APPENDIX K

IRVINE RANCH WATER DISTRICT
PRELIMINARY SUB-AREA MASTER PLAN ADDENDUM

IRVINE RANCH WATER DISTRICT

THE KOLL CENTER

PRELIMINARY SUB-AREA MASTER PLAN ADDENDUM

Submitted to

IRVINE RANCH WATER DISTRICT

15600 Sand Canyon Avenue

Irvine, California 92618

Submitted by

DAVID EVANS AND ASSOCIATES INC.

17782 17th Street, Suite 200

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May 9TH, 2017

1.0 Introduction

The Koll Center Residences are a distinct and attractive mixed use commercial and residential village set within Newport Beach and located near the Santa Ana Airport. The development is located on existing surface parking at the Koll Center office Park between Von Karman Avenue and Birch Street. The existing site, as shown on **Figure 1**, is currently occupied by multi-story office buildings. The proposed development includes luxury residential condominiums, neighborhood serving retail, a stand-alone parking garage and a 1-acre public park.

The Koll Center is located in the Irvine Business Complex (IBC) redevelopment area, of which a Sub-Area Master Plan (SAMP) was developed in 2008. The purpose of this report is to provide a specific SAMP for the Koll Center Residences development area to address the planning of the potable water and non-potable water facilities to service this development. Sewer collection facilities are managed by the city of Newport Beach and are not a part of this report.

2.0 Land Uses

The Koll Center Residences includes 260 luxury residential condominiums, 3,000 square feet of neighborhood serving retail, a 490-space stand-alone parking garage and a 1-acre public park. The proposed development is as shown on **Figure 2**. The current General Plan land use designation is Mixed Use Horizontal (MU-H2) and the zoning falls under the Koll Center Newport Planned Community Development Plan (PC-15 Koll Center). The project is applying for a Planned Community Text Amendment to allow for residential mixed use.

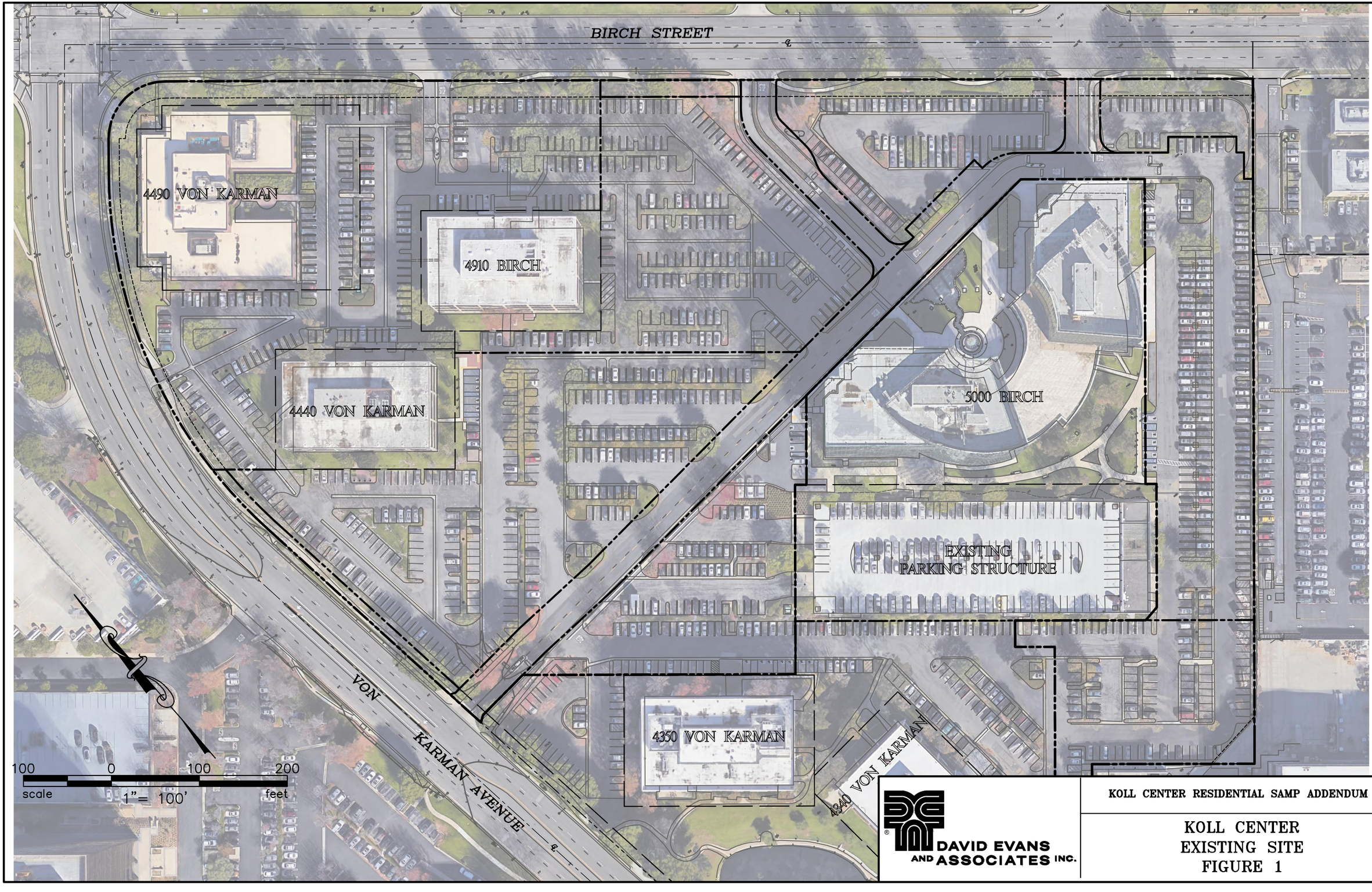
Building 1 consists of Tower 1, a 13 story residential building with 87 units perched on 5 levels of parking with 1,768 SF ground floor retail. The building includes private amenities at the podium level including pool/ spa, clubroom and fitness center.

Building 2 consists of Towers 2 & 3, 13 story residential buildings with 86 and 87 units (respectively) perched on 4 levels of parking with 1,232 SF ground floor retail. The building includes private amenities at the podium level including pool/ spa, clubroom and fitness center.

The site is composed of four main **landscape** zones including the city park, the paseo, the plaza and the podium. The park will be a passive park owned by the city of Newport Beach and maintained by the future Home Owners Association. The plaza provides for the landscaping elements associated with connectivity between the buildings and the parking garage. The paseo provides an elevated walkway and marsh area to provide respite for the surrounding office buildings and connectivity to the parking garages. The paseo will be utilized as a water quality treatment feature. The podium level landscaping is located on the third floor of the buildings and provides the private amenities for the building residents.

A new 490 stall, stand alone, **parking garage** will be constructed at the south east corner of the site. The parking garage will be constructed in advance of the residential Towers. The parking garage will include a car wash amenity and domestic water is provided to the garage. Reclaimed water is also provided to the garage to provide irrigation for the surrounding landscaping.

Table 1 provides the Residential unit count and retail square footage for each of the Towers.



KOLL CENTER RESIDENTIAL SAMP ADDENDUM

DAVID EVANS AND ASSOCIATES INC.

KOLL CENTER
EXISTING SITE
FIGURE 1

Drawing Name: S:\140107\Planning\SAMP\SAMP Fig 1 & 2 – Site Exhibits.dwg
Last Opened: May 05, 2017 – 12:05pm by: juab

BIRCH STREET

4490 VON KARMAN AVE

4910 BIRCH ST

BUILDING 1

RESIDENTIAL BLDG 1 ABOVE

PARK

PARK

4440 VON KARMAN AVE

RESIDENTIAL BLDG 2 ABOVE

BUILDING 2

RESIDENTIAL BLDG 3 ABOVE

5000 BIRCH ST

5000 BIRCH PARKING GARAGE

VON KARMAN AVENUE

PARKING STRUCTURE

4350 VON KARMAN AVE

4340 VON KARMAN AVE

N.T.S.

DAVID EVANS AND ASSOCIATES INC.

KOLL CENTER RESIDENTIAL SAMP ADDENDUM

KOLL CENTER
PROPOSED DEVELOPMENT
FIGURE 2

Drawing Name: S:\140107\Planning\SAMP\SAMP Fig 1 & 2 – Site Exhibits.dwg
Last Opened: May 05, 2017 – 11:51am by: juab

Table 1

Koll Center Residential Land Uses

Tower ID	Existing Use Type	Future Use Type	Dwelling Units (DU)	Retail Floor Area (Sq. Ft.)	Total Building Area (Sq. Ft.)
1	Office Parking	HDR + Retail	87	1,768	441,002
2	Office Parking	HDR + Retail	86	1,232	628,648
3	Office Parking	HDR + Retail	87		
		Total	***260***	3,000	

2.0 Potable Water

3.1 Potable Water System

Potable water service to the existing office buildings is currently through connections to IRWD water mains located in Von Karman and Birch. The Koll Center Office park was originally constructed in the early 1980's with each office building constructed independently of one another. Each office building is independently owned and operated. The Koll Companies own the common areas and provides the property management. The existing office buildings owners are responsible for payment of their water bills to IRWD.

The proposed development constructs a new 10 inch looped water system with connection to an existing 10-inch Irvine Ranch Water District (IRWD) main in Von Karman Avenue and a 10" main in Birch Street. **See Figure 3**. The property is located in IRWD's Zone 1 service area (HGL = 291'). A new potable water line will be constructed in the new on site access road from Von Karman to Birch A proposed water lateral will feed the proposed parking garage from the proposed loop water system being constructed with the development.

Fire Flow tests were performed at the existing hydrants on Birch Street and Von Karman Avenue with locations as shown on **Figure 3** and the results as shown on **Attachment 1.**

3.2 Potable Water Demands

Potable water demands for the Koll Center were estimated based upon the dwelling unit counts and retail floor area, and the adopted IRWD *Land Use and Water Use Factors* (September 2012). The total average day demand is 44,794 gpd as shown in **Table 2.**

The maximum day demand (MDD) and peak hour demand (PHD) is calculated by applying the IRWD's MDD and PHD factor of 1.8 and 2.5, respectively. These are the peaking factors documented in IRWD's current Water Resources Master Plan. The potable water demands for The Koll Center are shown in Table 2.

Table 2

Potable Water Demands

Tower ID	Use Type	Dwelling Units (DU)	Floor Area (Sq. Ft.)	Area (Ac)	Demand Factor (gpd)	Units	Average Day Demand (gpd)	Average Day Demand (gpm)	Maximum Day Demand (ADD x 1.8) (gpm)	Peak Hour Demand (ADD x 2.5) (gpm)	Model Junction ID
1	HDR	87			125	gpd/du	10,875	7.6	13.6	18.9	04
	Retail		1,768		175	gpd/tsf	309	0.2	0.4	0.5	
2	HDR	86			125	gpd/du	10,750	7.5	13.4	18.7	12
	Retail		1,232		175	gpd/tsf	216	0.1	0.3	0.4	
3	HDR	87			125	gpd/du	10,875	7.6	13.6	18.9	16
Parking Garage	Car Wash	N/A	N/A		20	gpv*	640	0.4	0.8	1.1	09
Total		***260***		***3.51***	***Total***		***33,665***	***31.1***	***56.0***	***77.8***	

From a report for the International Carwash Association, "WATER USE IN THE PROFESSIONAL CAR WASH INDUSTRY" published September 2002), a demand factor of 20 gallons per vehicle for self-serve carwash stations was derived. It is assumed that one vehicle will be washed every 15 minutes during an 8-hour working day.

3.3 Fire Flow Demands

The following Guidelines were reviewed to determine the appropriate fire flow demands for the proposed development:

1. **Newport Beach Fire Department Guidelines B.01 – Determination of Required Fire Flow**

The local fire authority is the Newport Beach fire department. Per the Newport Beach Fire Department Guidelines B.01, "*All buildings built within the City of Newport Beach are required to comply with the California Fire Code Appendix B, Fire Flow Requirements for Buildings and Appendix C, Fire Hydrant Locations and Distribution*".

See **Attachment 2** of this report for a copy of California Fire Code Appendix B.

2. **Orange County Fire Authority Guideline B-09 – Fire Master Plans for Commercial & Residential Development**

Per OCFA Guideline B-09, Section 8A, "*Determine the required fire flow from CFC Table B105.1, provided in Attachment 23.*"

See **Attachment 3** of this report for a copy of the required fire flow table.

The two tables/attachments referred to above are essentially the same and it is shown in **Table 3** below. The largest building proposed for construction in the Koll Center Residential development exceeds 295,901 square feet. For a Type I building construction type, the required fire flow is 6,000 gpm. A 25% reduction is allowed for group R building with fire sprinklers. The

required fire flow is then reduced to 4,500 gpm.

Therefore, a fire flow criteria of 4,500 gpm for 4 hours was selected to be utilized in the hydraulic analysis. The results are discussed in Section 3.5.

TABLE 3

Minimum Required Fire Flow and Flow Duration for Buildings

Fire Flow Calculation Area (sq. ft.)					Fire Flow (gpm)[c]	Flow Duration (hrs)
Type IA and IB[b]	Type IIA and IIIA[b]	Type IV and V-A[b]	Type IIB and IIIB[b]	Type V-B[b]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
-	-	115,801-,125,500	83,701-90,600	51,501-55,700	6,250	
-	-	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
-	-	135,501-145,800	97,901-16,800	60,201-64,800	6,750	
-	-	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
-	-	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
-	-	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
-	-	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
-	-	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. The minimum required fire flow shall be allowed to be reduced by 25 percent for Group R

b. Types of construction are based on the *California Building Code*

Types I and II = noncombustible materials
Types III = exterior walls are noncombustible materials; interior elements are any material permitted by code
Types IV = exterior walls are noncombustible materials; interior elements are solid or laminated wood
Types V = any materials permitted by code

c. Measured at 20 psi at hydrant outlet

3.4 System Performance Criteria

IRWD's general performance criteria for its potable water system includes the following:

- Minimum Pressures:

  Minimum pressures must be greater or equal to 40 psi at peak hour demand

- Maximum Pressures:

  Maximum pressures must be less than or equal to 80 psi unless individual pressure regulators are installed

- Fire Flow Residual Pressures;

  A minimum residual pressure of 20 psi at the flowing fire hydrant is required. For modeling purposes, a minimum residual pressure of 26 psi is desired on the mainline to account for losses through the fire hydrant lateral.

- Velocities:

  Maximum Velocity at Average Day Demand = 3 to 5 fps Maximum Velocity at Peak Hour

  Demand = 8 fps

  Maximum Velocity at Maximum Day Demand + Fire Flow Demand = 15 fps Minimum Velocity =

  1 fps

3.5 Potable Water System Model

The IRWD potable water model was updated to include the domestic water pipelines per the Koll Center Domestic Water Improvement Plans. Proposed pipelines with model junctions at pipe intersections, end points, and fire hydrant laterals were added to the model. Pipe sizes, elevations, and demands were added at appropriate locations.

The surface grades shown on the improvement plans were used for elevations in the model in order to keep it consistent with the existing model, which utilized street contours for elevations of the model pipes.

3.6 Potable Water System Analysis

The existing and future potable water system model was run under average day, maximum day, and maximum day plus fire flow conditions
The pressures demand nodes under existing and future, average day and maximum day conditions are shown in Table 4.

The maximum day demand plus fire flow analysis results are shown in Table 5. A fire flow of 4,500 gpm was applied at each fire hydrant lateral node. The residual pressures varied from 52 psi to 58 psi which is above the residual pressure required by IRWD and the City of Newport

Beach Fire Department. The analysis utilizes one hydrant, but in reality, firefighting will take place by using multiple hydrants to meet the fire demand. When multiple hydrants are used, the residual pressures will increase.

The pipe velocities remain less than IRWD's Water Resources Master Plan pipeline velocity criteria of 15 feet per second under maximum day demand plus fire flow conditions when the fire demands are applied on the 10-inch loop that is **Table 4.**

Table 4

Demand Node Results

Demand Node	Building/Site ID or Irrigation Zone	ADD (gpm)	MDD (gpm)	Elevation (feet)	Existing Analysis				Future Analysis			
					ADD Head (feet)	ADD Pressure (psi)	MDD Head (feet)	MDD Pressure (psi)	ADD Head (feet)	ADD Pressure (psi)	MDD Head (feet)	MDD Pressure (psi)
01	Exist.	12.6	38.8	44	265	95.8	265	95.8	265	95.8	265	95.7
04	1	7.6	13.7	45.5	-	-	-	-	264	94.8	264	94.5
12	2	7.6	13.7	49.7	-	-	-	-	264	93.0	264	92.7
16	3	7.8	14.0	51.3	-	-	-	-	264	92.3	264	92.0
22	Exist.	21.6	38.8	49.3	265	93.5	265	93.5	265	93.5	264	92.0
09	Parking Structure	0.4	0.7	50.5	-	-	-	-	264	92.6	264	92.4
	Total	**66.6**	**119.7**									

ADD = Average Day Demand MDD = Maximum Day Demand

Table 5

MDD plus Fire Flow Analysis

Fire Node	Future Analysis			
	Static Pressure (psi)	Static Head (ft)	Fire- Flow Demand (gpm)	Residual Pressure (psi)
03	94.6	264	4500	58.0
07	94.2	264	4500	55.3
11	93.0	264	4500	52.6
15	92.3	264	4500	52.2
19	92.2	264	4500	54.5
21	92.4	264	4500	56.1

EX. 08

EX. 09

(10" A.C.P. WATER)

EX. 11

APPROX LOCATION OF FH#2 FOR TEST.

BIRCH ST.

EX 05

EX. 07

EX 04

EX. 06

EX 03

EX. 05

EX 02

EX. 04

EX 01

(10" A.C.P. WATR) EX. 02

VON KARMAN AVE

EX. 02

EXISTING BLDG
4490 VON KARMAN AVE
NOT-A-PART

EXISTING BLDG
4910 BIRCH ST
NOT-A-PART

EXISTING BLDG
4440 VON KARMAN AVE
NOT-A-PART

EXISTING BLDG
4350 VON KARMAN AVE
NOT-A-PART

EXISTING BLDG
5000 BIRCH ST
NOT-A-PART

PROPOSED BUILDING 1

PROPOSED TOWER 1

PROPOSED TOWER 2

PROPOSED BUILDING 2

PROPOSED TOWER 3

PROPOSED PARKING STRUCTURE

N 22 ELEV. 49.3'

N 21

N 20 ELEV. 50.5

N 18 ELEV. 51.0

N 19

N 17

N 16 ELEV. 51.3

N 15

N 13

N 14 ELEV. 50.7

N 11

N 12 ELEV. 49.7

N 10 ELEV. 49.1

N 08

N 07

N 05

N 06 ELEV. 46.3

N 04 ELEV. 45.5

N 02 ELEV. 45.3

N 03

N 01 ELEV. 44.0

N 09 ELEV. 50.5 (BLOW-OFF)

P23

P22

P20

P19

P18

P16

P14

P12

P10

P08

P06

P04

P02

P09

10" WATER

(8" VCP WATER)

LEGEND

- PROP. LINE/NODE
- EXIST. LINE
- FIRE HYDRANTS

100 0 100 200
scale
1"= 100'
feet

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KOLL CENTER RESIDENTIAL SAMP ADDENDUM

KOLL CENTER POTABLE WATER SYSTEM FIGURE 3

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4.0 Non-potable Water System

IRWD maintains a non-potable water main immediately adjacent the subject property, located in Von Karman Avenue. This 10 inch PVC main was constructed for the IBC and completed in 1994. The non-potable water line locations are as shown in **Figure 4.** Since this project is still in the entitlement phase, irrigation plans have not been developed at this time. **Irrigation water plans are not being provided at this time and the landscape architect will submit later during the design process**. Irrigation areas tributary to each meter have not been determined and therefore this portion of the SAMP Addendum will need to be completed during the final engineering phase of the project. The project proposes to utilize reclaimed water for all of the landscaping on site.

Table 6

Non-Potable Water Demands

Meter ID	Use Type	Area (Ac)	Demand Factor (gpd)	Units	Average Day Demand (gpd)	Average Day Demand (gpm)	Maximum Day Demand (ADD x 1.8) (gpm)	Peak Hour Demand (ADD x 2.5) (gpm)	Model Junction ID
1	Irrigation	-	-	gpd/ac	-	-	-	-	-
2	Irrigation	-	-	gpd/ac	-	-	-	-	-
3	Irrigation	-	-	gpd/ac	-	-	-	-	-
Total		**-**	***Total***		**-**	**-**	**-**	**-**	

5.0 Sewer Collection System

Sewer service will be provided to the Koll Center development by the City of Newport Beach and is not a part of this report.

6.0 Easements

IRWD will require unlimited access to their facilities for routine maintenance, operation, repair, replacements, monitoring, and other critical functions. The streets within the Koll Center development area will be privately owned and maintained. Easements will be provided for meters and backflow devices for the public portion of the system.

6.1 Easement Requirements

The proposed easements are required for IRWD water facilities. The minimum easement width shall be twenty (20) feet for potable and non-potable water facilities, as required by IRWD. In the case of parallel facilities, the easement width shall not overlap.

6.2 Proposed Easements

All IRWD pipelines or facilities outside of the public right of way require easements within the individual tracts or parcels. Easements for all IRWD maintained facilities are to be in accordance with IRWD guidelines and requirements. Where a proposed easement is required over private roads or driveways for more than one property, a separate permanent easement is necessary

(8" PVC RECLAIMED WATER)

BIRCH ST.

EXISTING BLDG
4490 VON KARMAN AVE
NOT-A-PART

EXISTING BLDG
4910 BIRCH ST
NOT-A-PART

PROPOSED
BUILDING 1

PROPOSED
TOWER 1

EXISTING BLDG
4440 VON KARMAN AVE
NOT-A-PART

PROPOSED
TOWER 2

PROPOSED BUILDING 2

PROPOSED
TOWER 3

6" PVC RECLAIMED WATER

EXISTING BLDG
5000 BIRCH ST
NOT-A-PART

(8" PVC RECLAIMED WATER)

VON KARMAN AVE

6" PVC RECLAIMED WATER

PROPOSED PARKING
STRUCTURE

EXISTING BLDG
4350 VON KARMAN AVE
NOT-A-PART

LEGEND

- PROP. LINE
- EXIST. LINE
- IRRIGATION METERS

100 0 100 200
scale
1"= 100'
feet

DAVID EVANS AND ASSOCIATES INC.

KOLL CENTER RESIDENTIAL SAMP ADDENDUM

KOLL CENTER
NON-POTABLE WATER SYSTEM
FIGURE 4

Drawing Name: S:\140107\Planning\SAMP\SAMP Fig 4 - Non-Potable Water Line Exhb.dwg
Last Opened: May 05, 2017 - 11:48am by: juab

from each property owner. The locations of the public water lines are shown on Figure 2. The public water lines are to be IRWD maintained facilities and permanent easements will be provided for them.

7.0 Telemetry

All potable water improvements include installation of pipelines. Telemetry is, therefore, not required as there are no active IRWD facility improvements.

8.0 Natural Treatment Systems

A Preliminary Water Quality Management Plan (WQMP) was prepared for the Koll Center Project. The Preliminary WQMP complies with the requirements of the City of Newport Beach NPDES Stormwater Program and has been reviewed and approved by the city.

It is determined that the impervious area of the project site will be decreased from pre-construction to post construction conditions due to the amount of landscape area being provided. Because the percentage of impervious surface will be decreased, runoff volumes will be reduced from the pre-developed condition. Anticipated pollutants for the proposed land uses include suspended-solids/sediments, nutrients, heavy metals, pathogens (bacteria/virus), pesticides, oil and grease, toxic organic compounds, and trash and debris.

The landscape areas will be incorporated to treat the low flow runoff before connecting to the public storm drain system. The marsh area will provide a bioretention basin with underdrains to treat the plaza areas, roof and podium deck low flows from the buildings. The park areas represent the opportunity to utilize vegetated swales to treat the low flow runoff. If it is determined in final design that the swale is unable to detain the entire design capture volume then infiltration drywell systems are proposed. For the streets and parking areas, catch basin (inlet) Modular Wetlands systems are proposed.

9.0 Construction Cost Estimate

While construction will be phased minimize impact on existing building operations, the entire development will be constructed at one time. Special consideration has been given to maintaining adequate parking stock for adjacent businesses during construction.

10.0 Project Costs

The IRWD policy is to fund and construct “backbone” facilities only. Smaller facilities are generally the developer’s responsibility. IRWD uses the criteria shown in Table 9 to determine IRWD funded and developer funded facilities.

Table 9 Funding Criteria

System	IRWD Funded Facilities	Developer Funded Facilities
Potable Water	Mains 12-inch and larger	Mains 10-inch and smaller
Sewer	Sewers 12-inch and larger	Sewers 10-inch and smaller
Non-potable Water	Mains 6-inch and larger	Mains 4-inch and smaller

Permanent reservoirs, pumping stations and turnouts are also generally funded by IRWD. Active pressure reducing stations, or those that are the primary source with telemetry, are funded by IRWD. Non-active pressure reducing stations, or secondary sources without telemetry, are funded according to interconnected main size. Special consideration is given to IRWD funding of smaller facilities that help accomplish a regional objective.

There are no tanks, pumping stations, or pressure reducing stations associated with The Koll Center development project.

Due to the complexity of this project, the developer will fund 100 percent of the construction of the potable water system.

Unit costs used in this SAMP, which include contractor's overhead and profit, will be taken from the bonding estimate provided to the City of Newport Beach for approval of the final map. Construction costs are not available at this time.

Attachment 1

Fire Flow Test Results

IRVINE RANCH WATER DISTRICT *15600 Sand Canyon Ave., P.O. Box 57000, Irvine, CA 92619-7000 (949) 453*

Water Flow Test Results

Location: Birch St. 5015

Test Date: 4/27/2017

IDENTIFIED BY TEST OR HYDRANTS FLOWED

These tests are not performed with calibrated equipment.

Test # 1

HGL	260
Differential psi	15
Outlet Size (inches)	4
Outlet Coefficient	0.9
Pitot Pressure	35
Flow - GPM	2541

IRWD does not provide the static or residual pressures that are taken at the time of flow tests. The static pressure at the location of the flow test will differ from that of the location of your building site, which will result in incorrect calculations when designing your system. To find the answers to your static/residual questions please follow the example below.

1) Take the given HGL and subtract the pad elevation of your building site from it.
2) Multiply that number by .433 (psi per foot).
3) This is the theoretical static psi at the building site.
4) Take your static psi and subtract the given differential psi.
5) This is the theoretical residual psi at the building site.

Example:

HGL-436', Differential psi- 6psi, Building Pad Elevation- 250'

436 – 250 = 186 186x.433 = 80.5 psi static

80.5 – 6 = 74.5 psi residual

Static PSI = (260 ft – 50 ft) x .433 psi/ft = 90 psi
Residual PSI = 90 ft -14 ft = 76 psi

IRVINE RANCH WATER DISTRICT 15600 Sand Canyon Ave., P.O. Box 57000, Irvine, CA 92619-7000 (949) 453

Water Flow Test Results

Location: Von Karman

Test Date: 4/27/2017

IDENTIFIED BY TEST OR HYDRANTS FLOWED

These tests are not performed with calibrated equipment.

Test # 1

HGL	260
Differential psi	14
Outlet Size (inches)	4
Outlet Coefficient	0.9
Pitot Pressure	37
Flow - GPM	2613

IRWD does not provide the static or residual pressures that are taken at the time of flow tests. The static pressure at the location of the flow test will differ from that of the location of your building site, which will result in incorrect calculations when designing your system. To find the answers to your static/residual questions please follow the example below.

1) Take the given HGL and subtract the pad elevation of your building site from it.
2) Multiply that number by .433 (psi per foot).
3) This is the theoretical static psi at the building site.
4) Take your static psi and subtract the given differential psi.
5) This is the theoretical residual psi at the building site.

Example:

HGL-436', Differential psi- 6psi, Building Pad Elevation- 250'

436 – 250 = 186 186x.433 = 80.5 psi static

80.5 – 6 = 74.5 psi residual

Static PSI = (260 ft – 50 ft) x .433 psi/ft = 90 psi
Residual PSI = 90 ft -15 ft = 75 psi

Attachment 2

2016 California Fire Code Appendix B

CALIFORNIA FIRE CODE – MATRIX ADOPTION TABLE
APPENDIX B – FIRE-FLOW REQUIREMENTS FOR BUILDINGS

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the user.
See Chapter 1 for state agency authority and building applications.)

Adopting Agency	BSC	BSC-CG	SFM		HCD			DSA		OSHPD				BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
			T-24	T-19*	1	2	1/AC	AC	SS	1	2	3	4								
Adopt Entire Chapter																					
Adopt Entire Chapter as amended (amended sections listed below)			X																		
Adopt only those sections that are listed below																					
[California Code of Regulations, Title 19, Division 1]																					
Chapter / Section																					
B105.2			X																		

* The *California Code of Regulations* (CCR), Title 19, Division 1 provisions that are found in the *California Fire Code* are a reprint from the current CCR, Title 19, Division 1 text for the code user's convenience only. The scope, applicability and appeals procedures of CCR, Title 19, Division I remain the same.

APPENDIX B
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

SECTION B101
GENERAL

B101.1 Scope. The procedure for determining fire-flow requirements for buildings or portions of buildings hereafter constructed shall be in accordance with this appendix. This appendix does not apply to structures other than buildings.

SECTION B102
DEFINITIONS

B102.1 Definitions. For the purpose of this appendix, certain terms are defined as follows:

FIRE-FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required fire flow.

SECTION B103
MODIFICATIONS

B103.1 Decreases. The fire chief is authorized to reduce the fire-flow requirements for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire-flow requirements is impractical.

B103.2 Increases. The fire chief is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall not be more than twice that required for the building under consideration.

B103.3 Areas without water supply systems. For information regarding water supplies for fire-fighting purposes in rural and suburban areas in which adequate and reliable water supply systems do not exist, the fire code official is authorized to utilize NFPA 1142 or the *California Wildland-Urban Interface Code.*

SECTION B104
FIRE-FLOW CALCULATION AREA

B104.1 General. The fire-flow calculation area shall be the total floor area of all floor levels within the exterior walls, and under the horizontal projections of the roof of a building, except as modified in Section B104.3.

B104.2 Area separation. Portions of buildings which are separated by fire walls without openings, constructed in accordance with the *California Building Code,* are allowed to be considered as separate fire-flow calculation areas.

B104.3 Type IA and Type IB construction. The fire-flow calculation area of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: Fire-flow calculation area for open parking garages shall be determined by the area of the largest floor.

SECTION B105
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

B105.1 One- and two-family dwellings, Group R-3 and R-4 buildings and townhouses. The minimum fire-flow and flow duration requirements for one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses shall be as specified in Tables B105.1(1) and B105.1(2).

TABLE B105.1(1)
REQUIRED FIRE-FLOW FOR ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

FIRE-FLOW CALCULATION AREA (square feet)	AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE-FLOW (gallons per minute)	FLOW DURATION (hours)
0-3,600	No automatic sprinkler system	1,000	1
3,601 and greater	No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2) at the required fire-flow rate
0-3,600	Section 903.3.1.3 of the *California Fire Code* or Section *313.3* of the *California Residential Code*	500	$^1/_2$
3,601 and greater	Section 903.3.1.3 of the *California Fire Code* or Section *313.3* of the *California Residential Code*	$^1/_2$ value in Table B105.1(2)	1

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m.

TABLE B105.1(2)
REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *California Building Code*.

b. Measured at 20 psi residual pressure.

Attachment 3

Orange County Fire Authority Guideline B-09

Attachment 23 CFC Table B105.1

Orange County Fire Authority

Guideline B-09
Fire Master Plans for Commercial & Residential Development
January 1, 2014
ATTACHMENT 23

CFC TABLE B105.1:
Minimum Required Fire Flow and Flow Duration for Buildings as adopted by the OCFA

FIRE FLOW CALCULATION AREA (square feet)					FIRE FLOW (gallons/min)[2]		Flow Duration
Type IA/IB[1]	Type IIA/IIIA[1]	Type IV/VA[1]	Type IIB/IIIB[1]	Type VB[1]	unsprinklered[3]	*sprinklered*[4]	
0-22700	0-12700	0-8200	0-5900	0-3600	1500	*1500*	
22701-30200	12701-17000	8201-10900	5901-7900	3601-4800	1750	*1500*	
30201-38700	17001-21800	10901-12900	7901-9800	4801-6200	2000	*1500*	
38701-48300	21801-24200	12901-17400	9801-12600	6201-7700	2250	*1500*	2
48301-59000	24201-33200	17401-21300	12601-15400	7701-9400	2500	*1500*	
59001-70900	33201-39700	21301-25500	15401-18400	9401-11300	2750	*1500*	
70901-83700	39701-47100	25501-30100	18401-21800	11301-13400	3000	*1500*	
83701-97700	47101-54900	30101-35200	21801-25900	13401-15600	3250	*1625*	
97701-112700	54901-63400	35201-40600	25901-29300	15601-18000	3500	*1750*	3
112701-128700	63401-72400	40601-46400	29301-33500	18001-20600	3750	*1875*	
128701-145900	72401-82100	46401-52500	33501-37900	20601-23300	4000	*2000*	
145901-164200	82101-92400	52501-59100	37901-42700	23301-26300	4250	*2125*	
164201-183400	92401-103100	59101-66000	42701-47700	26301-29300	4500	*2250*	
183401-203700	103101-114600	66001-73300	47701-53000	29301-32600	4750	*2375*	
203701-225200	114601-126700	73301-81100	53001-58600	32601-36000	5000	*2500*	
225201-247700	126701-139400	81101-89200	58601-65400	36001-39600	5250	*2625*	
247701-271200	139401-152600	89201-97700	65401-70600	39601-43400	5500	*2750*	
271201-295900	152601-166500	97701-106500	70601-77000	43401-47400	5750	*2875*	
295901+	166501+	106501-115800	77001-83700	47401-51500	6000	*3000*	
		115801-125500	83701-90600	51501-55700	6250	*3125*	
		125501-135500	90601-97900	55701-60200	6500	*3250*	4
		135501-145800	97901-106800	60201-64800	6750	*3375*	
		145801-156700	106801-113200	64801-69600	7000	*3500*	
		156701-167900	113201-121300	69601-74600	7250	*3625*	
		167901-179400	121301-129600	74601-79800	7500	*3750*	
		179401-191400	129601-138300	79801-85100	7750	*3875*	
		191401+	138301+	85101+	8000	*4000*	

[1] **Construction Types:** based upon actual construction without applying 1-hour equivalency allowed by CBC Table 601 footnote 'd'.

[2] **Fire flow:** measured at 20 psi.

[3] **Unsprinklered homes:** Minimum fire flow for a detached, unsprinklered single-family residence/duplex up to 3600 sq.ft. is 1000 gpm for one hour. Fire-flow and flow duration for dwellings having a fire-flow calculation area in excess of 3,600 square feet shall not be less than that specified in the table above.

6 **Sprinklered homes:** When a detached single-family residence/duplex is equipped with an approved automatic sprinkler system, the fire flow may be reduced to 50% of that required for an unsprinklered structure, provided that the resulting fire flow is not less than 1,000 gallons per minute for 1 hour.