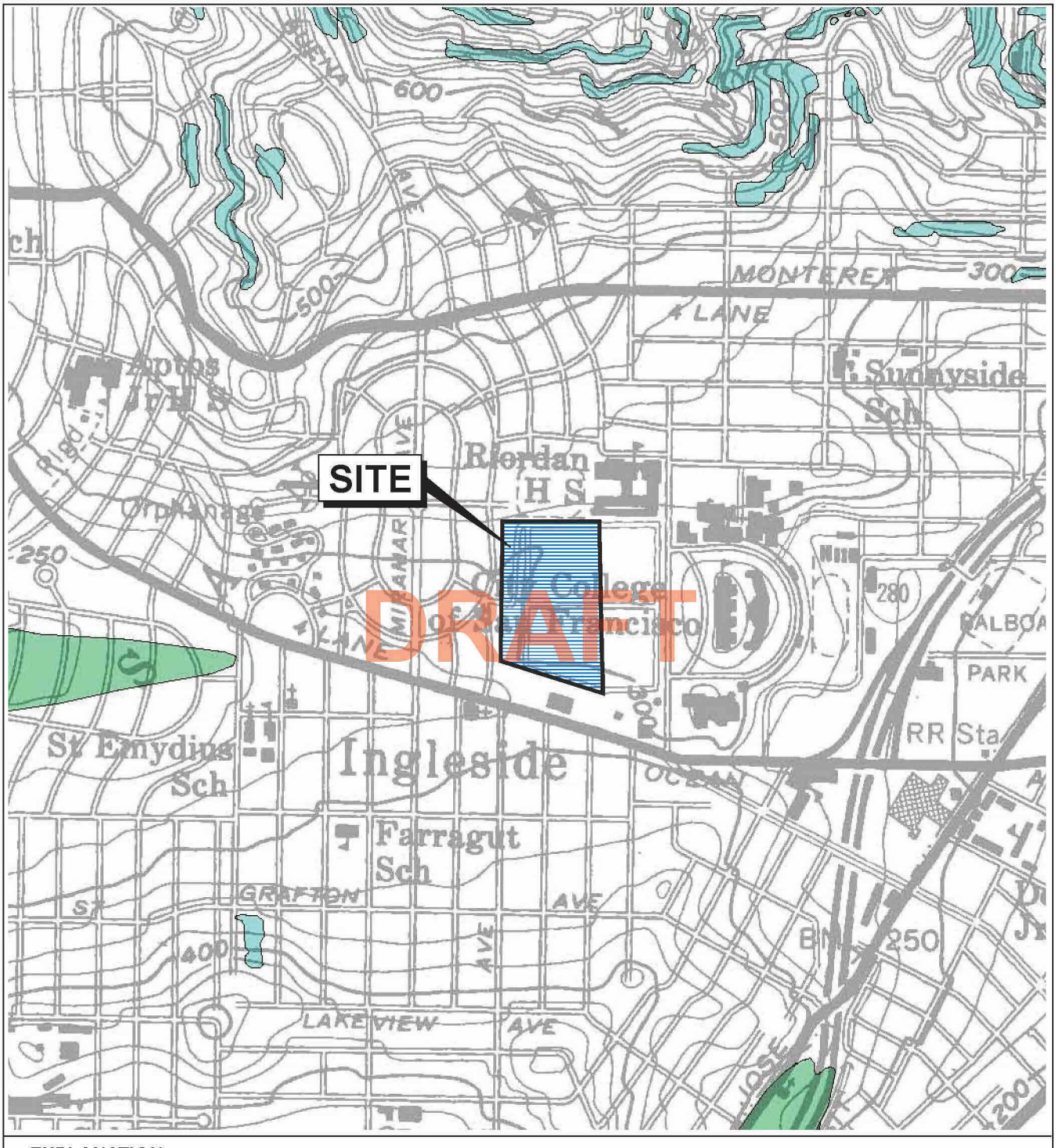
BALBOA RESERVOIR
San Francisco, California

REGIONAL FAULT MAP

ROCKRIDGE GEOTECHNICAL

Date 01/05/18	Project No. 17-1425	Figure 4

DRAFT



EXPLANATION

Liquefaction; Areas where historic occurence of liquefaction, or local topographic, geological, geotechnical, and subsurface water conditions indicate a potential for permanent ground displacements.

Earthquake-Induced Landslides; Areas where previous occurence of landslide movement, or local topographic, geological, geotechnical, and subsurface water conditions indicate a potential for permanent ground displacements.

0 1,000 2,000 Feet

Approximate scale

Reference:
State of California "Seismic Hazard Zones"
City and County of San Francisco
Released on November 17, 2000

BALBOA RESERVOIR
San Francisco, California

SEISMIC HAZARDS ZONE MAP

ROCKRIDGE GEOTECHNICAL

Date 01/05/18	Project No. 17-1425	Figure 5

ROCKRIDGE GEOTECHNICAL

APPENDIX A

Cone Penetration Test Results and Logs of Borings

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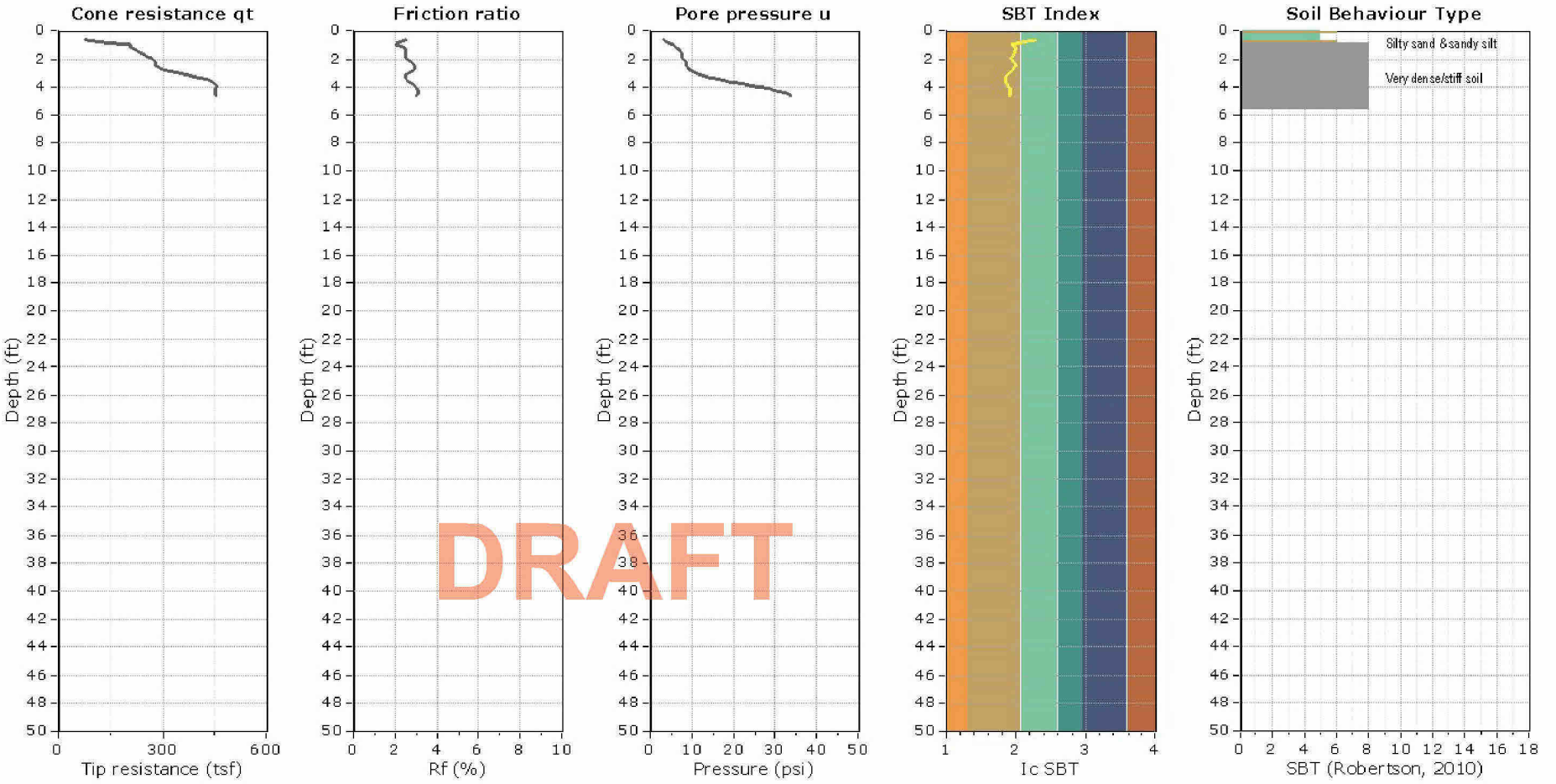

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Total depth: 4.59 ft, Date: 1/3/2018 (Refusal at 4.6 on second attempt)
Groundwater not measured
Cone Operator: Middle Earth Geo Testing, Inc.

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE GEOTECHNICAL

CONE PENETRATION TEST RESULTS
CPT-1

Date 01/16/18	Project No. 17-1425	Figure A-1

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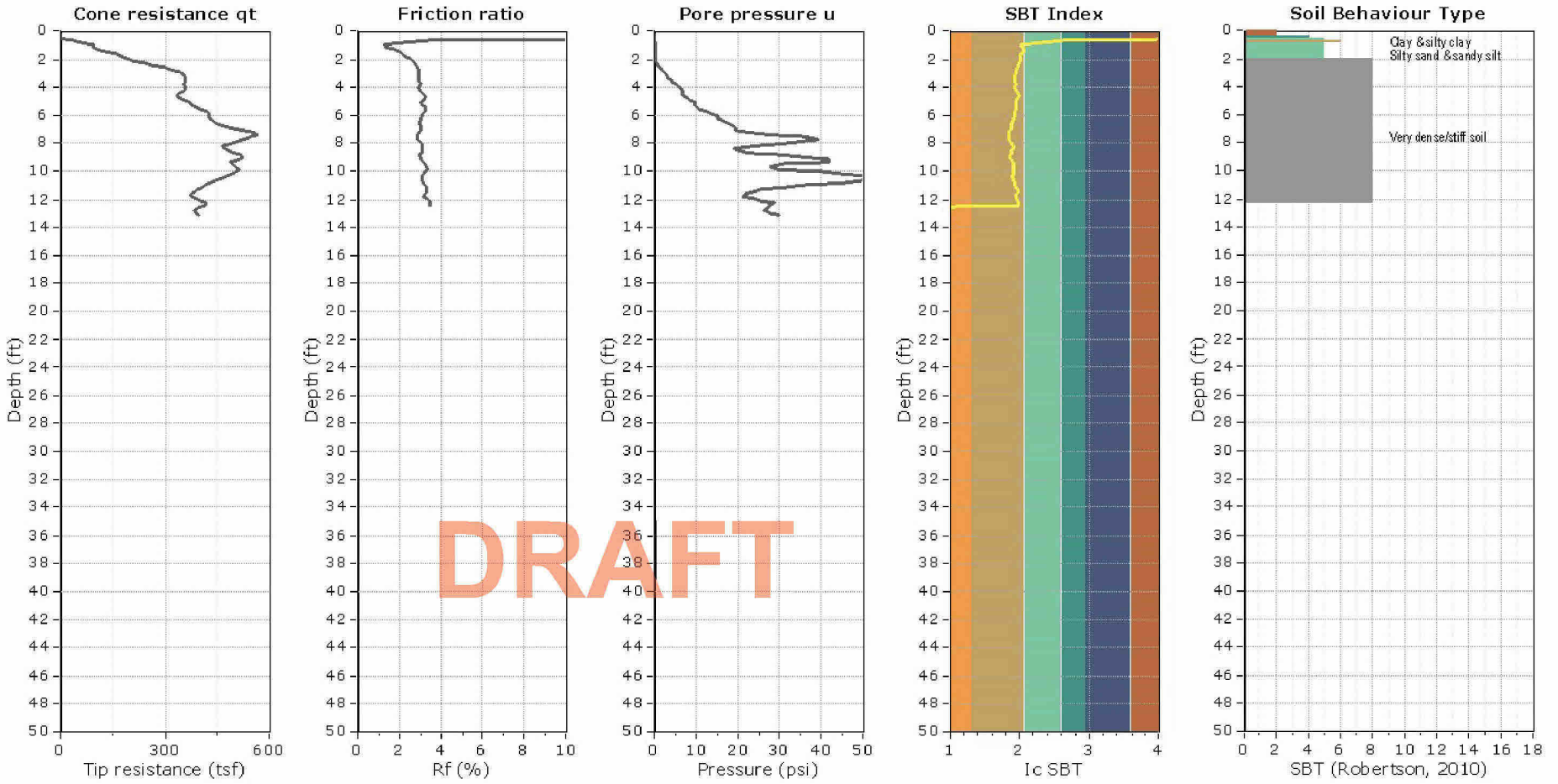

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Total depth: 13.12 ft, Date: 1/3/2018
Groundwater not measured
Cone Operator: Middle Earth Geo Testing, Inc.

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE GEOTECHNICAL

CONE PENETRATION TEST RESULTS
CPT-2

Date 01/16/18	Project No. 17-1425	Figure A-2

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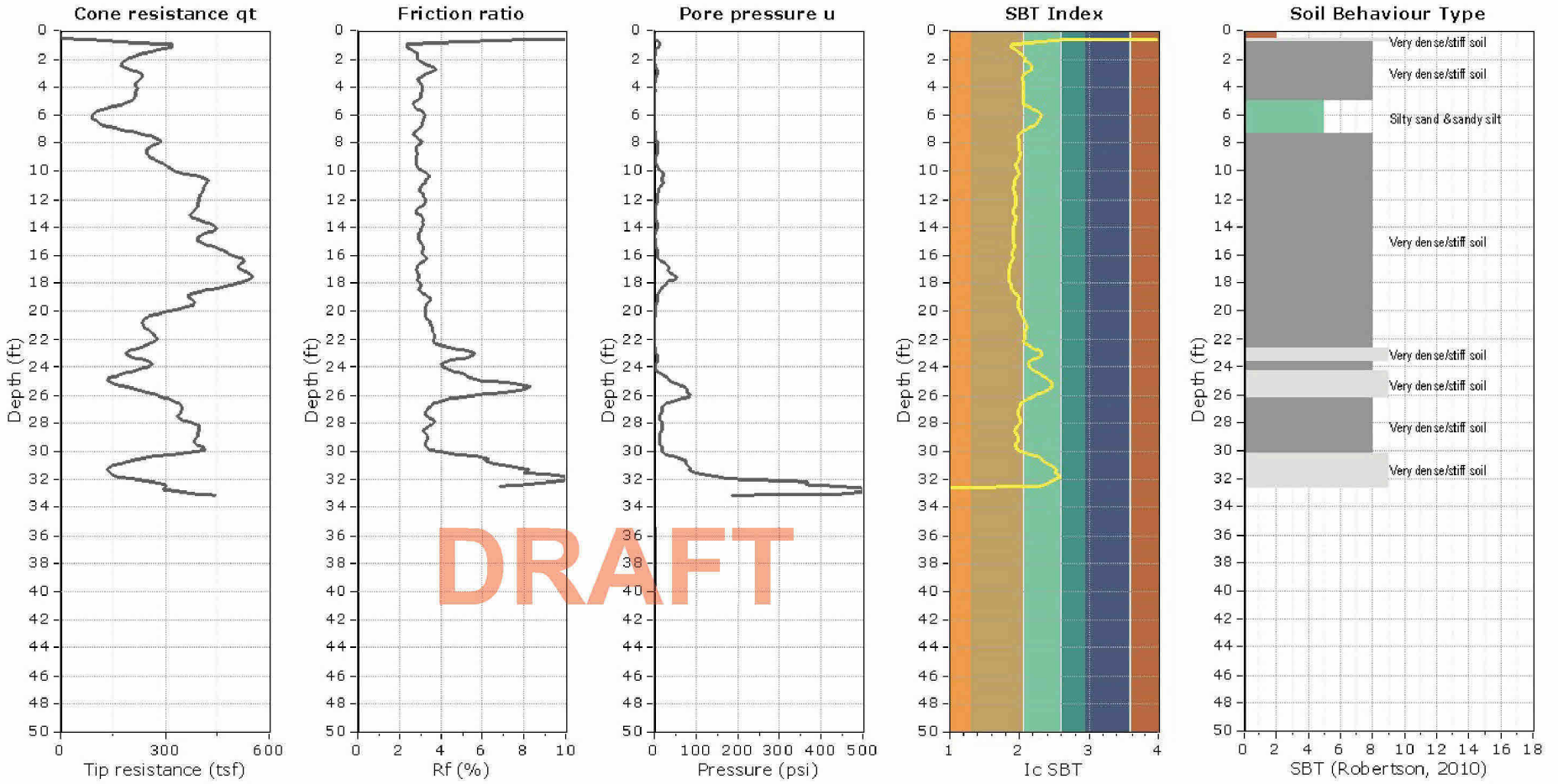

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Total depth: 33.14 ft, Date: 1/3/2018
Groundwater not measured
Cone Operator: Middle Earth Geo Testing, Inc.

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE GEOTECHNICAL

CONE PENETRATION TEST RESULTS
CPT-3

Date 01/16/18	Project No. 17-1425	Figure A-3

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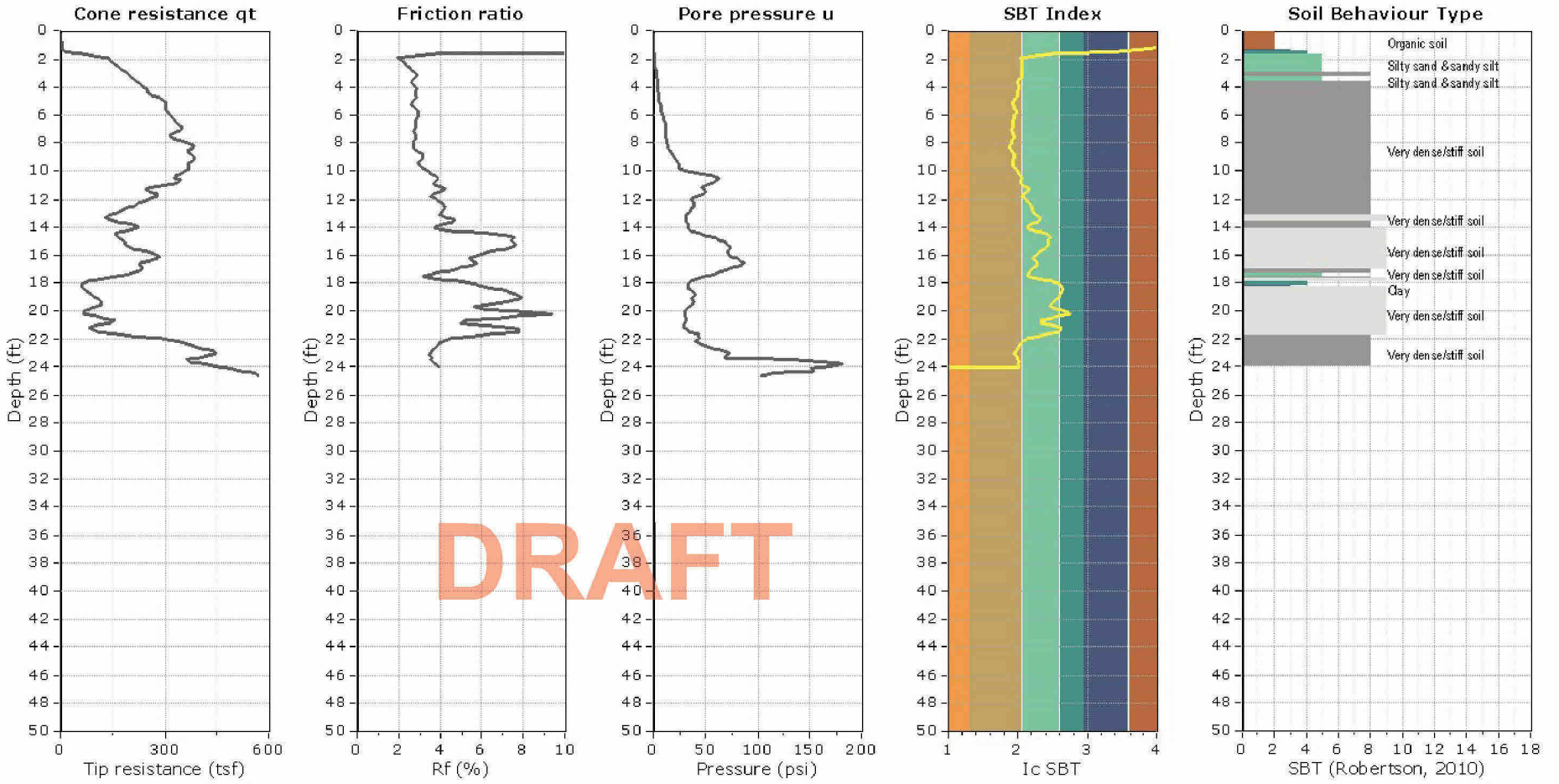

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Total depth: 24.61 ft, Date: 1/3/2018
Groundwater not measured
Cone Operator: Middle Earth Geo Testing, Inc.

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE GEOTECHNICAL

CONE PENETRATION TEST RESULTS
CPT-4

Date 01/16/18	Project No. 17-1425	Figure A-4

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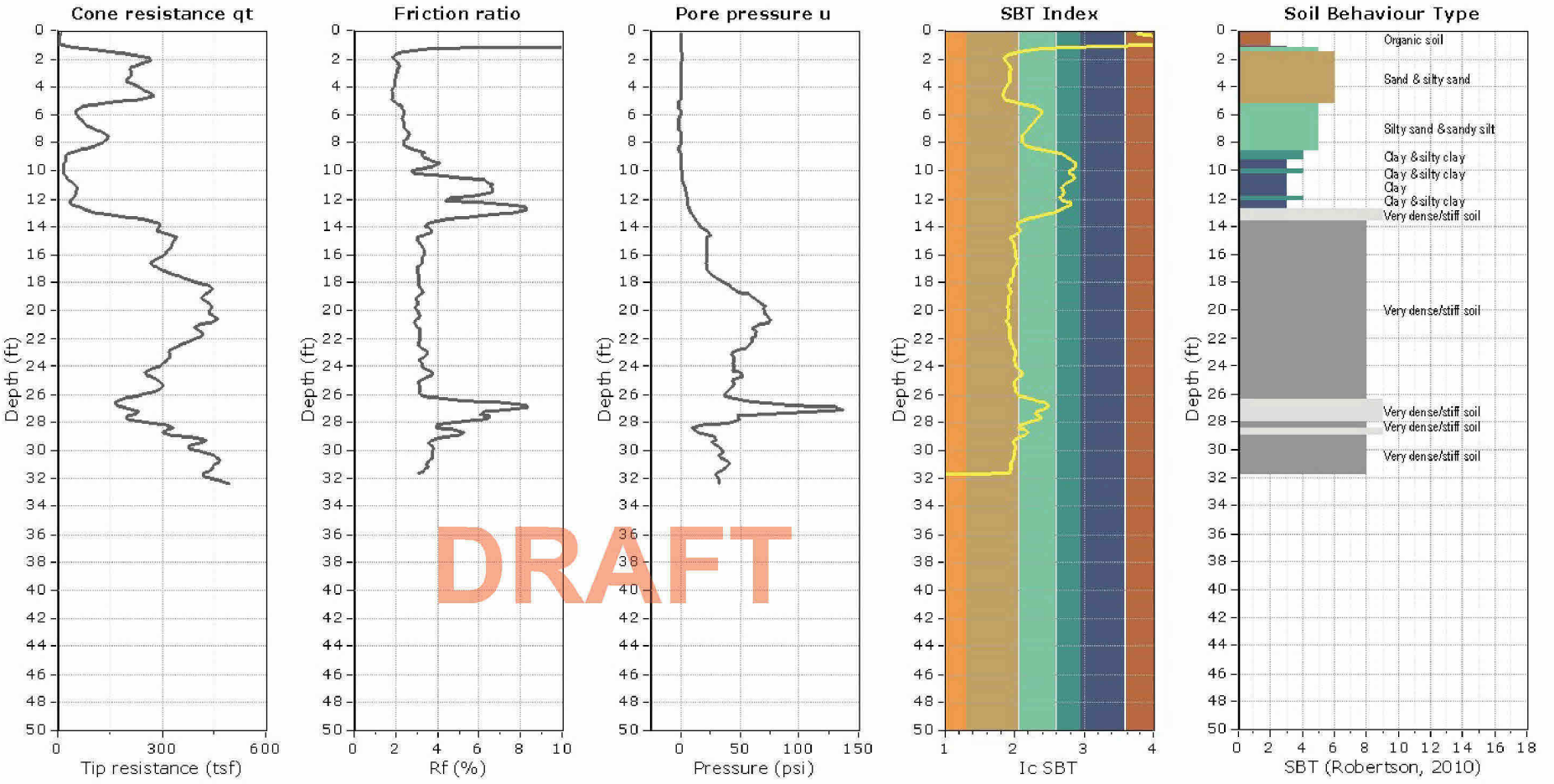

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Total depth: 32.32 ft, Date: 1/3/2018
Groundwater not measured
Cone Operator: Middle Earth Geo Testing, Inc.

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE GEOTECHNICAL

CONE PENETRATION TEST RESULTS
CPT-5

Date 01/16/18	Project No. 17-1425	Figure A-5

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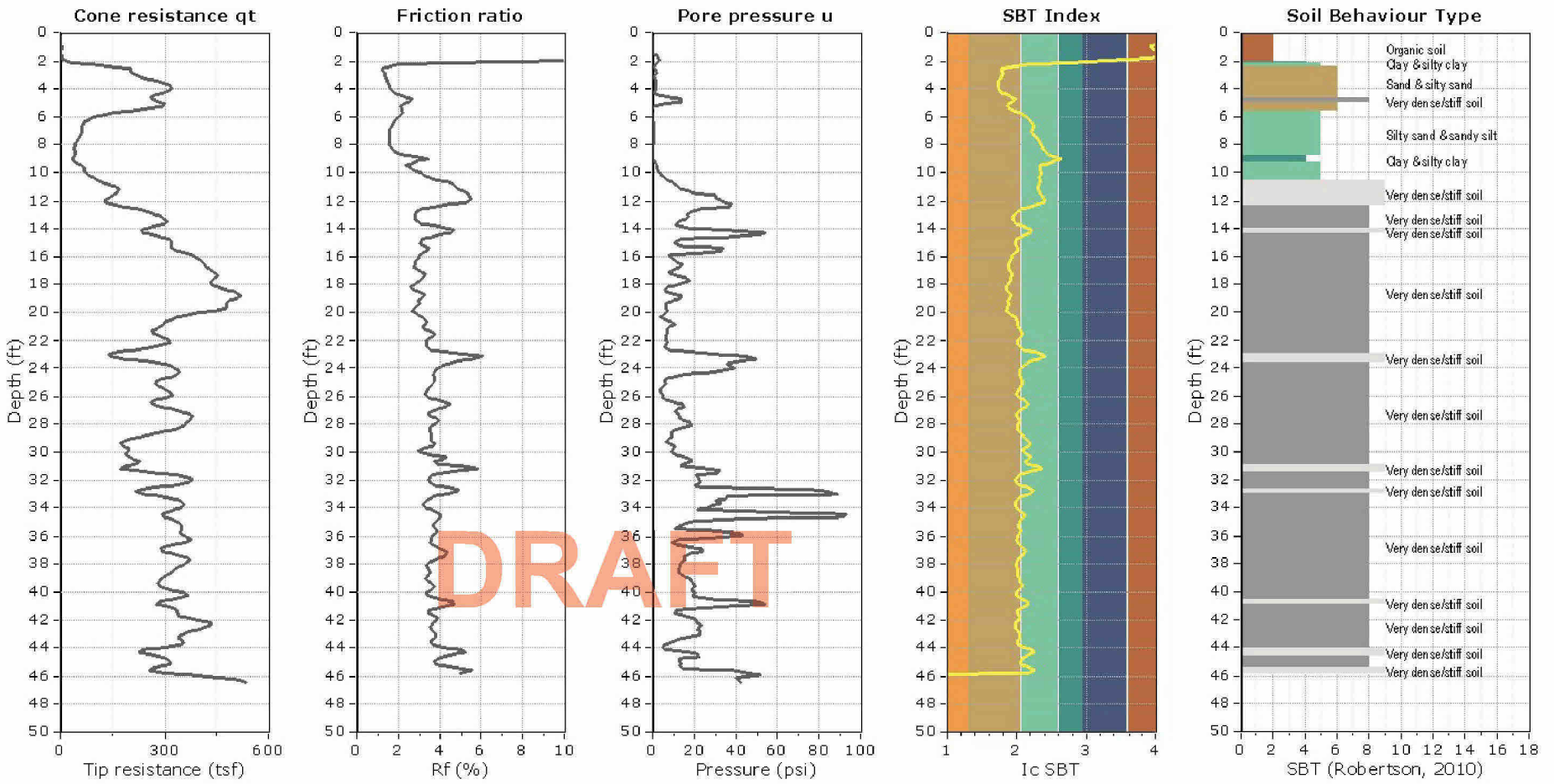

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Total depth: 46.42 ft, Date: 1/3/2018
Groundwater not measured
Cone Operator: Middle Earth Geo Testing, Inc.

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE GEOTECHNICAL

CONE PENETRATION TEST RESULTS
CPT-6

Date 01/16/18	Project No. 17-1425	Figure A-6

PROJECT: **BALBOA RESERVOIR**
San Francisco, California

Log of Boring B-1

Boring location: See Site Plan, Figure 2
Logged by: D. Landkamer
Date started: 1/3/18 Date finished: 1/3/18
Drilling method: Solid Stem Auger
Hammer weight/drop: 140 lbs./30 inches Hammer type: Safety/Rope & Cathead
Sampler: Standard Penetration Test (SPT)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1						SILTY SAND (SM) olive-brown, dense, dry, fine-grained sand, with clay, weak cementation, trace rootlets						
2	SPT		13 22 18	48								
3						orange-brown						
4	SPT		16 21 23	53		6 inches gravel layer very dense, moist, no cementation						
5												
6	SPT		13 16 14	36		dense						
7												
8												
9												
10												
11	SPT		6 5 7	14		red-brown, medium dense, decreased silt content, no clay						
12												
13					SM							
14												
15												
16	SPT		13 14 15	35		orange-brown, dense						
17												
18												
19												
20												
21	SPT		18 20 28	58		very dense, increased silt content						
22												
23												
24												
25												
26	SPT		24 30 38	82		yellow-brown						
27												
28												
29												
30												

Boring terminated at a depth of 26.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] SPT blow counts for the last two increments were converted to SPT N-Values using a factor of 1.2 to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1425
Figure: A-7

DRAFT

PROJECT:	BALBOA RESERVOIR San Francisco, California	Log of Boring B-2 PAGE 1 OF 1

Boring location: See Site Plan, Figure 2 | Logged by: D. Landkamer

Date started: 1/3/18 | Date finished: 1/3/18

Drilling method: Solid Stem Auger

Hammer weight/drop: 140 lbs./30 inches | Hammer type: Safety/Rope & Cathead

Sampler: Standard Penetration Test (SPT)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1	SPT		21 22 21	52	SM	SILTY SAND (SM) orange-brown, very dense, moist, fine-grained sand, trace clay						
3	SPT		11 22 22	53		trace gravel						
5	SPT		17 23 26	54		no gravel						
9						DRAFT						
10	SPT		10 19 23	50								
15	SPT		14 16 22	46		dense, with clay, trace gravel						
19					SC	CLAYEY SAND (SC) brown to red-brown, dense, moist, fine- to coarse-grained sand, trace gravel						
20	SPT		16 18 27	54								
21					SM	SILTY SAND (SM) orange-brown, very dense, moist, fine-grained sand, with clay, trace fine gravel						
25	SPT		10 13 22	42		dense, with clayey sand inclusions						

Boring terminated at a depth of 26.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] SPT blow counts for the last two increments were converted to SPT N-Values using a factor of 1.2 to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1425 | Figure: A-8

ROCKRIDGE 17-1425.GPJ TR.GDT 1/10/18

DRAFT

PROJECT: **BALBOA RESERVOIR**
San Francisco, California

Log of Boring B-3

Boring location: See Site Plan, Figure 2
Logged by: D. Landkamer
Date started: 1/3/18 Date finished: 1/3/18
Drilling method: Solid Stem Auger
Hammer weight/drop: 140 lbs./30 inches Hammer type: Safety/Rope & Cathead
Sampler: Standard Penetration Test (SPT)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1						SAND with SILT (SP-SM) olive gray, dense, dry to moist, fine-grained sand						
2	SPT		7 13 20	40								
3												
4	SPT		13 13 15	34		yellow-brown and olive-gray						
5												
6	SPT		15 21 25	55	SP-SM	very dense, moist						
7												
8												
9												
10												
11	SPT		21 23 26	59								
12												
13												
14												
15												
16												
17												
18												
19												
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22												
23												
24												
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26												
27												
28												
29												
30												

Boring terminated at a depth of 11.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] SPT blow counts for the last two increments were converted to SPT N-Values using a factor of 1.2 to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No.: 17-1425
Figure: A-9

DRAFT

PROJECT: **BALBOA RESERVOIR**
San Francisco, California

Log of Boring B-4

Boring location: See Site Plan, Figure 2
Logged by: D. Landkamer
Date started: 1/3/18 Date finished: 1/3/18
Drilling method: Solid Stem Auger
Hammer weight/drop: 140 lbs./30 inches Hammer type: Safety/Rope & Cathead
Sampler: Standard Penetration Test (SPT)

DEPTH (feet)	SAMPLES: Sampler Type	SAMPLES: Sample	SAMPLES: Blows/ 6"	SAMPLES: SPT N-Value[1]	LITHOLOGY	MATERIAL DESCRIPTION	LABORATORY TEST DATA: Type of Strength Test	Confining Pressure Lbs/Sq Ft	Shear Strength Lbs/Sq Ft	Fines %	Natural Moisture Content, %	Dry Density Lbs/Cu Ft
1					SC	CLAYEY SAND with GRAVEL (SC) brown to red-brown, medium dense, moist, fine- to medium-grained sand						
2	SPT		7 14 18	38								
3					SM	SILTY SAND (SM) brown, dense, moist, fine- to medium-grained sand						
4	SPT		6 7 12	23		orange-brown, medium dense, with clay						
5												
6	SPT		14 20 20	48		mottled dark brown, dense, weak cementation						
7						brown, no clay						
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												

Boring terminated at a depth of 6.5 feet below ground surface.
Boring backfilled with cement grout.
Groundwater not encountered during drilling.

[1] SPT blow counts for the last two increments were converted to SPT N-Values using a factor of 1.2 to account for sampler type and hammer energy.

ROCKRIDGE GEOTECHNICAL

Project No. 17-1425 Figure A-10

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		Symbols	Typical Names
Coarse-Grained Soils (more than half of soil > no. 200 sieve size)	Gravels (More than half of coarse fraction > no. 4 sieve size)	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	Sands (More than half of coarse fraction < no. 4 sieve size)	SW	Well-graded sands or gravelly sands, little or no fines
		SP	Poorly-graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
Fine -Grained Soils (more than half of soil < no. 200 sieve size)	Silts and Clays LL = < 50	ML	Inorganic silts and clayey silts of low plasticity, sandy silts, gravelly silts
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
		OL	Organic silts and organic silt-clays of low plasticity
	Silts and Clays LL = > 50	MH	Inorganic silts of high plasticity
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic silts and clays of high plasticity
Highly Organic Soils		PT	Peat and other highly organic soils

GRAIN SIZE CHART

Classification	Range of Grain Sizes	
	U.S. Standard Sieve Size	Grain Size in Millimeters
Boulders	Above 12"	Above 305
Cobbles	12" to 3"	305 to 76.2
Gravel coarse fine	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
Sand coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.075 4.76 to 2.00 2.00 to 0.420 0.420 to 0.075
Silt and Clay	Below No. 200	Below 0.075

Unstabilized groundwater level

Stabilized groundwater level

SAMPLE DESIGNATIONS/SYMBOLS

Sample taken with Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter. Darkened area indicates soil recovered

Classification sample taken with Standard Penetration Test sampler

Undisturbed sample taken with thin-walled tube

Disturbed sample

Sampling attempted with no recovery

Core sample

Analytical laboratory sample

Sample taken with Direct Push sampler

Sonic

SAMPLER TYPE

C	Core barrel
CA	California split-barrel sampler with 2.5-inch outside diameter and a 1.93-inch inside diameter
D&M	Dames & Moore piston sampler using 2.5-inch outside diameter, thin-walled tube
O	Osterberg piston sampler using 3.0-inch outside diameter, thin-walled Shelby tube
PT	Pitcher tube sampler using 3.0-inch outside diameter, thin-walled Shelby tube
S&H	Sprague & Henwood split-barrel sampler with a 3.0-inch outside diameter and a 2.43-inch inside diameter
SPT	Standard Penetration Test (SPT) split-barrel sampler with a 2.0-inch outside diameter and a 1.5-inch inside diameter
ST	Shelby Tube (3.0-inch outside diameter, thin-walled tube) advanced with hydraulic pressure

BALBOA RESERVOIR
San Francisco, California

ROCKRIDGE GEOTECHNICAL

CLASSIFICATION CHART

Date 01/05/18 | Project No. 17-1425 | Figure A-11

ROCKRIDGE GEOTECHNICAL

APPENDIX B

Corrosivity Test Results

Results Only Soil Testing for Balboa Reservoir

January 15, 2018

DRAFT

Prepared for:
Clayton Proto
Rockridge Geotechnical
270 Grand Ave,
Oakland, CA 94610
cjproto@rockridgegeo.com

Project X Job#: S180112A
Client Job or PO#: 17-1425

Soil Analysis Lab Results

Client: Rockridge Geotechnical
Job Name: Balboa Reservoir
Client Job Number: 17-1425
Project X Job Number: S180112A
January 15, 2018

	Method	ASTM G187		ASTM D516		ASTM D512B		SM 4500-NO3-E	SM 4500-NH3-C	SM 4500-S2-D	ASTM G200	ASTM G51
Bore# / Description	Depth	Resistivity As Rec'd	Resistivity Minimum	Sulfates		Chlorides		Nitrate	Ammonia	Sulfide	Redox	pH
	(ft)	(Ohm-cm)	(Ohm-cm)	(mg/kg)	(wt%)	(mg/kg)	(wt%)	(mg/kg)	(mg/kg)	(mg/kg)	(mV)	
B-2 #5	15.0	12,060	10,050	120	0.0120	255	0.0255	165	97.5	5.70	211	7.99

Unk = Unknown
NT = Not Tested
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
mg/L - milligrams per liter of liquid volume
Chemical Analysis performed on 1:3 Soil-To-Water extract

Please call if you have any questions.

Prepared by,

Nathan Jacob,
Lab Technician

Respectfully Submitted,

Eddie Hernandez, M.Sc., P.E.
Sr. Corrosion Consultant
NACE Corrosion Technologist #16592
Professional Engineer
California No. M37102
ehernandez@projectxcorrosion.com

Project X Corrosion Engineering

Corrosion Control - Soil, Water, and Metallurgy Lab

S180112A Rockridge 17-1425 1 FULL

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Lab Request Sheet Chain of Custody

Phone: (213) 928-7213 · Fax (951) 226-1720 · www.projectxcorrosion.com

Ship Samples To: 29970 Technology Dr, Suite 105F, Murrieta, CA 92563

IMPORTANT: Please complete Project and Sample Identification Data as you would like it to appear in report & include this form with samples.

Project X Job #:	
Date:	

Company Name:	Rockridge Geotechnical	**Contact Name:**	Clayton Proto
Mailing Address:	270 Grand Avenue, Oakland California	**Phone No. :**	510-420-5738 x 120
Accounting Contact:	Kate Schenk	**Contact Email:**	cjproto@rockridgegeo.com
Project Name:	Balboa Reservoir	**Invoice Email:**	kaschenk@rockridgegeo.com
Client Project No:	17-1425	**P.O. #:**	

	5 Day Normal	3 Day RUSH 75% mark-up	2 Day RUSH 100% mark-up
Turn Around Time:	X		

Results By: ☐ Phone ☐ Fax ☒ Email ☒ Mail ☐ Overnight Mail (charges apply)

Received by: **Default Method**

SPECIAL INSTRUCTIONS:

DRAFT

ANALYSIS REQUESTED (Please circle)

	SAMPLE ID - BORE #	DESCRIPTION	DEPTH (ft)	DATE COLLECTED	CORROSION SERIES	Soil Resistivity	pH	Sulfate	Chloride	Redox Potential	BiCarbonate	Alkalinity	Acidity	Nitrate	Ammonia	Sulfide	Moisture Content	Soil Corrosivity Evaluation Report	Metallurgical Analysis	NOTES
					Min. Resistivity, Sulfate, Chloride, Sulfide, Redox, pH, Ammonia, Nitrate	ASTM G187	ASTM G 51	ASTM D516	ASTM D512B	SM 2580B	SM 2320B	SM 2520B	SM 2510B	Hach 835	Hach 830	SM 4500-S2	ASTM D2216				
						Caltrans CTM643	Caltrans CTM643	Caltrans CTM417	Caltrans CTM422					SM 4500-NO3	SM 4500-NH3	SM 4500-S2				
						ASTM G57	AASHTO T 289	AASHTO T 290	AASHTO T 291											
1	B-2 #5	Silty Sand (SM)	15'	1/3/18	X															
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				

APPENDIX B – NON-POTABLE WATER CALCULATOR OUTPUT

NON-POTABLE WATER CALCULATOR

Project Summary Sheet

Project Contact: Brian Scott, BKF Engineers
(650) 482-6335
bscott@bkf.com

Estimated Site/Building Permit Issuance Date: TBD

San Francisco Water Power Sewer

1. Demands and Supplies Summary

Grant Criteria Status: This building is 250,000 sq.ft. or greater in size and is not eligible for a grant

Demands Met by Non-Potable Supply for Project (gpy):	6,391,500	Meets grant criteria of offsetting a minimum of 1,000,000 gal/yr of potable water use
Demands Met by Non-Potable Supply for Project :*	16%	
Project Total Annual Water Demand (gpy) :*	39,543,551	
Project Total Annual Toilet + Irrigation Water Demand (gpy) :*	6,391,463	
Toilet + Irrigation Demands Met by Non-Potable Supply :*	100.0%	
Potable Water Allocation (gpy):	36,467,297	Potable supplies are allocated to this project to meet remaining demands. Projects are allocated an additional 10% in potable supplies that are available as a buffer.
Daily Wet Weather Potable Allocation (gpd):	100,326	Projects are allocated these potable supplies during wet weather months (October - March)
Daily Dry Weather Potable Allocation (gpd):	99,664	Projects are allocated these potable supplies during dry weather months (April - September)

*Note: Estimates for *Demands Met by Non-Potable Supply for Project* and *Project Total Annual Water Demand* based on Tab 6 - Building Potential Summary total water demand values. Manually entered non-potable demands that exceed auto-calculated non-potable demands from Tab 6 may result in Total Annual Water demands greater than the value used in this analysis.
Project Total Annual Toilet Water Demand and *Toilet Demands Met by Non-Potable Supply* based on Tab 6 - Building Potential Summary toilet demands.

2. Building Information Summary

Project / Building Name:	Balboa Reservoir	*Building Type:*	Mixres
Project Address:	11 Frida Kahlo Way	*(gross square footage or GSF):*	1,640,400
		Total Lot Size (ft²):	556,140
		Number of Residential Units:	1,100
Assessor's Block & Lot No. / APN:	3180190	*Impervious Surface Above Grade (ft²):*	207,194
Year Online:	#VALUE!	*Impervious Surface Below Grade (ft²):*	152,121
		Landscaped Area (ft²):	196,825
		Site Location (Zone):	Western SF

3. Summary of Non-Potable Demands and Supplies for the Project

Non-Potable Water Supply Estimates

On-site Alternate Water Source Supplies	Water Quantity (gpy)
Rainwater:	0
Stormwater:	0
Graywater:	19,287,683
Blackwater:	0
Foundation Drainage	0
Cooling & Other Supplies	0
TOTAL :	19,287,683

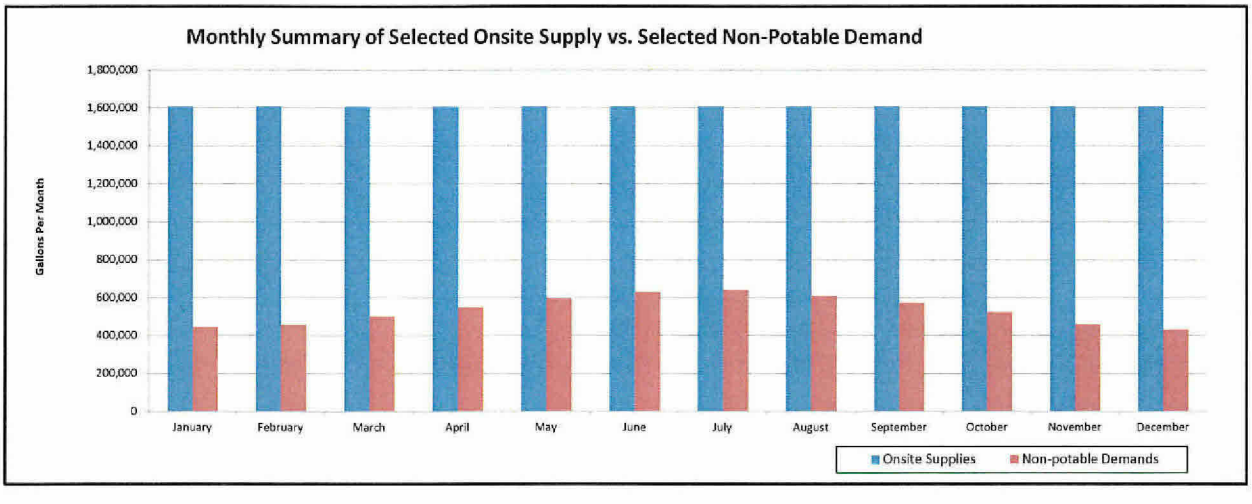
Non-Potable Water Demand Estimates

Project Specific Non-Potable Application Demands	Quantity (gpy)
Toilets/Urinals:	4,964,795
Irrigation:	1,426,668
Toilets/Urinals + Irrigation	6,391,463
Cooling Tower:	0
Commercial Laundry & Other	0
Total :	6,391,463

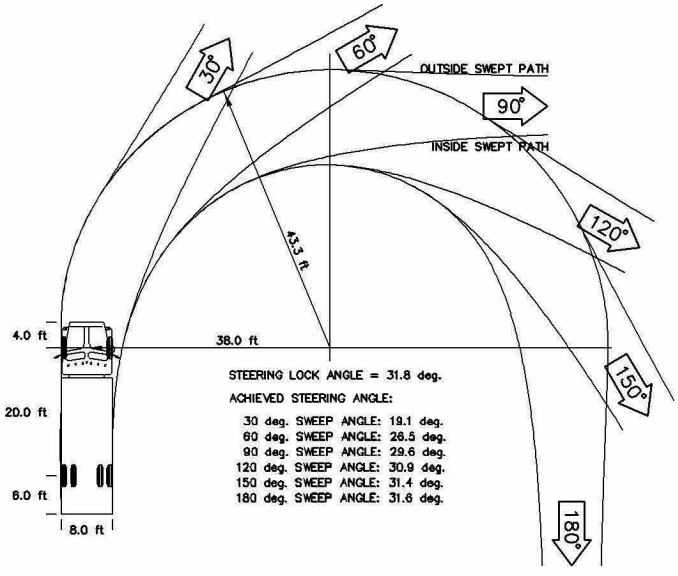
4. Project Summary

Demands Met by Non-Potable Supply for Projects (gpy):	6,391,500	
Total Water Demand (gpy):	39,543,551	*Based on Tab 6 - Building Potential Summary tab*
Total Water Demand Offset:	16%	
Potable Water Allocation (gpy):	36,467,297	*Amount of Potable Water Allocated to Project to Meet Total Demands*
Daily Wet Weather Potable Allocation (gpd):	100,326	*Amount of Potable Water Allocated Daily during Wet Weather Months*
Daily Dry Weather Potable Allocation (gpd):	99,664	*Amount of Potable Water Allocated Daily during Dry Weather Months*
Total Toilet + Irrigation Water Demand (gpy):	6,391,463	*Based on Tab 6 - Building Potential Summary tab*
Total Toilet + Irrigation Water Demand Offset:	100%	*Based on Tab 6 - Building Potential Summary tab*
Selected Toilet + Irrigation Water Demand (gpy):	6,391,463	*Based on selections on Tab 7 - Project Definition*
Selected Toilet + Irrigation Water Demand:	100%	*Based on selections on Tab 7 - Project Definition*

This offset analysis assumes the full year of supplies is available to offset non-potable demands. Some scenarios may require storage to store excess supplies from one month in order to use those supplies in another month with unmet demands.

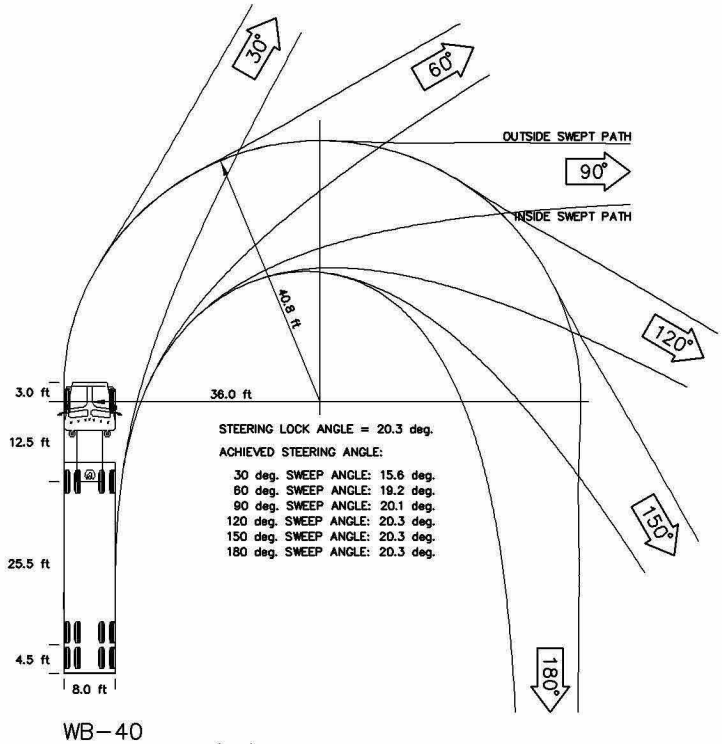


APPENDIX C – SU-30 AND WB-40 DESIGN VEHICLE MOVEMENTS



SU-30
AASHTO 2011 (US)
[ft]

0ft 10ft 20ft



WB-40
AASHTO 2011 (US)
[ft]

0ft 10ft 20ft

GRAPHIC SCALE
0 30

Source: BKF ENGINEERS, 03/2019

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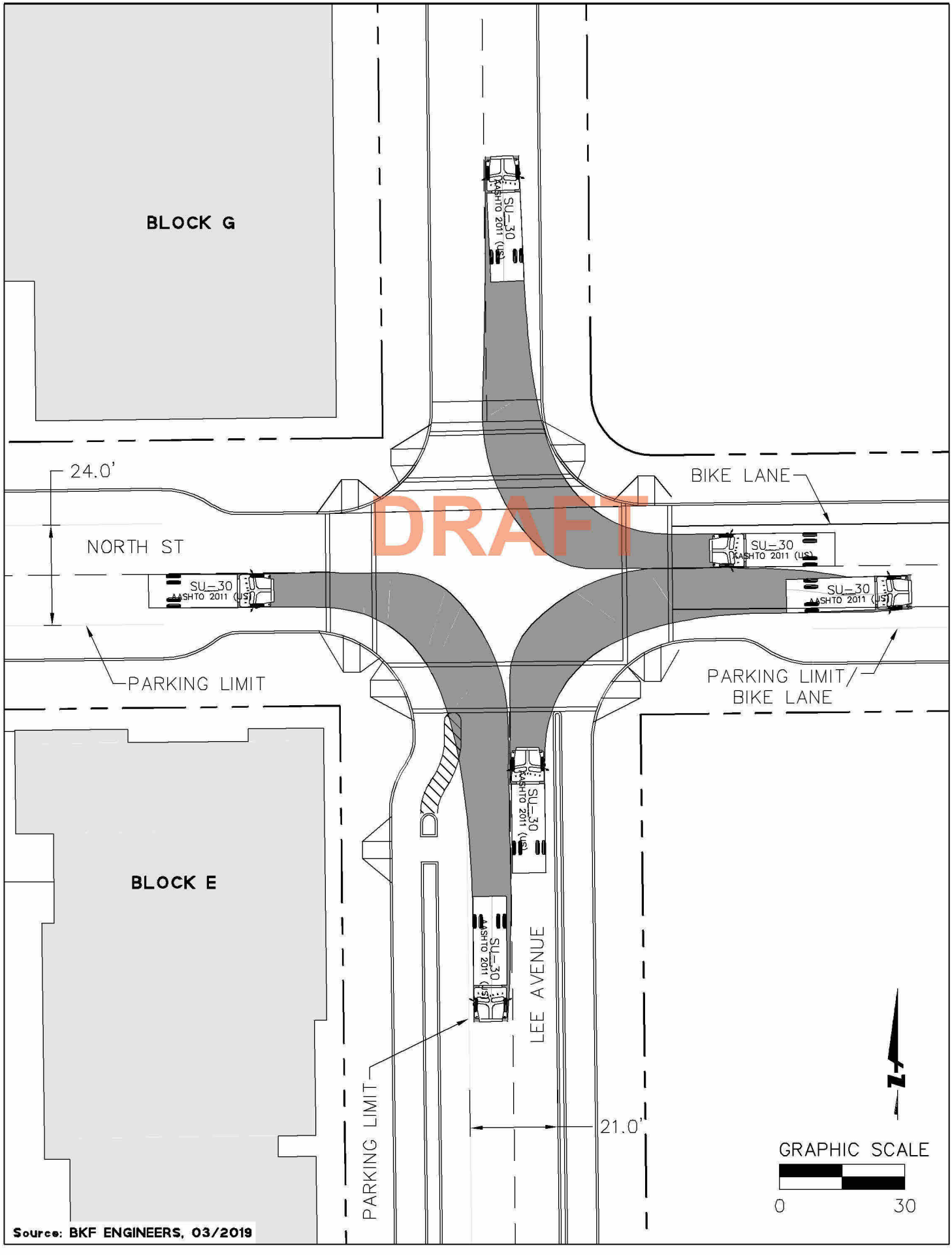
PLOT DATE: 03-15-19 PLOTTED BY: cheh



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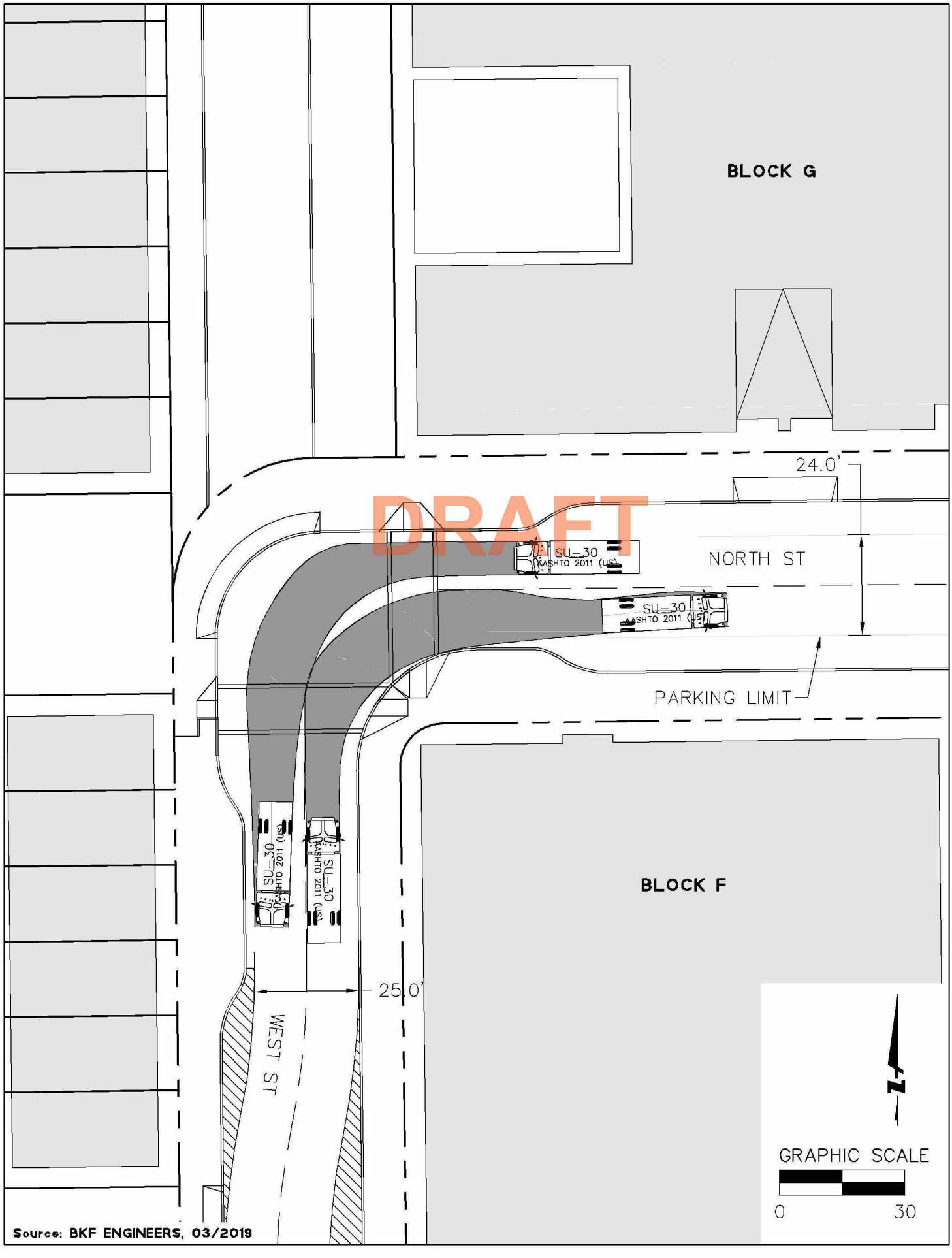
PLOT DATE: 03-15-19 PLOTTED BY: cheh

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.2 – SU-30 TURNING TEMPLATE – NE CORNER



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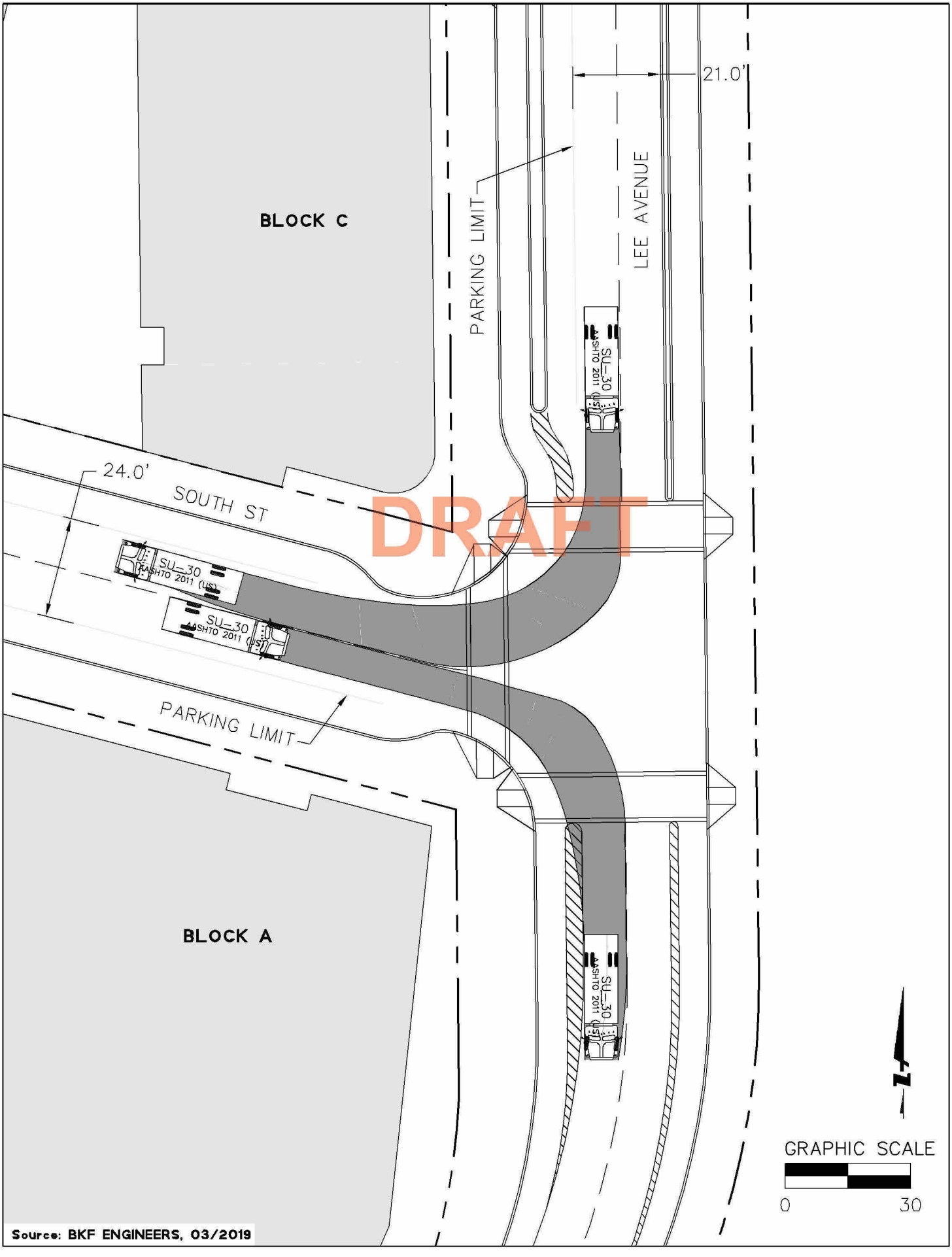
PLOT DATE: 03-15-19 PLOTTED BY: cheh

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.3 – SU-30 TURNING TEMPLATE – NW CORNER



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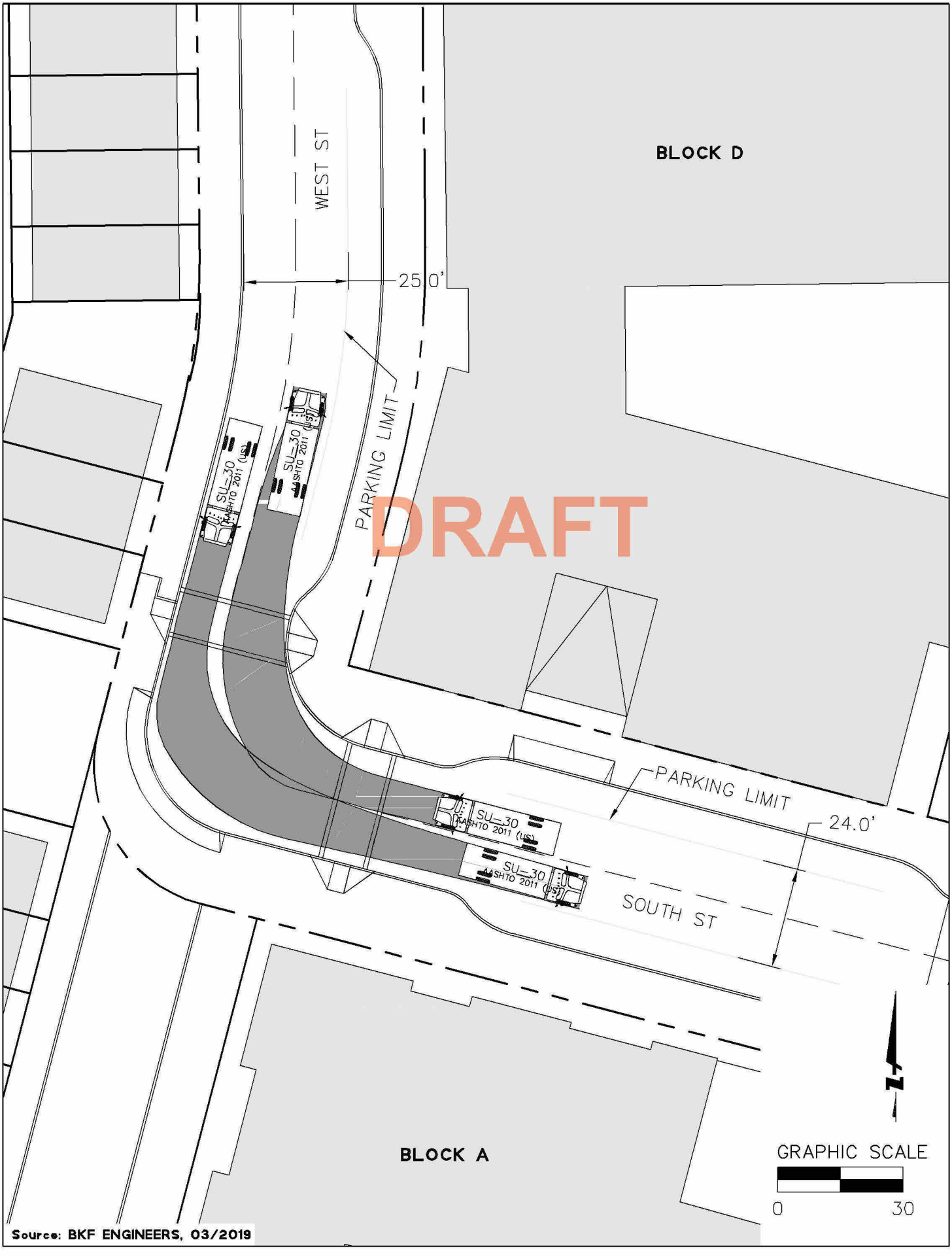
PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.4 – SU-30 TURNING TEMPLATE – SE CORNER



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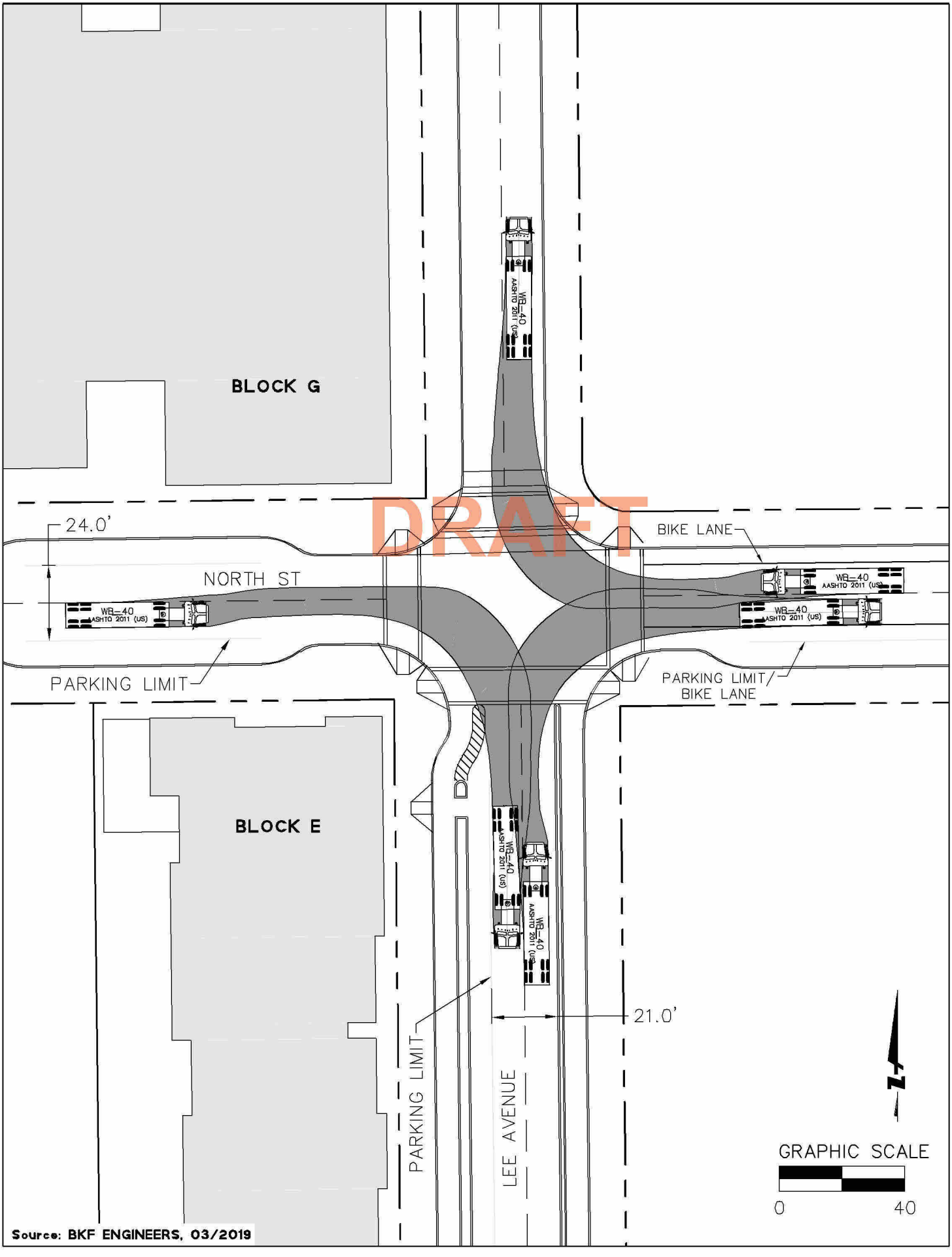
PLOT DATE: 03-15-19 PLOTTED BY: cheh

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.5 – SU-30 TURNING TEMPLATE – SW CORNER



Source: BKF ENGINEERS, 03/2019

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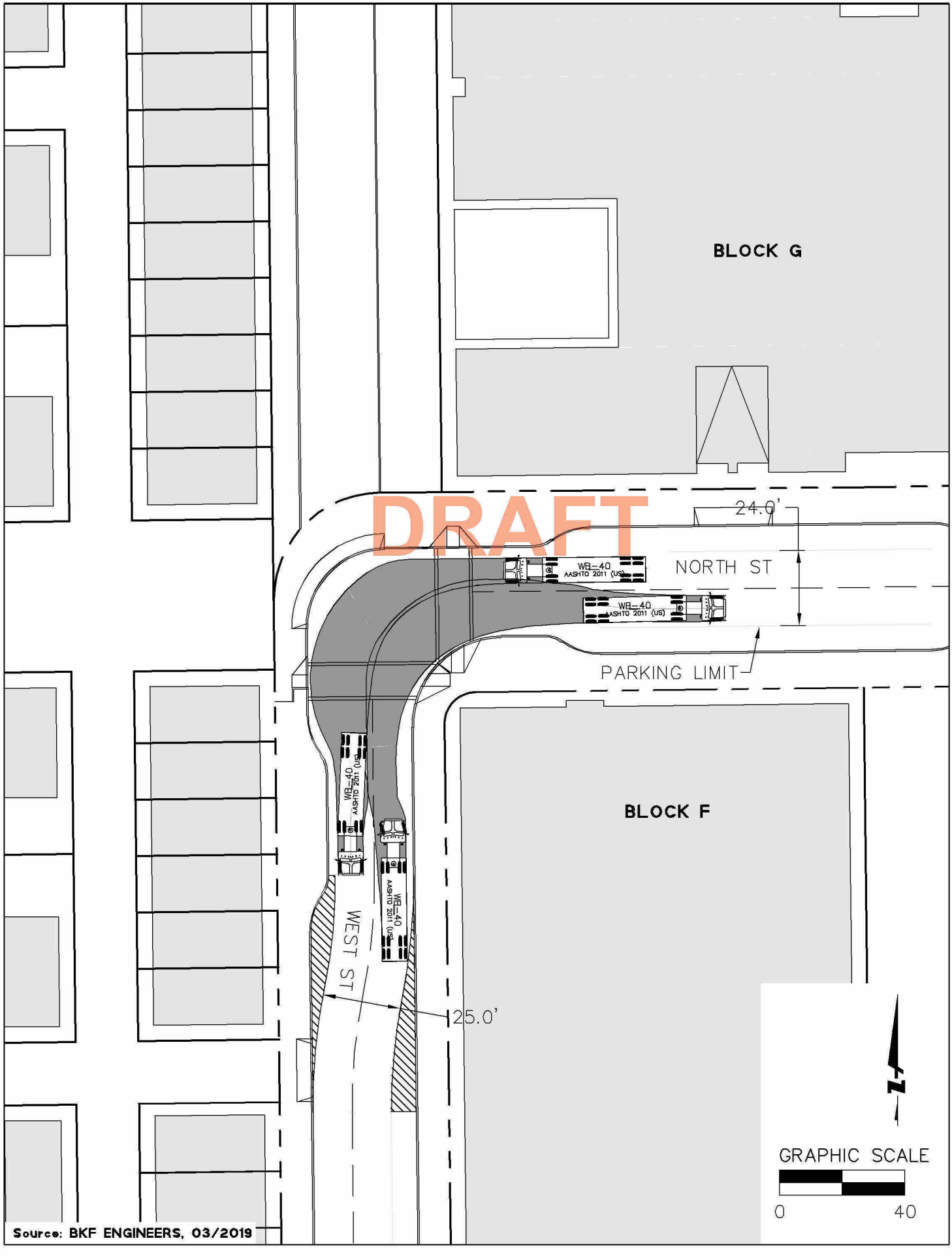
PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.6 – WB-40 TURNING TEMPLATE – NE CORNER



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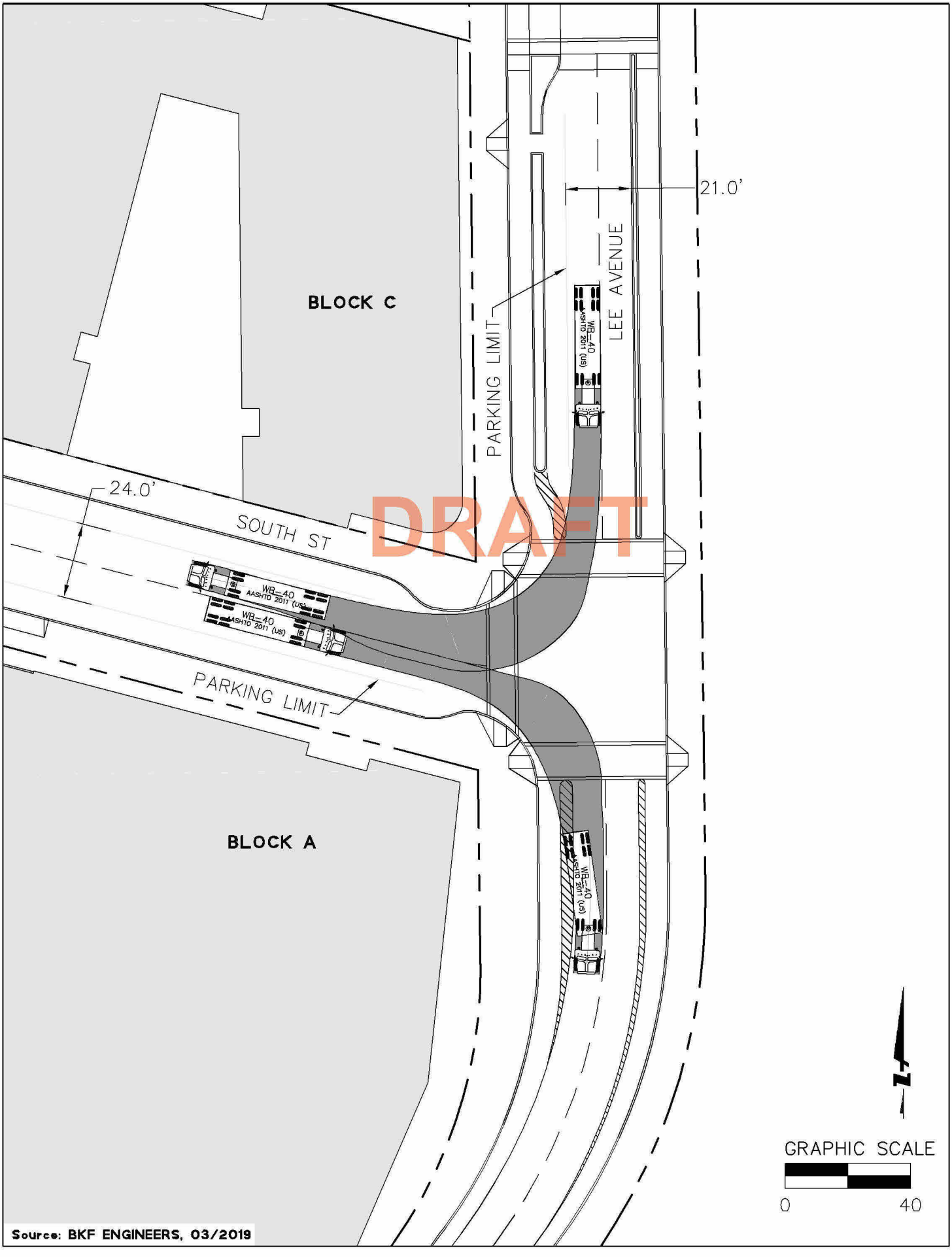
PLOT DATE: 03-15-19 PLOTTED BY: chen

Source: BKF ENGINEERS, 03/2019

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.7 – WB-40 TURNING TEMPLATE – NW CORNER



Source: BKF ENGINEERS, 03/2019

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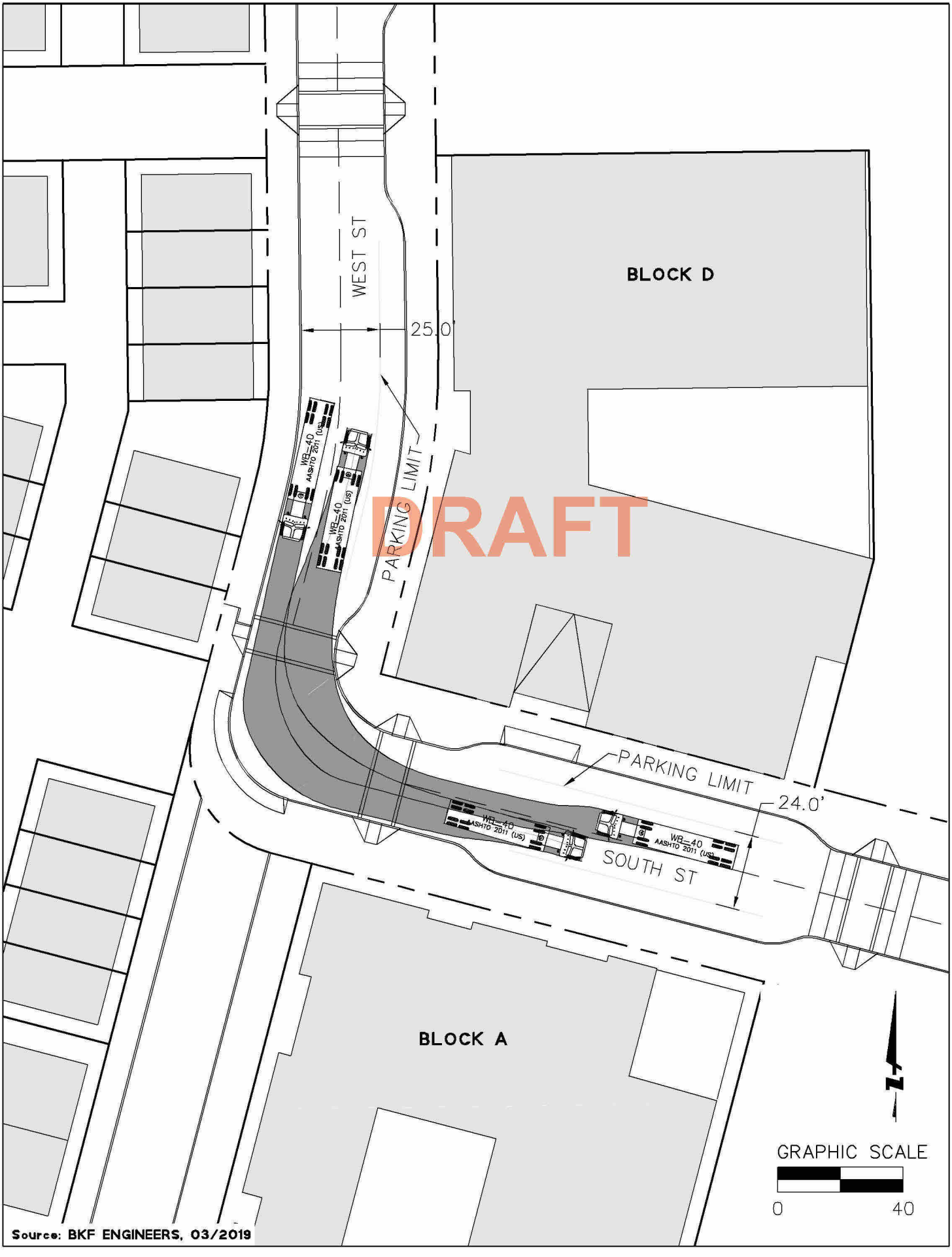
PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.8 – WB-40 TURNING TEMPLATE – SE CORNER



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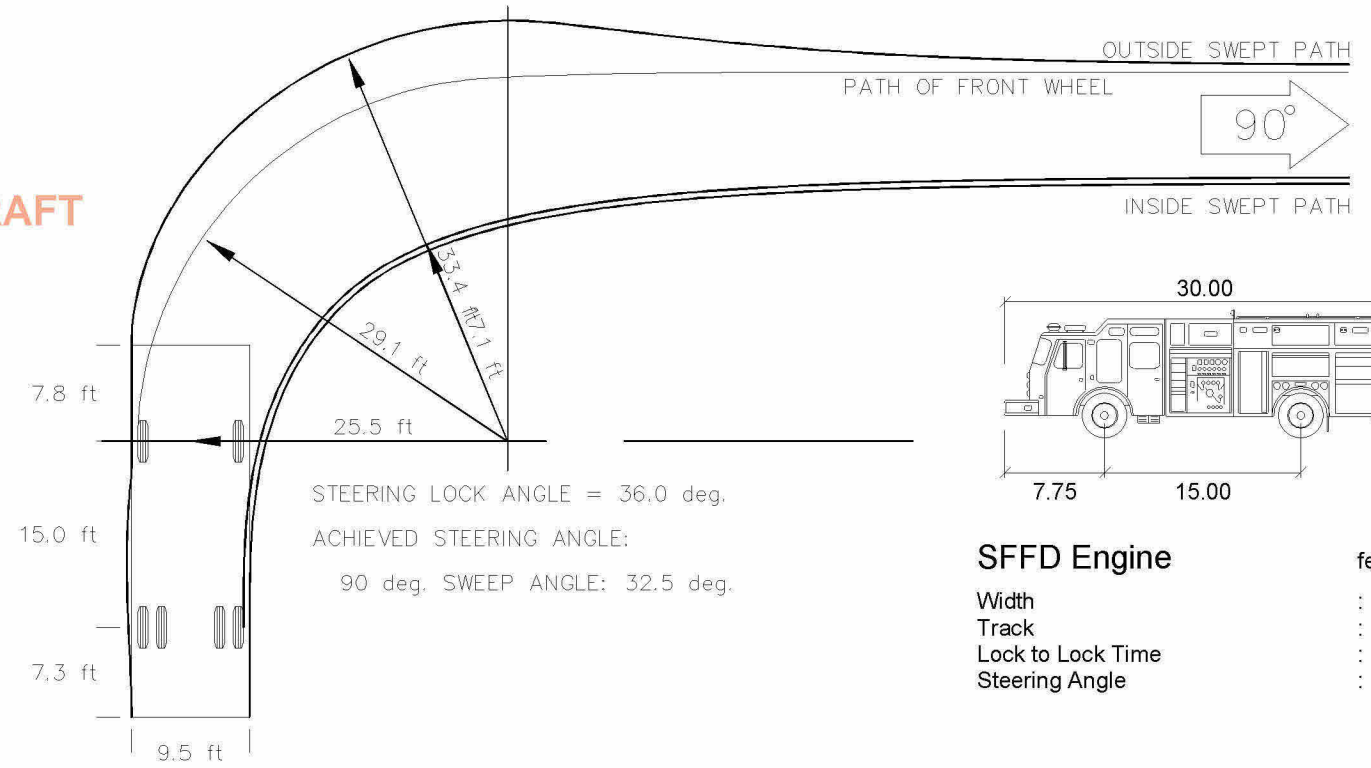
PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. C.9 – WB-40 TURNING TEMPLATE – SW CORNER

APPENDIX D – FIRE ENGINE AND FIRE TRUCK TURNING MOVEMENTS

DRAFT



STEERING LOCK ANGLE = 36.0 deg.

ACHIEVED STEERING ANGLE:

90 deg. SWEEP ANGLE: 32.5 deg.

SFFD Engine	feet
Width	: 9.50
Track	: 8.50
Lock to Lock Time	: 6.0
Steering Angle	: 36.0

SFFD Engine
Custom
[ft]

0FT 10FT 20FT

NO.	DATE	DESCRIPTION	BY	APP

TABLE OF REVISIONS
CHECK WITH TRACING TO SEE IF YOU HAVE LATEST REVISION

SFMTA
Municipal Transportation Agency

DRAWN: W. TABAJONDA DATE: 03/24/2016
CHECKED: M. SALLABERRY DATE: 03/24/2016

APPROVED
SENIOR ENGINEER DATE:
CITY TRAFFIC ENGINEER DATE:

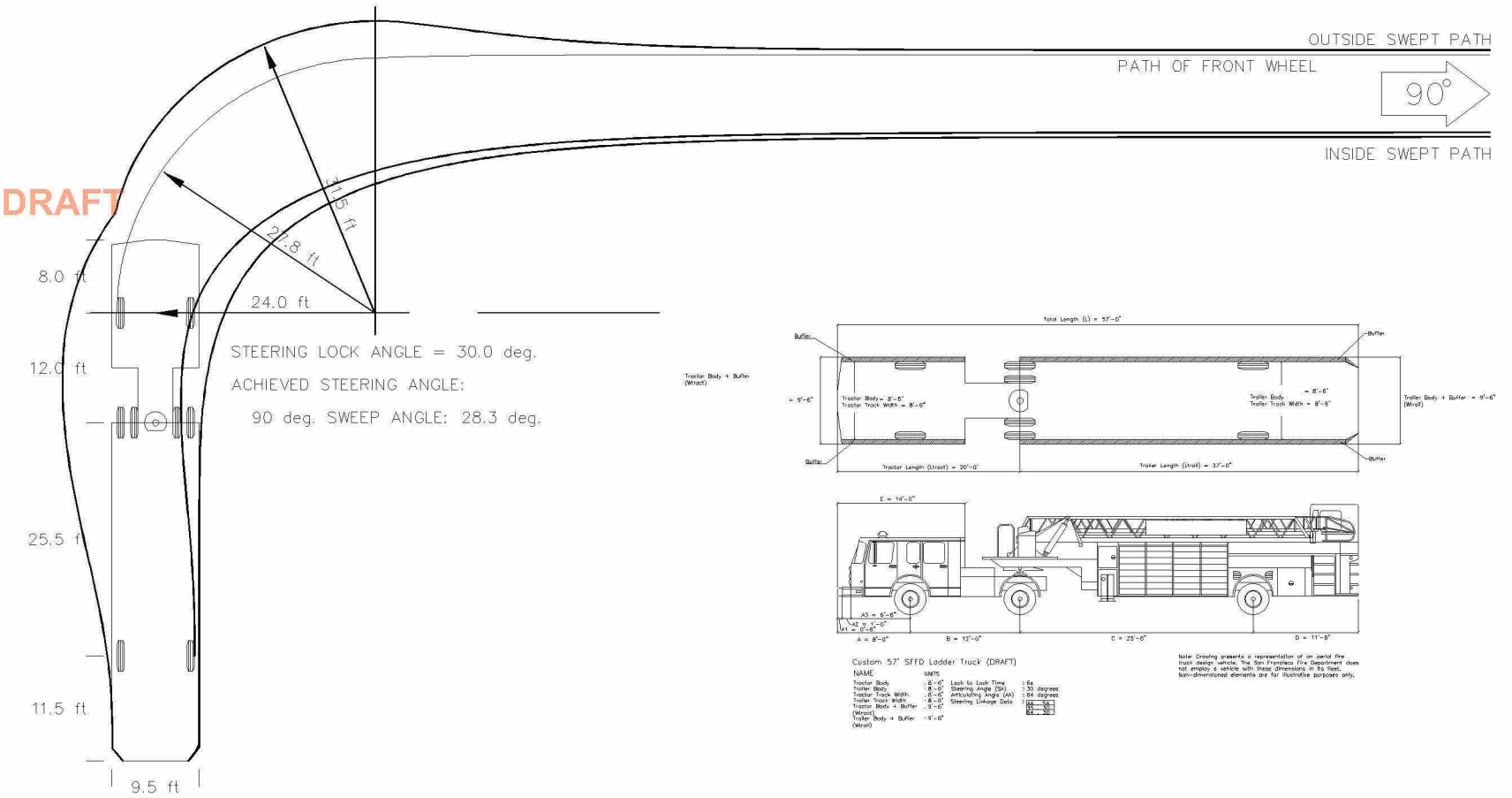
SCALE: 1" = 5'
SHEET/SHEETS: 1 OF 1

CUSTOM TURN TEMPLATE
DEVELOPED FOR
SAN FRANCISCO FIRE DEPARTMENT

SAN FRANCISCO FIRE DEPARTMENT
CUSTOM FIRE ENGINE
APPROVED 4/12/2016

CONTRACT NO. XXXXX
DRAWING NO. DWGNO
FILE NO. XXXXX
REV. NO. 0

FILE NAME:
DATE: --/--/--



Custom SFFD Aerial Ladder Truck
Custom
[ft]

0FT 10FT 20FT

NO.	DATE	DESCRIPTION	BY	APP

TABLE OF REVISIONS
CHECK WITH TRACING TO SEE IF YOU HAVE LATEST REVISION

SFMTA
Municipal Transportation Agency

DRAWN: W.TABAJONDA DATE: 11/03/2015
CHECKED: M. SALLABERRY DATE: 11/03/2015

APPROVED
SENIOR ENGINEER DATE:
CITY TRAFFIC ENGINEER DATE:

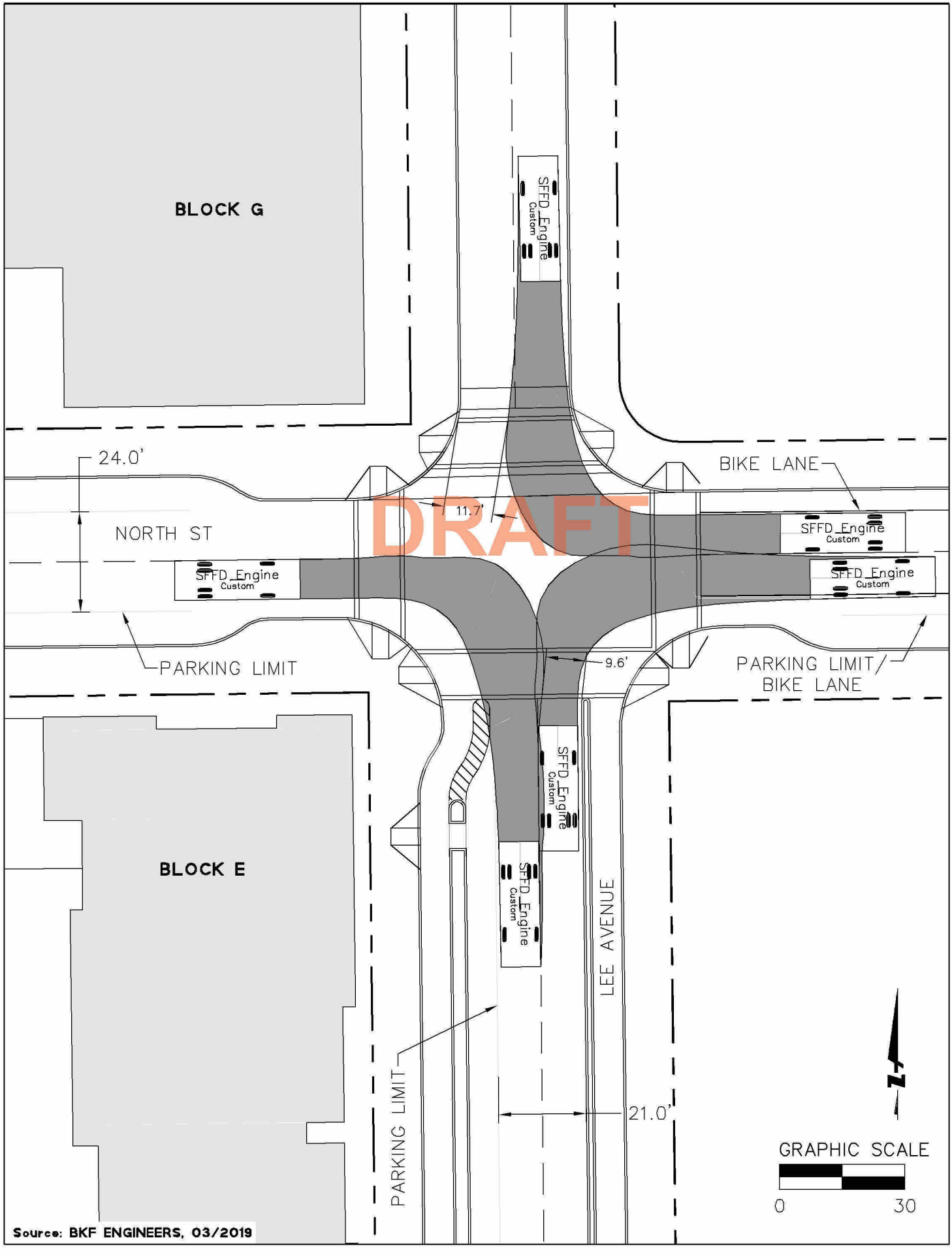
SCALE: 1" = 6"
SHEET/SHEETS: 1 OF 1

CUSTOM TURN TEMPLATE
DEVELOPED FOR
SAN FRANCSICO FIRE DEPARTMENT

SAN FRANCSICO FIRE DEPARTMENT
CUSTOM AERIAL LADDER TRUCK
APPROVED 4/12/2016

CONTRACT NO. XXXXX
DRAWING NO. DWGNO
FILE NO. XXXXX
REV. NO. 2

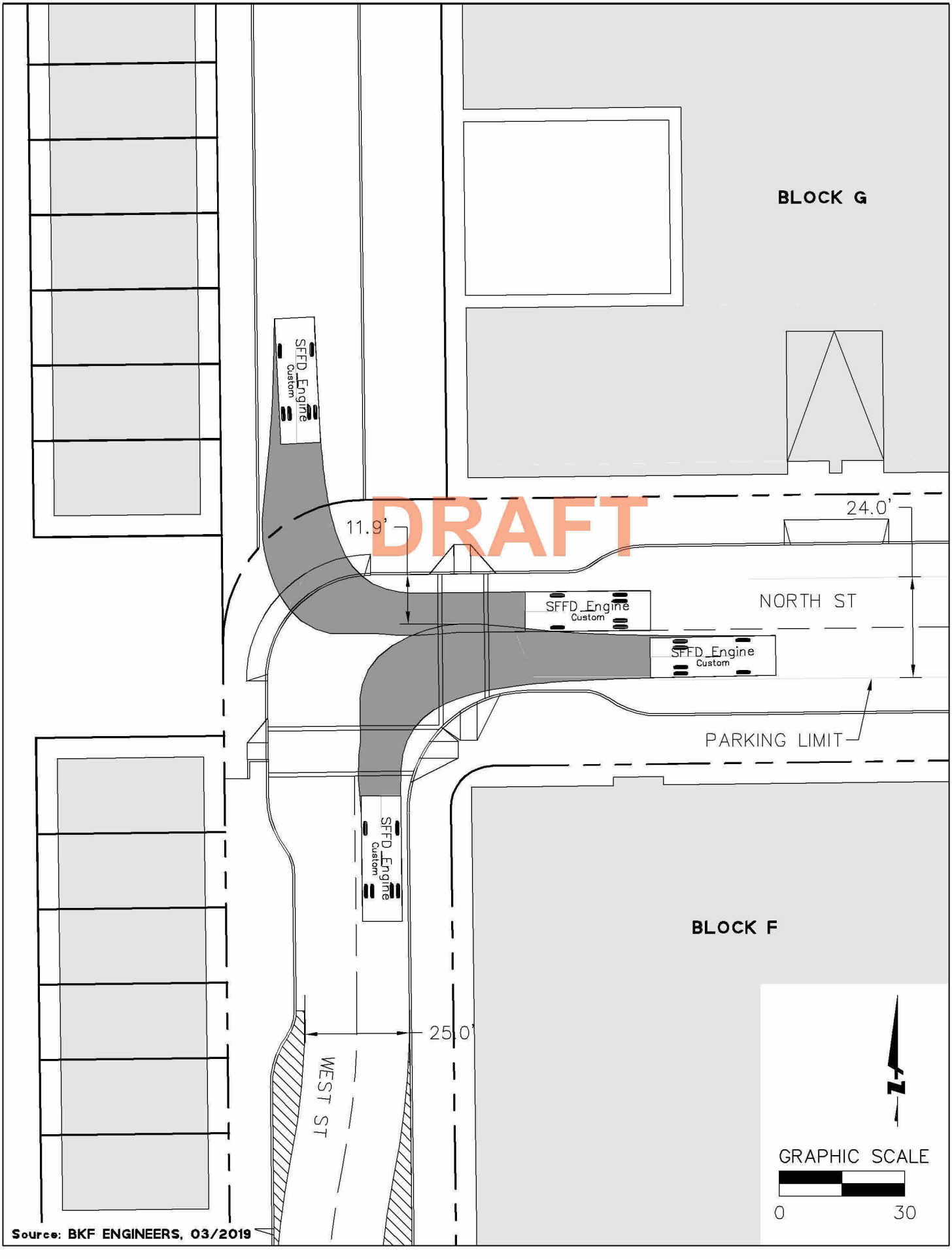
FILE NAME:



Source: BKF ENGINEERS, 03/2019

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\ENG\EXHIBITS\AUTOTURN\Fire_Truck\Fire_Truck_Turning.dwg
PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN APPX. D.2 – SFFD FIRE ENGINE TURNING TEMPLATE – NE CORNER



Source: BKF ENGINEERS, 03/2019

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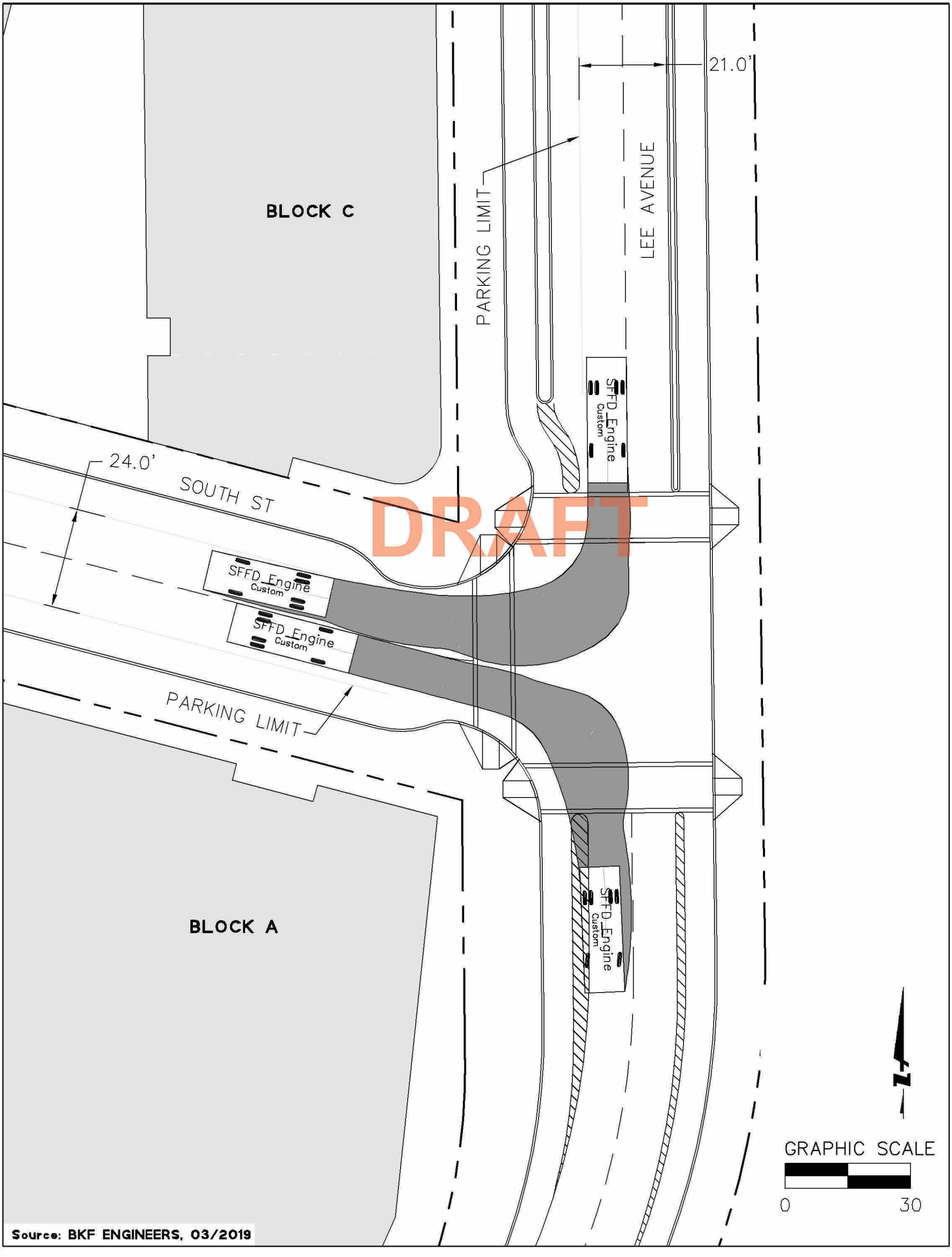
PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN APPX. D.3 – SFFD FIRE ENGINE TURNING TEMPLATE – NW CORNER



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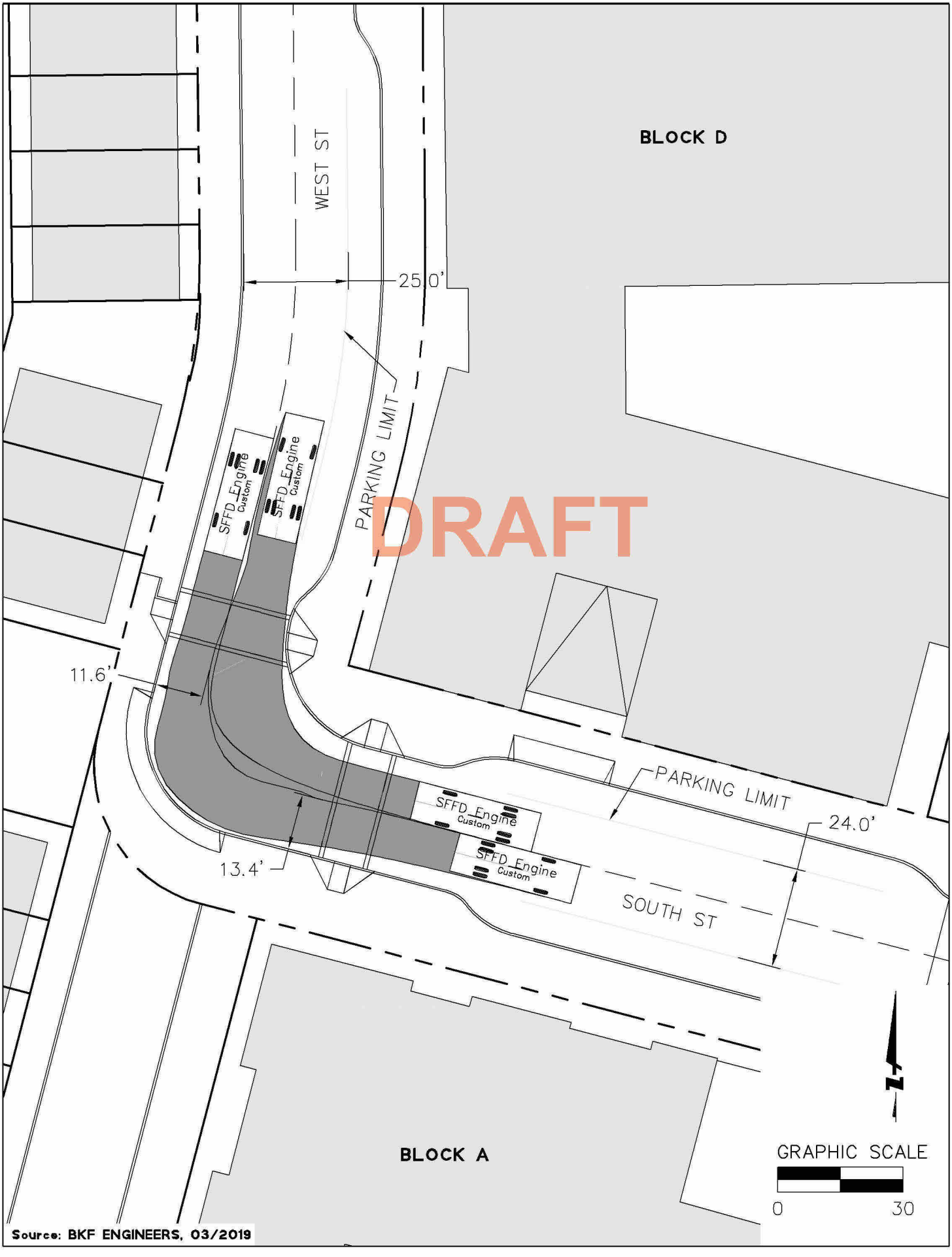
PLOT DATE: 03-15-19 PLOTTED BY: cheh

BALBOA RESERVOIR INFRASTRUCTURE PLAN APPX. D.4 – SFFD FIRE ENGINE TURNING TEMPLATE – SE CORNER



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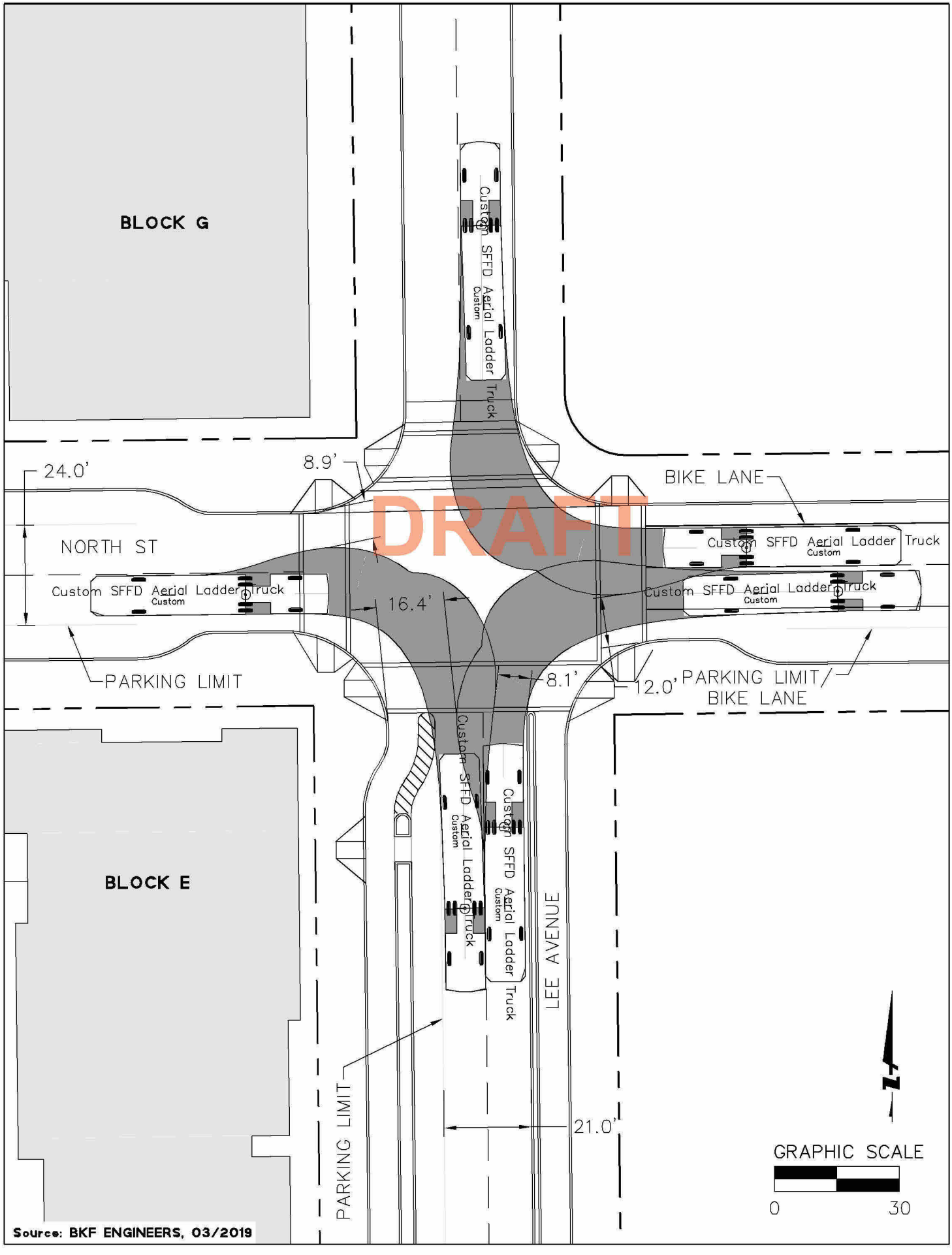
PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN APPX. D.5 – SFFD FIRE ENGINE TURNING TEMPLATE – SW CORNER



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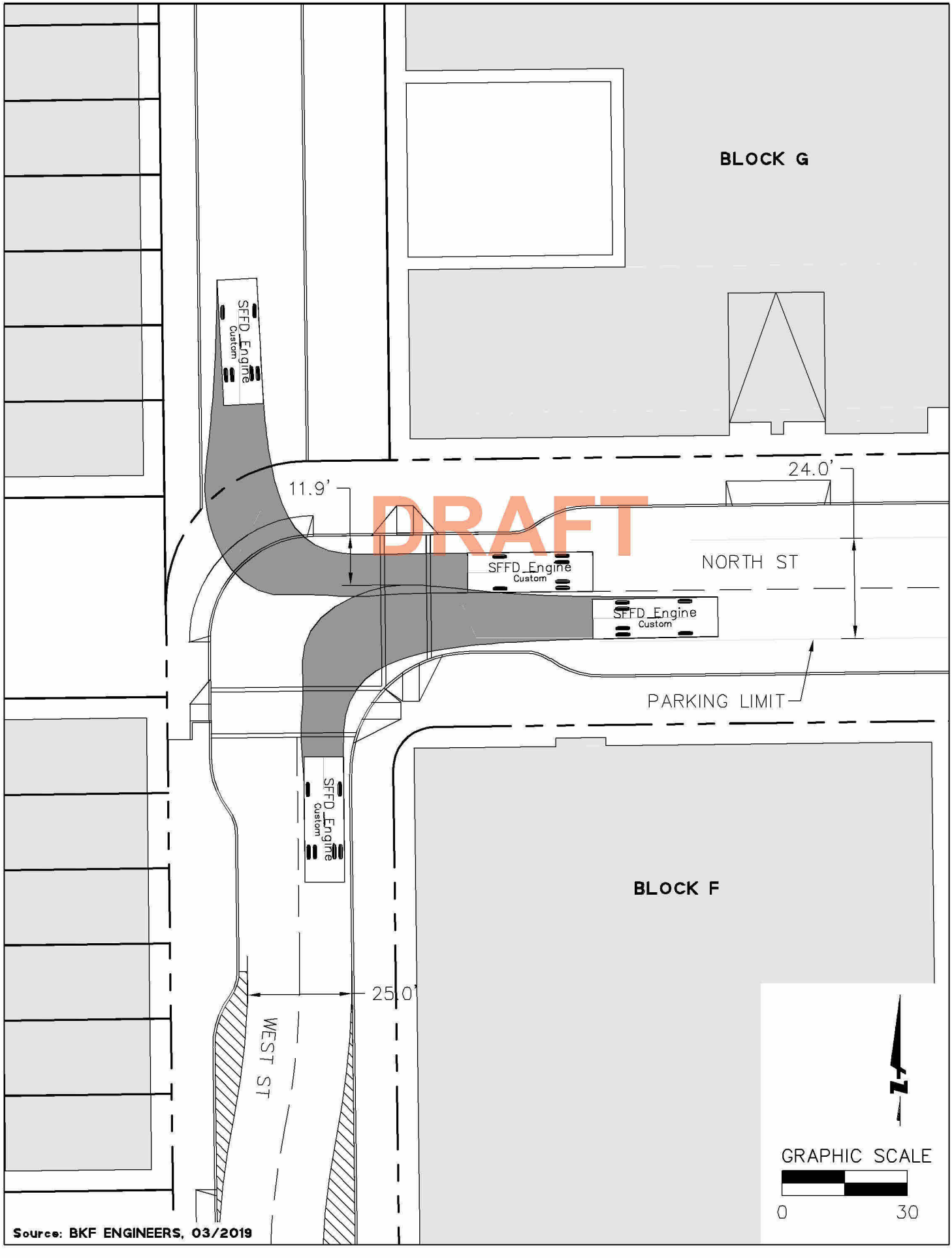
PLOT DATE: 03-15-19 PLOTTED BY: cheh

BALBOA RESERVOIR INFRASTRUCTURE PLAN **APPX. D.6 – SFFD AERIAL FIRE TRUCK TURNING TEMPLATE – NE**



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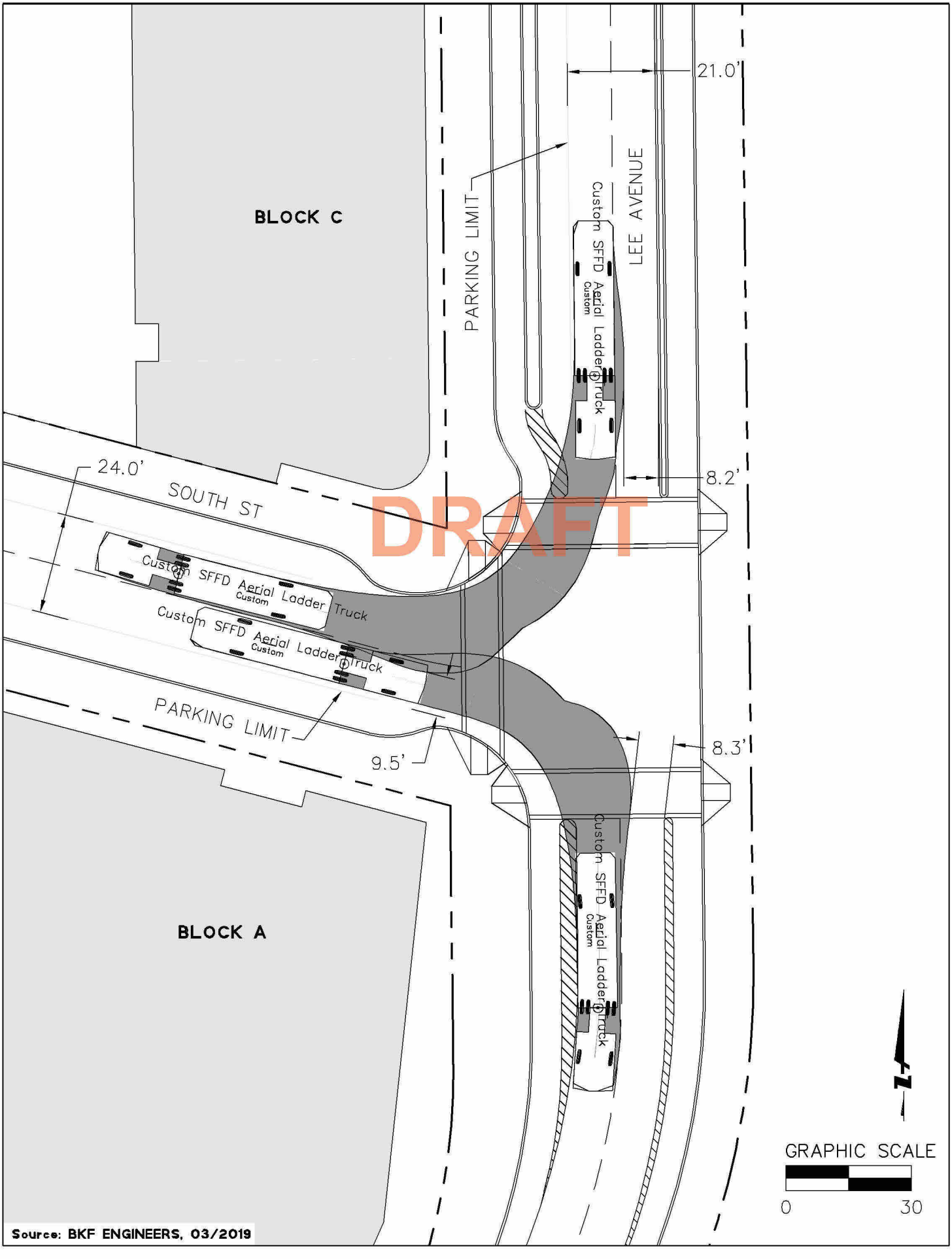
PLOT DATE: 03-15-19 PLOTTED BY: cheh

BALBOA RESERVOIR INFRASTRUCTURE PLAN APPX. D.7 – SFFD AERIAL FIRE TRUCK TURNING TEMPLATE – NW



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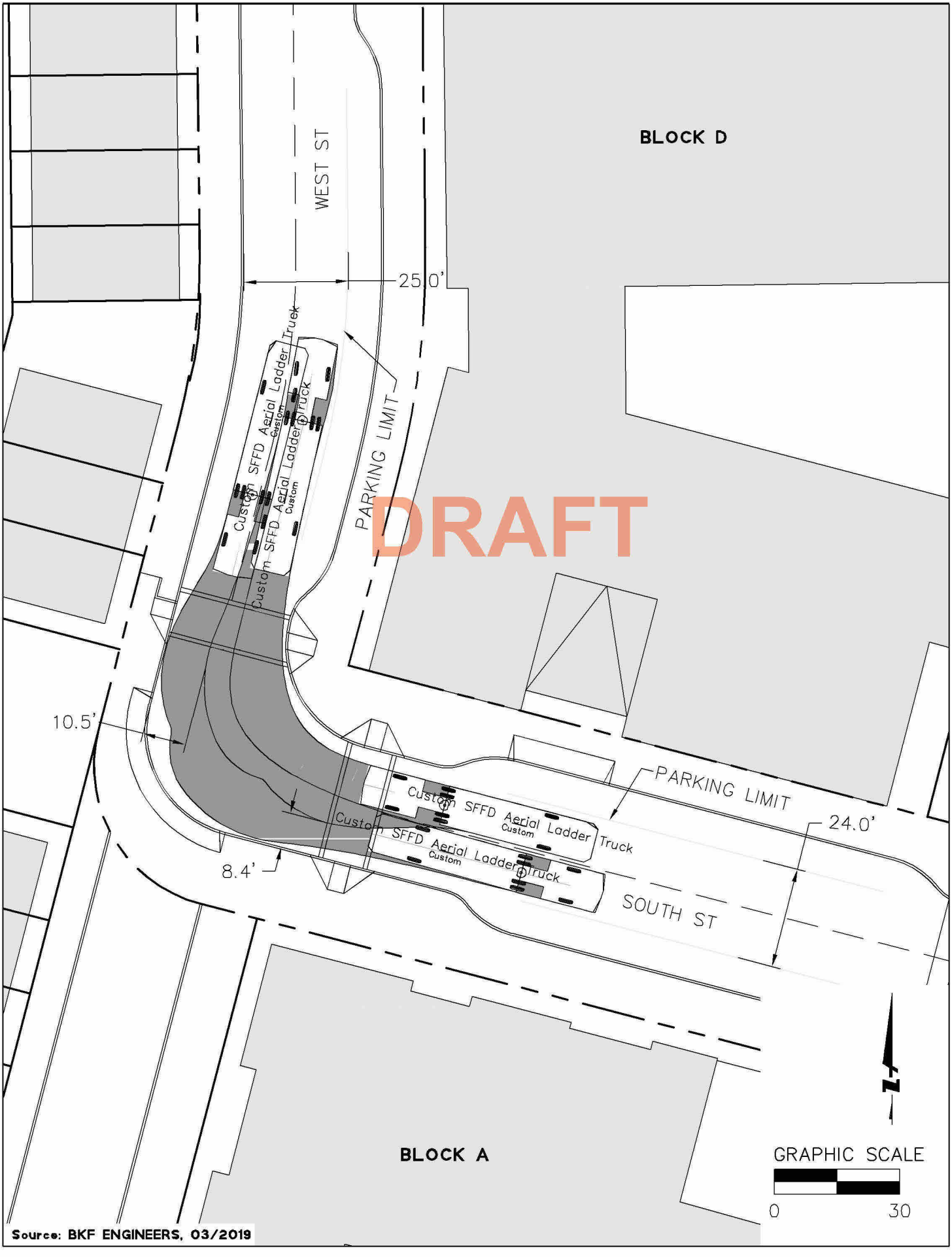
PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN APPX. D.8 – SFFD AERIAL FIRE TRUCK TURNING TEMPLATE – SE

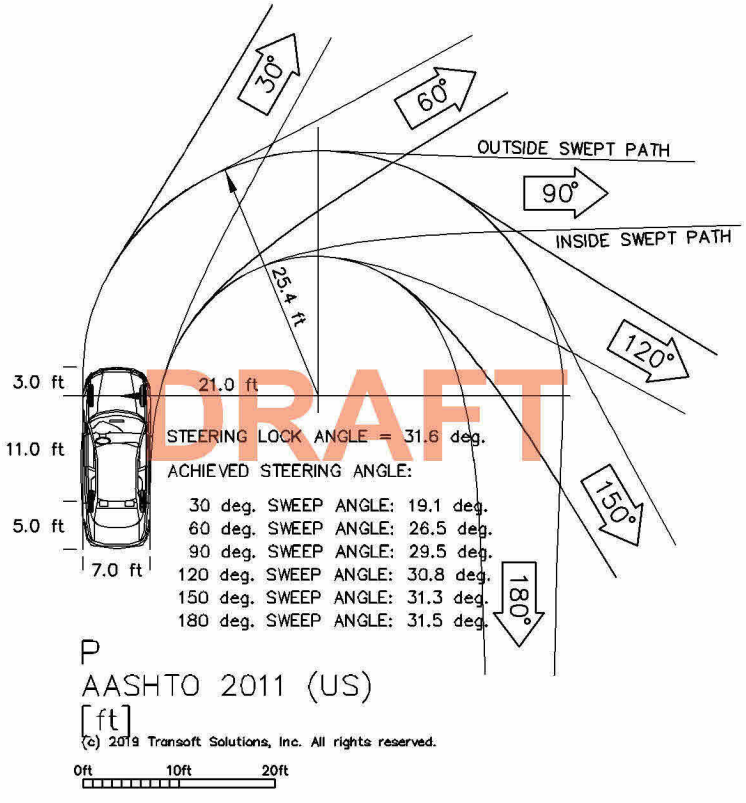


Source: BKF ENGINEERS, 03/2019

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\ENG\EXHIBITS\AUTOTURN\Fire_Truck\Fire_Truck_Turning.dwg
PLOT DATE: 03-15-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN APPX. D.9 – SFFD AERIAL FIRE TRUCK TURNING TEMPLATE – SW

APPENDIX E – PASSENGER VEHICLE TURNING MOVEMENTS

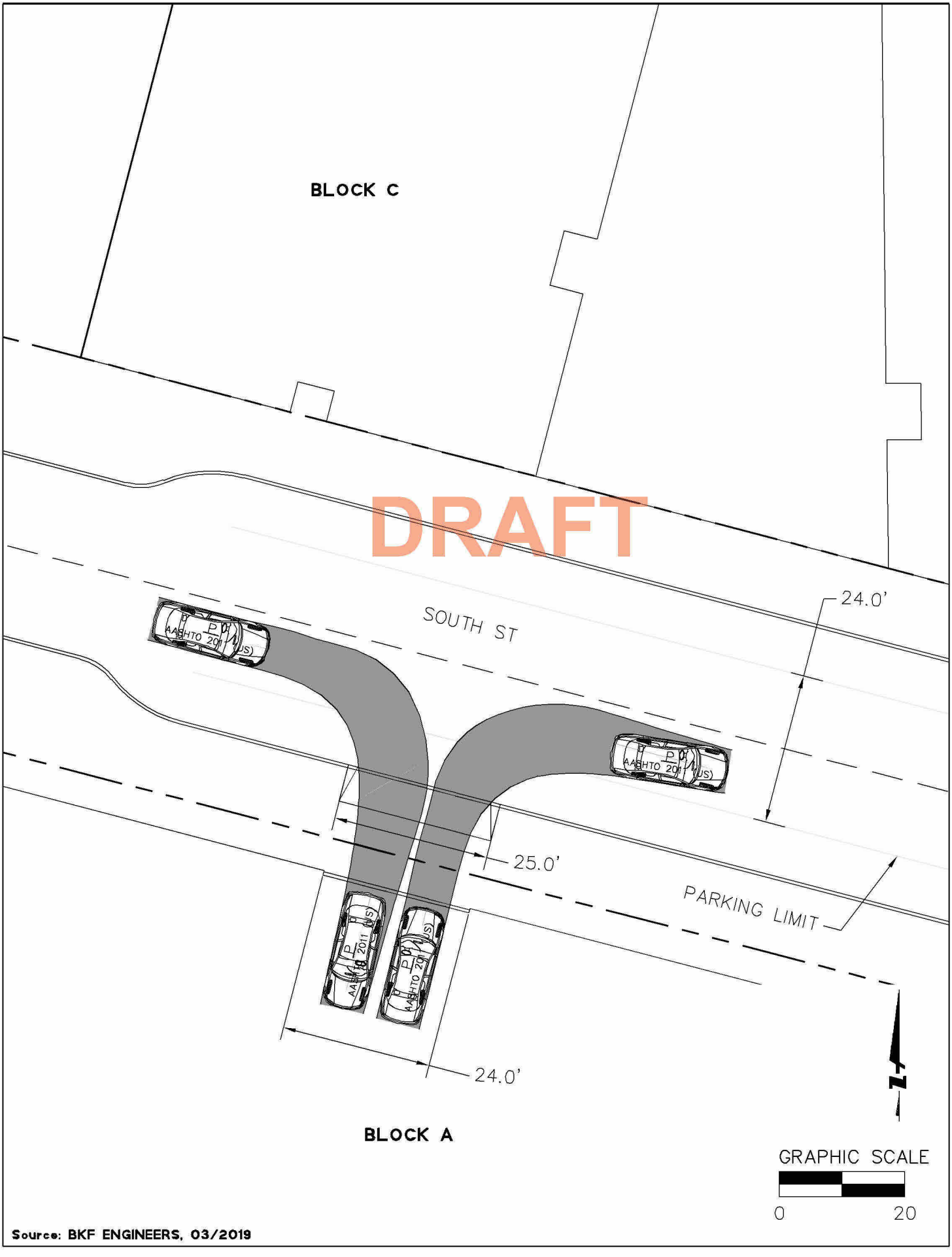


GRAPHIC SCALE

0 20

Source: BKF ENGINEERS, 03/2019

DRAWING NAME: K:\2016\160367_Balboa_Reservoir\ENG\EXHIBITS\AUTOTURN\Garage Entrances\Garage_Entrance_Turning.dwg
PLOT DATE: 03-01-19 PLOTTED BY: chen



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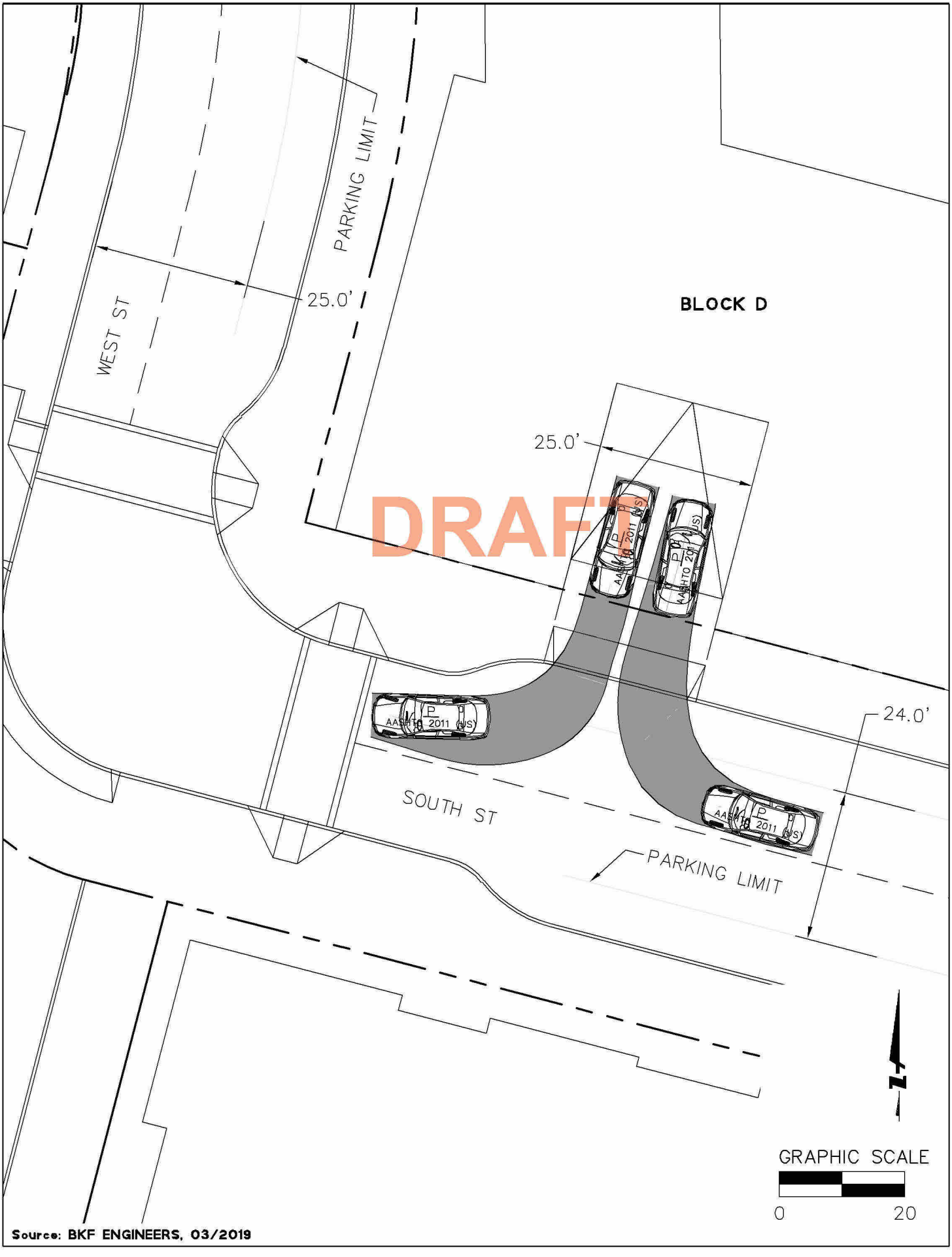
PLOT DATE: 03-01-19 PLOTTED BY: cheh

Source: BKF ENGINEERS, 03/2019

BALBOA RESERVOIR INFRASTRUCTURE PLAN APPX. E.2 – PASS. VEH. TURNING TEMPLATE – GARAGE A & B



Source: BKF ENGINEERS, 03/2019

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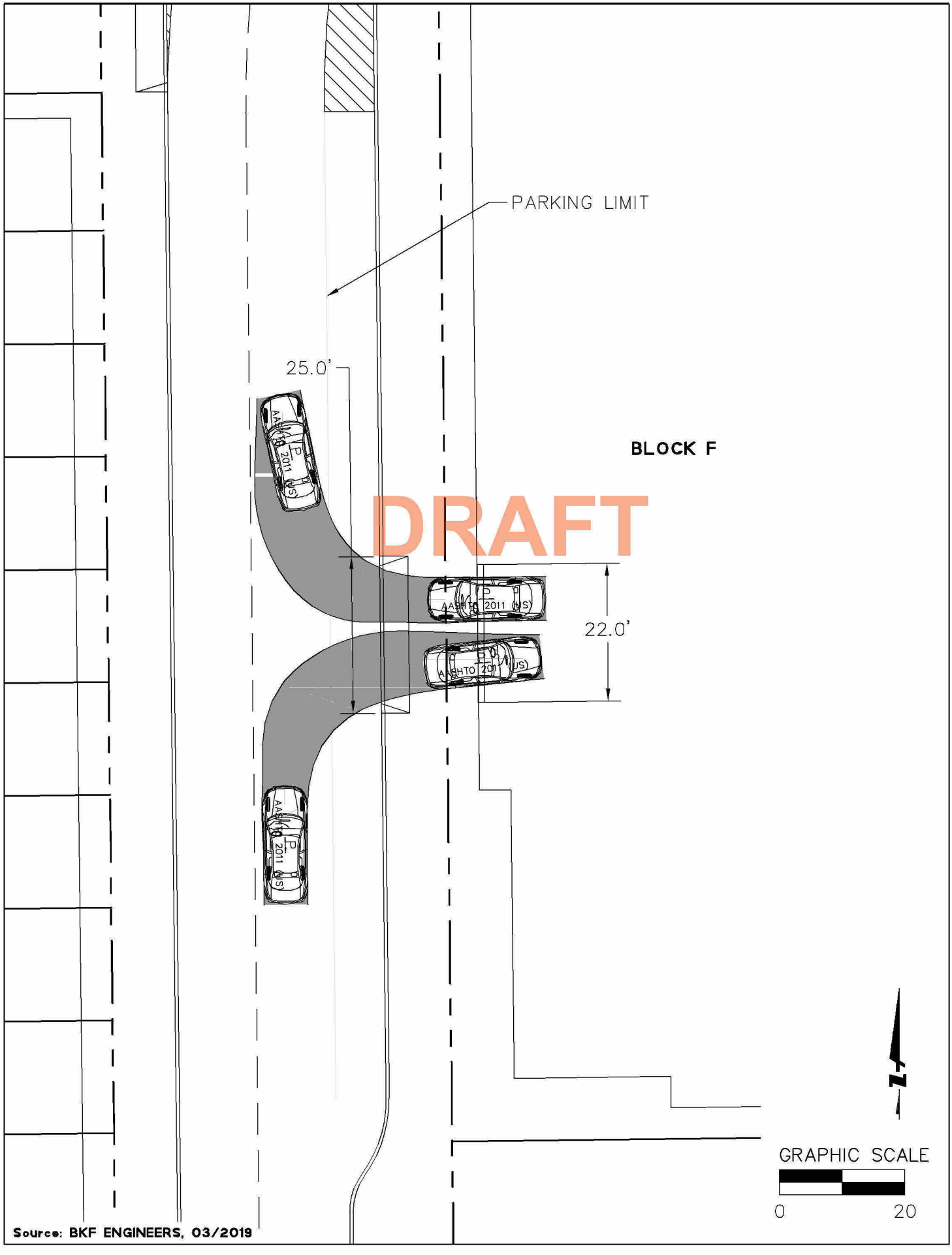
PLOT DATE: 03-01-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. E.3 – PASS. VEH. TURNING TEMPLATE – GARAGE C & D



Source: BKF ENGINEERS, 03/2019

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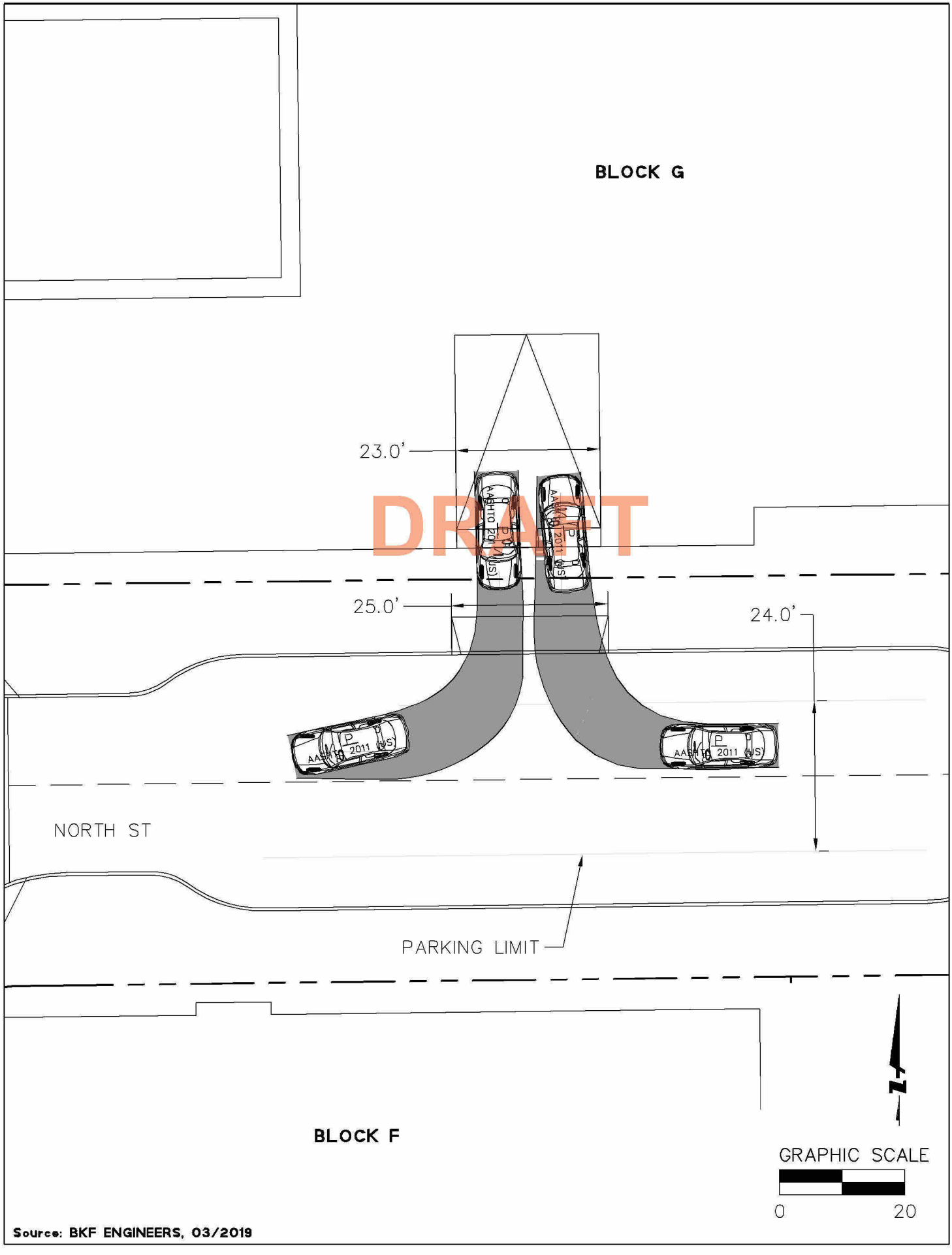
PLOT DATE: 03-01-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. E.4 – PASS. VEH. TURNING TEMPLATE – GARAGE F



Source: BKF ENGINEERS, 03/2019

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PLOT DATE: 03-01-19 PLOTTED BY: chen

BALBOA RESERVOIR INFRASTRUCTURE PLAN

APPX. E.5 – PASS. VEH. TURNING TEMPLATE – GARAGE G