201 North Civic Drive, Suite 300
Walnut Creek, CA 94596

T: 925.937.9010
F: 925.937.9026

April 8, 2021

Mr. Roland Yip, PE, QSP/D
Senior Civil Engineer
City of Daly City
333 - 90th Street
Daly City, California 94015

153172-018

Subject: Hydraulic Analysis for the Westlake South Project

Dear Mr. Yip:

In completion of Phase 018 of the Agreement for Consulting Services dated October 8, 2018, between the City of Daly City (Daly City) and Brown and Caldwell (BC), BC is pleased to submit this letter report for your review and use. This report documents the hydraulic analysis performed to determine the water main sizes required to deliver domestic and fire flow demands to the proposed Westlake South Project in Daly City.

For this assignment, BC evaluated potential connection points to Daly City's water system and modifications to Daly City water system. This report describes the model development, summarizes hydraulic analysis results, and presents BC's recommendations for the diameters and connection points of the distribution pipelines.

BC's scope does not include the following activities and thus they are not part of this analysis:

- Surge analysis
- Water quality analysis
- Sizing of the proposed automatic fire-suppression sprinklers system

Hydraulic Model Development

BC modeled the proposed project using InfoWater Pro 3.0 by Innovyze, Inc. InfoWater Pro is a commercially available, fully Geographic Information System integrated, water distribution modeling and management software application that calculates and tracks various hydraulic constituents, such as flow, velocity and pressure of water through the water system.

The updated model includes the existing Daly City pipe network (last updated in March 2021), including distribution mains 8 to 16 inches in diameter; note that the model also shows mains with diameters less or equal to 6 inches when those mains are the only local water mains or provide locations for service connections and the proposed pipe network and facilities for the project site. Figure 1 illustrates the existing and proposed water systems of the proposed project.

Author: Kevin Kai Path: \\bc\corp\PW_Exports\153172_Daly_City\DalyCity-111120.aprx

City of Daly City
Hydraulic Analysis
Westlake South Project

Figure 1
Existing and Proposed Water System

Legend

Junction

- (All Modeled Facilities)
- (Project Specific Facilities)
- (Inactive Facilities)

Pipe (Diameter, In)

- <=4
- 6
- 8
- 10
- >=12

- Pump
- PRV
- Reservoir
- Water Source
- Existing Hydrant
- New Hydrant

* For new hydrants, actual number, spacing, and location as required by North County Fire Authority.

N

0 85 170
Feet

Service Layer Credits: World Imagery: GeoEye, Maxar, Microsoft
Hybrid Reference Layer: Esri Community Maps Contributors, County of San Mateo, California, BuildingFootprintUSA, Esri, HERE, Garmin, SafeGraph, INCREMENT P,

DALY CITY CALIFORNIA

Brown AND Caldwell

PARCEL 8
251 WESTLAKE CENTER

SOUTHGATE AVE

LAKE MERCED BLVD

PALMCREST DR

SDMH RIM: 101.43
INV IN: 92.03 (S)
INV IN: 95.68 (SW)
INV IN: 94.73 (W)
INV IN: 95.88 (NW)
INV IN: 78.28 (E)
INV OUT: 78.18 (N)

SSMH RIM: 101.72
INV IN: 93.75 (S)
INV OUT: 93.75 (N)

SSMH RIM: 101.10
INV IN: 77.50 (S & E)
INV OUT: 77.50 (N)

SSMH RIM: 101.41
INV IN: 85.91 (S)
INV OUT: 85.91 (N)

SSMH RIM: 102.47
INV IN: 94.23 (W)
INV IN: 94.28 (S)
INV OUT: 94.13 (N)

SSMH RIM: 98.53

SSMH RIM: 98.53
INV IN: 87.79 (W)
INV IN: 87.43 (E)
INV OUT: 87.25 (N)

SSMH RIM: 100.40
INV OUT: 94.44 (E)

SDMH RIM: 97.73
INV IN: 83.73 (E)
INV OUT: 83.73 (NW)

SDCB TOG: 95.87

SSMH RIM: 96.77
INV IN: 76.87 (S)
INV OUT: 75.67 (W)

SDMH RIM: 96.38
INV IN: 90.08 (N)
INV IN: 80.38 (S)
INV OUT: 80.24 (W)

SDMH RIM: 95.93
INV IN: 92.68 (SW)
INV IN: 92.48 (E)
INV OUT: 92.43 (NE)

SDCB TOG: 100.56
INV: 93.66 (NW)

SDMH RIM: 101.42
INV IN: 93.36 (E)
INV IN: 93.22 (S)
INV OUT: 93.10 (N)

SDCB TOG: 99.97

PROPERTY LINE

DEMO EX SD LINE

PROPOSED SERVICE CONNECTIONS

PG&E EASEMENT

5' CITY UTILITY EASEMENT

50' PIPELINE EASEMENT

INGRESS, EGRESS, UTILITY & DRAINAGE EASEMENT

PROPERTY LINE

12' SANITARY SEWER EASEMENT

Ex. 10" water be relocated outside of the property line

Commercial and Fire connections, See Note 1.

Ex. 8" water to be relocated outside of the property line

EXISTING 30" SEWER MAIN

Residential connection, See Note 1

UTILITY ROOM WITH BUILDING CONNECTIONS

Demo Ex. 8" W

DEMO EX 8" SD LINE

DEMO EX 8" W LINE

PG&E MANHOLES

PG&E EASEMENT

EX 4" PGE GAS LINE TO BE RELOCATED

PG&E EASEMENT

SSMH RIM: 98.96
INV IN: 92.31 (E)
INV IN: 81.05 (SW)
INV OUT: 81.01 (N)

SSMH RIM: 99.35
INV IN: 93.65 (NE & SW)
INV OUT: 93.65 (N)

SSMH RIM: 99.40
INV IN: 93.96 (NE)
INV OUT: 93.65 (N)

PG&E EASEMENT

UTILITY EASEMENT

PG&E MANHOLE

SSMH RIM: 101.71
INV IN: 93.59 (SW)
INV IN: 93.32 (SE)
INV OUT: 93.06 (NE)

50' PIPELINE EASEMENT

PG&E EASEMENT

SSMH RIM: 102.47
INV IN: 95.80 (S)
INV IN: 96.19 (W)
INV OUT: 95.77 (N)

SDCB TOG: 102.55
INV OUT: 98.75 (NE)

SDMH RIM: 102.69
INV IN: 96.08 (E)
INV IN: 95.9 (S)
INV IN: 97.49 (SW)
INV IN: 95.25 (W)
INV OUT: 95.21 (N)

SSMH RIM: 102.83
INV IN: 89.98 (SW)
INV OUT: 89.98 (N)

10" W

REROUTE EX GAS LINE

PROPERTY LINE

CONNECT EX PGE GAS LATERALS TO RELOCATED MAIN

EX PGE GAS LATERALS TO BE DEMO

EX PGE GAS LATERALS TO BE DEMO

EXISTING BUILDING FIRE SERVICE CONNECTIONS

SDCB TOG: 100.97

PG&E MANHOLES

SSMH RIM: 103.43
INV IN: 98.90 (W)
INV IN: 98.76 (SW)
INV IN: 98.84 (E)
INV OUT: 98.78 (NE)

REROUTE EX W LINE

PG&E MANHOLE

8" W

INGRESS, EGRESS, UTILITY & DRAINAGE EASEMENT

INGRESS, EGRESS, UTILITY & DRAINAGE EASEMENT

SDCB TOG: 102.80

LEGEND

- PROPERTY LINE
- EASEMENT LINE
- SANITARY SEWER LINE
- STORM DRAIN LINE
- WATER LINE
- SANITARY SEWER MANHOLE
- STORM DRAIN MANHOLE
- TELECOM MANHOLE
- WATER VALVE
- FIRE DEPARTMENT CONNECTION
- FIRE HYDRANT
- SIGN
- STREET LIGHT

Notes:

1. Both water service locations were studied, however, the City has only authorized the connection at Lake Merced Boulevard. Any deviations will need to be authorized by the Department of Water and Wastewater Resources (DWWR).

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

No.	REVISIONS	DATE	BY

Kimley»Horn
4637 CHABOT DRIVE, SUITE 300, PLEASANTON, CA 94588
PHONE: 925-398-4840 FAX: 925-398-4849
WWW.KIMLEY-HORN.COM

KHA PROJECT 197058004
DATE SEPT 16, 2020
SCALE AS SHOWN
DESIGNED BY
DRAWN BY SAL
CHECKED BY AH

KIMCO - WESTLAKE
99 SOUTHGATE AVE
DALY CITY, CA 94015

LICENSED PROFESSIONAL
DATE:

FIGURE 2
PRELIMINARY
UTILITY LAYOUT

SHEET NUMBER
EX-2

The Westlake South Project will construct a new mixed-use building. The proposed 7-story building consists of 214 residential unit and 10,800 square-feet (ft^2) of street-level retail space with a five-story residential wood-frame (Type III-A) superstructure atop a two-story enclosed concrete podium (Type I-A) with 251 parking spaces. As shown on the drawings by Van Meter Williams Pollack LLP (dated September 16, 2020), the overall project encompasses approximately 1.93-acre and bounded by Lake Merced Boulevard, Southgate Avenue, and Palmcrest Drive in Daly City's water system Pressure Zone 4.

The basic construction type for the building is Type III-A over Type I-A. Typically, Type III-A building's exterior walls are of noncombustible materials and the interior building elements are of any material permitted by the California Building Code. Type I-A construction is construction in which the building elements are of noncombustible materials. The project consists of one new building described in Table 1 and as shown on Figure 1.

Table 1. Proposed Facilities

Building	Type	Approximate Area, ft^2	New Laterals, Diameter[a] and Length
Westlake South	Residential/Commercial Mixed-Use	355,580	• Residential: 3-in, 65-ft • Commercial: 2-in, 65-ft • Fire Sprinkler: 8-in, 65-ft • Landscaping: TBD, 65-ft

a. *The project mechanical engineer will determine the actual diameter and length of the various laterals for the proposed building during detail design.*

ft = foot/feet
in = inch

As determined during the project kick-off meeting on March 8, 2021, the proposed project will require the following modifications to the existing Daly City water system as depicted in Figure 2:

- Making a commercial connection: to the existing 10-inch-diameter asbestos concrete pipe (ACP) in Southgate Avenue.
- Making a fire sprinkler connection: to the existing 10-inch-diameter ACP in Southgate Avenue.
- Making a residential connection: to the existing 10-inch-diameter ACP in Lake Merced Boulevard.
- Making a landscaping connection: to the existing 10-inch-diameter ACP in Lake Merced Boulevard.
- Relocating the existing 10-inch-diameter ACP in Southgate Avenue out of the private property and onto public right of way.
- Relocating the existing 8-inch-diameter ACP in Palmcrest Drive out of the private property and onto public right of way.
- Upsizing a portion of the existing 6-inch-diameter ACP in Lake Merced Boulevard to a 10-inch-diameter water pipe.
- Demolishing and rerouting the existing 8-inch-diameter ACP located in the southwest corner of the project site.

The hydraulic model consists of the following elements and assumptions:

1. Daly City will require new project hydrants per Daly City Design Standards (Section 6.02.C) and 2019 California Fire Code (CFC); see the minimum number of required hydrants for the proposed building in Table 2.
2. For demand nodes servicing the proposed building, BC modeled new water service to the development using two demand nodes for the proposed building; however, Daly City may require separate connections/meters for fire, domestic, and irrigation demand. The findings of this water study still apply when proposed building requires multiple connections.

Required Fire Flow and Hydrant

For these analyses, North County Fire Authority (NCFA) agreed to the following required fire flow and duration after the initial project review in March 2021. The local fire authority may increase fire flow demand at its discretion to address concerns regarding wild land or other issues.

1. To estimate the fire flow requirements, BC used Type III-A over Type I-A mixed building construction type for the proposed Westlake South building.
2. Per Daly City Municipal Code, the proposed building will have approved National Fire Protection Association (NFPA) 13 automatic sprinklers. The highest ceiling elevations will be approximately 85 ft above pad elevations for the Westlake South building.
3. Table 2 shows the required fire flow and duration per CFC Appendix B (Table B105.1(2) and B105.2). When the building has an automatic fire protection sprinkler system (Section 903.3.1.1 CFC), the local fire authority can reduce the required fire-flow by up to 75 percent but not less than 1,000 gpm. However, NCFA does not permit reduction of fire flow by more than 50 percent and not less than 1,500 gpm.
4. Per CFC Appendix C (Table C102.1), the proposed Westlake South building requires six hydrants based on the full fire-flow before sprinkler related reduction. Existing fire hydrants on public streets can be considered as available to meet the CFC hydrant requirements. NCFA shall dictate all new hydrant location.
5. Required hydrant spacing per Daly City Design Standards (Section 6.02.C): 300 ft between hydrants. NCFA shall dictate final hydrant spacing.

Demand Allocations

BC allocated the new residential, commercial, and fire sprinkler demands to two model nodes using the unit demand factors by land use as developed in the Water Demands Summary Technical Memorandum (BC, July 13, 2012) and CFC. Table 2 and 2A present the water demands and the sprinkler system demands used for this analysis, respectively.

Table 2. Average Day and Fire Flow Demands for the Proposed Project

Proposed Project	Approximate Area[a] ft²	No. of Units	Stories	Building Type[b], per CBC	Approximate Building Height, ft.	Land Use Classifications	Unit Water Demands[c,d]	Average Day Demands[e], gpm	Required Fireflow[f], gpm	Reduced Fireflow[g], gpm	Flow Duration[h], hours.	Minimum No. of Hydrants[i]	Average Spacing between Hydrants[j], ft.
Westlake South													
Apartment Building	239,690	214	5	III-A	60	High density residential	60 gpcd	41.7	6,000	3,000	3	6	300
Commercial Office	115,890	-	2	I-A	25	Commercial	0.045 gpsfpd	10.9	6,000	3,000	3	6	300
Project Total	355,580		-	-	-	Mixed-Use	-	**52.6**	**6,000**	**3,000**	**3**	**6**	**300**

a. Approximate total building areas of all floor levels within the exterior walls from developer.
b. For mixed construction building, calculations per State Fire Marshal code interpretation "Fire Flow Requirements with Mixed Construction" 11-015.
c. Unit Water Demands and occupants per Unit from Near- and Long-Term Water Resources Planning (BC, 2012). Residential: 3.12 people per unit and:60 gpcd. Commercial: 0.045 gpsfpd
d. gpcd = gallons per capita per day, gpsfpd = gallons per ft² per day, gps = gallons per minute per sprinkler, gpd/rm = gallons per day per room.
e. gpm = gallons per minute. Residential/Hotel demand is averaged over 16 hours and all non-residential demand is averaged over 8-hours per day.
f. Required fire flow per the 2019 CFC, Appendix B. (Table B105.1(1) and B105.1(2)).
g. Reduced fire flow with an approved automatic sprinkler system Per CFC Table B105.1(1). NCFA does not permit reduction of fire flow by more than 50 percent and the reduced fire flow shall not be less than 1,500 gpm.
h. Required fire flow duration are to be based on the reduced fire flow required per CFC Tables.
i. Required minimum number of hydrants are to be based on the full fire flow per the 2019 CFC, Appendix B and C. (Table C102.1).
j. Required hydrant spacing per 1990 Daly City Design Standards (Section 6.02.C). Actual final spacing of hydrants as required by NCFA.

Table 2A. Sprinkler Demands for the Proposed Project

Proposed Project	Sprinkler Type	NFPA 13 Occupancy	Sprinkler Area, ft²	Density, gpm/ft²	Sprinklers Demands[a], gpm	Hose Stream Demands, gpm	Total Sprinklers System Demands, gpm
Westlake South							
Apartment Building	NFPA 13	Light	1,500	0.1	150	100	250
Commercial/Office	NFPA 13	Ordinary 2	1,500	0.2	300	250	550
Project Total					**300**	**250**	**550**

a. Sprinkler demand based on Density/area curves of 2019 NFPA 13, Figure 19.3.3.1.1 in accordance with the density/area method of 19.3.3.2.

Hydraulic Analysis

BC used Daly City's Water Master Plan (BC, August 1991) hydraulic design criteria for this analysis; they reflect the fire flow requirements under the revised CFC with provisions for automatic fire sprinklers. Table 3 summarizes the distribution system pressure criteria, and Table 4 summarizes the velocity and headloss criteria.

Table 3. Pressure Criteria

Condition	Pressure psig	System-Wide Demand Multiplier[a]
Minimum pressure at peak-hour[b]	40	3.0
Minimum residual pressure under Fire Flow + Max Day Demand—hydrant pressure per California Waterworks Standard (CCR Title 22, 2008)[c]	20	1.5 + fire flow
Minimum residual pressure under Fire Sprinkler demand + Max Day Demand—sprinkler pressure at highest sprinkler (pressure measured at pad elevation on utility side of water meter)[d]	55	1.5

a. Demand multipliers based on the 1991 Master Plan.
b. The latest edition of the California Water Works Standards (Section 64602) requires a peak-hour pressure of 40 psig.
c. Fire flow demand at the model junction varies, with a minimum residual pressure of at least 20 pounds per square inch gage (psig).
d. Fire sprinkler demand for each building is estimated based on 2019 NFPA 13, Figure 19.3.3.1.1.
psig = pound(s) per square inch gauge

Table 4. Velocity and Head Loss Criteria

Parameter	Condition	Distribution Pipeline Criteria
Maximum distribution velocity	Maximum day	5 fps
Maximum distribution headloss	Pipeline diameter < 16 inches	10 ft/1,000 ft
	Pipeline diameter ≥ 16 inches	3 ft/1,000 ft

fps = feet per second

BC analyzed the hydraulic network model under four scenarios: maximum day demand, peak hour demand, fire sprinkler demand plus maximum day demand, and structure fire flow plus maximum day demand. Table 5 lists the node's demands information, including junction's identifications, pressure zone, elevations, and average day demands (ADD).

Table 5. Model Nodes and Domestic Demands

Junction ID[a]	Description[b]	Pressure Zone	Elevation (ft)	Additional Demand, (gpm)
J-4427	Westlake South Sprinkler	4	97	550
J-4427	Westlake South Commercial	4	97	10.9
J-4416	Westlake South Residential	4	100	41.7

a. See Figure 1 for the location of the demand node.
b. See table 2A for fire sprinkler system demand based on new building area.

Scenario 1. Maximum day demand is the theoretical largest demand that occurs during any single day of the year. The day of maximum demand is usually associated with hot weather during the late summer or early fall. The maximum day demand factor for Daly City is 1.5. BC applied this global multiplier to all demand nodes in the model to simulate maximum day demand conditions.

Scenario 2. Peak hour is the largest demand that occurs on any one single hour during the day of maximum demand and is larger than maximum day demand. BC multiplied average-day demands globally by 3.0 for peak-hour conditions.

Scenario 3. Based on the density/area method from the 2019 NFPA 13, BC estimated the fire sprinkler demand to be 550 gpm for the proposed Westlake South building (see Table 2A). In accordance with Daly City procedure, BC also assumed a minimum residual pressure of 55 psig will be required at pad elevation of the proposed building. The project fire protection engineer will address the actual required pressure and number of sprinkler head for the fire protection system.

Scenario 4. BC analyzed available fire flow by running the structure fire flow simulation under the maximum day demand scenario in the steady state mode.

Scenario 5. BC analyzed Daly City water model using the ADD for the field test day simulation.

Findings, Conclusions and Recommendations

After analyzing the model output for five different model scenarios, BC found that the existing Daly City public water system shown in Figure 1 would deliver satisfactory pressure and flow to the project building. Table 6 summarize the hydraulic analysis results for Scenario 1-5.

Table 6. Hydraulic Analysis Scenario 1-4 Results

	Model Assumptions				Analysis Results			
Analysis Scenario[a,b]	Tank Level	System Demands	Fire Flow/ Sprinkler Demands	Min. Pressure	Max. Pressure	Available Sprinkler/ Fire Flow	Max. Velocity	Max. Headloss
1	Full -1 ft	Maximum day	-	-	104 psig	-	<5 fps	<10 ft/1,000 ft
2	Full -10 ft	Peak hour	-	>40 psig	-	-	-	-
3	Full -1 ft	Maximum day	550 gpm (Sprinkler)	>55 psig	-	-	-	-
4	Full -5 ft	Maximum day	3,000 gpm (Hydrant)	>20 psig	-	-	-	-

a. For Scenario 4 detail results, see Table 7.

b. For Scenario 5 detail results, see Table 8.

Finding 1. Under maximum day demand conditions, BC found that the modeled system met both the maximum velocity and headloss criteria. The Uniform Plumbing Code (Section 608.2) limits internal pressures in any structure to 80 psig; therefore, structures with pad elevation lower than approximately 220 ft in Pressure Zones 4 will require individual pressure-regulating devices:

- Westlake South project appears to have pad elevation lower than 220 ft. The designer of the building plumbing system will address building internal pressure control.

Finding 2. Under peak-hour demand conditions, BC found that all junctions within the proposed project meet the peak-hour minimum required residual pressure of 40 psig.

Finding 3. Under maximum day conditions with sprinkler flow demands, the modeled system delivered the estimated sprinkler flow to the proposed building and met the minimum required residual pressure of 55 psig at pad elevation of the proposed building on the utility side of the water meter.

Finding 4. Under maximum day conditions with structure fire flow demands, the modeled system delivered the required fire hydrant flows and met the minimum required residual pressure of 20 psig for the proposed building. Table 7 lists the available fire flow simulation results:

- Daly City's water system would deliver the total maximum fire demand for the Project (3,000 gpm for 180-minute equals 540,000 gallons) from Reservoir 4, San Francisco Public Utilities Commission (SFPUC) turnouts, and pressure reducing stations from adjacent pressure zones.
- Since Zone 4 draws water from several sources, BC assumes based on past master planning that these various water sources will have enough available capacity to supply the required fire flow.

Table 7. Residual Pressure During Fire Flow Demand Simulation

Junction ID	Description	Static Pressure, (psig)	Fire-Flow Demand (gpm)	Residual Pressure, (psig)	Available Flow at Hydrant[a] (gpm)	Available Flow Pressure, (psig)	Notes
J-4416, J-4418, J-4427	Westlake South Fire Hydrant	103	1,000 each	75	3,000	20	Provided at Ex. and New Hydrants.

a. New project hydrant will be required per CFC and City Design Standards (Section 6.02.C).

Finding 5. As described in the American Water Works Association (AWWA) Manual M-32 Computer Modeling of Water Distribution Systems, fire flow testing is a widely used method for estimating the available fire flow from specific fire hydrants within water distribution systems and for validating water models. Fire flow tests consist of measuring flow from a hydrant (flow hydrant) while measuring the pressure at an adjacent hydrant (residual or pressure hydrant). The flow hydrant causes a pressure drop (AWWA recommends a drop of 10 psig, or more to create sufficient "stress" on the water system to reveal its characteristics) measured at the residual hydrant. Normally, city/agency staff use a supervisory control and data acquisition (SCADA) system to record flow rates from pumps/ pressure reducing valves (PRVs) and reservoir levels at test time to determine water demand and operating parameters. The modeler then simulates the test in the model by setting the pump/PRV operation and reservoir levels to match the field data and imposes a flow hydrant in the model. Finally, the modeler

compares the pressure drop at the residual hydrant in the model results to the field data. Table 8 list the fire hydrant test data versus the model simulation results for this project.

Table 8. Summary of Fire Hydrant Test and Model Results

	BPS Status	Reservoir Level	Pressure Hydrant[b]		Flow Hydrant[c]
	Westlake BPS	Reservoir 4	Static (psig)	Residual (psig)	Flow (gpm)
Field measurements[a]	Off	14.8'	122	103	1,251
Model results	Off	14.8'	112	82	1,251
Deviation	-	-	10	21	-

a. Fire flow test was conducted by City Staff on 07:25,1/17/2021.
b. Pressure Hydrant location: Hydrant 30 on Map C-03.
c. Flow Test Hydrant location: Hydrant 16 on Map C-04.

As part of model validation procedure, BC inserted SCADA system reservoir level (Reservoir 4 at 14.8-ft) and Booster Pump Station (BPS) data (Westlake BPS is off), recorded during hydrant testing into Daly City water model and analyzed the model assuming the ADD for the test day. We compared the field-measured static pressure and residual pressure to the static pressure and residual pressure predicted by the model.

Fire Hydrant Flow Test Findings

The water system at this test location is well looped with watermain diameters ranging from 6 to 12-inch diameter. The system has enough hydraulic capacity and the model predicts that pressure at the hydrant would drop 30 psig.

The model static pressure result deviated from the field measurement by 10 psig and the model residual result deviated from the field measurement by 21 psig. Within the water industry standards for a distribution system, typically a model is sufficiently validated when the static and residual pressure predicted by the model at the specific locations are within 5 psig of the field measured static pressures. Although the model predicted pressures are lower than the field measurements, the 122 psig measured in the field indicated that there is adequate system pressure to provide the required fire flow for the project. The following are some possible reasons for the lower static and residual pressures predicted by the water model:

- The Pressure Zone 4 hydraulic grade line at the time of the fire hydrant flow test may be influenced by additional sources besides Reservoir 4, such as the SFPUC turnouts and/or PRVs from Zone 3 and Zone 5.
- Lower C-value for the water pipeline in the model than the actual C-value in the project vicinity.

Summary

For the proposed Westlake South Project Site, the model conforms to the fire hydrant flow requirements while the existing Daly City public water system shown in Figure 1 would meet the velocity and headloss criteria. Improvements as described in this letter and summarized in Table 9 below would produce a water system that meets all Daly City criteria.

The project will connect at two locations to the existing Daly City water system:

- Commercial and Fire Sprinkler connection: to the existing 10-inch-diameter ACP in Southgate Avenue.
- Residential connection: to the existing 10-inch-diameter ACP in Lake Merced Boulevard.
- Both water service locations were studied, however, the City has only authorized the connection at Lake Merced Boulevard. Any deviations will need to be authorized by the Department of Water and Wastewater Resources (DWWR).

Table 9. Summary of Proposed Water System

Proposed Water System	Estimated Quantity
New Pipelines	• Residential: 3-in, 65-ft • Commercial: 2-in, 65-ft • Fire Sprinkler: 8-in, 65-ft • Landscaping: TBD, 65-ft
New Hydrants	Up to 6

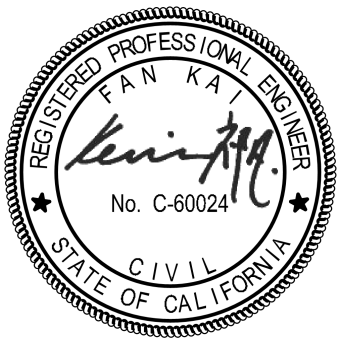
a. *The project engineer will determine the actual diameter and length of the various laterals for the proposed building during detail design.*
b. *The project engineer will determine the actual length of the existing pipeline demolition and relocation during detail design as required by the City.*

The project will require a maximum of six new fire hydrants for the Westlake South building per the CFC and Daly City Design Standards (Section 6.02.C). The project fire protection engineer will address the actual number, spacing, and location of the fire hydrant system.

BC appreciates the opportunity to assist Daly City with this project. Please call us with any questions.

Very truly yours,

Brown and Caldwell



Kevin Kai, P.E.
Project Manager
CA License C 60024

KK:ddt

cc: William K. Faisst, Brown and Caldwell