

Appendix 3.16-4
Hydraulic Modeling Study



**CITY OF SAN BRUNO
CITY OF SOUTH SAN FRANCISCO**

TECHNICAL MEMORANDUM

Hydraulic Modeling Study

TANFORAN DEVELOPMENT

FINAL DRAFT

May 2025

A K E L
ENGINEERING GROUP, INC.

May 6, 2025

**FINAL
DRAFT**

City of San Bruno Department of Public Works
Engineering Division
567 El Camino Real,
San Bruno, CA 94066

Attention: Mr. Stephen Tovmassian, P.E., Public Works Project Manager

**Subject: Tanforan Development Hydraulic Modeling Study
Final Draft Technical Memorandum**

Dear Stephen,

We are pleased to submit this Technical Memorandum (TM) summarizing the sewer modeling study for the redevelopment of the Tanforan Shopping Center located in the City of San Bruno. This TM is organized as follows:

1. Purpose and Scope
2. Study Area
3. Sewer Flow Projections
4. Capacity Evaluation
5. Conclusion

We are extending our thanks to you; Harry Yip, Senior Civil Engineer; Frank Navarro, Principal Engineer; Heidi Mekkelson, Senior Managing Director; City of San Bruno staff, and City of South San Francisco staff whose courtesy and cooperation were valuable components in completing this study.

Sincerely,

AKEL ENGINEERING GROUP, INC.

Tony Akel, P.E., D. WRE.
President
Enclosure: Final Draft Technical Memorandum

City of San Bruno
City of South San Francisco
Tanforan Development Hydraulic Modeling Study

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City of San Bruno
City of South San Francisco
Tanforan Development Hydraulic Modeling Study

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City of San Bruno
City of South San Francisco
Tanforan Development Hydraulic Modeling Study

LIST OF ABBREVIATIONS

2014 SMP	2014 City of San Bruno Sewer Master Plan
2022 SSMP	2022 City of South San Francisco Sewer System Master Plan
ADWF	Average Dry Weather Flow
d/D	Depth of Flow to Pipe Diameter Ratio
ft	Feet
ft / s	Feet per Second
gpd	Gallons per Day
gpm	Gallons per Minute
HGL	Hydraulic Grade Line
I&I	Infiltration and Inflows
mgd	Million Gallons per Day
PDWF	Peak Dry Weather Flow
PS-11	Shaw Road Pump Station (Pump Station Number 11)
PWWF	Peak Wet Weather Flow
R&D	Research and Development
sq. ft.	Square Feet
WQCP	City of South San Francisco and City of San Bruno Water Quality Control Plant

FLOW RATE CONVERSIONS

To Convert From:	To:	Multiply By:
mgd	gpd	1,000,000
mgd	gpm	694.4
mgd	cfs	1.547

Technical Memorandum

1.0 PURPOSE AND SCOPE

The City of San Bruno provides sewer collection and treatment services to approximately 41,500 residents within its service area. The raw sewage is collected via 87 miles of pipelines and ultimately conveyed to the City of South San Francisco's Shaw Road Pump Station, known as Pump Station Number 11 (PS-11). Subsequently, the flows are pumped into the City of South San Francisco and the City of San Bruno Water Quality Control Plant (WQCP) for treatment and disposal.

The City of San Bruno is currently reviewing a redevelopment application that proposes to convert the existing 44-acre Tanforan Shopping Center into a Mixed-Use Village. The purpose of this study is to estimate sewer flows from the redevelopment area and document the capacity impact on the City of South San Francisco's downstream sewer system. The scope of work for this study included the following tasks:

- Describe the study area and proposed land uses.
- Estimate sewer flows for the redevelopment area.
- Update sewer flow allocations in the City of South San Francisco's existing hydraulic model and perform a capacity evaluation for existing and buildout conditions.
- Identify potential capacity deficiencies and recommend improvements to maintain the target level of service.

2.0 STUDY AREA

The Tanforan Shopping Center is currently situated on a 44-acre lot that includes more than 1,000,000 million square feet (sq. ft.) of retail space surrounded by parking stalls. The shopping center is bound by Sneath Lane to the north, Huntington Avenue to east, Interstate 380 to the south and El Camino Real to the west, as shown on [Figure 1](#).

Sewer flows from the shopping center are currently conveyed northwest via several connection points that discharge into the 24-inch gravity pipe at Tanforan Avenue ([Point A](#)). The flows are then conveyed west into PS-11 ([Point B](#)) via 24-inch to 27-inch gravity pipes. Sewage is ultimately pumped into the WQCP via 28-inch and 42-inch force mains that run under Highway 101.

A plan view illustrating the existing sewer flow route is shown on [Figure 2](#) with the critical flow path highlighted in yellow. Additional flows from the City of South San Francisco also contribute flows into PS-11 at the intersection of Shaw Road and San Mateo Avenue.

According to the conceptual plans provided in [Appendix A](#), the developer plans to build a vibrant Mixed-Use Village with a life science campus, residential units, and retail space. Two development scenarios currently under consideration are as follows:

- **Scenario A. Research and Development (R&D).** This alternative is centered around employment areas and assumes approximately 56% of the site will consist of R&D office space, surrounded by *1,014 residential dwelling units*. The remaining areas will consist of retail space.
- **Scenario B. Residential.** This alternative focuses on residential growth and assumes approximately 46% of the site will consist of multi-family apartments with *1,514 residential dwelling units*. The remaining areas will consist of R&D office space, retail space and a hotel with 170 rooms.

The developer also provided a utility plan that illustrates sewer connection points and relocated pipes within the study area. This plan is shown in [Appendix A](#) for reference purposes.

3.0 SEWER FLOW PROJECTIONS

Sewer flow projections for both Scenario A and Scenario B are shown on [Table 1](#) and [Table 2](#), respectively.

These flows were calculated through discussions with the City of San Bruno and indicate that Scenario B generates more sewage. As such, the following Scenario B flows were used for subsequent analysis:

Scenario B Flow Projections:

- Average Dry Weather Flow = **0.46 mgd**
- Peak Dry Weather Flow = **0.72 mgd**
- Peak Wet Weather Flow = **1.37 mgd**

- **Average Dry Weather Flow.** Scenario B projections indicate an average dry weather flow (ADWF) of approximately 0.46 million gallons per day (mgd) based on the planning unit factors shown on [Table 1](#). These unit factors are consistent with the City of San Bruno's ongoing Sewer System Master Plan Update.
- **Peak Dry Weather Flow.** The ADWF is typically multiplied by a peaking factor to account for diurnal peaks that occur over a 24-hour period. This peak is known as the peak dry weather flow (PDWF) and was estimated at approximately 0.72 mgd based on the City of San Bruno's current peaking factor of 1.57.
- **Peak Wet Weather Flow.** In addition to PDWF, unintended flows can enter the sewer system during rainfall events and increase the risk of overflows. This sudden peak is defined as the peak wet weather flow (PWWF), and calculated from Infiltration and Inflows (I&I) that occur during a 10-year 24-hour design rainfall event. According to the City of San Bruno's 2014 Sewer Master Plan (2014 SMP), wet weather peaking factors

range from 3 to over 15 in various parts of system. The PWWF for this study was estimated at 1.37 mgd based on the 2014 SMP peaking factor of 3.0 for Basin 12.

4.0 CAPACITY EVALUATION

A comprehensive capacity evaluation was completed using the City of South San Francisco's existing hydraulic model. Redevelopment conditions were simulated using inflow time series data obtained from the City of San Bruno's hydraulic model. A field survey of existing pipelines along Tanforan Avenue was also completed in January 2025 and incorporated into the hydraulic model.

This section summarizes the City of South San Francisco's design criteria and documents evaluation results for existing and buildout conditions.

4.1 PERFORMANCE AND DESIGN CRITERIA

The performance and design criteria listed on [Table 3](#) was established from the City of South San Francisco's 2022 Sewer System Master Plan (2022 SSMP). A summary of the criteria is as follows:

- **Gravity Pipe Depth of Flow.** Maximum allowable depth of flow to pipe diameter ratio (d/D) during PDWF should not exceed 0.92 for existing gravity pipes and 0.75 for proposed gravity pipes. An illustration of the PDWF criteria is shown in [Exhibit A](#).

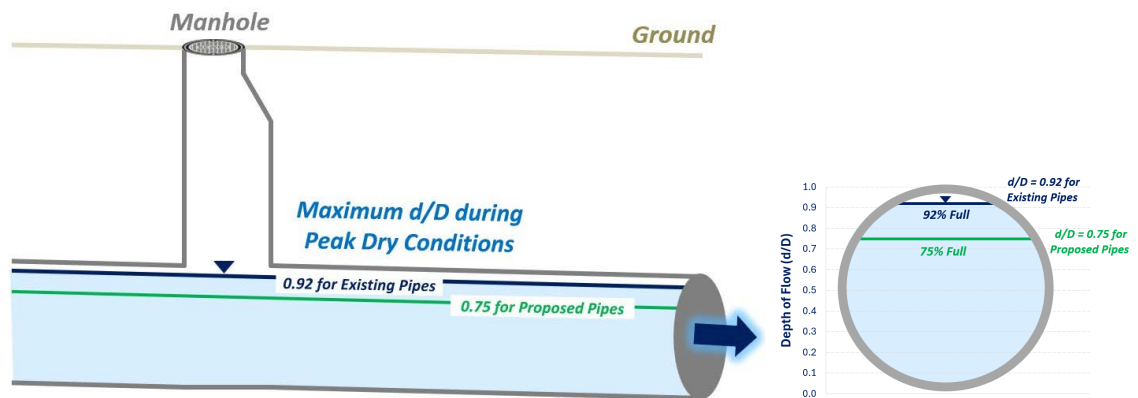


Exhibit A. Peak Dry Weather Flow Evaluation Criteria

- **Manhole Freeboard Depth.** Hydraulic Grade Line (HGL) in manholes should be at least 1 foot (ft) below the ground elevation during PWWF. This criterion is typically implemented to avoid premature trunk line replacements and minimize the risk of overflows. An illustration of the PWWF criteria is shown in [Exhibit B](#).

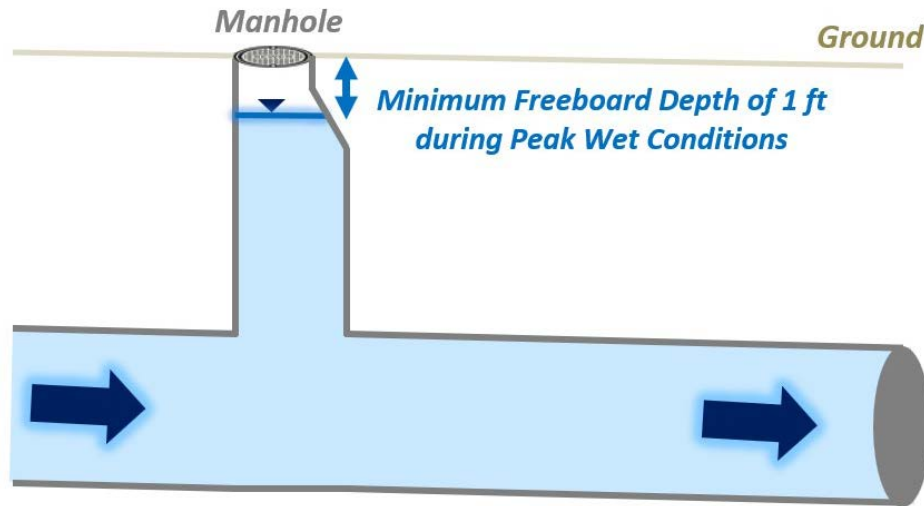


Exhibit B. Peak Wet Weather Flow Evaluation Criteria

- **Lift Station Capacity.** Lift stations should be designed to convey the PWWF with the largest pump out-of-service. This is commonly known as the firm capacity of a lift station. The standby pump provides redundancy in case the duty pump fails or requires maintenance.
- **Force Main Velocities.** Maximum and minimum force main velocities should be between 2 to 10 feet per second (ft/s) during hydraulic model simulations.

4.2 CAPACITY EVALUATION RESULTS

The capacity evaluation results for existing and buildout conditions are presented in the subsequent sections. The pipeline invert elevations and ground elevations shown in the HGL profiles reflect measurements from the January 2025 field survey.

4.2.1 Existing Conditions

The capacity results for existing dry and wet weather scenarios are as follows:

- **Scenario 1. Existing Peak Dry Weather Flow.** The HGL profile from Tanforan Avenue to PS-11 is shown on [Figure 3](#) and indicates that the existing system is adequately sized to meet the design criteria. The results indicate that the most critical pipe is 27-inches in diameter and located immediately west of PS-11. This critical pipeline exhibits a d/D ratio of 0.44 (44% full) and conveys a PDWF of approximately 5.9 mgd into PS-11.
- **Scenario 2. Existing + Redevelopment Peak Dry Weather Flow.** This scenario was simulated by adding the redevelopment flows estimated on [Table 1](#) and subtracting existing Tanforan Shopping Center flows calculated in [Appendix B](#). The HGL profile shown on [Figure 4](#) illustrates that the downstream sewer system is adequately sized to meet the design criteria. When compared to [Scenario 1](#), the d/D in the most critical 27-

inch pipe increases from 0.44 to 0.45. The PDWF discharging into PS-11 also increases from approximately 5.9 mgd to 6.1 mgd.

- **Scenario 3. Existing Peak Wet Weather Flow.** The capacity evaluation results for this scenario are illustrated on [Figure 5](#) and meet the design criteria. The hydraulic model predicts a freeboard depth of 3.0 ft at a critical manhole near the intersection of Tanforan Avenue and Montgomery Avenue. The wet weather flows discharging into PS-11 are summarized on [Table 4](#), along with the station's firm and total pumping capacity. The lift station evaluation indicates an existing deficiency of 16.6 mgd, which can be attributed to the high volume of I&I observed in the collection system. The force main capacity evaluation results are listed on [Table 5](#) and satisfy the maximum velocity criteria of 10 ft/s.
- **Scenario 4. Existing + Redevelopment Peak Wet Weather Flow.** This scenario includes Tanforan redevelopment flows and a pumping capacity constraint at PS-11, to avoid exacerbating the existing deficiency of 16.6 mgd from [Scenario 3](#) ([Table 4](#)). The pump station outflow was constrained to mimic [Scenario 3](#) and sewage was allowed to temporarily backwater / surcharge within the upstream collection system. The corresponding HGL profile is shown on [Figure 6](#) and satisfies the City's 1 ft freeboard requirement. When compared to [Scenario 3](#), the freeboard depth at Tanforan Avenue and Montgomery Avenue decreases from 3.0 ft to 2.2 ft due to the backwater effect caused by the capacity constraint. However, the hydraulic model results illustrate that the additional flows are attenuated in the upstream pipelines.

4.2.2 Buildout Conditions

Buildout conditions were developed from land uses in the City of South San Francisco's 2040 General Plan and include capital improvement projects recommended in the 2022 SSMP. It should be noted that the City of South San Francisco is actively implementing a Capital Improvement Program to mitigate existing capacity deficiencies, rehabilitate aging infrastructure and reduce I&I in the collection system. The buildout simulations include a 20-percent reduction in I&I to account for planned and ongoing capital improvements.

The buildout flows from the City of San Bruno were also incorporated into the hydraulic model as an inflow timeseries at three connection points. These flows account for ultimate growth, which includes the Tanforan Redevelopment project, Southline development and other growth areas. The capacity results for buildout dry weather and wet weather scenarios are as follows:

- **Scenario 5. Buildout Peak Dry Weather Flow.** The HGL profile from Tanforan Avenue to PS-11 is shown on [Figure 7](#) and indicates that the existing system is adequately sized to accommodate buildout PDWF of 8.7 mgd. When compared to [Scenario 1](#), the d/D ratio in the most critical 27-inch pipe increases from 0.44 to 0.55. This increase can be attributed to growth in both the City of San Bruno and the City of South San Francisco.

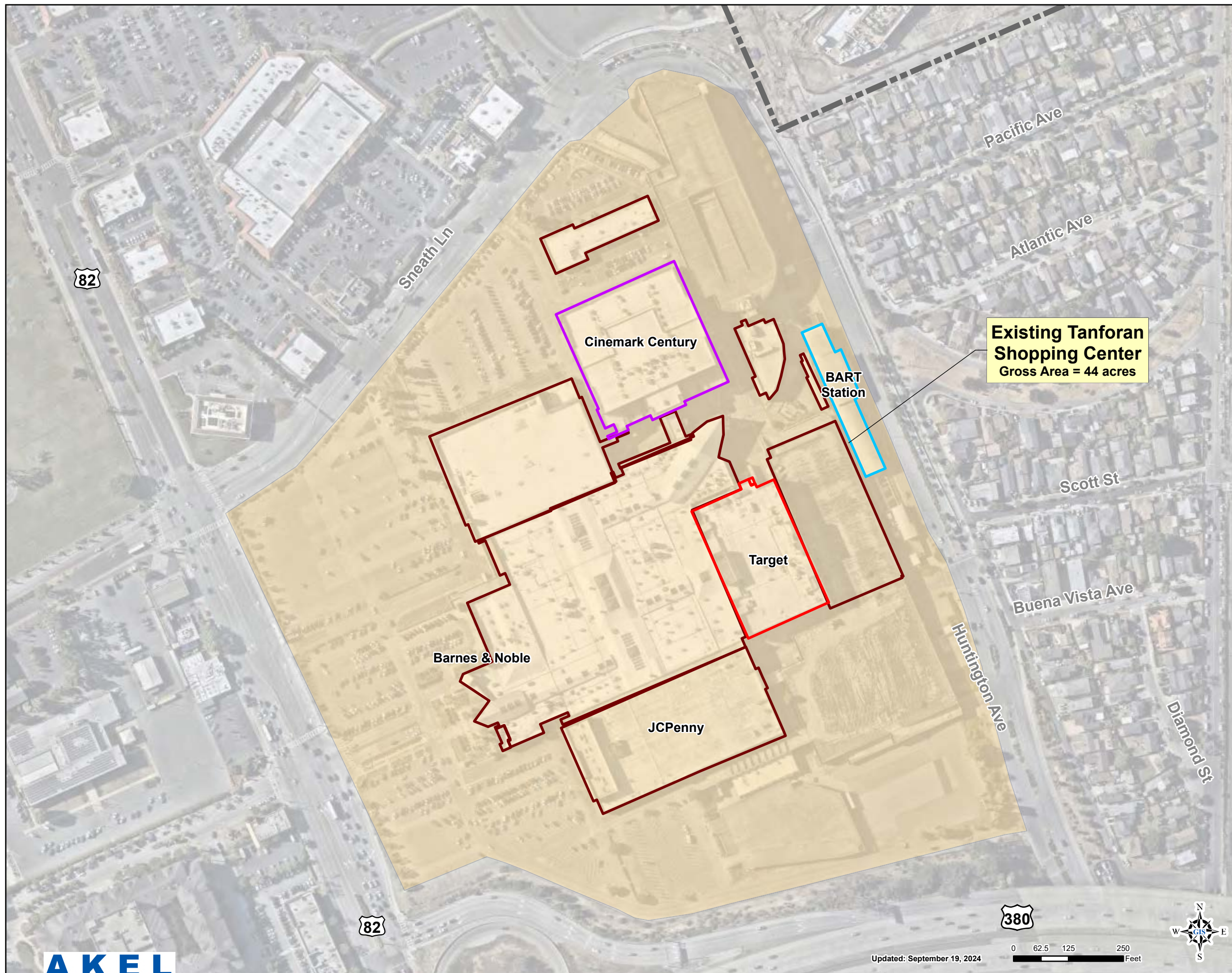
- **Scenario 6. Buildout Peak Wet Weather Flow.** The evaluation results for this scenario are shown on **Figure 8** and meet the City’s design criteria. Similar to **Scenario 4**, the pumping capacity at the Shaw Road Pump Station is constrained to avoid exacerbating an existing deficiency of 16.6 mgd (**Table 4**). This modeled constraint causes temporary backwater / surcharge in the upstream pipelines, leading to a higher HGL at the critical manhole near Tanforan Avenue and Montgomery Avenue. When compared to **Scenario 3**, the freeboard depth at the critical manhole decreases from 3.0 ft to 1.6 ft. Overall, the buildout flows are attenuated in the upstream pipelines.

5.0 CONCLUSION

A hydraulic modeling study was completed to estimate sewer flows from the Tanforan Redevelopment project and evaluate capacity of the downstream sewer system.

The hydraulic analysis indicated that the existing pipelines are adequately sized to accommodate redevelopment flows and the project does not exacerbate an existing capacity deficiency at the Shaw Road Pump Station.

FIGURES



Legend

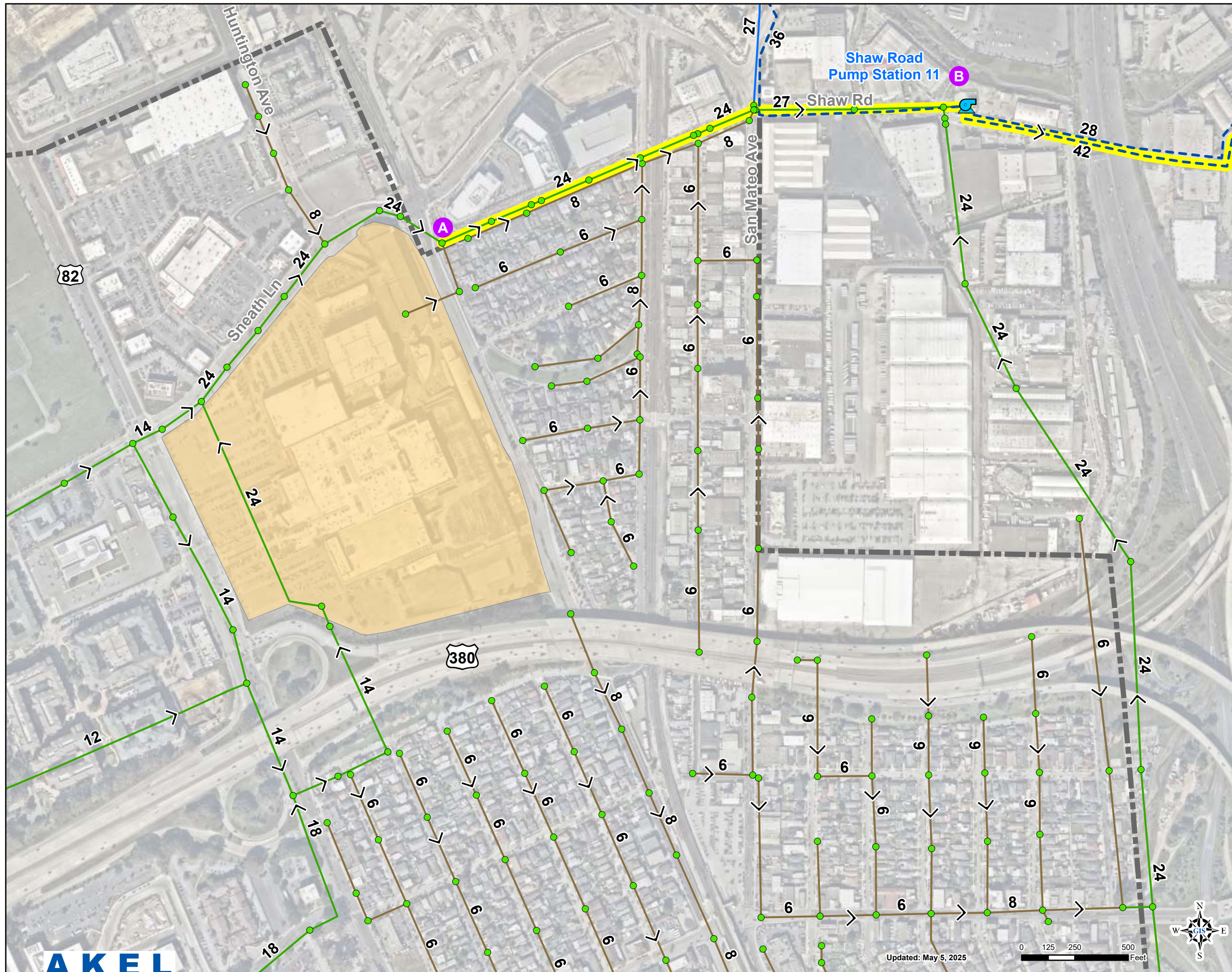
Building Footprints

- Target
- BART Station
- Cinemark Century
- Other Retail
- Tanforan Redevelopment Site
- San Bruno City Limits

Existing Tanforan Shopping Center
Gross Area = 44 acres

Figure 1
Study Area
Tanforan Development
Hydraulic Modeling Study





Legend

Existing City of South San Francisco Sewer System

-  Lift Station
-  Gravity Pipes
-  Force Mains
-  Sewer Flow Route

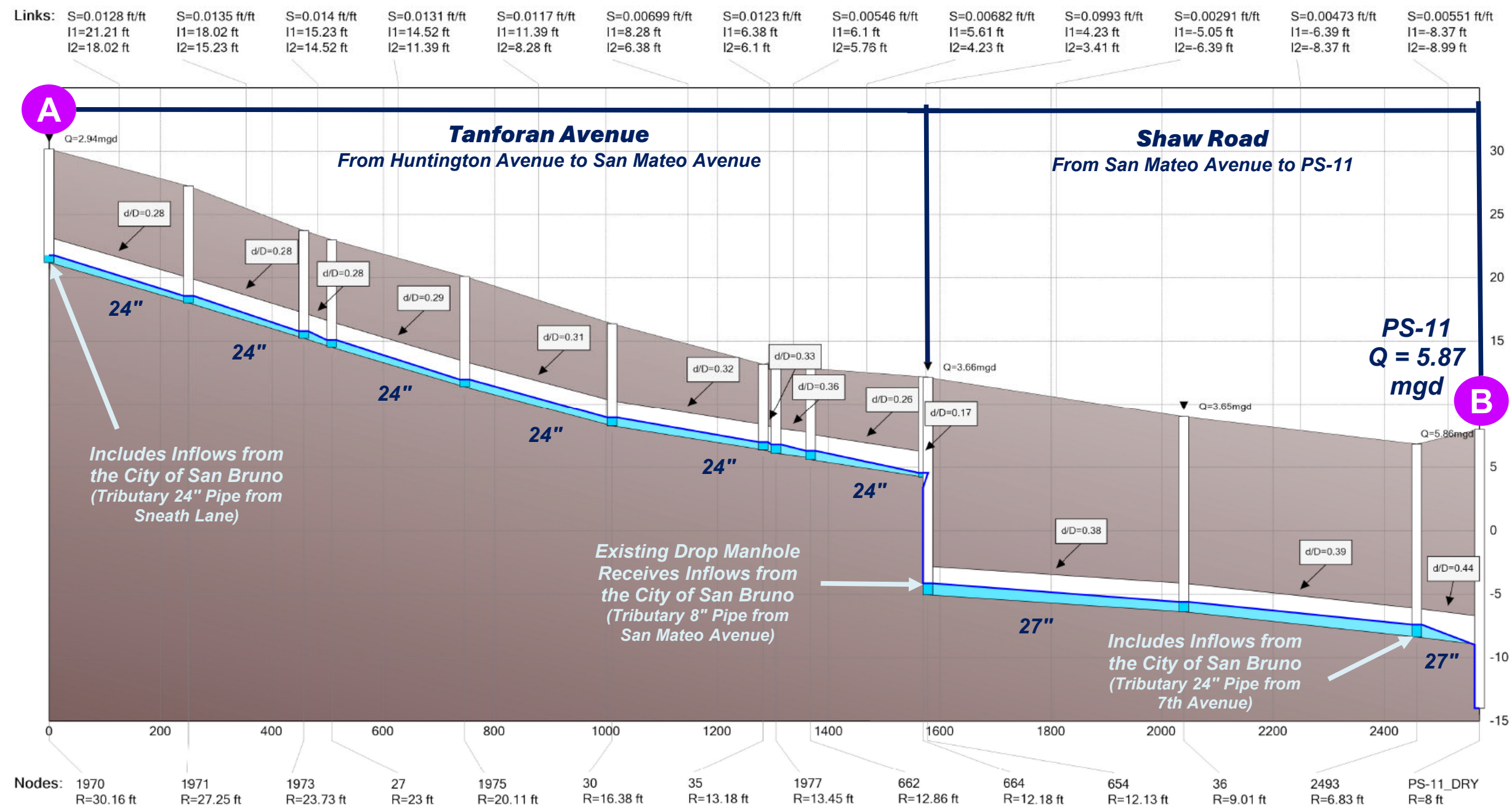
Existing City of San Bruno Sewer System

-  Manholes
- Gravity Pipes
 -  8" or Smaller
 -  10" or Larger
-  Tanforan Redevelopment Site
-  San Bruno City Limits

PRELIMINARY

Figure 2
Sewer Flow Route
 Tanforan Development
 Hydraulic Modeling Study





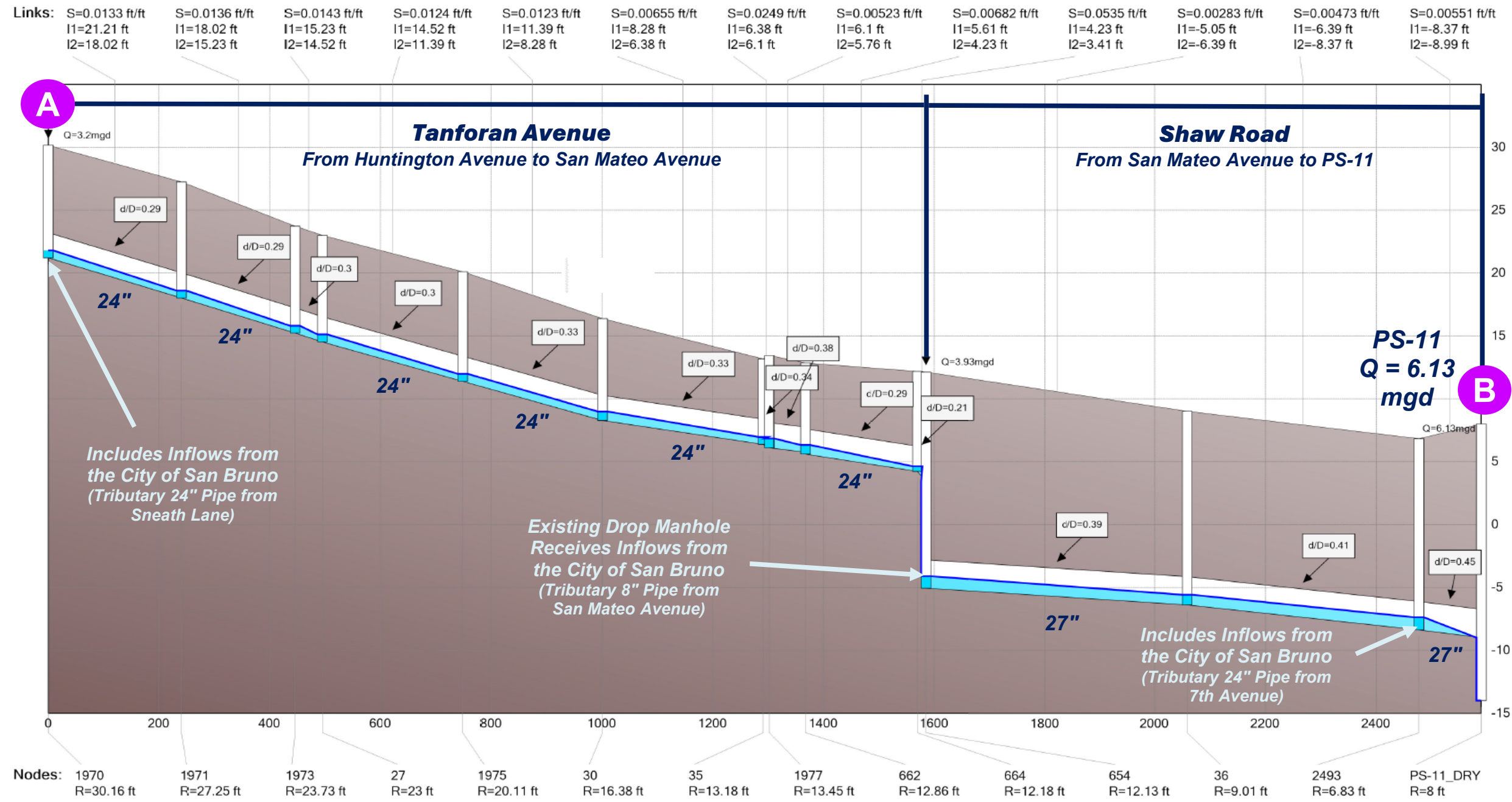
Notes:

1. The hydraulic grade line (HGL) profile shown in the figure represents the existing peak dry weather flow scenario.
2. Q represents maximum peak flow in million gallons per day (mgd) and d/D represents the depth of flow to pipe diameter ratio (d/D).
3. S represents pipe slope, I1 represents inlet pipe invert, I2 represents outlet pipe invert and R represents manhole rim elevation.
4. The capacity evaluation results indicate that the existing system is adequately sized to meet the City's design criteria (d/D < 0.92).
5. The most critical 27" pipe exhibits a d/D ratio of 0.44 (44% full), and is located immediately north of PS-11.
6. Inflow time series obtained from the City of San Bruno's hydraulic model were added to three locations shown on the profile.

Figure 3
Scenario 1. Existing PDWF
HGL Profile

Tanforan Development
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City of San Bruno
City of South San Francisco





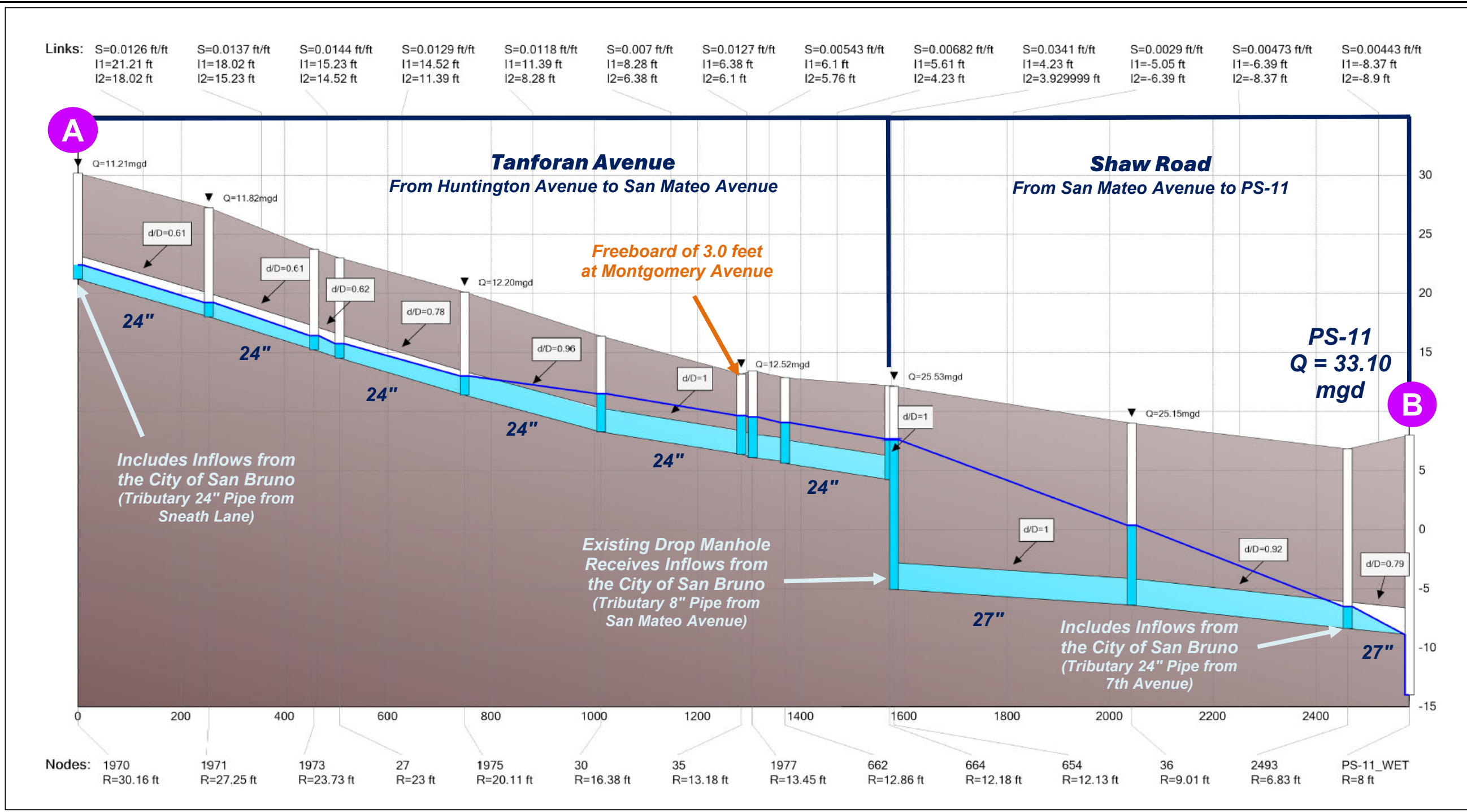
Notes:

1. The hydraulic grade line (HGL) profile shown in the figure represents the existing peak dry weather flow scenario with Tanforan Redevelopment flows.
2. Q represents maximum peak flow in million gallons per day (mgd) and d/D represents the depth of flow to pipe diameter ratio (d/D).
3. S represents pipe slope, I1 represents inlet pipe invert, I2 represents outlet pipe invert and R represents manhole rim elevation.
4. The capacity evaluation results indicate that the existing system is adequately sized to meet the City's design criteria ($d/D < 0.92$).
5. The most critical 27" pipe exhibits a d/D ratio of 0.45 (45% full), and is located immediately north of PS-11.
6. Inflow time series obtained from the City of San Bruno's hydraulic model were added to three locations shown on the profile.

Figure 4
Scenario 2. Existing +
Redevelopment PDWF
HGL Profile

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City of San Bruno
City of South San Francisco





Notes:

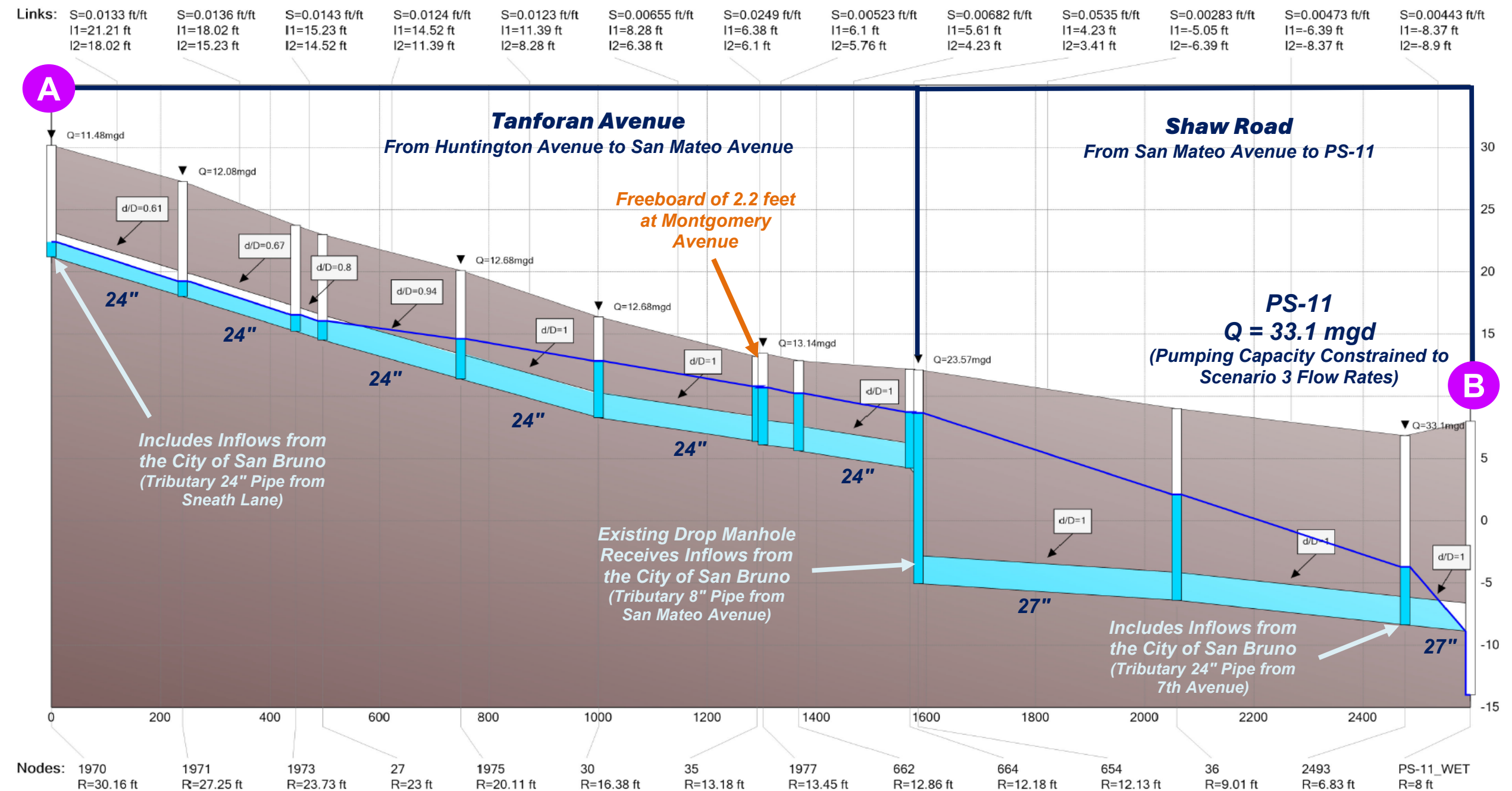
1. The hydraulic grade line (HGL) profile shown in the figure represents the existing peak wet weather flow scenario.
2. Q represents maximum peak flow in million gallons per day (mgd) and d/D represents the depth of flow to pipe diameter ratio (d/D).
3. S represents pipe slope, I1 represents inlet pipe invert, I2 represents outlet pipe invert and R represents manhole rim elevation.
4. The capacity evaluation results indicate a manhole freeboard depth of 3.0 ft at Montgomery Avenue.
5. Inflow time series obtained from the City of San Bruno's hydraulic model were added to three locations shown on the profile.

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Figure 5
Scenario 3. Existing PWWF
HGL Profile

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City of South San Francisco





Notes:

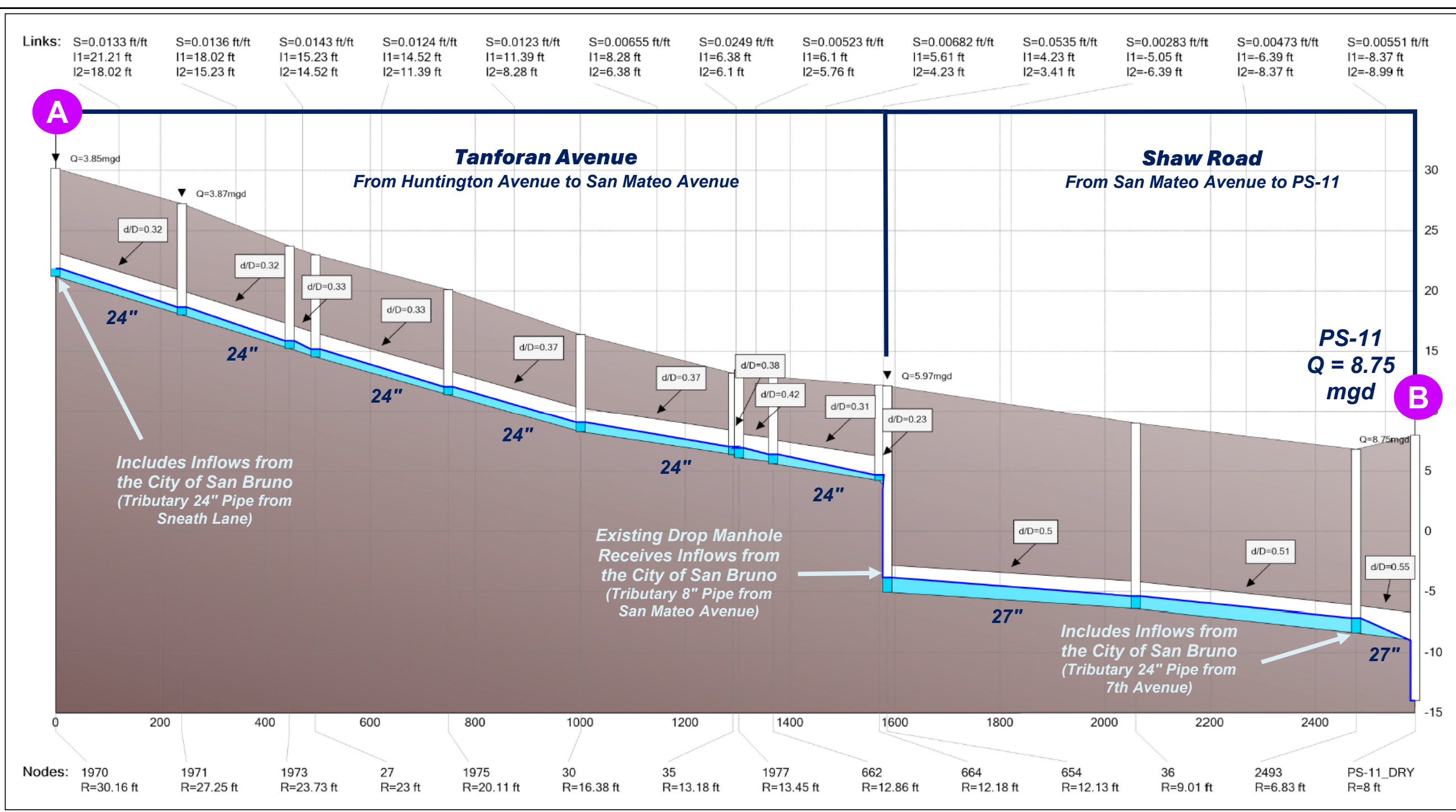
1. The hydraulic grade line (HGL) profile shown in the figure represents the existing peak wet weather flow scenario with Tanforan Redevelopment flows.
2. Q represents maximum peak flow in million gallons per day (mgd) and d/D represents the depth of flow to pipe diameter ratio (d/D).
3. S represents pipe slope, I1 represents inlet pipe invert, I2 represents outlet pipe invert and R represents manhole rim elevation.
4. The capacity evaluation results indicate a manhole freeboard depth of 2.2 ft at Montgomery Avenue.
5. Inflow time series obtained from the City of San Bruno's hydraulic model were added to three locations shown on the profile.

PRELIMINARY

Figure 6 Scenario 4. Existing + Redevelopment PWWF HGL Profile

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Notes:

1. The hydraulic grade line (HGL) profile shown in the figure represents the buildout peak dry weather flow scenario.
2. Q represents maximum peak flow in million gallons per day (mgd) and d/D represents the depth of flow to pipe diameter ratio (d/D).
3. S represents pipe slope, I1 represents inlet pipe invert, I2 represents outlet pipe invert and R represents manhole rim elevation.
4. The capacity evaluation results indicate that the existing system is adequately sized to meet the City's design criteria ($d/D < 0.92$).
5. The most critical 27" pipe exhibits a d/D ratio of 0.55 (55% full), and is located north of PS-11.
6. Inflow time series obtained from the City of San Bruno's hydraulic model were added to three locations shown on the profile.

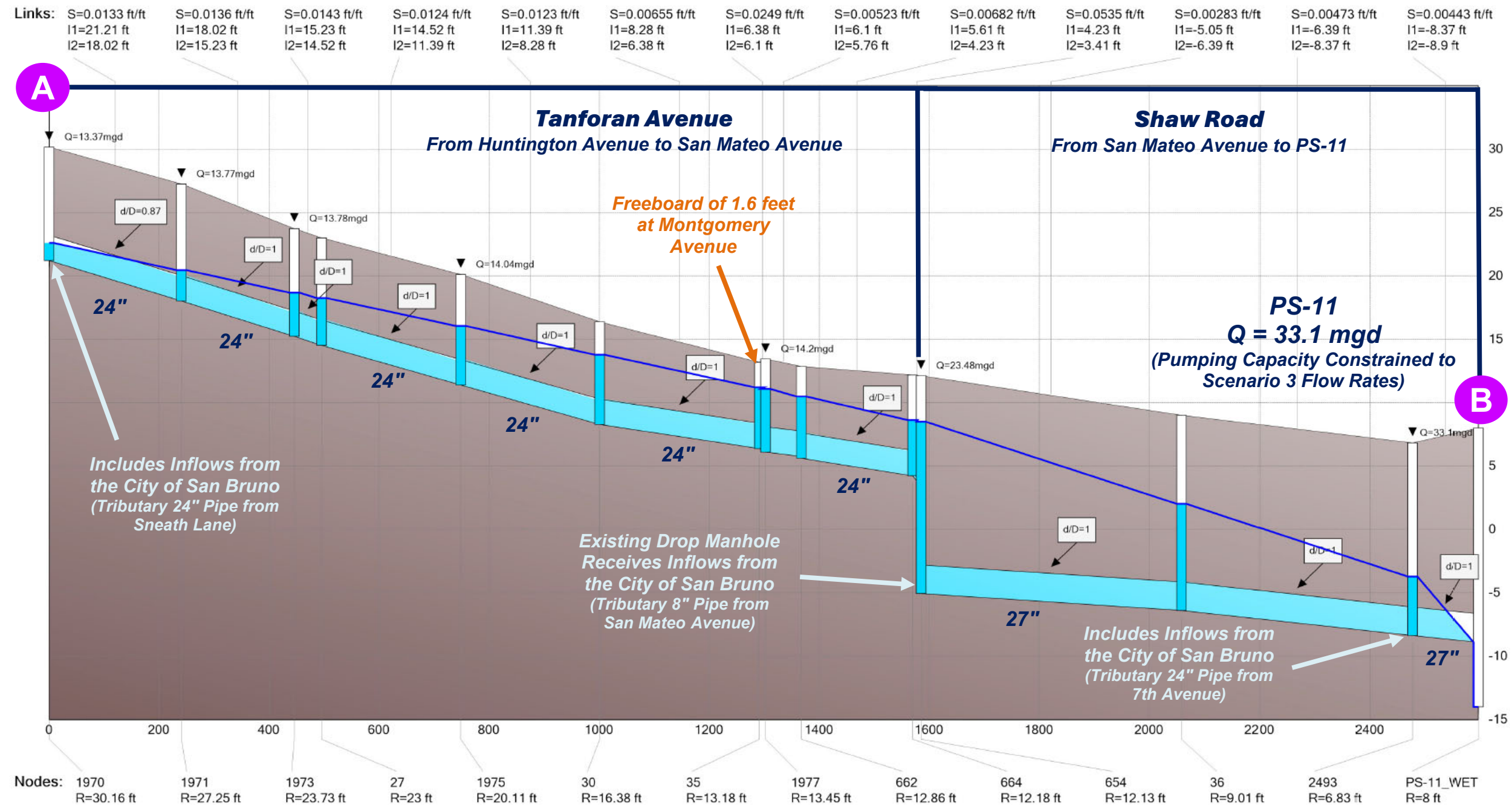
PRELIMINARY

Figure 7

Scenario 5. Buildout PDWF HGL Profile

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City of San Bruno
City of South San Francisco





Notes:

1. The hydraulic grade line (HGL) profile shown in the figure represents the buildout peak wet weather flow scenario.
2. Q represents maximum peak flow in million gallons per day (mgd) and d/D represents the depth of flow to pipe diameter ratio (d/D).
3. S represents pipe slope, I1 represents inlet pipe invert, I2 represents outlet pipe invert and R represents manhole rim elevation.
4. The capacity evaluation results indicate a manhole freeboard depth of 1.6 ft at Montgomery Avenue.
5. Inflow time series obtained from the City of San Bruno's hydraulic model were added to three locations shown on the profile.

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Figure 8

Scenario 6. Buildout PWWF HGL Profile

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City of San Bruno
City of South San Francisco



TABLES

Table 1 Sewer Flow Projections for Scenario A

Tanforan Development Hydraulic Modeling Study

City of San Bruno

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Tanforan Mixed-Use Village Scenario A Land Use Received from Developer 02/04/2025			Average Dry Weather Flow Based on Total Buildout Square Footage		Peak Dry Weather Flow Based on City of San Bruno Peaking Factor of 1.57		Peak Wet Weather Flow Based on City of San Bruno Peaking Factor of 3.0	
Land Uses	Total Buildout (Sq. Ft.)	% of Total Buildout (%)	Unit Flow Factor ¹	ADWF (mgd)	Peaking Factor relative to ADWF	PDWF (mgd)	Peaking Factor relative to ADWF	PWWF (mgd)
1	2	3	4	5	6	7	8	9
Retail	377,321	12%	190 gpd / 1,000 sq. ft.	0.072	1.57	0.113	3.00	0.215
Residential	1,050,000 (1,014 Dwelling Units)	33%	120 gpd / Dwelling Unit	0.122	1.57	0.191	3.00	0.365
Life Science Lab and Office	1,792,580	56%	130 gpd / 1,000 sq. ft.	0.233	1.57	0.366	3.00	0.699
Total	3,219,901	100%		0.426		0.669		1.279

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Note:

1. Unit flow factors were obtained from the City of San Bruno's 2014 Sewer Master Plan.

Table 2 Sewer Flow Projections for Scenario B

Tanforan Development Hydraulic Modeling Study

City of San Bruno

City of South San Francisco

Tanforan Mixed-Use Village Scenario B Land Use Received from Developer 02/04/2025			Average Dry Weather Flow Based on Total Buildout Square Footage		Peak Dry Weather Flow Based on City of San Bruno Peaking Factor of 1.57		Peak Wet Weather Flow Based on City of San Bruno Peaking Factor of 3.0	
Land Uses	Total Buildout (Sq. Ft.)	% of Total Buildout (%)	Unit Flow Factor ¹	ADWF (mgd)	Peaking Factor relative to ADWF	PDWF (mgd)	Peaking Factor relative to ADWF	PWWF (mgd)
1	2	3	4	5	6	7	8	9
Retail	477,321	14%	190 gpd / 1,000 sq. ft.	0.091	1.57	0.142	3.00	0.272
Residential	1,550,000 (1,514 Dwelling Units)	46%	120 gpd / Dwelling Unit	0.182	1.57	0.285	3.00	0.545
Life Science Lab and Office	1,229,000	36%	130 gpd / 1,000 sq. ft.	0.160	1.57	0.251	3.00	0.479
Hotel	125,000 (170 Rooms)	4%	150 gpd / room	0.026	1.57	0.040	3.00	0.077
Total	3,381,321	100%		0.458		0.718		1.373

Note:

1. Unit flow factors were obtained from the City of San Bruno's 2014 Sewer Master Plan.

Table 3 System Performance and Design Criteria

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Gravity Pipe Criteria ¹	
Peak Dry Weather Flow	
Existing Pipes:	Maximum Flow Depth to Diameter (d/D) $\leq$ 0.92
New Pipes:	Maximum Flow Depth to Diameter (d/D) $\leq$ 0.75
Peak Wet Weather Flow	
Hydraulic Grade Line must be at least 1 foot below manhole ground elevation (Minimum Freeboard of 1 foot)	
Lift Station and Force Main Criteria ¹	
Lift Station Capacity:	Peak Wet Weather Flow with Largest Pump Out of Service (Firm Capacity)
Force Main Velocity:	2 to 10 Feet per Second
Hazen Williams C-Factor:	110

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Notes:

1. Criteria obtained from the City of South San Francisco's 2022 Sewer System Master Plan.

Table 4 Pump Station Capacity Evaluation

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PS-11 Information ¹				Existing Peak Wet Weather Flows ²		Buildout Peak Wet Weather Flows ^{2,3,4}	
Tributary Area	No. of Pumps and Individual Capacity	Total Capacity (mgd)	Firm Capacity (mgd)	Without Redevelopment (Scenario 3)		With Redevelopment (Scenario 4)	
				Inflows (mgd)	Surplus/ Deficiency (mgd)	Inflows (mgd)	Surplus/ Deficiency (mgd)
Wet Weather Flows from PS-9 (36-inch Force Main) 3 Pumps @ 4.2 mgd each (Dry) 3 Pumps @ 8.3 mgd each (Wet)		37.6	29.2	12.7	Deficiency of 16.6 mgd	12.7	Deficiency of 16.6 mgd (Scenario 3 Deficiency is not Exacerbated)
Wet Weather Flows from Shaw Road (27-inch Gravity Main)				33.1		33.1 (Constrained to Scenario 3 Flow Rate)	
Total				45.8		45.8	44.0

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Notes:

1. Pump station information was obtained from the City of South San Francisco's 2022 City-Wide Sewer System Master Plan (2022 SSMP).
2. Flows from the City of San Bruno were included in the hydraulic model as inflow timeseries. This data was obtained from the City of San Bruno's hydraulic model and accounts for pipe upsizing to alleviate upstream capacity deficiencies.
3. Buildout peak weather flows include a 20-percent infiltration and inflow (I&I) reduction to account for the City of South San Francisco's planned capital improvements.
4. Buildout peak weather flow scenarios include Capital Improvement Projects recommended in the City of South San Francisco's 2022 SSMP. These projects were included in the hydraulic model to alleviate overflows within the upstream tributary areas.

Table 5 Force Main Capacity Evaluation

Tanforan Development Hydraulic Modeling Study

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Force Main Information ¹			Existing Peak Wet Weather Velocities ²		Buildout Peak Wet Weather Velocities ^{2,3,4}
Pump Station Name	Force Main Size and Material	Discharge Outlet	Without Redevelopment (Scenario 3) (ft/s)	With Redevelopment (Scenario 4) (ft/s)	With Redevelopment (Scenario 6) (ft/s)
PS-11 Shaw Road	28" HDPE ⁵	Water Quality Control Plant	5.0	5.0	6.2
	42" HDPE ⁵	Water Quality Control Plant Bar Screen No. 4	5.4	5.4	4.6

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5/3/2025

Notes:

- Force main information was obtained from the City of South San Francisco's 2022 City-Wide Sewer System Master Plan (2022 SSMP).
- Flows from the City of San Bruno were included in the hydraulic model as inflow timeseries. This data was obtained from the City of San Bruno's hydraulic model and accounts for pipe upsizing to alleviate upstream capacity deficiencies.
- Buildout peak weather flows include a 20-percent infiltration and inflow (I&I) reduction to account for the City of South San Francisco's planned capital improvements.
- Buildout peak weather flow scenarios include Capital Improvement Projects recommended in the City of South San Francisco's 2022 SSMP. These projects were included in the hydraulic model to alleviate overflows within the upstream tributary areas.
- HDPE refers to high-density polyethylene pipe.

APPENDICES

APPENDIX A

Conceptual Redevelopment Plans

TANFORAN MASTER PLAN | MAX LAB A

OFFICE / R&D	FAR	AREA (GSF)*
BLDG 1	0.13	247,000
BLDG 2	0.11	211,000
BLDG 3	0.14	266,000
BLDG 4	0.10	193,600
BLDG 5	0.09	164,560
BLDG 6	0.10	197,580
BLDG 7	0.12	221,920
BLDG 8	0.12	221,920
FIELD HOUSE 1 (AMENITY)	0.02	35,000
FIELD HOUSE 2 (AMENITY)	0.01	20,000
FIELD HOUSE 3 (AMENITY)	0.01	14,000
TOTAL	0.94	1,792,580

*NOTE: AREA SUBTRACTS 16% OF TOP FLOOR AREA OF EACH BLDG. FOR MEP

RETAIL	FAR	AREA (GSF)
TARGET	0.10	189,571
CINEMA	0.04	81,500
IN-LINE	0.06	106,250
TOTAL	0.20	377,321

RESIDENTIAL	UNIT MIX	DU	DU	AC	DU/AC	FAR	AREA (GSF)**
RESI 1	STUDIO (25%) 1-BED (50%) 2-BED+ (25%)	158 315 158	630	3.13	201	0.33	640,000
RESI 2	STUDIO (25%) 1-BED (50%) 2-BED+ (25%)	49 97 49	194	1.76	110	0.12	221,000
RESI 3	STUDIO (25%) 1-BED (50%) 2-BED+ (25%)	48 95 48	190	1.42	134	0.10	189,000
TOTAL		1,014	6.32			0.55	1,050,000

TOTAL PROJECT	FAR	AREA (GSF)**
	1.68	3,219,901

BIKE STALLS & LOCATION
per Table 12.100-3 San Bruno Muni Code

LONG Class I	SHORT Class II	LOCATION (ANTICIPATED)
1 per 10k sf	1 per 20k sf	
25	12	SW PARCEL
21	11	SW PARCEL
27	13	SW PARCEL
19	10	FLEX I
16	8	FLEX I
20	10	FLEX I
22	11	FLEX II
22	11	FLEX II
4	2	SW PARCEL
2	1	FLEX I
1	1	FLEX II
179	90	

1 per 12k sf	1 per 5k sf	
16	38	TARGET
7	16	CINEMA
9	21	RETAIL DIST.
31	75	

1 per 4 DU	1 per 15 DU	
158	42	RESI 1
49	13	RESI 2
48	13	RESI 3
254	68	

- Office
- Retail
- Legacy Retail
- Residential
- Parking
- Flex Use Block



TANFORAN MASTER PLAN | MAX LAB A

OFFICE / R&D	FAR	AREA (GSF)*
BLDG 1	0.13	247,000
BLDG 2	0.11	211,000
BLDG 3	0.14	266,000
BLDG 4	0.10	193,600
BLDG 5	0.09	164,560
BLDG 6	0.10	197,580
BLDG 7	0.12	221,920
BLDG 8	0.12	221,920
FIELD HOUSE 1 (AMENITY)	0.02	35,000
FIELD HOUSE 2 (AMENITY)	0.01	20,000
FIELD HOUSE 3 (AMENITY)	0.01	14,000
TOTAL	0.94	1,792,580

*NOTE: AREA SUBTRACTS 16% OF TOP FLOOR AREA OF EACH BLDG. FOR MEP

RETAIL	FAR	AREA (GSF)
TARGET	0.10	189,571
CINEMA	0.04	81,500
IN-LINE	0.06	106,250
TOTAL	0.20	377,321

RESIDENTIAL	UNIT MIX	DU	DU	AC	DU/AC	FAR	AREA (GSF)**
RESI 1	STUDIO (25%)	158	630	3.13	201	0.33	640,000
	1-BED (50%)	314					
	2-BED+ (25%)	158					
RESI 2	STUDIO (25%)	49	194	1.76	110	0.12	221,000
	1-BED (50%)	96					
	2-BED+ (25%)	49					
RESI 3	STUDIO (25%)	48	190	1.42	134	0.10	189,000
	1-BED (50%)	94					
	2-BED+ (25%)	48					
TOTAL		1,014	6,322	6.32		0.55	1,050,000

TOTAL PROJECT	FAR	AREA (GSF)**
	1.68	3,219,901

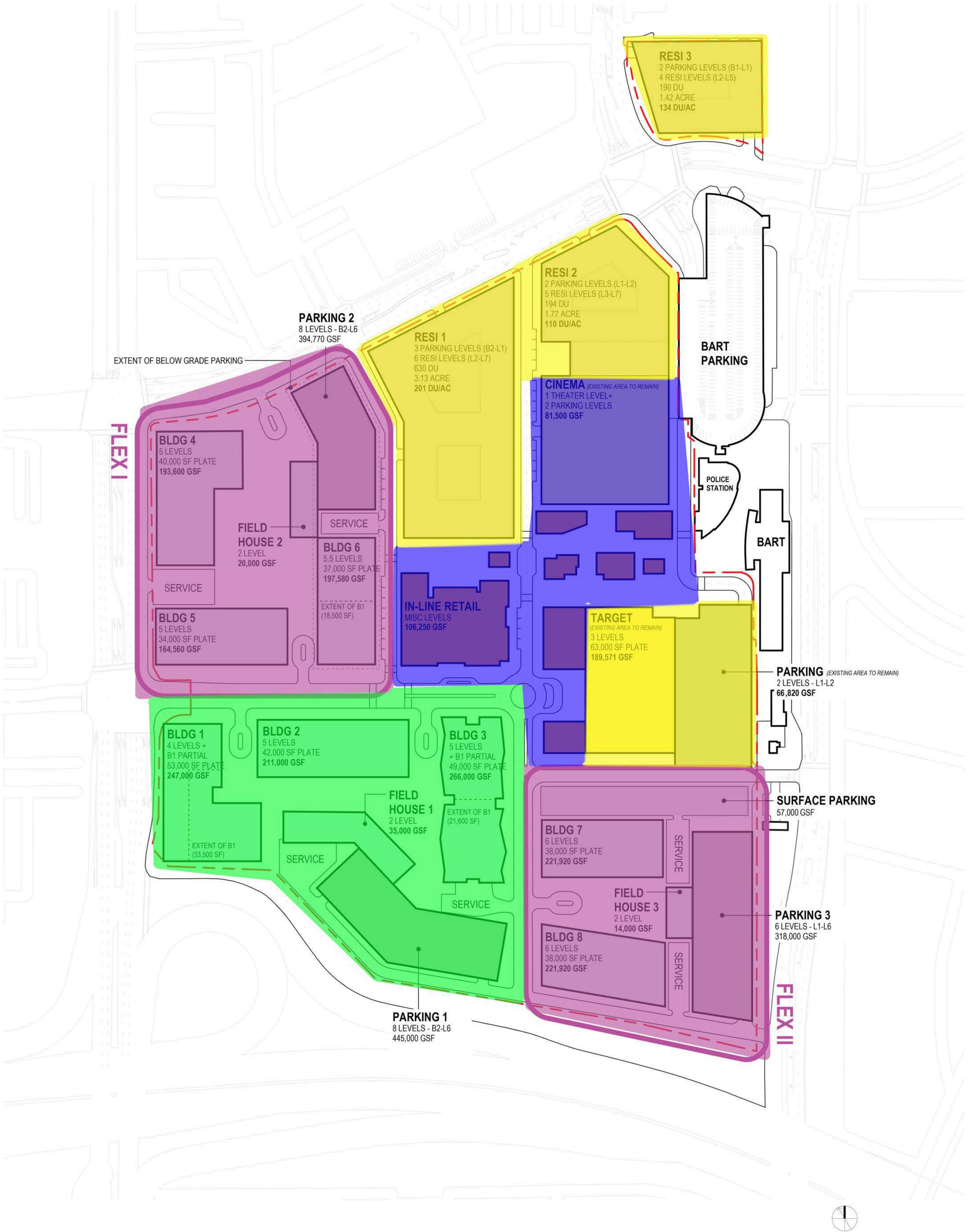
- Phase 1
- Phase 2
- Phase 3
- Phase 4

BIKE STALLS & LOCATION
per Table 12.100-3 San Bruno Muni Code

LONG Class I	SHORT Class II	LOCATION (ANTICIPATED)
1 per 10k sf	1 per 20k sf	
25	12	SW PARCEL
21	11	SW PARCEL
27	13	SW PARCEL
19	10	FLEX I
16	8	FLEX I
20	10	FLEX I
22	11	FLEX II
22	11	FLEX II
4	2	SW PARCEL
2	1	FLEX I
1	1	FLEX II
179	90	

1 per 12k sf	1 per 5k sf	
16	38	TARGET
7	16	CINEMA
9	21	RETAIL DIST.
31	75	

1 per 4 DU	1 per 15 DU	
158	42	RESI 1
49	13	RESI 2
48	13	RESI 3
254	68	



TANFORAN MASTER PLAN | MAX MIXED USE

OFFICE / R&D

	FAR	AREA (GSF)**
BLDG 1	0.13	247,000
BLDG 2	0.11	211,000
BLDG 3	0.14	266,000
BLDG 4	0.13	258,180
BLDG 5	0.10	191,820
FIELD HOUSE 1 (AMENITY)	0.02	35,000
AMENITY	0.01	20,000
TOTAL	0.64	1,229,000

*NOTE: AREA SUBTRACTS 16% OF TOP FLOOR AREA OF EACH BLDG. FOR MEP

RETAIL

	FAR	AREA (GSF)
TARGET	0.10	189,571
CINEMA	0.04	81,500
IN-LINE	0.06	106,250
FLEX AREA RETAIL	0.05	100,000
GROCER		35,000
GROCER		25,000
RESI 3 IN-LINE		23,674
RESI 4 IN-LINE		16,326
TOTAL	0.25	477,321

RESIDENTIAL

	UNIT MIX	DU	DU	AC	DU/AC	FAR	AREA (GSF)**
RESI 1			630	3.13	201	0.33	640,000
	STUDIO (25%)	158					
	1-BED (50%)	315					
	2-BED+ (25%)	158					
RESI 2			194	1.76	110	0.12	221,000
	STUDIO (25%)	49					
	1-BED (50%)	97					
	2-BED+ (25%)	49					
RESI 3			190	1.42	134	0.10	189,000
	STUDIO (25%)	48					
	1-BED (50%)	95					
	2-BED+ (25%)	48					
RESI 4			296	1.28	231	0.14	275,000
	STUDIO (25%)	74					
	1-BED (50%)	148					
	2-BED+ (25%)	74					
RESI 5			204	1.03	198	0.12	225,000
	STUDIO (25%)	51					
	1-BED (50%)	102					
	2-BED+ (25%)	51					
TOTAL		1,514		8.63		0.81	1,550,000

HOTEL

	KEYS	FAR	AREA (GSF)
TOTAL	170	0.07	125,000

TOTAL PROJECT

FAR	AREA (GSF)**
1.77	3,381,321

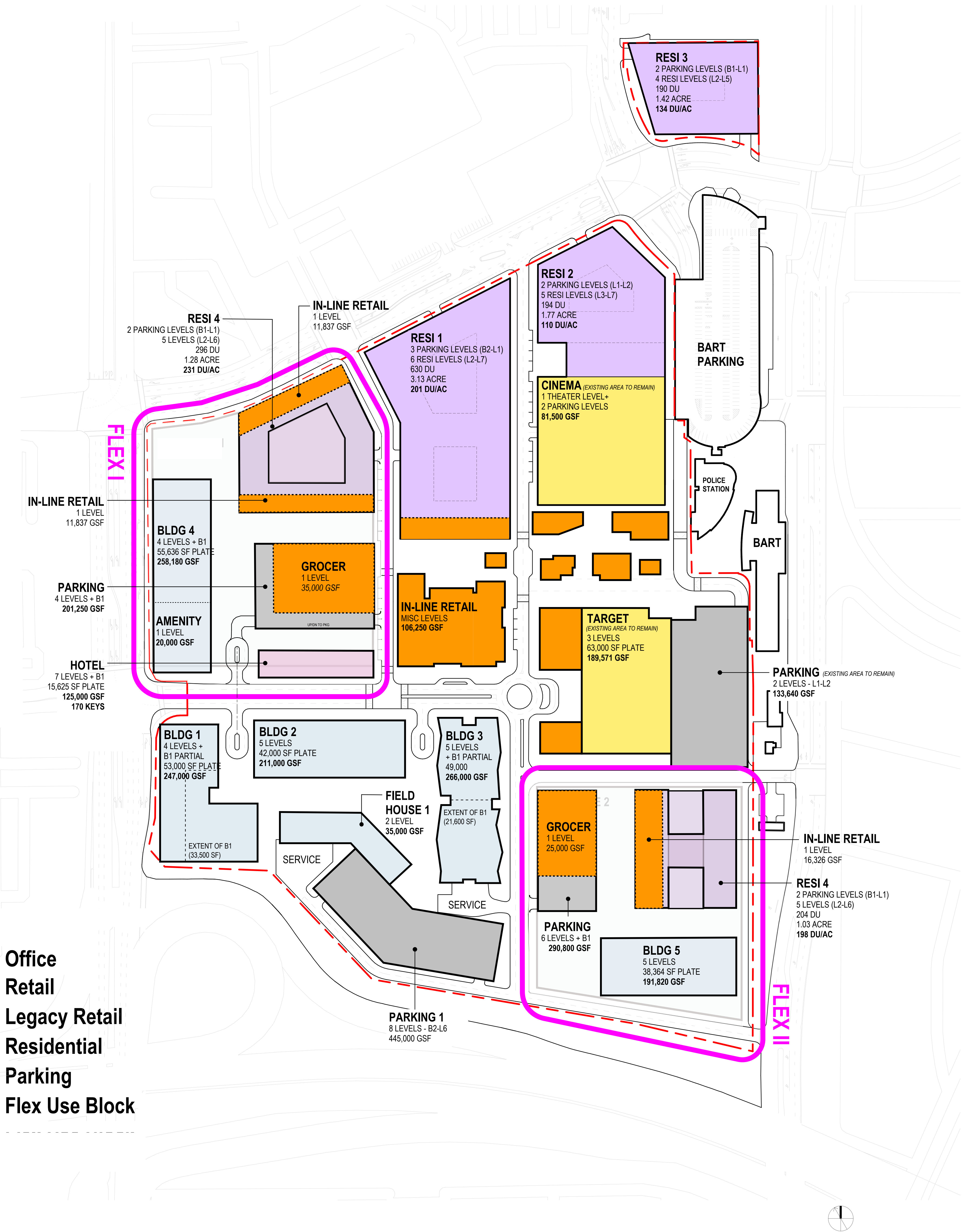
BIKE STALLS & LOCATION
per Table 12.100-3 San Bruno Muni Code

LONG Class I	SHORT Class II	LOCATION (ANTICIPATED)
1 per 10k sf	1 per 20k sf	
25	12	SW PARCEL
21	11	SW PARCEL
27	13	SW PARCEL
26	13	FLEX I
19	10	FLEX II
4	2	SW PARCEL
2	1	FLEX I
123	61	

1 per 12k sf	1 per 5k sf	
16	38	TARGET
7	16	CINEMA
9	21	
8	20	
2	5	FLEX I
2	5	FLEX II
1	3	FLEX I
1	3	FLEX II
40	95	

1 per 4 DU	1 per 15 DU	
158	42	RESI 1
49	13	RESI 2
48	13	RESI 3
74	20	FLEX I
51	14	FLEX II
379	101	

- Office
- Retail
- Legacy Retail
- Residential
- Parking
- Flex Use Block



TANFORAN MASTER PLAN | MAX MIXED USE

OFFICE / R&D	FAR	AREA (GSF)*
BLDG 1	0.13	247,000
BLDG 2	0.11	211,000
BLDG 3	0.14	266,000
BLDG 4	0.13	258,180
BLDG 5	0.10	191,820
FIELD HOUSE 1 (AMENITY)	0.02	35,000
AMENITY	0.01	20,000
TOTAL	0.64	1,229,000

*NOTE: AREA SUBTRACTS 16% OF TOP FLOOR AREA OF EACH BLDG. FOR MECH.

RETAIL	FAR	AREA (GSF)
TARGET	0.10	189,571
CINEMA	0.04	81,500
IN-LINE	0.06	106,250
FLEX AREA RETAIL	0.05	100,000
GROCER		35,000
GROCER		25,000
RESI 3 IN-LINE		23,674
RESI 4 IN-LINE		16,326
TOTAL	0.25	477,321

RESIDENTIAL	UNIT MIX	DU	DU	AC	DU/AC	FAR	AREA (GSF)**
RESI 1			630	3.13	201	0.33	640,000
	STUDIO (25%)	158					
	1-BED (50%)	315					
	2-BED+ (25%)	158					
RESI 2			194	1.76	110	0.12	221,000
	STUDIO (25%)	49					
	1-BED (50%)	97					
	2-BED+ (25%)	49					
RESI 3			190	1.42	134	0.10	189,000
	STUDIO (25%)	48					
	1-BED (50%)	95					
	2-BED+ (25%)	48					
RESI 4			296	1.28	231	0.14	275,000
	STUDIO (25%)	74					
	1-BED (50%)	148					
	2-BED+ (25%)	74					
RESI 5			204	1.03	198	0.12	225,000
	STUDIO (25%)	51					
	1-BED (50%)	102					
	2-BED+ (25%)	51					
TOTAL			1,514	8.63		0.81	1,550,000

HOTEL	KEYS	FAR	AREA (GSF)
TOTAL	170	0.07	125,000

	<i>FAR</i>	<i>AREA (GSF)**</i>
TOTAL PROJECT	1.77	3,381,321

BIKE STALLS & LOCATION
per Table 12.100-3 San Bruno Muni Code

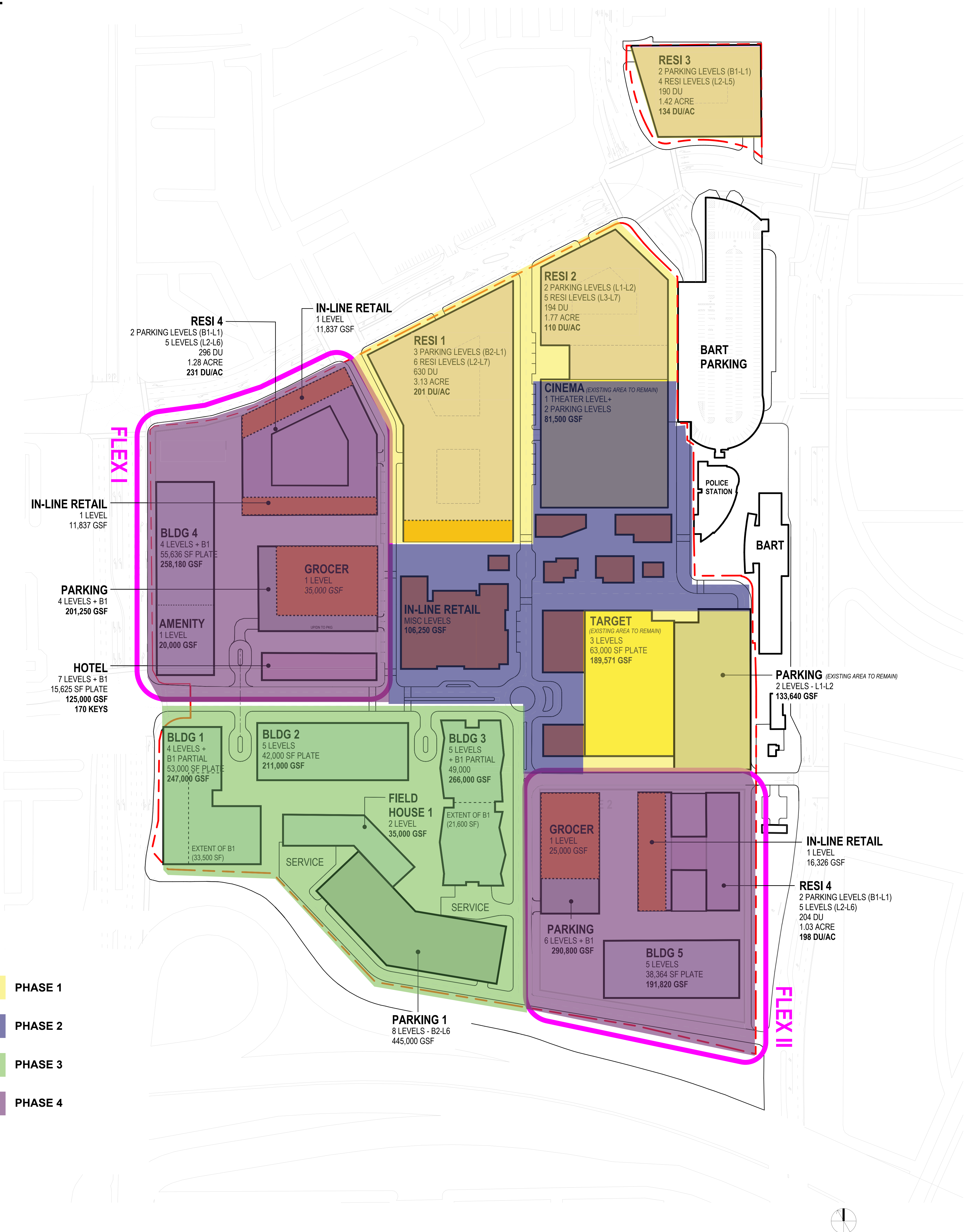
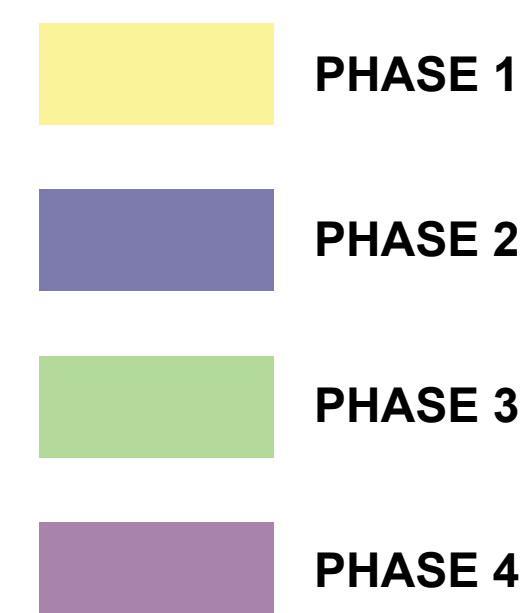
LONG Class I	SHORT Class II	LOCATION (ANTICIPATED)
<i>1 per 10k sf</i>	<i>1 per 20k sf</i>	
25	12	SW PARCEL
21	11	SW PARCEL
27	13	SW PARCEL
26	13	FLEX I
19	10	FLEX II
4	2	SW PARCEL
2	1	FLEX I
123	61	

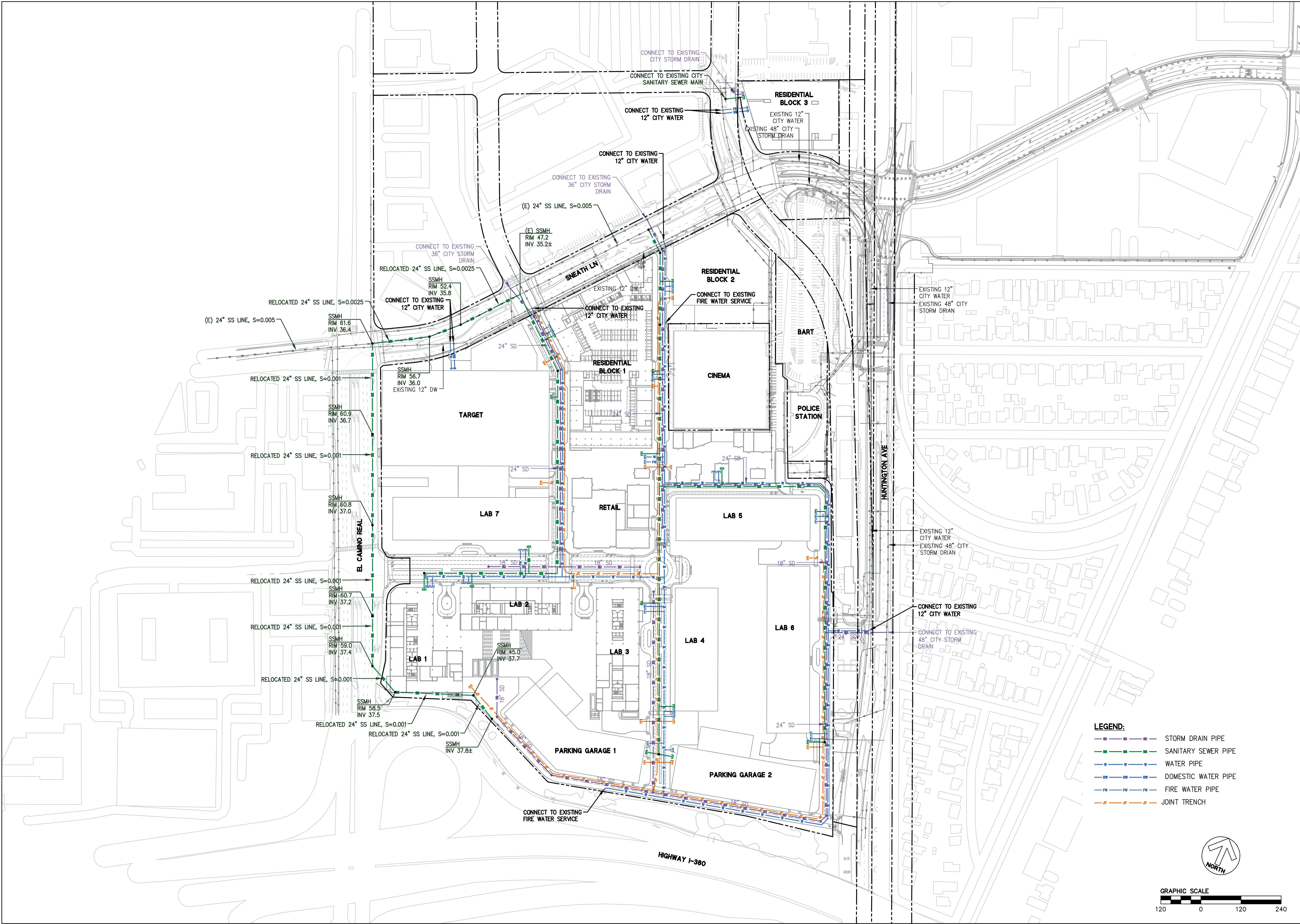
1 per 12k sf 1 per 5k sf

16	38	TARGET
7	16	CINEMA
9	21	
8	20	
2	5	FLEX I
2	5	FLEX II
1	3	FLEX I
1	3	FLEX II
40	95	

1 per 4 DU 1 per 15 DU

158	42	<i>RESI 1</i>
49	13	<i>RESI 2</i>
48	13	<i>RESI 3</i>
74	20	<i>FLEX I</i>
51	14	<i>FLEX II</i>
379	101	





TANFORAN REDEVELOPMENT
CONCEPT DESIGN
UTILITY PLAN

BKF
255 SHORELINE DRIVE
SUITE 200
REDWOOD CITY, CA 94065
(650) 482-6300
www.bkf.com

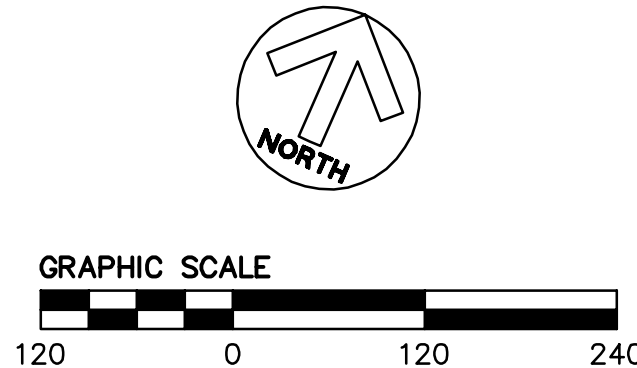
CALIFORNIA

SAN MATEO COUNTY

SAN BRUNO

Revisions		No.	Date
			07/17/2024
Scale	1" = 120'		
Design	JP		
Drawn	JP		
Approved	JT		
Job No	2021695		
Drawing Number:		C3.0	

- LEGEND:
- SD STORM DRAIN PIPE
 - SS SANITARY SEWER PIPE
 - W WATER PIPE
 - DW DOMESTIC WATER PIPE
 - FW FIRE WATER PIPE
 - JT JOINT TRENCH



Land Use	Scenario A NOP	Scenario A REVISED	Scenario A (Site Plan)	Scenario B NOP	scenario B REVISED	Scenario B (Site Plan)
Retail	328,000 sf	377,321 sf	377,321 sf	328,000	477,321 sf	477,321 sf
Residential	1,000 DU	1,014 DU	1,014 DU	1,500 DU	1,514 DU	1,514 DU
Life Science Lab &	2,000,000 sf	1,723,580 sf	1,792,580 sf	711,000 sf	1,174,000 sf	1,229,000
Hotel				170 keys		170 keys
Amenity	29,000 sf	69,000 sf	-	14,500 sf	45,000 sf	-

APPENDIX B

Existing Tanforan Shopping Center Flows

Table B1 Existing Tanforan Shopping Center Flows

Tanforan Development Hydraulic Modeling Study

City of San Bruno

City of South San Francisco

Tanforan Shopping Center		Average Dry Weather Flow Based on Existing Floor Area		Peak Dry Weather Flow Based on City of San Bruno Peaking Factor of 1.57		Peak Wet Weather Flow Based on City of San Bruno Peaking Factor of 3.0	
Land Uses	Existing Floor Area (Sq. Ft.)	Unit Flow Factor ¹	ADWF (mgd)	Peaking Factor relative to ADWF	PDWF (mgd)	Peaking Factor relative to ADWF	PWWF (mgd)
1	2	3	4	5	6	7	8
Retail, Other	785,489		0.149		0.234		0.448
Retail, Target	152,000	<i>190 gpd / 1,000 sq. ft.</i>	0.029	<i>1.57</i>	0.045	<i>3.00</i>	0.087
Retail, Cinema	70,000		0.013		0.021		0.040
Total			0.191		0.301		0.574