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12 October 2009

Mark Hurley
Associate Director
Infrastructure Management Services
The Presidio Trust
1750 Lincoln Boulevard
P.O. Box 29052
San Francisco, CA 94129-0052

Subject: The Presidio Trust Doyle Drive Water Distribution System Modeling - Final Letter Report
K/J 0968016

Dear Mr. Hurley:

Kennedy/Jenks Consultants (K/J) is pleased to submit this final letter report on the Doyle Drive Water Distribution System Modeling.

Project Background

Caltrans is currently working on the design for rebuilding Doyle Drive. This work includes two tunnels which will require water for fire suppression systems. The project will also require the elimination or relocation of several water pipelines, as well as the installation of new pipelines to replace those eliminated by the Doyle Drive Project (DDP). The DDP would like to obtain water from the Presidio water distribution system for the sprinkler systems at the two tunnels. The tunnels require a fire flow of 3500 gallons per minute (gpm) at 83 pounds per square inch (psi). To verify that the existing water distribution system can provide this water, the Presidio Trust (Presidio) has asked Kennedy/Jenks Consultants (Kennedy/Jenks) to update and run the Presidio hydraulic model for several scenarios. The existing Presidio water model was prepared by Kennedy/Jenks for the Water Utility Study in 2006.

Update of Presidio Water Model

The existing Presidio water model was updated to include recent changes to the water distribution system that were made after the development of the model. These changes include:

- Removal of the section of 6" PVC waterline along Lincoln Blvd. between buildings 122 and 107
- Removal of the section of 10" and 6" cast iron (CI) waterline along the southwest edge of the San Francisco National Cemetery

Additionally, the model was updated to reflect recommended modifications to the water distribution system described in URS' DDP Waterline Memoranda Numbers 1 through 3. These changes, along with the changes listed above, are depicted in Figure 1.

Points of connection (POC) were created in the model for the new tunnels' sprinkler systems. The connection points are located at the west end of the new Main Parade Tunnel (POC 2) and at the east end of the new Battery Tunnel (POC 3). Points of connection were also created at the east end of the Main Parade Tunnel (POC 1) and at the west end of the Battery Tunnel (POC 4) to supply additional flows if determined to be necessary to meet the required fire flow demand of 3500 gallons per minute (gpm) at the tunnels.

Evaluation of System Capacity Scenarios

The following scenarios were evaluated with the updated water distribution model to analyze the impact of the tunnel fire flow demand on the Presidio water system. In addition, Scenario 1 was evaluated using the original water distribution model, updated with the changes made to the water distribution system since 2006, to investigate the impact of the URS proposed modifications to the water system.

1. Simultaneous future Presidio average day domestic demand at all nodes and 1500 gpm Presidio fire flow demand at 20 psi evaluated at each node.

2. Simultaneous future Presidio average day domestic demand at all nodes, 3500 gpm demand at the new tunnel node POC 2 and 1500 gpm Presidio fire flow demand at 20 psi evaluated at each node.

3. Simultaneous future Presidio average day domestic demand at all nodes, 3500 gpm demand at the new tunnel node POC 3 and 1500 gpm Presidio fire flow demand at 20 psi evaluated at each node.

4. Simultaneous future Presidio average day domestic demand at all nodes, 3,500 gpm demand at the new tunnel split between nodes POC 1 and 2 and 1500 gpm Presidio fire flow demand at 20 psi evaluated at each node.

5. Simultaneous future Presidio average day domestic demand at all nodes, 3500 gpm demand at the new tunnel split between nodes POC 3 and 4 and 1500 gpm Presidio fire flow demand at 20 psi evaluated at each node.

6. Scenarios 1 through 5 repeated with future Presidio peak day domestic demand at all nodes instead of average day domestic demand.

To model the flow split between the two nodes at the opposite ends of each tunnel for scenarios 4 and 5, a "phantom" pipe was created between the two nodes and a node was added at the center of the phantom pipe. The demand was placed at the center node to allow the model to determine the flow split to the two nodes at the ends of the tunnel. Both phantom pipes were

closed when evaluating scenarios 1, 2 and 3. The phantom pipe between POC 3 and 4 was closed when evaluating scenario 4, and the phantom pipe between POC 1 and 2 was closed when evaluating scenario 5.

The results of the fire flow tests are presented in Figures 2 through 13. The red-colored nodes denote nodes that failed the fire flow test (i.e. 20 psi cannot be maintained when a fire flow of 1500 is applied to that node simultaneous with the other demands in the system, including 3500 gpm at one of the tunnels). The yellow-colored nodes indicate nodes that fail the fire flow test but are less than 100 gpm short of passing. The black nodes denote those nodes that passed the fire flow test.

The results of the scenario 1 fire flow test run on the updated water distribution model were compared to the results of the same test run on the original water model. The results indicate that, with the proposed modifications, four additional nodes would fail the fire flow test that did not previously fail and 16 nodes would pass the fire flow test that did not previously pass for future average day domestic demands. For future peak day domestic demands, no additional nodes would fail the fire flow test that did not previously fail and 15 nodes would pass the fire flow test that did not previously pass. The additional failed nodes are mostly located along Sibert Loop.

The results from the scenarios 2, 3 and 4 fire flow analysis indicate that 42 additional nodes would fail the fire flow test (that did not fail in the original model) with future average day demands and 51 additional nodes would fail with future peak day demands. The additional failed nodes are scattered about the distribution system. The scenario 5 analysis results indicate that 327 additional nodes would fail with the future average day demands and 371 additional nodes would fail with future peak day demands.

The results suggest that the entire tunnel fire flow demand can be supplied at POC 2 for the Main Parade Tunnel and POC 3 for the Battery Tunnel and that there is no significant benefit from having additional points of connections at the opposite ends of the tunnel (POC 1 and POC 4). In fact, the addition of a second POC on the west side of the Battery Tunnel (POC 4) would cause a large section of the northwest corner of the water distribution system to lose the capacity to meet Presidio fire flow demands. The addition of a second POC on the east side of the Main Parade Tunnel (POC 1) would not affect the water distribution system differently than having a single POC on the west side of the tunnel.

Manual fire flow tests were conducted to check the pressure at the POCs when set at realistic elevations and with 3500 gpm supplied to the POC, 1500 gpm supplied to a nearby fire hydrant at a minimum pressure of 20 psi and the future average day or future peak day demands supplied to all nodes. The POCs were set to the following elevations for the manual tests: POC 1 at 15 feet; POC 2 at 47 feet; POC 3 at 55 feet; and POC 4 at 55 feet. The results of the manual fire flow test are summarized in Table 1.

Table 1: Pressure at Tunnel Connection Points

Demand	Node @ 3500 gpm	Node @ 1500 gpm (Fire Hyd ID)		Pressure (psi)		Flow Rate (gpm)	
Avg Day	POC2	J-498	(151)	85.2	@ POC2	3500	@ POC2
		J-1739	(5)	85.6	@ POC2	3500	@ POC2
	POC3	J-1397	(80)	66.5	@ POC3	3500	@ POC3
		J-1735	(78)	66.7	@ POC3	3500	@ POC3
	POC1-2	J-2117	(50)	98.5	@ POC1	1195.1	@ POC1
				86.7	@ POC2	2304.9	@ POC2
		J-1703	(13)	98.2	@ POC1	1096.8	@ POC1
				86.8	@ POC2	2403.2	@ POC2
		J-498	(151)	99.6	@ POC1	1528.5	@ POC1
				86.6	@ POC2	1971.5	@ POC2
		J-1739	(5)	99.8	@ POC1	1483.7	@ POC1
				87.0	@ POC2	2016.3	@ POC2
	POC3-4	J-1397	(80)	85.0	@ POC3	1845.3	@ POC3
				84.7	@ POC4	1654.7	@ POC4
		J-1735	(78)	85.1	@ POC3	1848.6	@ POC3
				84.9	@ POC4	1651.4	@ POC4
		J-1651	(180)	79.3	@ POC3	2829.3	@ POC3
				76.8	@ POC4	670.7	@ POC4
		J-2209	(41)	78.3	@ POC3	2893.5	@ POC3
				75.7	@ POC4	606.6	@ POC4
Peak Day	POC2	J-498	(151)	84.6	@ POC2	3500	@ POC2
		J-1739	(5)	85.0	@ POC2	3500	@ POC2
	POC3	J-1397	(80)	65.9	@ POC3	3500	@ POC3
		J-1735	(78)	66.1	@ POC3	3500	@ POC3
	POC1-2	J-2117	(50)	97.8	@ POC1	1192.7	@ POC1
				86.1	@ POC2	2307.3	@ POC2
		J-1703	(13)	97.5	@ POC1	1094.6	@ POC1
				86.1	@ POC2	2405.5	@ POC2
		J-498	(151)	99.0	@ POC1	1527.3	@ POC1
				86.0	@ POC2	1972.7	@ POC2
		J-1739	(5)	99.2	@ POC1	1482.2	@ POC1
				86.3	@ POC2	2017.8	@ POC2
	POC3-4	J-1397	(80)	84.4	@ POC3	1860.2	@ POC3
				84.1	@ POC4	1639.9	@ POC4
		J-1735	(78)	84.5	@ POC3	1863.5	@ POC3
				84.3	@ POC4	1636.5	@ POC4
		J-1651	(180)	78.7	@ POC3	2846.8	@ POC3
				76.2	@ POC4	653.2	@ POC4
		J-2209	(41)	77.7	@ POC3	2909.8	@ POC3
				75.1	@ POC4	590.2	@ POC4

The results from the manual fire flow tests suggest that the Presidio water system is capable of supplying the required tunnel fire flow at the required pressure of 83 psi to POC 2, but it cannot supply the tunnel fire flow at the requested pressure to POC 3. With the elevation of POC 3 set at 55 feet, the fire flow at the connection point would be supplied at a pressure of approximately 66 psi when there is a Presidio fire flow demand of 1500 gpm at a minimum 20 psi at a nearby hydrant. When there is no Presidio fire flow demand, the fire flow to POC 3 can be supplied at a pressure of approximately 72 psi under both future average day and future peak day demand conditions.

Additional Recommended Modifications to the Water System

As discussed above, the entire tunnel fire flow demand can be supplied at POC 2 for the Main Parade Tunnel and POC 3 for the Battery Tunnel, and additional points of connections at the opposite ends of the tunnel (POC 1 and POC 4) are not necessary. The recommendations and analysis in this section is based on providing only one POC to each tunnel (POC 2 and POC 3). POC 1 and POC 4 are not considered further.

Table 2 lists additional sections of the Presidio water system where upsizing is recommended to address the sections of the distribution system that failed the Presidio fire flow test in the model when the additional fire flow demand at the tunnel was added. The total length of these sections is approximately 3,915 feet. The same sections of the Presidio distribution system fail the fire flow test when 3500 gpm is supplied to POC 2 and when 3500 gpm to POC 3, and the same recommendations apply for both cases.

Table 2: Recommended Upgrades to Water System Due to Address Presidio Fire Flow Deficiencies Due to Doyle Drive Tunnel Fire Flow Demands

PIPE ID	L (ft)	(E) DIA.	(E) MAT.	(N) DIA.	(N) MAT.	AREA
4219	61	6	CI	8	DI	BETWEEN LINCOLN BLVD AND MERCHANT RD WEST OF BLDG 1659
1669	16	6	CI	8	DI	SOUTHWEST OF BLDG 1659
1985	254	6	CI	8	DI	BETWEEN MERCHANT RD AND LINCOLN BLVD SOUTHWEST OF BLDG 1659
1952	465	8	CI	10	DI	ACROSS HWY 101 AT LINCOLN BLVD BETWEEN BLDG 1659 AND 966
4325	10	6	CI	8	DI	SOUTHWEST OB BLDG 966
4327	10	8	AbCe	12	DI	SOUTHWEST OB BLDG 966
1944	50	6	CI	8	DI	NORTH OF BLDG 964
1920	15	6	CI	8	DI	LINCOLN BLVD NORTHEAST OF BLDG 952
4275	55	6	CI			GREENOUGH AVE SOUTH OF BLDG 1341
2639	270	6	CI	8	DI	EAST OF GREENOUGH AVE FROM RALSTONE AVE TO BLDG 1341
4243	112	6	PVC	8	PVC	KOBBE AVE NORTHEAST OF BLDG 1308

PIPE ID	L (ft)	(E) DIA.	(E) MAT.	(N) DIA.	(N) MAT.	AREA
3850	554	12	CI	14	DI	SOUTH OF WASHINGTON BLVD EAST OF BATTERY CAULFIELD RD
3847	247	12	CI	14	DI	SOUTH OF WASHINGTON BLVD EAST OF BATTERY CAULFIELD RD
1726	11	12	CI	14	DI	NORTH OF BLDG 1449
5032	24	6	CI	8	DI	MASON ST NORTHWEST OF BLDG 644
5035	186	10	CI	12	DI	MCDOWELL AVE WEST OF BLDG 668
2785	550	10	CI	12	DI	MCDOWELL AVE AT PATTEN RD AND AT LINCOLN BLVD
2977	24	10	CI	12	DI	MCDOWELL AVE AT LINCOLN BLVD
2978	14	8	CI	10	DI	SOUTH OF LINCOLN BLVD AT MCDOWELL AVE
1604	18	8	CI	10	DI	EAST PF LINCOLN BLVD AND MCDOWELL AVE INTERSECTION
3532	53	8	CI	10	DI	WASHINGTON BLVD SOUTHEAST OF BLDG 424
3534	57	8	CI	10	DI	WASHINGTON BLVD SOUTHEAST OF BLDG 424
3520	144	8	CI	10	DI	WASHINGTON BLVD NORTHWEST OF DEEMS RD AND PIPER LOOP INTERSECTION
3489	71	6	CI	8	DI	INFANTRY TERRACE SOUTHEAST OF BLDG 329
2987	11	6	CI	8	DI	SOUTHWEST OF BLDG 130
1759	18	6	CI	8	DI	SOUTHWEST OF BLDG 130
2988	232	6	CI	8	DI	ACROSS FISHER LOOP NORTHWESTOF BLDG 130
5067	169	6	CI	8	DI	GRAHAM ST SOUTHEAST OF BLDG 34
3409	138	6	CI	8	DI	MACARTHUR AVE EAST OF BLDG 858
2195	20	6	CI	8	DI	NORTHEAST OF BLDG 861
1168	56	6	CI	8	DI	QUARRY RD BETWEEN BLDG 812 AND 813

L = Length; (E) = Existing; (N) = New; DIA. = Diameter; MAT. = Material; CI = Cast Iron; DI = Ductile Iron; AbCe = Asbestos Cement

There were a few failed nodes on Simonds Loop and Gibbon Court, as well as near Compton Road, that were not addressed by the upgrade recommendations listed in Table 2. This is because these failed nodes are in the vicinity of problem areas that do not currently meet Presidio fire flow requirements. Separate projects recommended in the 2006 Presidio Water Study to address these current problem areas would also resolve the additional deficiencies in these areas created by the additional tunnel fire flow demands. Figures 14 through 19 show the results of the fire flow tests with the additional modifications in Table 2 incorporated into the model.

The pressure of the fire flow supplied to POC 3 when there is a Presidio fire flow demand in the system is 66 psi, which is 17 psi short of the desired pressure (83 psi). This pressure can be increased by connecting POC 3 to additional nearby junctions. Connecting the POC 3 to the junction on Sheridan Avenue, west of Building 27, would add 5 psi. Connecting the POC 3 to the junction on Taylor Road, northeast of Building 107, would add another 5 psi. With these additional connections, the pressure at POC 3 would still be short 7 psi.

An alternative to upsizing the various sections of waterline would be to install a direct waterline from the reservoir to the two POCs. This direct waterline could be 12-inch pipe laid parallel to existing waterline from the reservoir to the intersection of Sheridan Avenue and Talyor Road. At the intersection, the waterline would branch to POC 2 and to POC 3. The direct waterline would be approximately 4,750 feet in length. A layout of the direct waterline to POC 2 and POC 3 is shown in Figure 20. Figures 21 through 26 show the results of the fire flow test for this alternative. The modeling results suggests that, with a directwaterline from the reservoir to the two POCs and the POC elevations set at 47 feet for POC 2 and 55 feet for POC 3, the required tunnel fire flow of 3500 gpm can be supplied to POC 2 at a pressure of 111.3 psi and to POC 3 at a pressure 109.8 psi. When no tunnel fire flow is supplied to the two POCs, the pressure at POC 2 is approximately 154 psi and 150 psi at POC 3.

A second alternative would be to supply POC 2 and POC 3 from a 12-inch dedicated waterline that connects to the water system upstream of a pressure reducing valve (PRV) rather than connecting directly to the reservoir. The dedicated waterline could connect to the existing 12-inch waterline at the intersection of Infantry Terrace and Arguello Boulevard. The dedicated waterline would be approximately 3,850 feet long. Figure 20 shows the layout of this waterline. Figure 27 shows the result from the fire flow test for this alternative with 3,500 gpm supplied to POC 2 under future average day demand conditions. The tunnel fire flow supplied to POC 2 from this connection causes an additional 24 nodes to fail the fire flow test (that did not fail in the original model). However, 22 of the 24 nodes would have an available fire flow of greater than 1,400 gpm. With this waterline, the required tunnel fire flow of 3,500 gpm can be supplied to POC 2 at a pressure of approximately 100 psi and to POC 3 at a pressure of approximately 99 psi (assuming elevations of 47 feet and 55 feet for POC 2 and POC 3, respectively). When no tunnel fire flow is supplied to the two POCs, the pressure at POC 2 is approximately 153 psi and 150 psi at POC 3.

Conclusions

The major conclusions from the Presidio water distribution system modeling for the DDP include the following:

- The entire tunnel fire flow demand of 3500 gpm can be supplied at POC 2 for the Main Parade Tunnel and at POC 3 for the Battery Tunnel, and additional connection points at the opposite ends of the tunnel are not needed.

- The installation of POC 4 would cause a large section of the Presidio water distribution system to lose the capacity to provide sufficient Presidio fire flow demands at the required minimum pressure of 20 psi.

- Based on assumed elevations of the tunnel POCs (POC 2 at 47 feet and POC 3 at 55 feet), the required fire flow of 3500 gpm can be supplied at the required pressure of 83 psi to POC 2 but not at POC 3. The fire flow at POC 3 could be supplied at a pressure of approximately 66 psi when 1500 gpm is supplied at a minimum pressure of 20 psi to a nearby hydrant. When there is no simultaneous Presidio fire flow demand,

the fire flow to POC 3 can be supplied at a pressure of approximately 72 psi under both future average day and future peak day demand conditions. An additional 10 psi could be achieved by connecting POC 3 to two other nearby junctions in the water system.

- The modifications to the Presidio water system for the DDP and the additional fire flow demands at the tunnels will cause some areas of the Presidio distribution system to fail the fire flow test that currently have adequate capacity for Presidio fire flow demands. Approximately 3,915 feet of the Presidio water system would require upsizing to maintain adequate capacity for Presidio fire flow demands in these areas.

- An alternative to providing a water connection for the Doyle Drive tunnels from nearby waterlines would be to provide a direct waterline from the reservoir to the tunnels. This waterline would be approximately 4,750 feet in length. With the direct waterline, the required tunnel fire flow of 3,500 gpm can be supplied to POC 2 at a pressure of 111.3 psi and to POC 3 at a pressure of 109.8 psi. When no tunnel fire flow is supplied to the two POCs, the pressure at POC 2 is approximately 154 psi and 150 psi at POC 3.

- An alternative to installing a direct line from the reservoir would be to supply POC2 and POC 3 from a dedicated 12" waterline near the intersection of Infantry Terrace and Arguello Boulevard. This would require a total of approximately 3,850 feet of 12-inch pipe. Supplying the tunnel fire flow from this connection would cause fire flow deficiencies in parts of the Presidio water system that currently have the capacity to meet fire flow demands, but most of these additional deficiencies are within 100 gpm of the required 1500 gpm for Presidio fire flows. With this waterline, the required tunnel fire flow of 3,500 gpm can be supplied to POC 2 at a pressure of 100 psi and to POC 3 at 90 psi. When no tunnel fire flow is supplied to the two POCs, the pressure at POC 2 is approximately 153 psi and 150 psi at POC 3.

Please let us know if you have any questions regarding this analysis.

Very truly yours,

KENNEDY/JENKS CONSULTANTS

Gregg Cummings
Project Manager

Patrick Johnston
Project Engineer

Enclosure: Figures 1 through 27

cc: David Fyfe, URS

San Francisco Bay

UPSIZE (E) WL TO 12" DIP

(N) 12" DIP

POC 4

PHANTOM PIPE 3-4

POC 3

UPSIZE (E) WL TO 12" DIP

(N) 12" DIP

POC 2

6" CI REMOVED BY PRESIDIO

10" CI REMOVED BY PRESIDIO

UPSIZE (E) WL TO 12" DIP

(N) 12" DIP

POC 1

PHANTOM PIPE 1-2

UPSIZE (E) WL TO 12" DIP

DEMO (E) WL (TYP)

(N) 12" DIP

RELOCATE 6" PIPE TO HERE

(N) 12" DIP

(N) 12" DIP

UPSIZE (E) WL TO 12" DIP

CRISSY FIELD

MARINA GATE

MARINA BLVD

JEFFERSON ST

BEACH ST

NORTH POINT ST

BAY ST

FRANCISCO ST

CHESTNUT ST

LOMBARD ST

LOMBARD GATE

GORGAS AVE GATE

RICHARDSON AVE

LYON ST

BAKER ST

PALACE OF FINE ARTS

ST. FRANCIS YACHT CLUB

MAIN POST

THOREAU CENTER

FORMER LETTERMAN COMPLEX

SAN FRANCISCO NATIONAL CEMETERY

CAVALRY STABLES

MASON ST

CRISSY FIELD

BATTERY BLANEY RD

BATTERY BLANEY

HIGHWAY 101

LINCOLN BLVD

CRISSY FIELD AVE

COWLES ST

PATTEN RD

INCINERATOR RD

LINCOLN BLVD

MCDOWELL AVE

PADDOCK

TRACT BLVD

INFANTRY TERRACE

FISHER LOOP

MONTGOMERY ST

HALLECK ST

GRAHAM ST

OWEN ST

ENA ST

BLISS RD

MORAGA ST

MCREYNOLDS RD

SHERIDAN AVE

MARGUERITE AVE

MARTINEZ ST

MASON ST

FUNSTON AVE

LINCOLN BLVD

GORGAS AVE

SIMONDS LOOP

SIMONDS AVE

PRESIDIO BLVD

NAUMAN RD

AMATURY LOOP

TENNIS COURTS

TRAINING COURTS

Kennedy/Jenks Consultants

THE PRESIDIO TRUST – DOYLE DRIVE
WATER DISTRIBUTION SYSTEM MODELING

CHANGES TO PRESIDIO WATER MODEL

K/J 0968016
OCTOBER 2009

FIGURE 1

THE PRESIDIO TRUST - DOYLE DRIVE
WATER DISTRIBUTION SYSTEM MODELING

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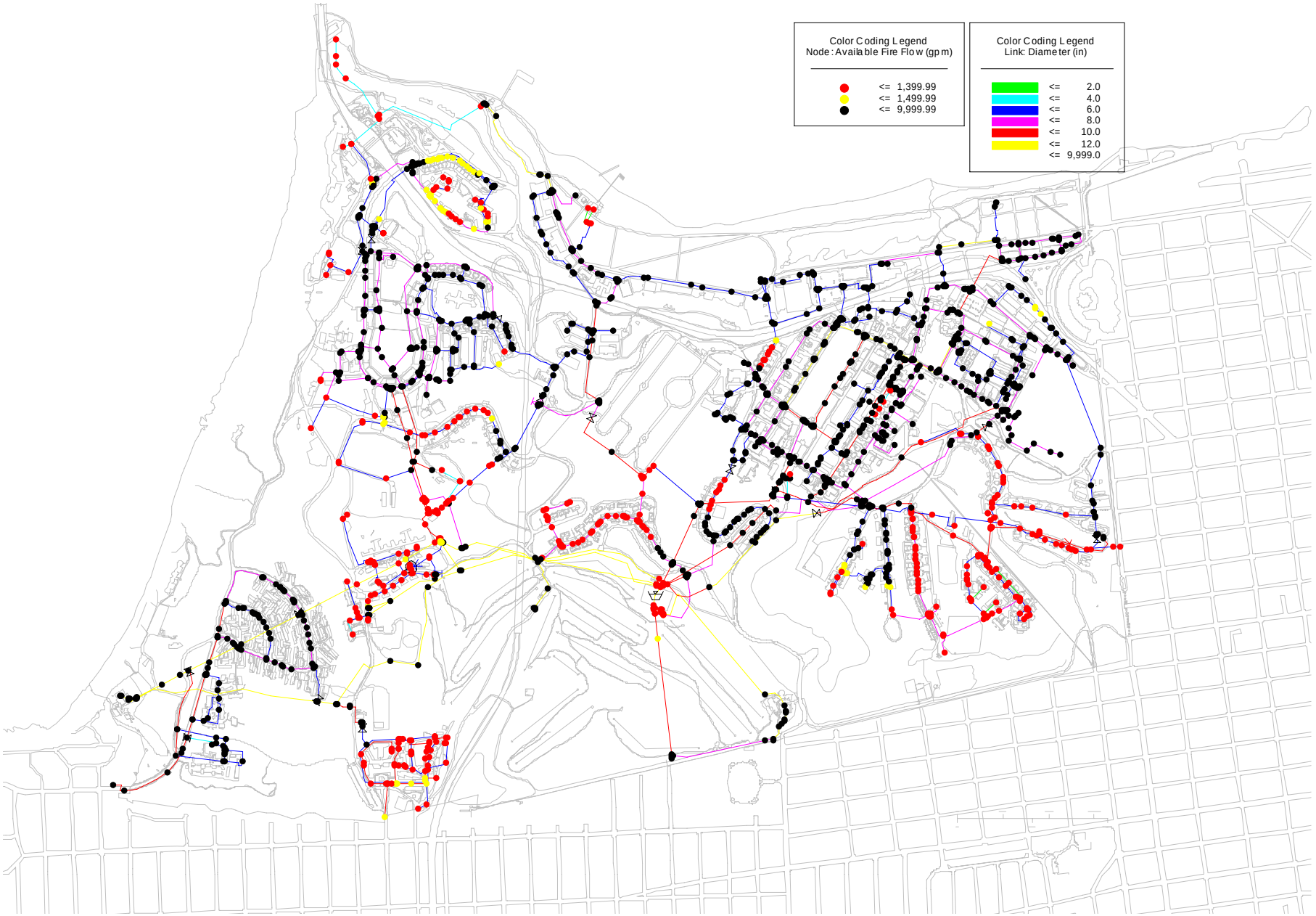
FIGURE 2

Scenario: Future Average Day (Original)



THE PRESIDIO TRUST - DOYLE DRIVE
WATER DISTRIBUTION SYSTEM MODELING

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FIGURE 3

Scenario: Future Average Day (Modified System)

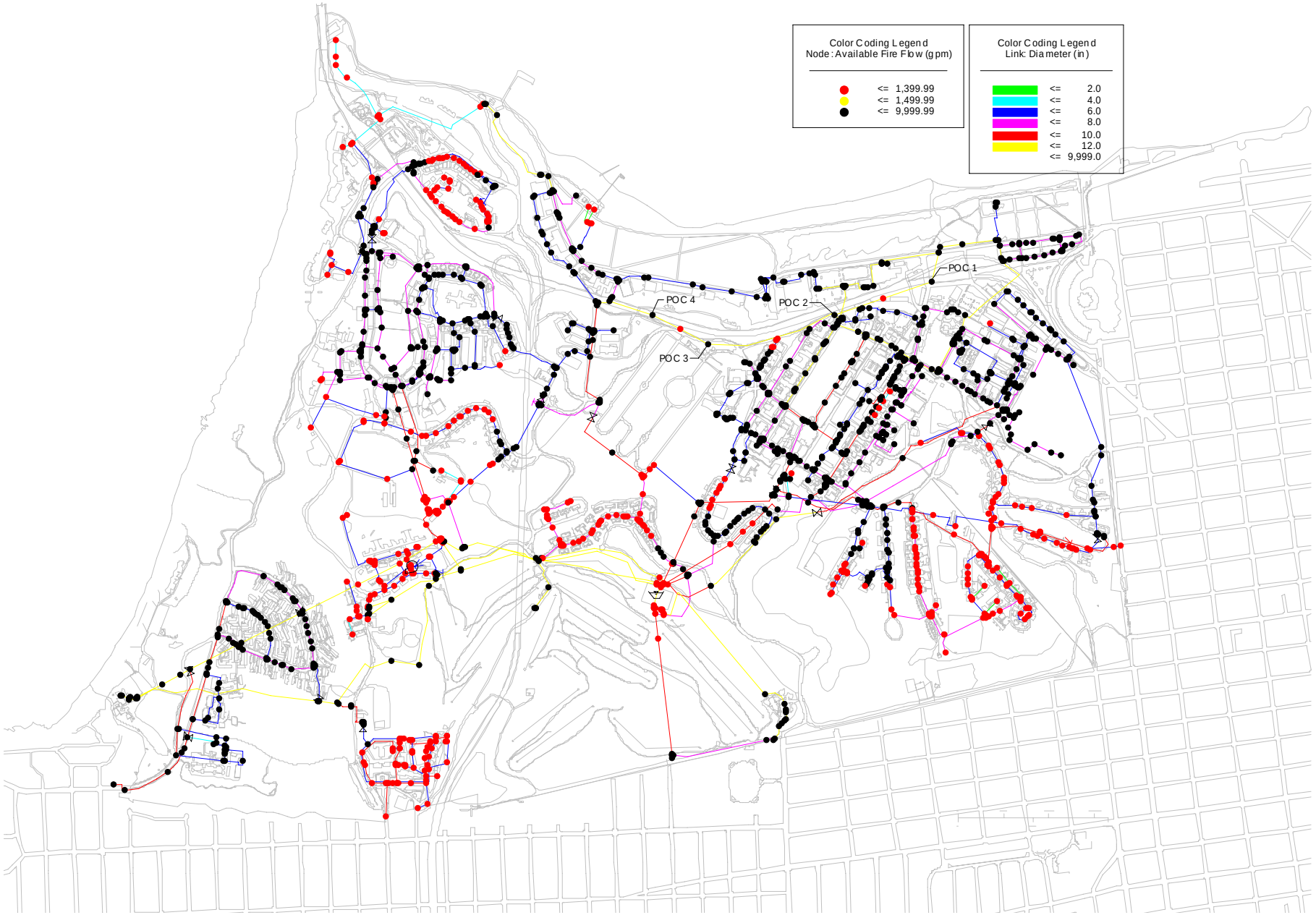

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FIGURE 4

Scenario: POC2 @ 3500 - AD

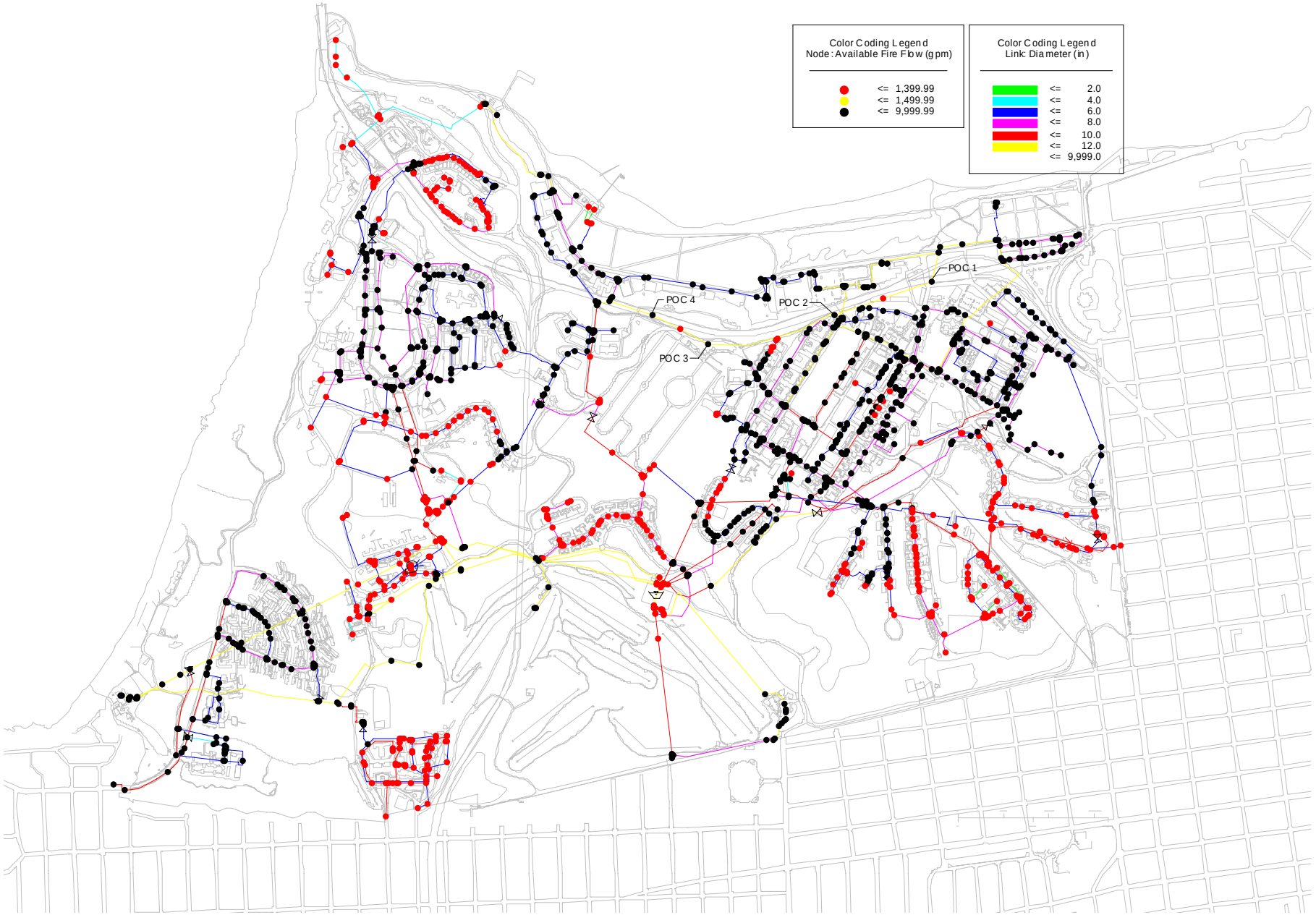

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FIGURE 5

Scenario: POC1-2 @ 3500 - AD

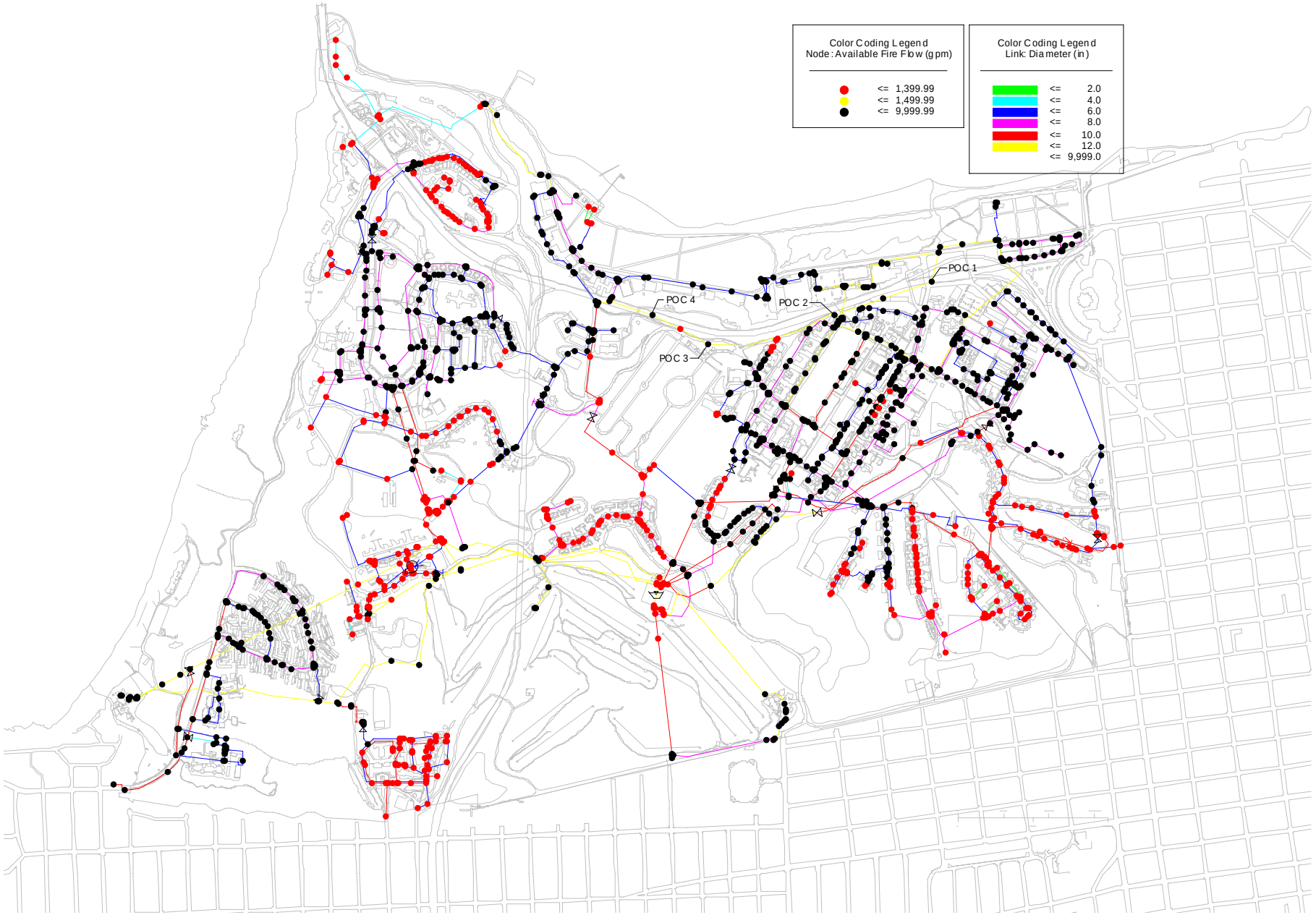

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FIGURE 6

Scenario: POC3 @ 3500 - AD

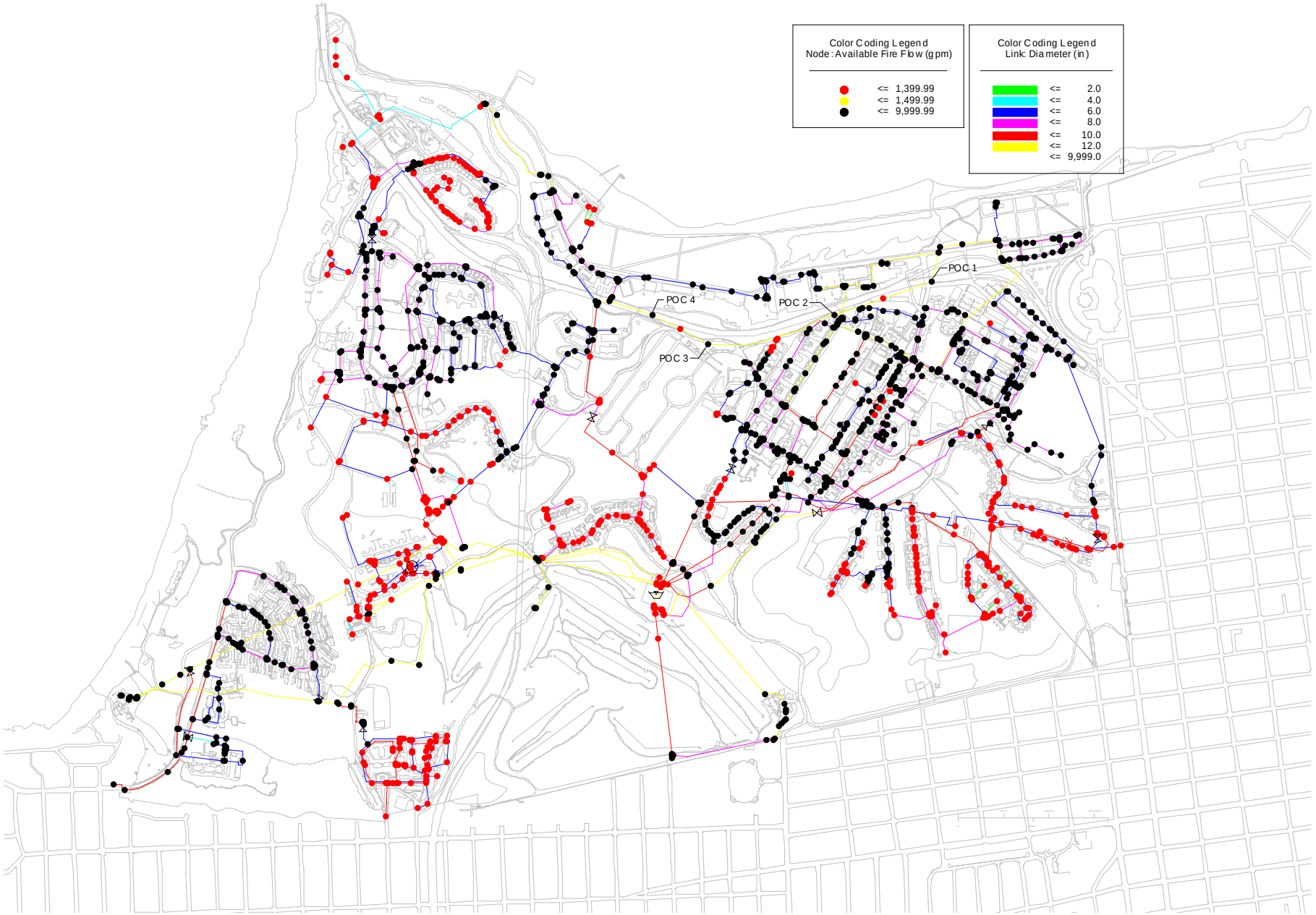

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FIGURE 7

Scenario: POC3-4 @ 3500 - AD

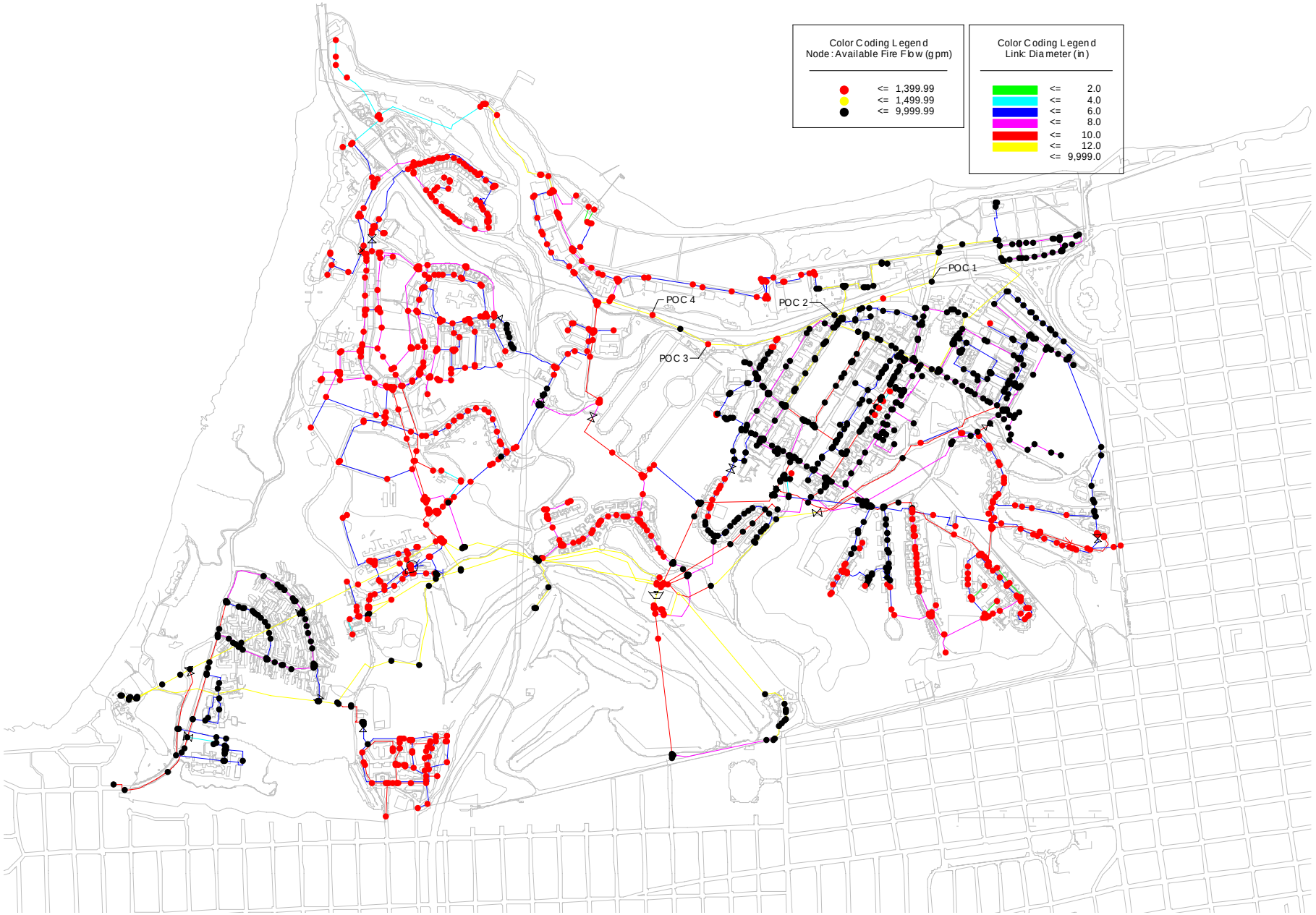

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FIGURE 8

Scenario: Future Peak Day (Original)

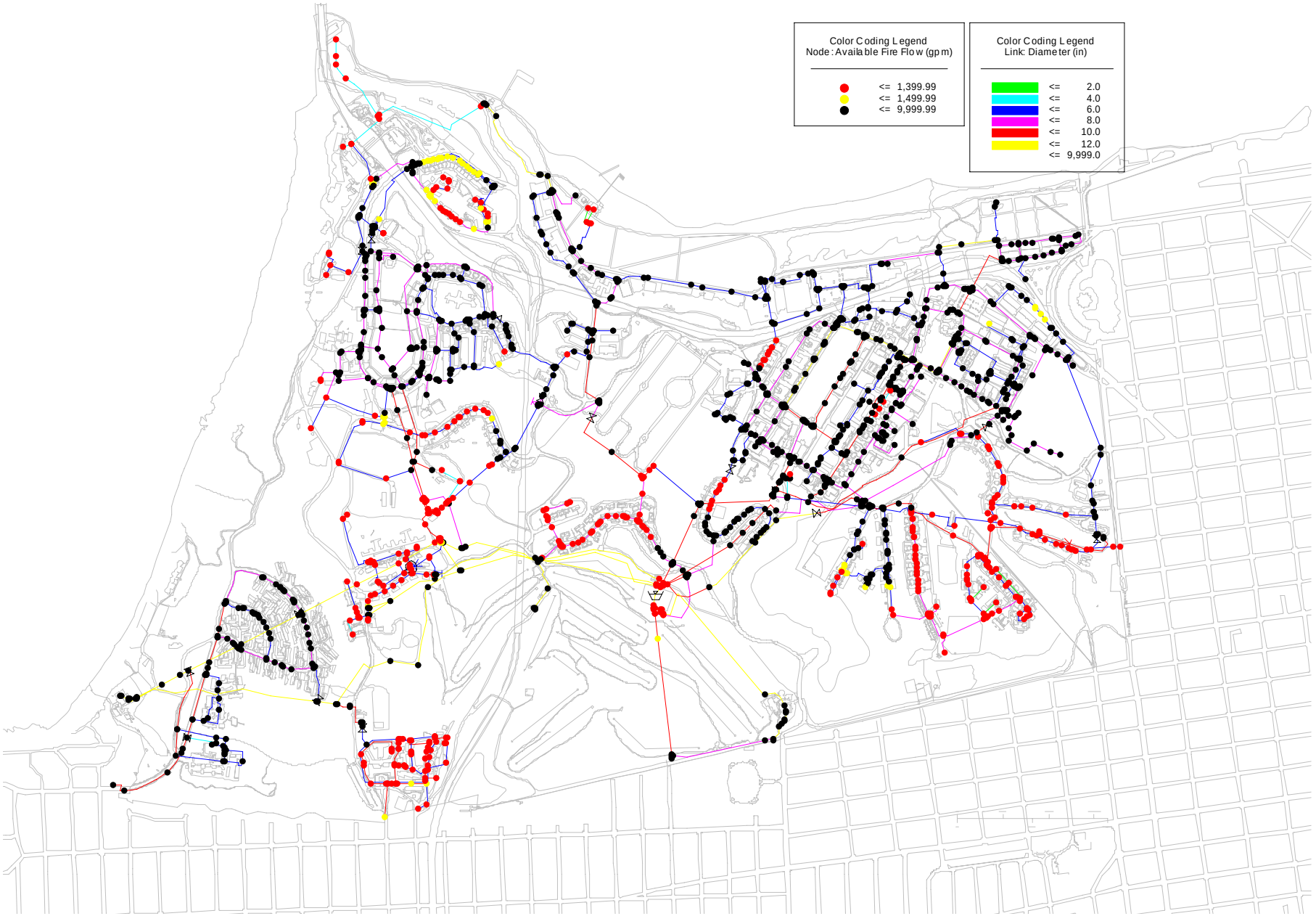

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FIGURE 9

Scenario: Future Peak Day (Modified System)

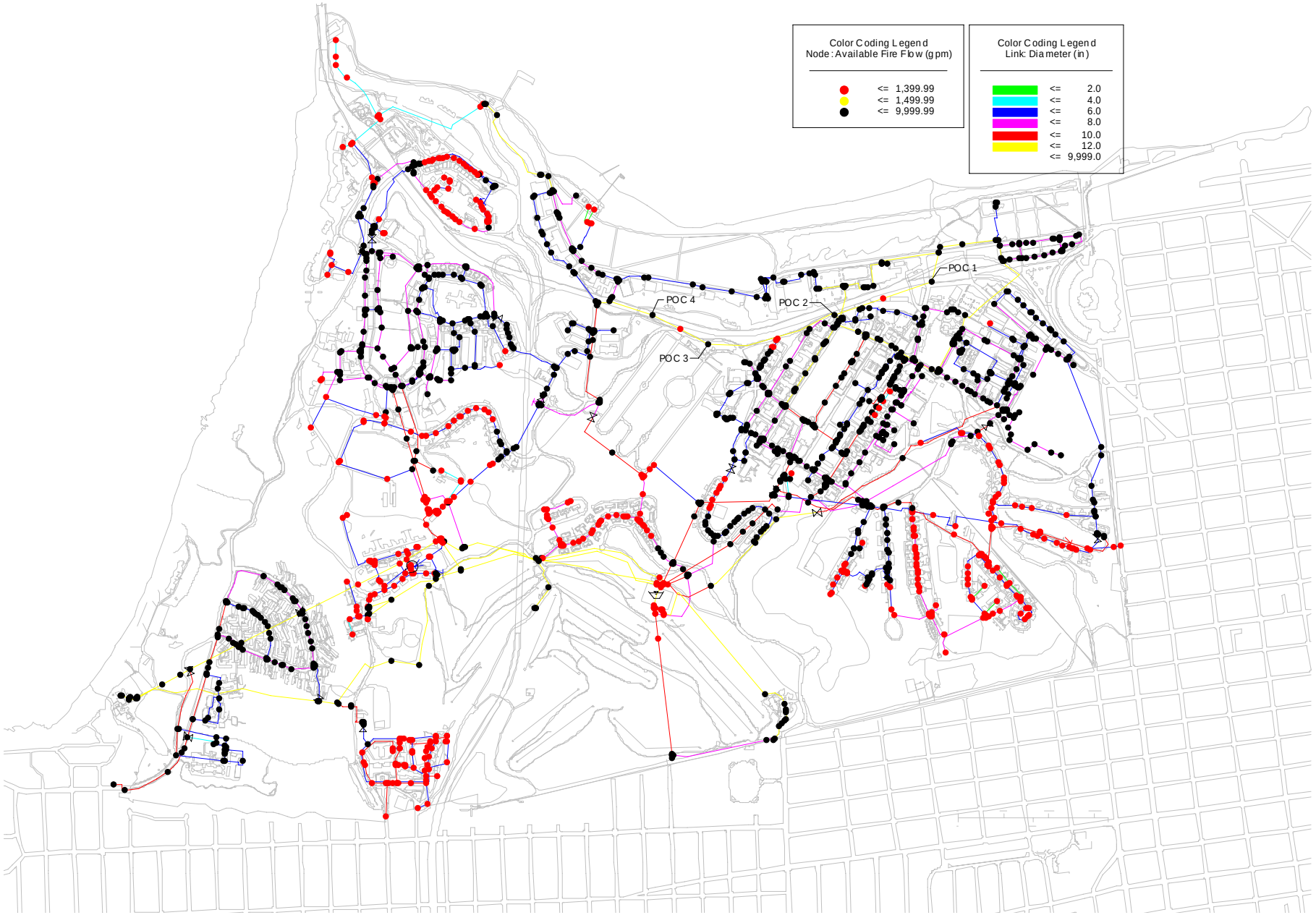

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FIGURE 10

Scenario: POC2 @ 3500 - PD

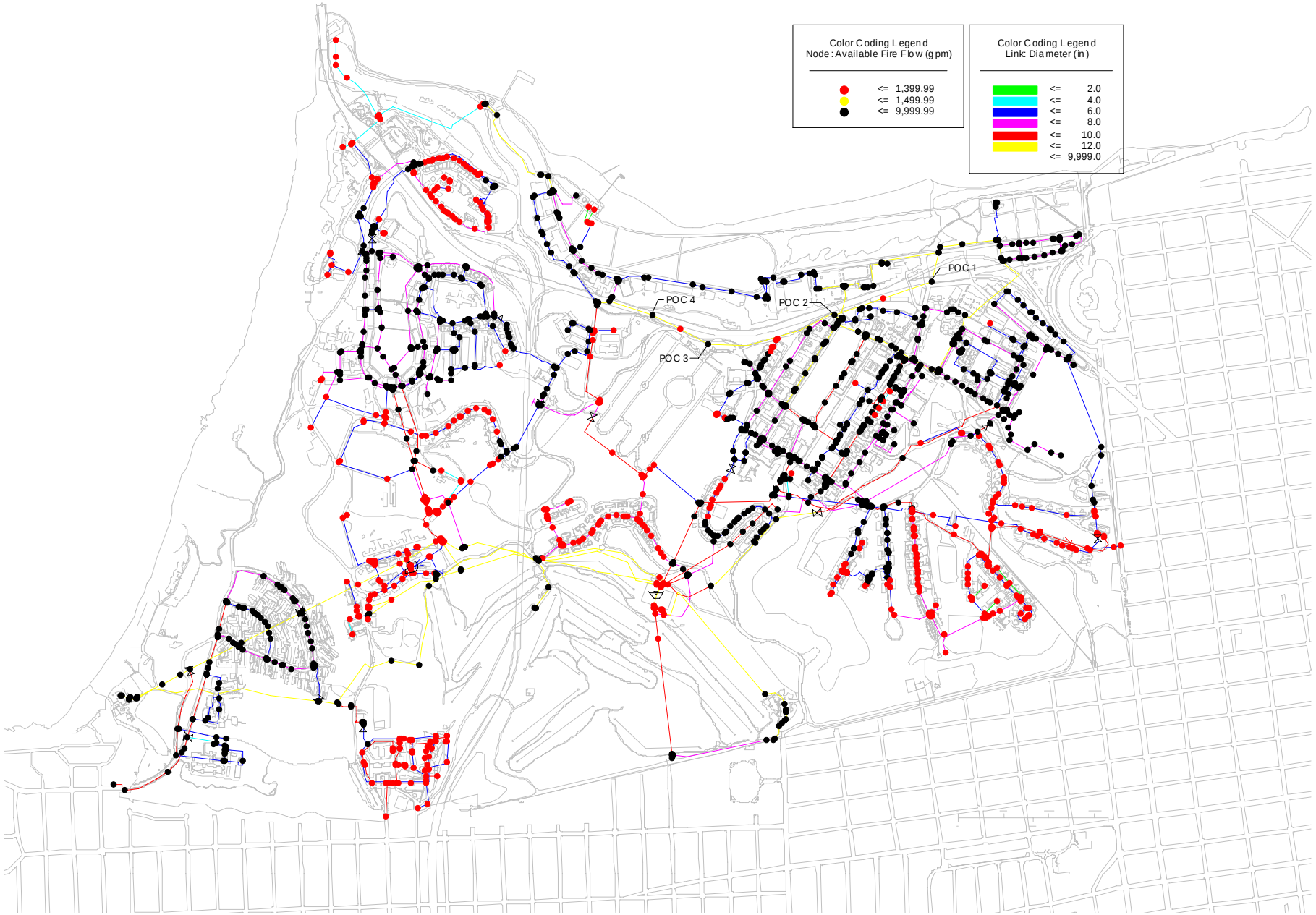

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FIGURE 11

Scenario: POC1-2 @ 3500 - PD

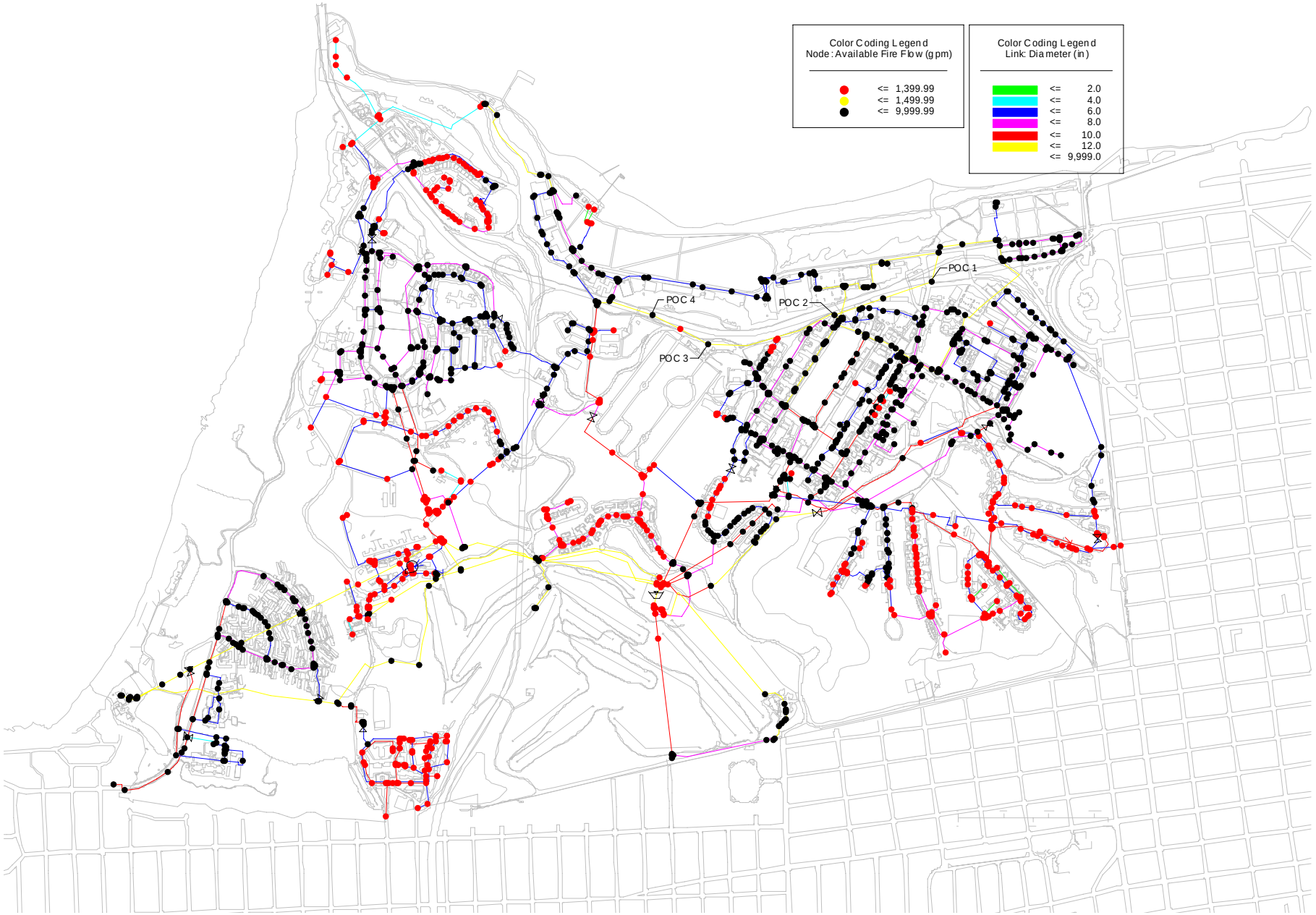

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FIGURE 12

Scenario: POC3 @ 3500 - PD

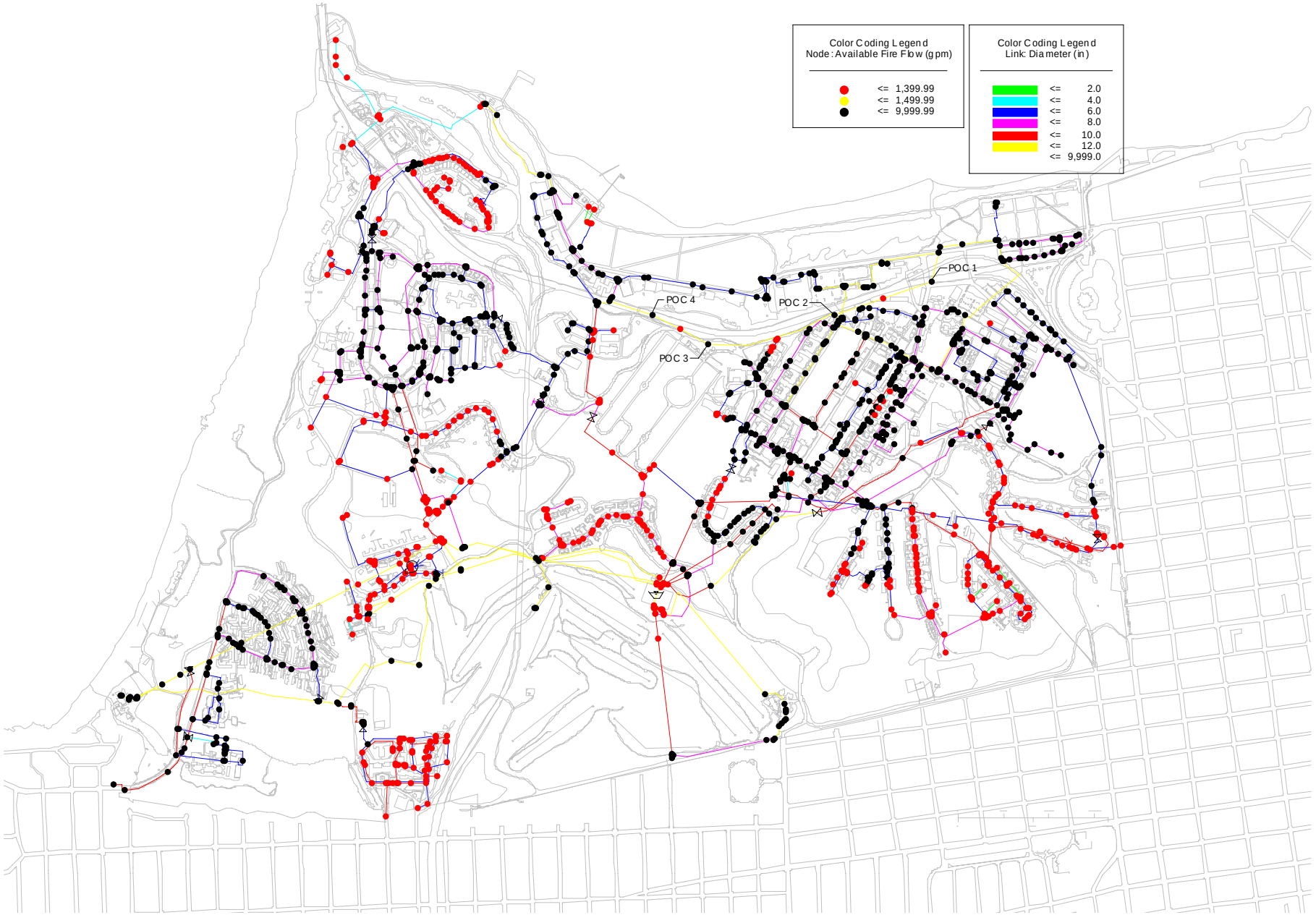

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FIGURE 13

Scenario: POC3-4 @ 3500 - PD

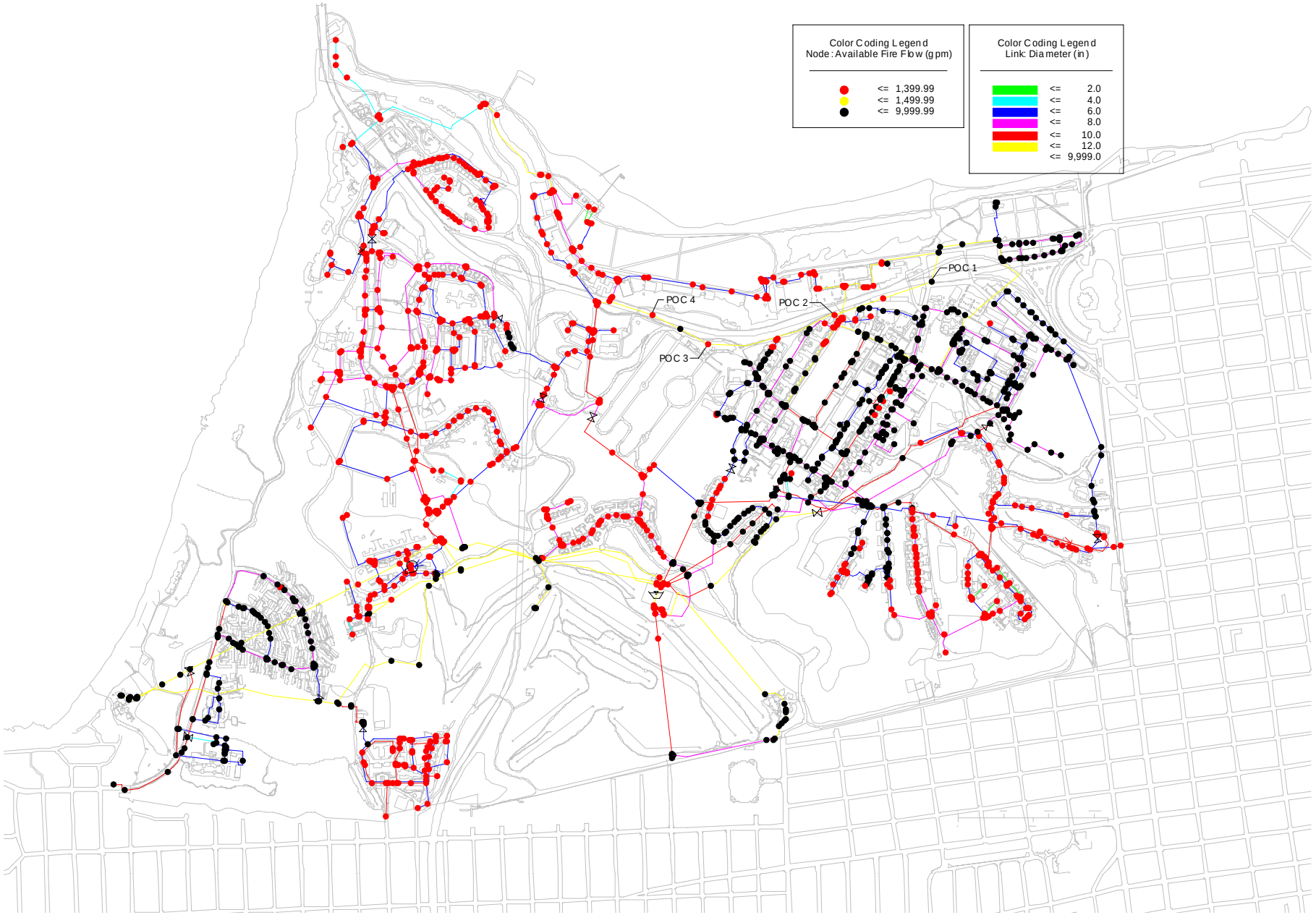

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FIGURE 14

Scenario: Future Average Day (with Additional Modifications)

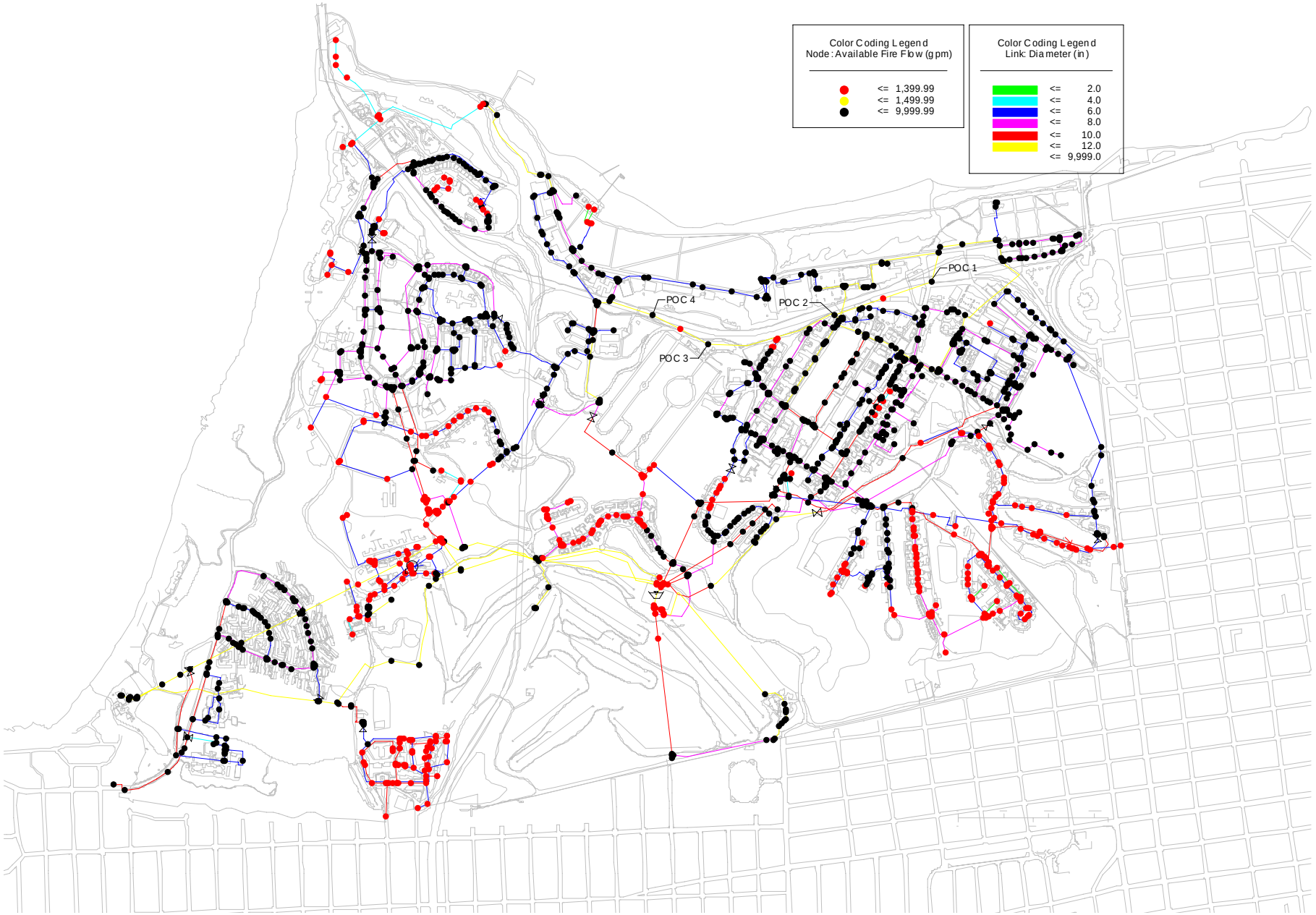

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FIGURE 15

Scenario: POC2 @ 3500 - AD (with Additional Modifications)

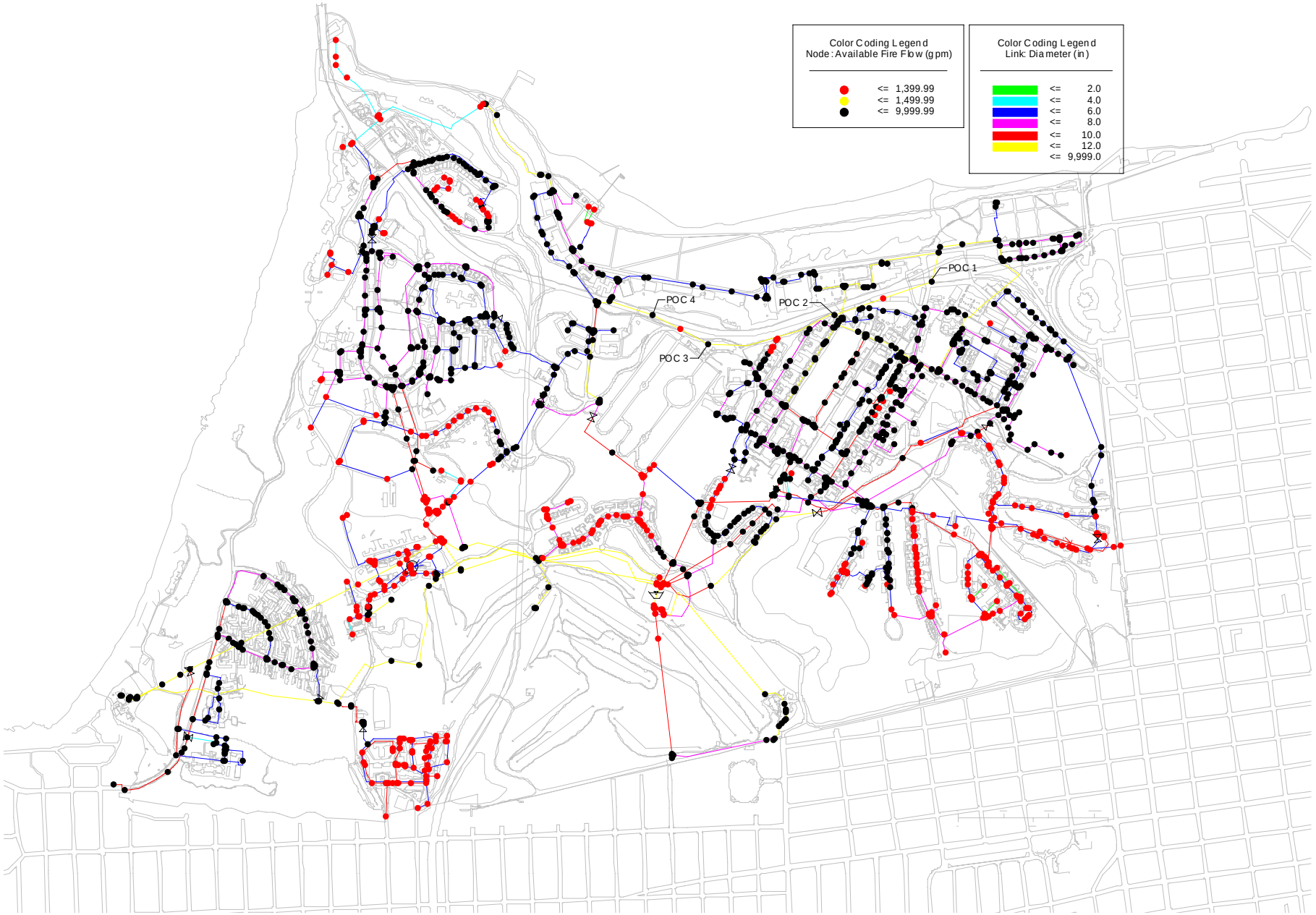

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FIGURE 16

Scenario: POC3 @ 3500 - AD (with Additional Modifications)

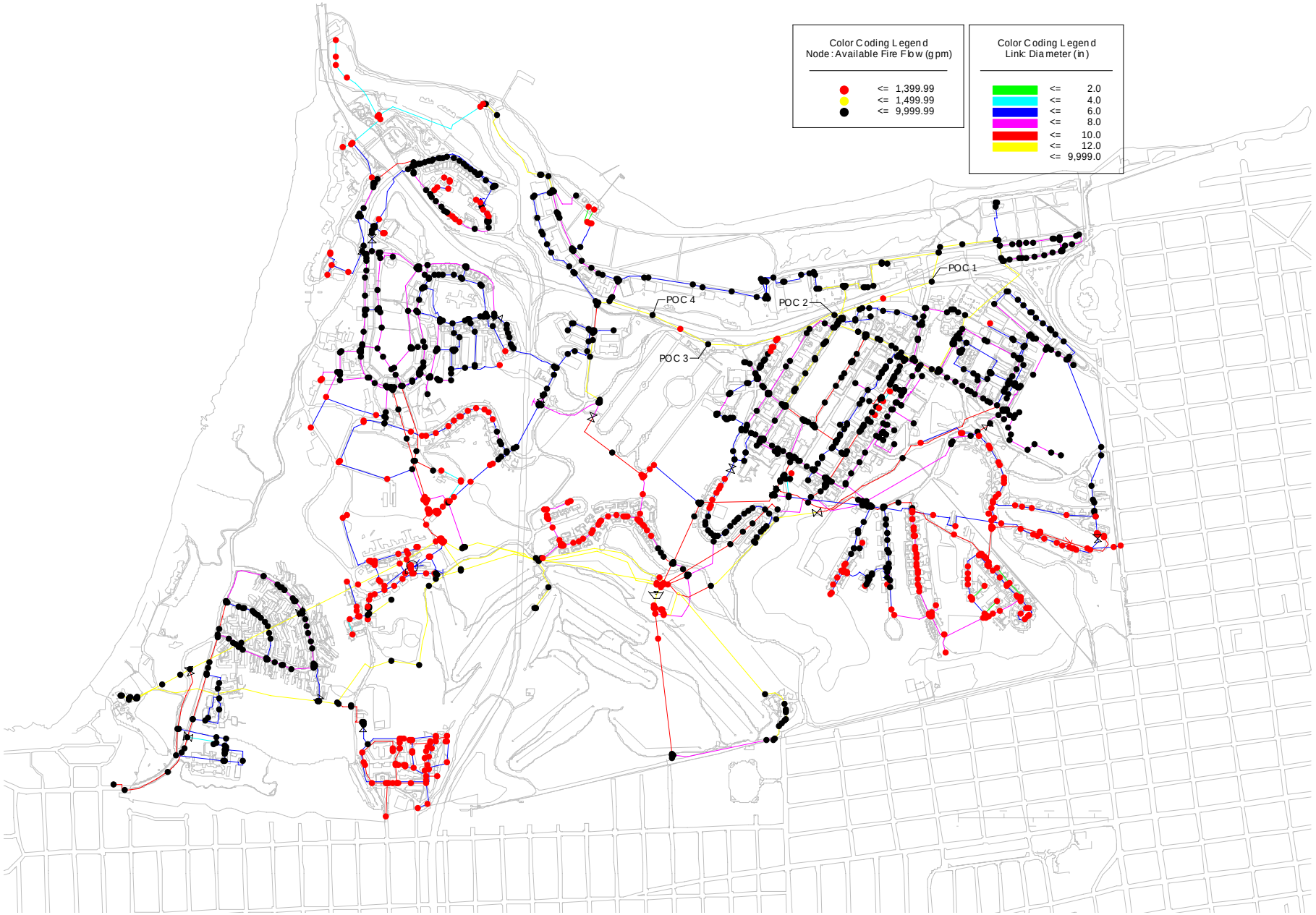

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FIGURE 17

Scenario: Future Peak Day (with Additional Modifications)

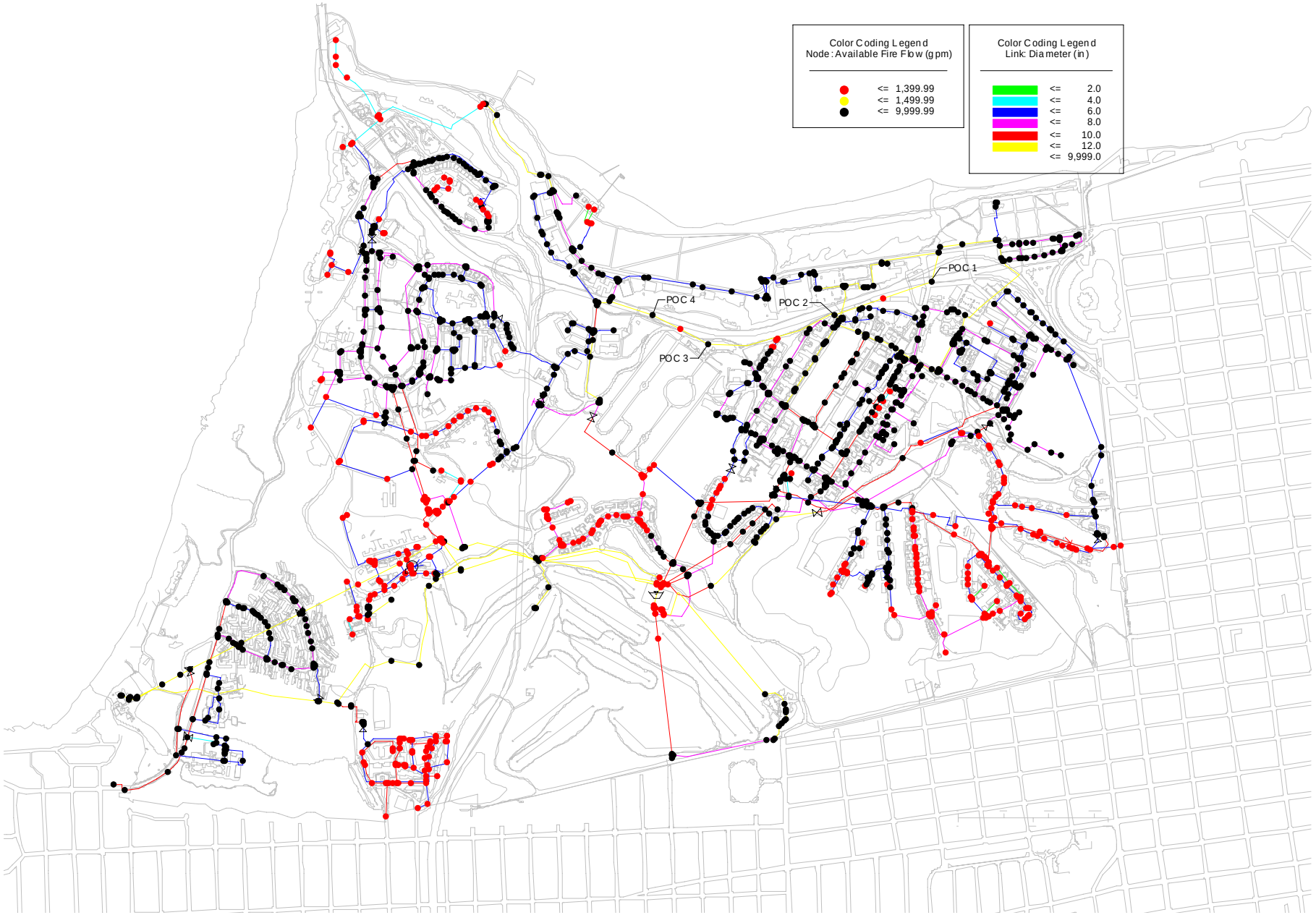

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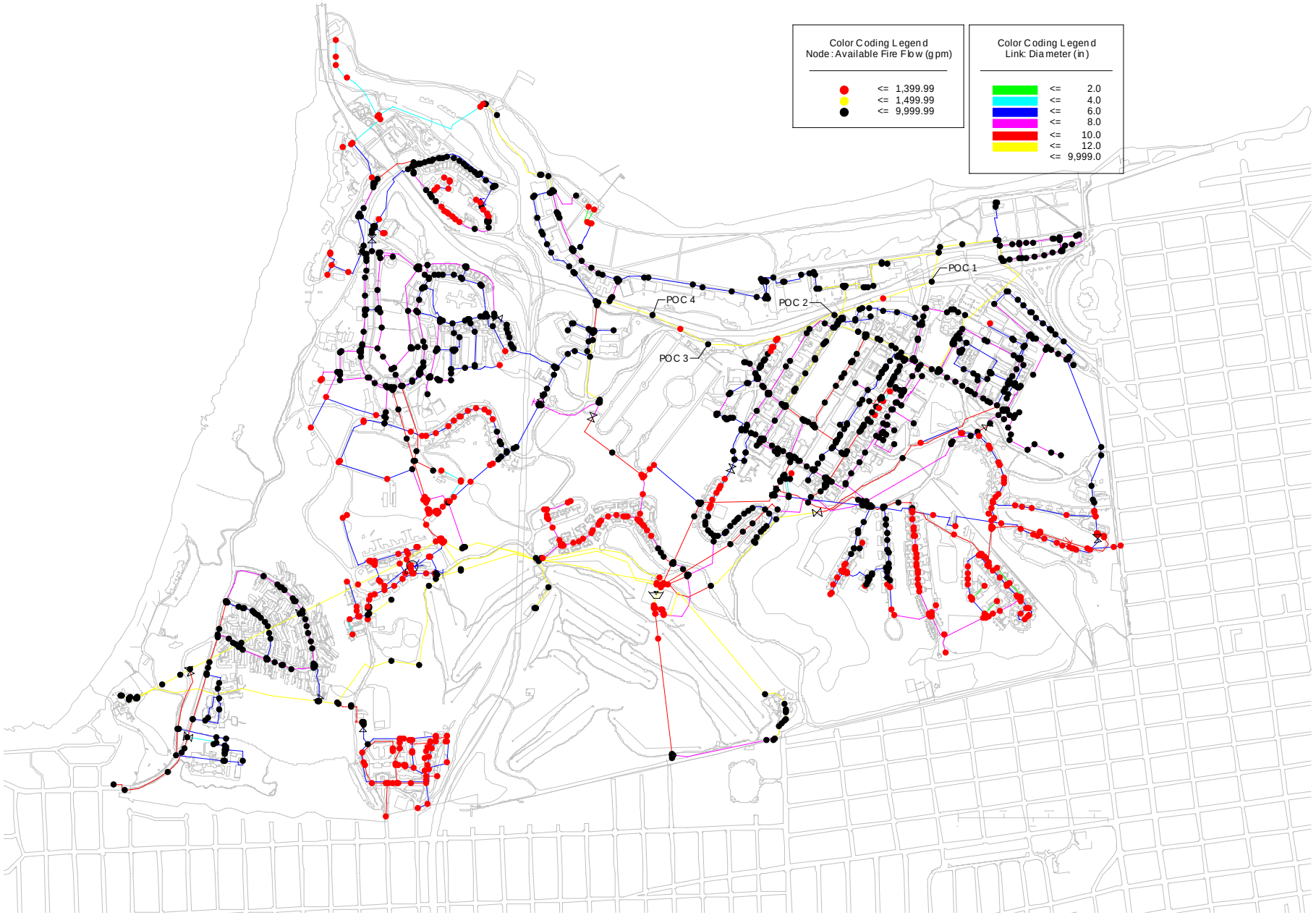
FIGURE 18

Scenario: POC2 @ 3500 - PD (with Additional Modifications)



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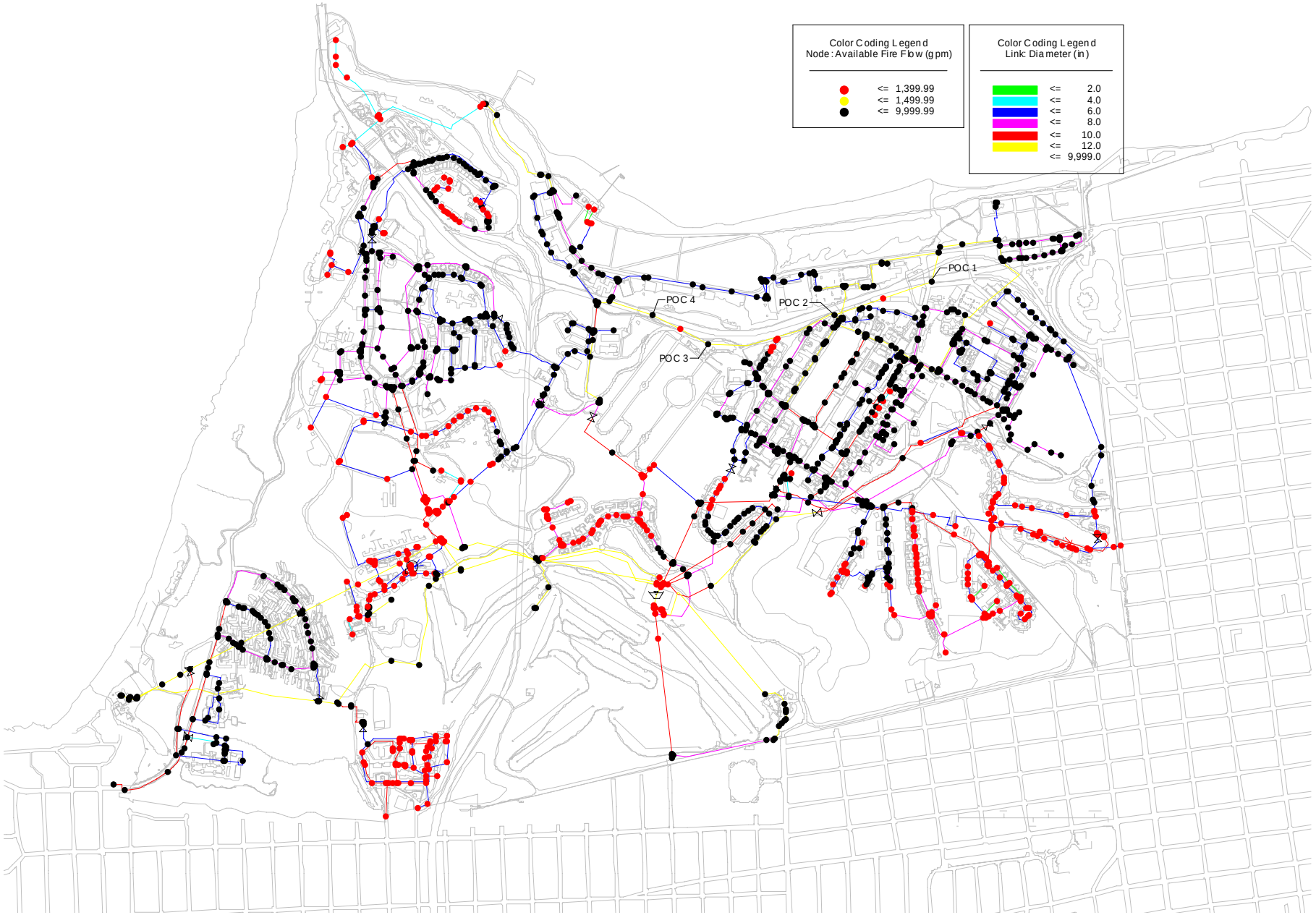
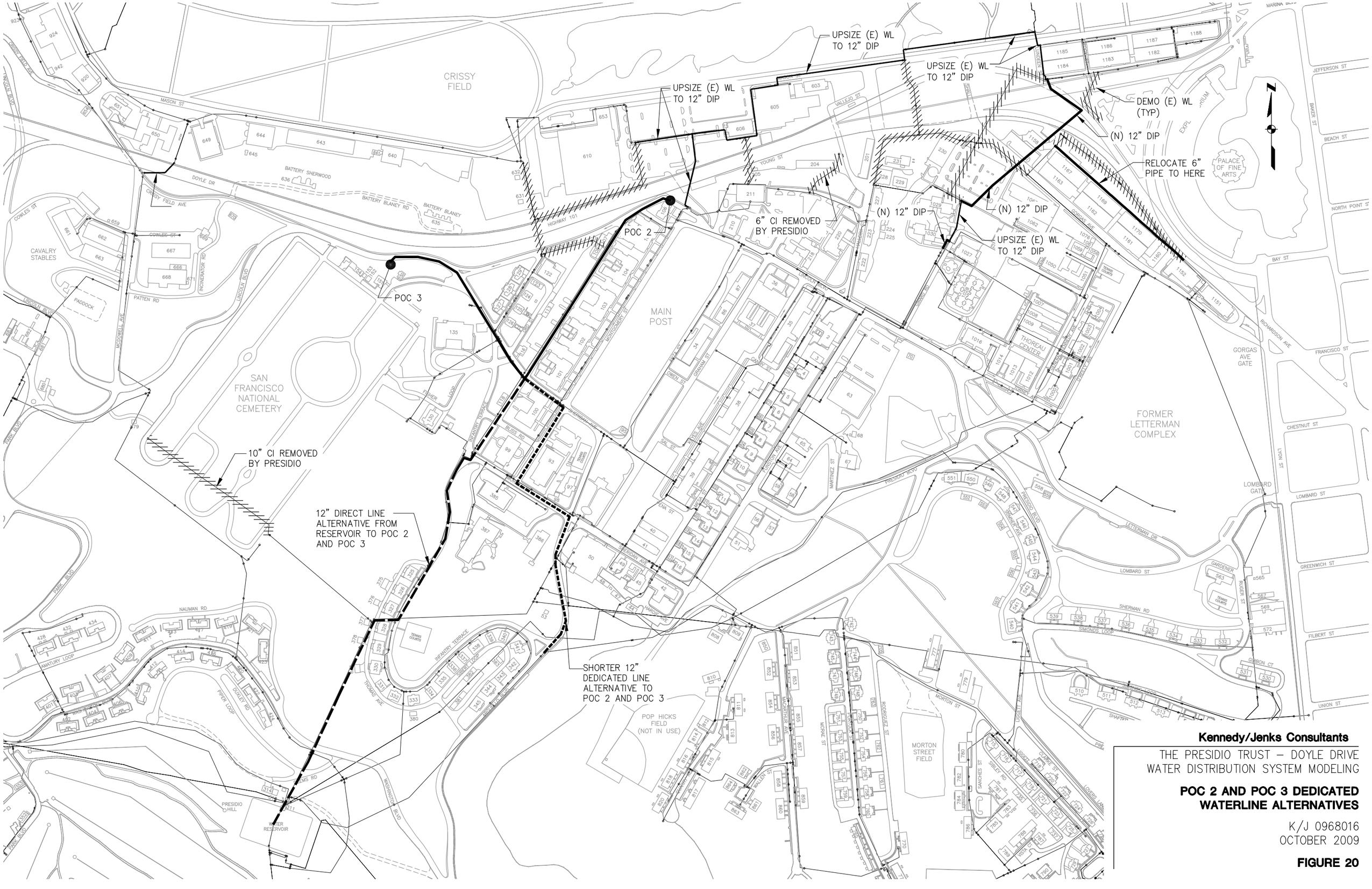
Scenario: POC3 @ 3500 - PD (with Additional Modifications)





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POC 2 AND POC 3 DEDICATED WATERLINE ALTERNATIVES

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OCTOBER 2009

FIGURE 20

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FIGURE 21

Scenario: Future Average Day (Direct Line to POCs)

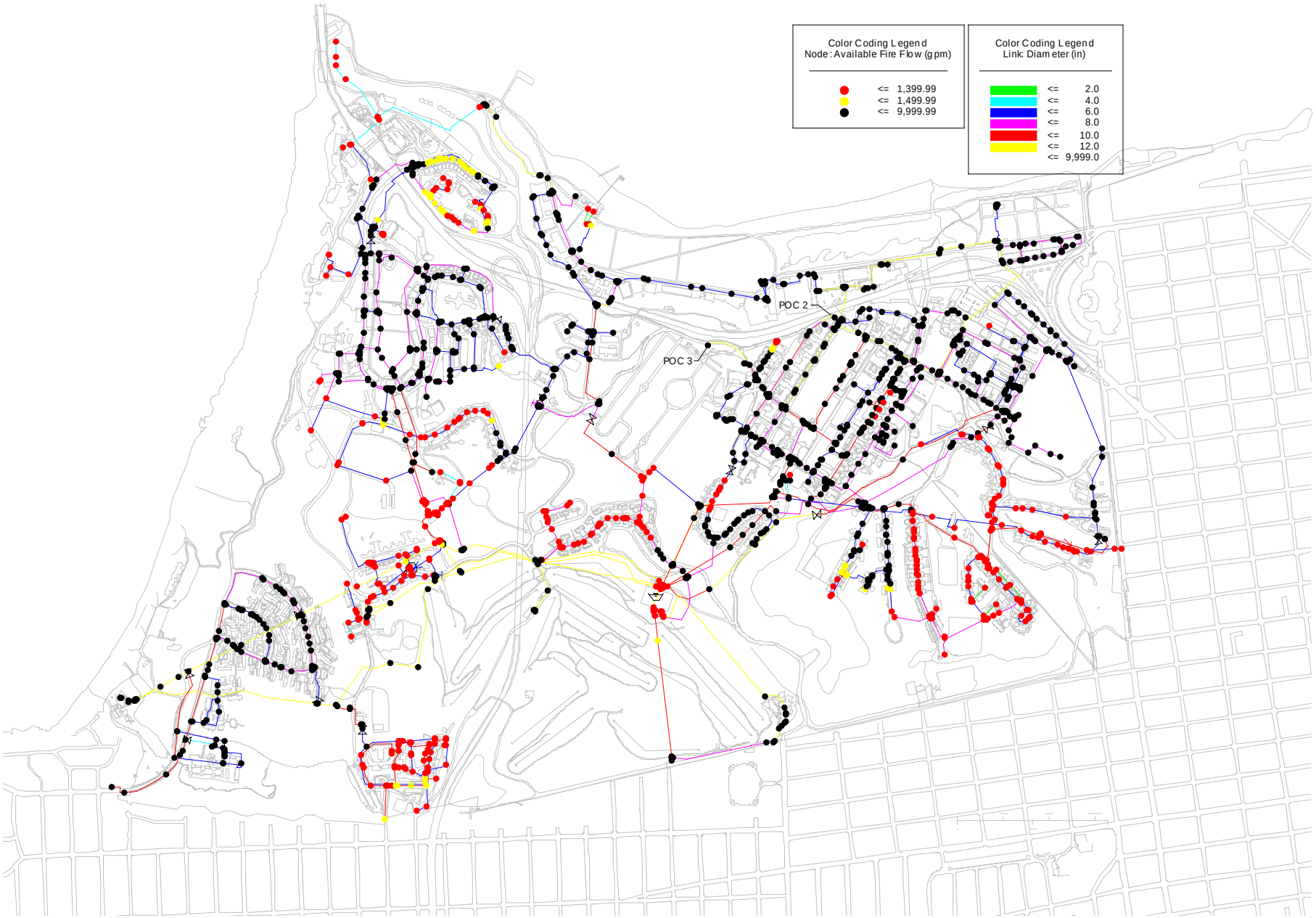

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FIGURE 22

Scenario: POC2 @ 3500 - AD (Direct Line to POCs)

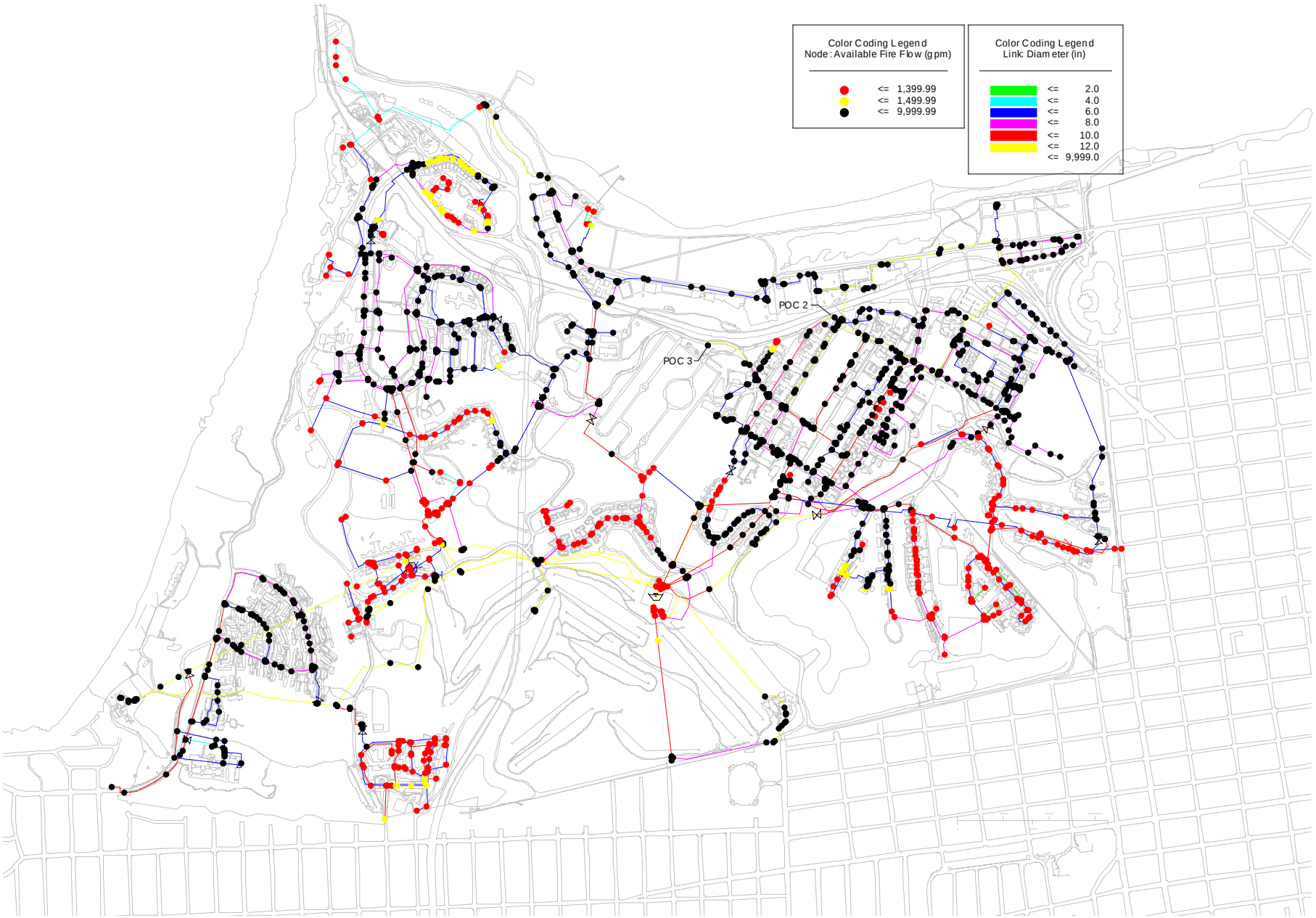

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FIGURE 23

Scenario: POC3 @ 3500 - AD (Direct Line to POCs)

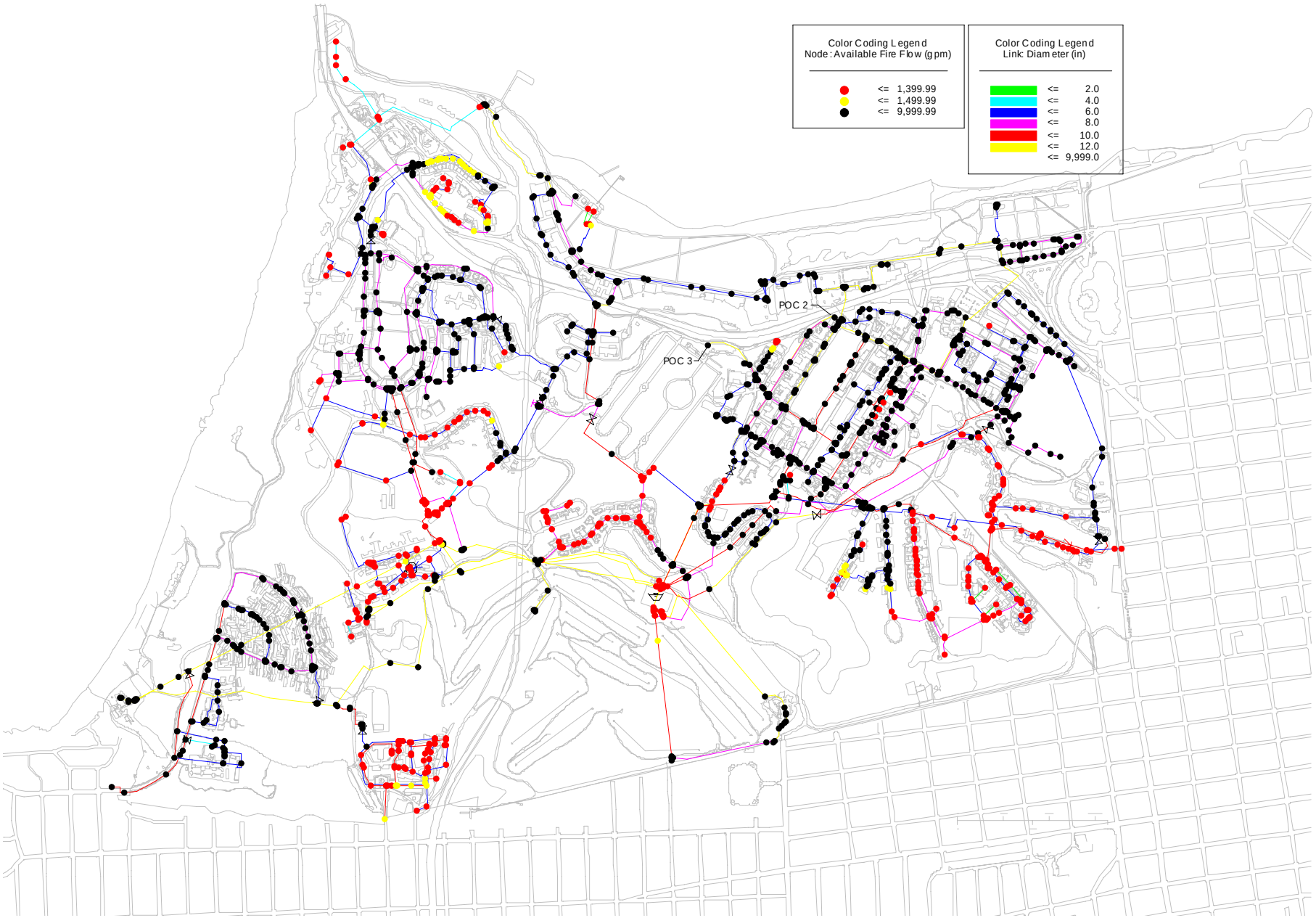

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FIGURE 24

Scenario: Future Peak Day Demand (Direct Line to POCs)

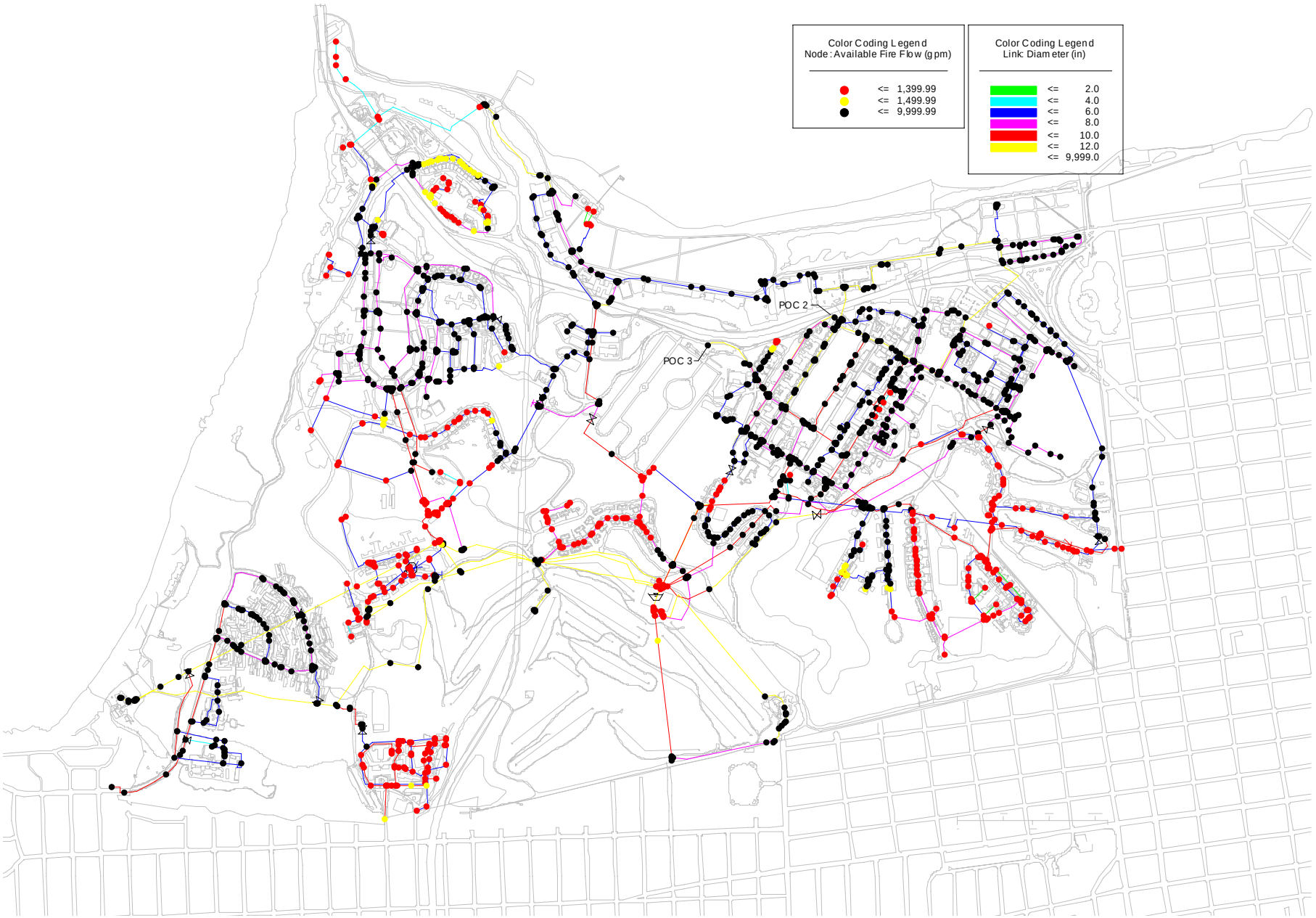

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FIGURE 25

Scenario: POC2 @ 3500 - PD (Direct Line to POCs)

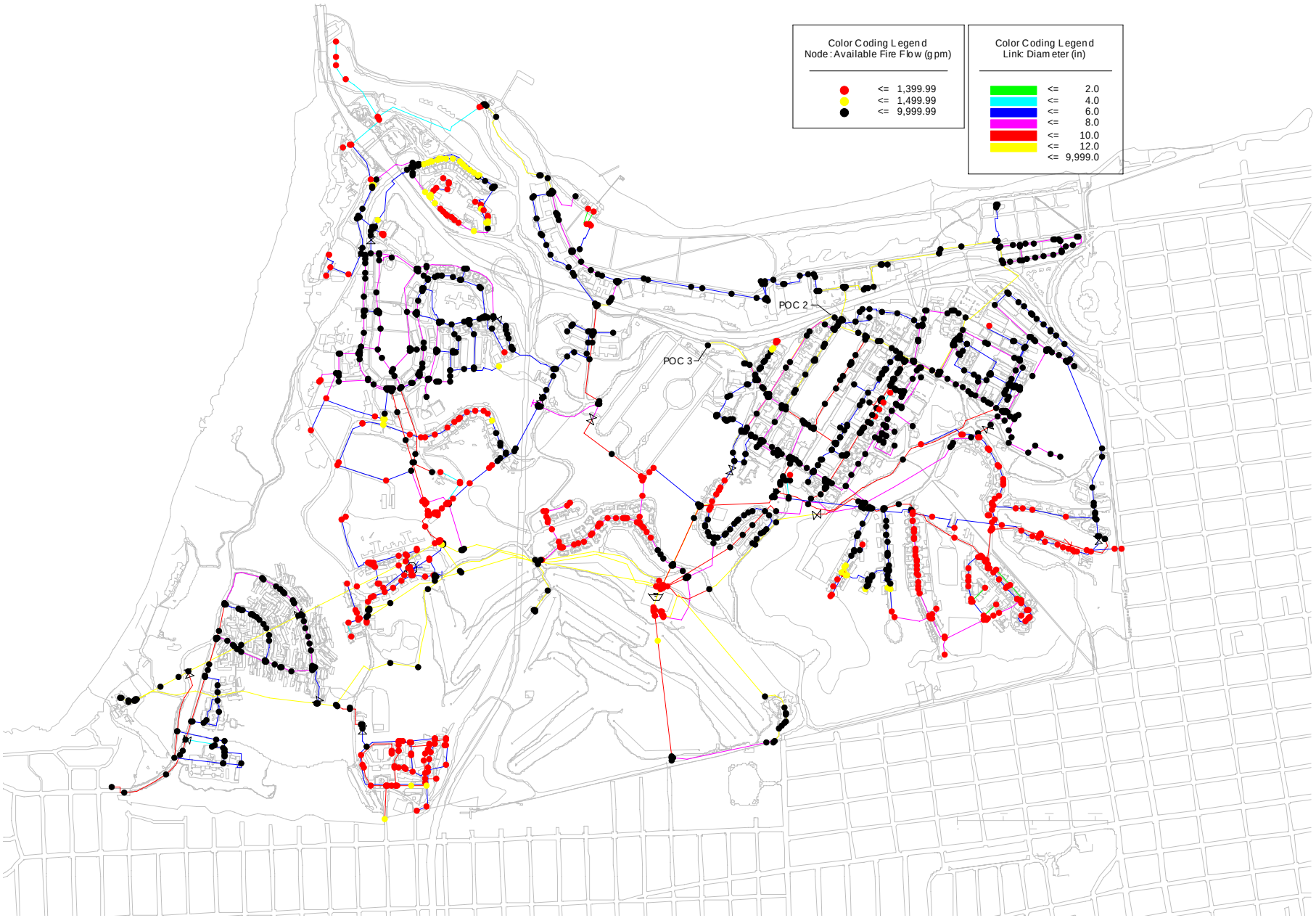

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FIGURE 26

Scenario: POC3 @ 3500 - PD (Direct Line to POCs)

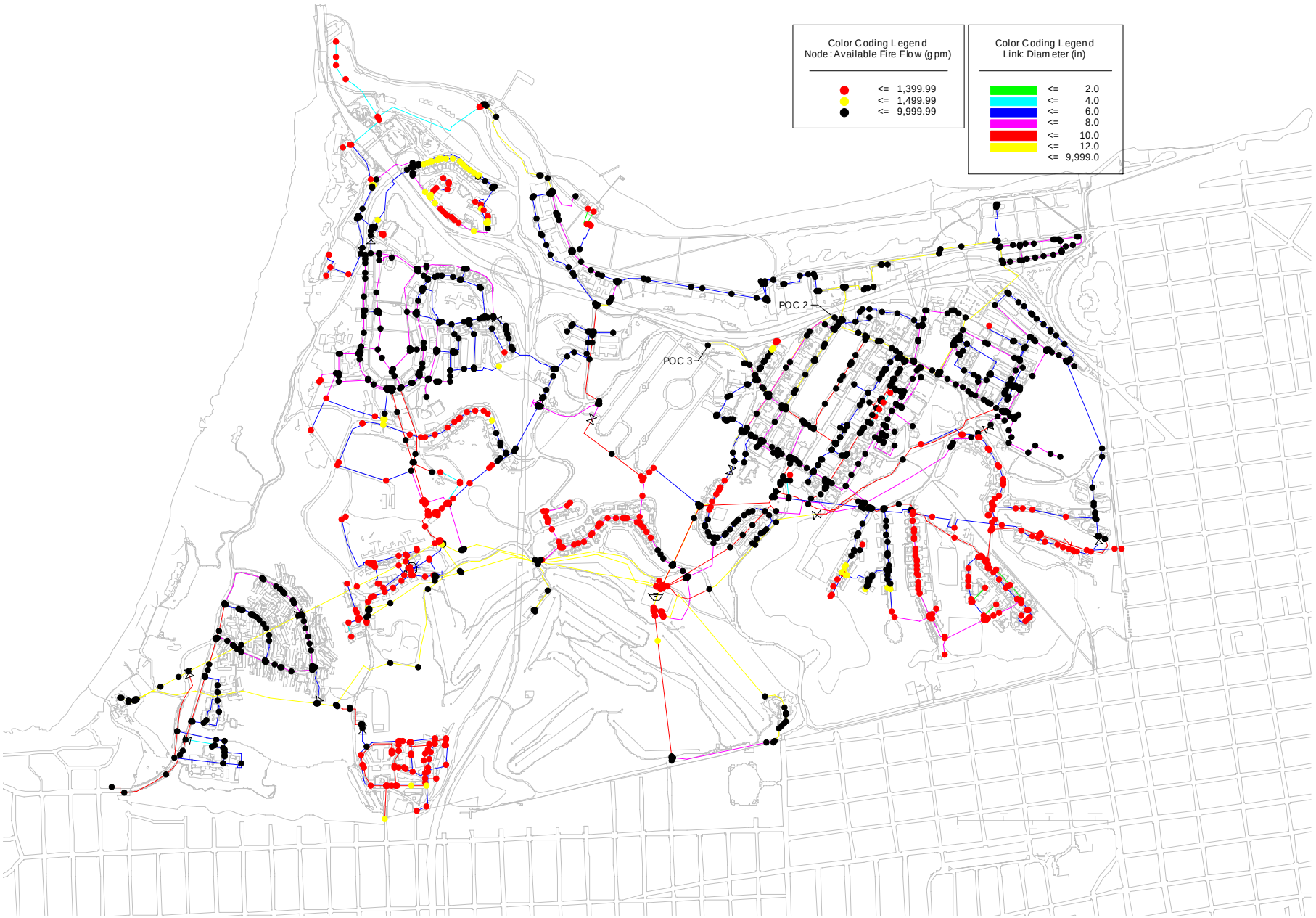

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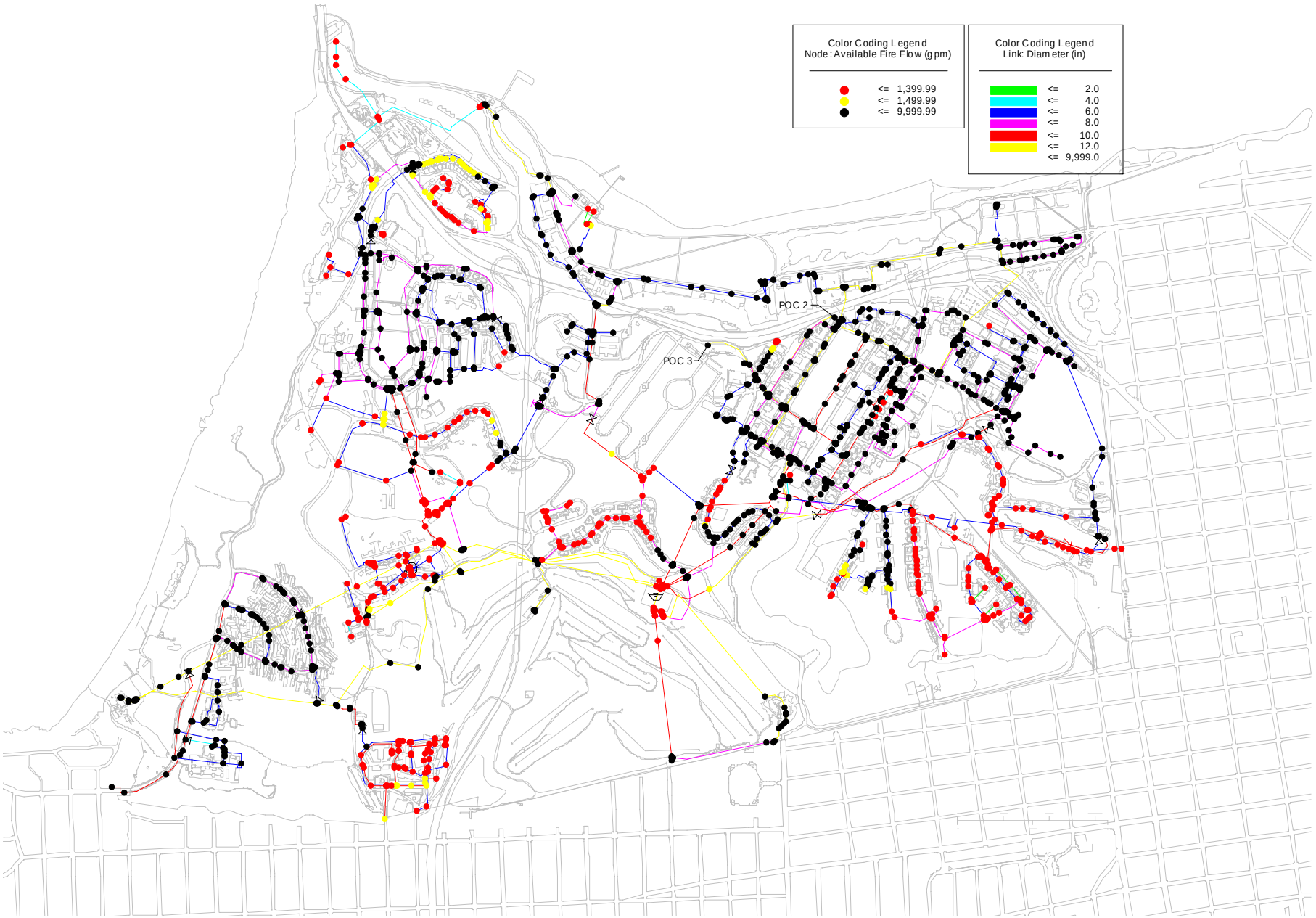
FIGURE 27

Scenario: POC2 @ 3500 - AD (Line U/S of PRV to POCs)



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