

December 16, 2022

City of Morgan Hill
17575 Peak Avenue
Morgan Hill, CA. 95037

Final

Attn: Chris Ghione, Public Services Director

Subject: **Proposed New 42" Storm Drain Outfall at Half Road**

Dear Chris,

The purpose of this letter memorandum is to provide an update on the size requirement for the proposed storm drain outfall at Half Road, and which was identified in the 2018 Storm Drain Master Plan (2018 SDMP). This letter memorandum includes the following sections

- Relevant Documents
- Madrone Channel Remaining Capacity
- Proposed Half Road Outfall
- Managing the Madrone Remaining Allotments
- Conclusions and Recommendations

1.0 RELEVANT DOCUMENTS

The following relevant documents were reviewed and referenced during this analysis, as they impacted the size requirement for the Half Road Outfall.

1. **2018 Morgan Hill Storm Drainage System Master Plan** (Akel) – This document is a City-wide hydrology and hydraulic evaluation of the storm drainage requirements and includes proposed improvements to mitigate existing deficiencies as well as to accommodate future growth.
2. **2022 Madrone Channel 2D Floodplain Study** (Kasraie, August 2022) – This hydrology document was focused on the Madrone Channel tributary and evaluated the capacity constraints for existing land use conditions, as well as for the impacts of potential future developments from currently vacant lands. This study was commissioned by the City of Morgan Hill and by Valley Water.
3. **Post-Construction Stormwater Control Plan for San Sebastian: Phase 3 & 4** (RJA, March 2021) – This hydrology report compared the pre-development and post-development runoff for the project during 2-year, 10-year, 25-year, and 100-year storm events.
4. **Post-Construction Stormwater Runoff Management Plan for The Crosswinds** (RJA, May 2020) – This hydrology report compared the pre-development and post-development

runoff for the project during 2-year, 10-year, 25-year, 100-Year hydrology calculations could not be found in this report.

5. **Stormwater and Hydrology Report for Redwood Technology Center at 101 (Kier & Wright, June 2022)** – This hydrology report compared the pre-development and post-development runoff for the project during 2-year, 5-year, 10-year, 25-year, and 100-year storm events, and also included a detention basin analysis to reduce the impact to the downstream outfall. It should be noted that this hydrology report included Redwood Tech, the undeveloped lands north of Redwood Tech, as well as the De Paul Health Center.

2.0 MADRONE CHANNEL REMAINING CAPACITY

Valley Water has been diligently monitoring the capacity adequacy of the receiving waters within Santa Clara County, and their regional models have identified the Madrone Channel with capacity constraints, even during existing conditions. Due to the imminent nature of the developments along Half Road, Valley Water and the City of Morgan Hill agreed to work together and complete a more detailed 2-dimensional (2D) floodplain analysis for the Madrone Channel. Akel Engineering Group retained the services of Kasraie consulting, a renowned hydrologist, to complete this analysis.

The Kasraie analysis concluded that under existing conditions, 100-year 24-hour storm runoff from vacant lands within the Madrone tributary area does not all drain towards the Madrone Channel, but rather sheet flows in a southerly/southeasterly direction. Furthermore, the existing pipelines and outfalls are designed for 10-year 24-hour storm events, and do not usually facilitate the 100-year 24-hour runoff to discharge directly to the Madrone Channel.

According to the Kasraie analysis, the 2D floodplain analysis indicates the capacity constraint in the Madrone Channel is at the channel crossing under Tennant Avenue. This constraint can currently accommodate an additional capacity of **120 cfs**, including freeboard in the channel.

The Kasraie report also advised with a rough estimate for distributing this available 120 cfs to undeveloped lands:

- Additional runoff during 100-year storm events can be accepted at an approximate rate of 0.5 cfs per acre, and only for lands currently draining towards the Madrone Channel.

Madrone Channel Remaining Capacity

The 2D floodplain analysis indicates the capacity constraint in the Madrone Channel is at the channel crossing under Tennant Avenue. This constraint can currently accommodate an additional capacity of **120 cfs**, including freeboard in the channel.

It is important to note that this rough estimate was based on the existing drainage patterns in the 2D floodplain Model and which identifies lands currently draining towards the Madrone Channel. Lands that currently sheet flow southwards, and away from the Madrone Channel, were excluded from this rough 0.5 cfs per acre estimate.

Runoff flows exceeding the 120 cfs will trigger the construction of the 72-inch parallel culvert improvement at the Tennant Avenue crossing. It should be noted that, prior to any such culvert improvements, Valley Water will require a study to determine if this culvert improvement results in increased flooding, during 100-year storm events, in downstream channel reaches.

3.0 PROPOSED HALF ROAD OUTFALL

This section discusses the Half Road pipe size requirements, as stipulated in the 2018 SDMP, and as revised to account for changes in land use and stormwater drainage assumptions based on imminent developments.

3.1 2018 SDMP Assumptions

The 2018 Storm Drainage Master Plan reflected 2017 land use conditions and identified improvements needed to mitigate existing deficiencies, as well as improvements to service future growth. At the time, the Half Road tributary area, which is intended to discharge to the Madrone Channel, was largely undeveloped, including the area east of Peet Road, as shown on [Figure 1](#). This figure shows the Half Road tributary (highlighted in a light-green color) extending eastward to Coyote Road. The hydraulic analysis, at the time, identified the corresponding outfall pipe size requirement at 54 inches, and continuing eastward with 48 inches.

3.2 2022 Land Use Conditions and Imminent Developments

The 2022 land use conditions for the Half Road tributary area has changed since the 2018 SDMP, as developments have been either occurring or currently being planned for imminent construction. The revised tributary area for Half Road is shown on [Figure 2](#), and the mostly imminent developments within this area are discussed in this section.

3.2.1 San Sebastian (Tributary to Half Road)

The area previously tributary to Half Road, and east of Peet Road (North and South San Sebastian on [Figure 2](#)), is in different stages of development. This North San Sebastian area has been designed to retain 100-year 24-hour storms, while the South San Sebastian area was designed to detain 25-year 24-hour storms, and thus is still tributary to Half Road.

During the 100-year 24-hour storm events, stormwater runoff from the South San Sebastian area will exceed the south basin capacity and overtop Peet Road and flow southwesterly into Madrone Channel, and via the future Half Road storm drainage pipeline. It should be noted that the post-development release runoff from the South Sebastian area is less than the pre-development runoff.

3.2.1 Crosswinds

The area adjacent and to the east of the Redwood Tech development is known as the Crosswinds development (highlighted in a light-green color on [Figure 2](#)). This development consists of residential units, and its hydrology report includes calculations and quantifying storm runoff from up to 25-year 24-hour events. No 100-year 24-hour events were found.

3.2.2 County Area (Tributary to Half Road)

Though this area is currently under the County jurisdiction, there have been discussions of potential developments. This study assumes that this area will be draining to the future Half Road pipeline. Furthermore, the study assumes that either the County, or the City if this area is incorporated, will condition the development to construct 25-year 24-hour detention facilities.

3.2.3 Redwood Tech / Undeveloped Area to the north / De Paul Health Center (Not Tributary to Half Road)

The Redwood Tech development (highlighted in a light-blue color on [Figure 2](#)) was assumed tributary to the future Half Road outfall in the 2018 SDMP. This development is currently proposed to be draining northward to an existing, and private, detention facility, and then draining to the Madrone Channel via an existing 30-inches outfall. The hydrology report for Redwood Tech also included the undeveloped area to the north and which is labeled as “Future Dev. Area” on [Figure 2](#), as well as the De Paul Health Center. These areas are also not tributary to Half Road, though they are included in the calculations to determine the additional runoff flows anticipated in the Madrone Channel.

3.2.4 Future Developed Area north of Redwood Tech plus Lands of Lee (Not Tributary to Half Road)

This study accounts for a reserved capacity from the future developments of the lands north of Redwood Tech.

3.3 2022 Half Road Outfall Pipeline Size Requirement

Based on the changes from the imminent developments discussed in this section, the analysis recommends reducing the outfall pipe size at Half Road from the master plan recommend 54-inches to 42-inches, as shown on [Figure 2](#).

The revised outfall pipe size at Half Road is **42-inches**.

4.0 MANAGING THE REMAINING ALLOTMENTS

Developments within the Madrone Channel watershed tributary drainage area, and located north of Half Road, are currently going through various phases of approvals and are thus considered Imminent Growth. For that reason, City staff will be allocating the 120 cfs remaining capacity, as identified in the Kasraie report, to these imminent developments. Developments within the Madrone Channel watershed tributary area, and located south of Half Road, are considered Long-Term Growth.

4.1 Imminent Growth (North of Half Road)

This study includes a more detailed inventory of the remaining undeveloped lands within the Madrone Channel watershed, and north of Half Road. This inventory includes lands within the Madrone Channel watershed tributary area, even if they currently do not drain towards the Madrone Channel.

Developments north of Half Road are considered imminent and will be allotted the 120 cfs remaining capacity at a rate of 0.42 cfs/acre.

This inventory is documented on [Table 1](#), and shown on [Figure 2](#), and includes: the South San Sebastian development, the County Area, the Crosswinds, the Redwood Tech development, the future development area north of Redwood Tech, and the De Paul Health Center. [Table 1](#) and [Figure 2](#) further distinguish between developments tributary to the future Half Road drainage outfall, and those tributary to the De Paul drainage outfall.

This analysis estimated the 120 cfs available capacity can be distributed on existing undeveloped lands north of Half Road and which are considered imminent growth. Based on the land use inventory summarized on [Table 1](#), and during the 100-year 24-hour storm event, an approximate

runoff flow rate of up to 0.42 cfs per acre can be allotted to these imminent developments, without exceeding the 120 cfs currently available capacity in the Madrone Channel. The following table provides a clarification to the modified allowable rate

Study	Allocation Rate for the 120 cfs Available Capacity	Assumptions
2022 Kasraie Study	0.50 cfs per acre	This recommendation is based on the 2D floodplain study and <u>applies only to lands currently draining towards Madone Channel</u> .
This study	0.42 cfs per acre	This recommendation is based on a detailed land use inventory (Table 1), for <u>lands north of Half Road and tributary to the Madone Channel watershed</u> , even if they do not currently drain towards the channel.

The developments north of Half Road are listed below, including a reference to their hydrology reports if applicable.

- **South San Sebastian.** South San Sebastian hydrology report indicates the 100-year storm runoff, overtopping the designed 25-year detention facilities, is estimated at 23 cfs. This amount is well below the allotment of 34 cfs.
- **County Area north of Half Road.** This area has not been developed and should be conditioned to construct a detention facility to accommodate a 25-year storm event. The maximum allowable runoff flows from this area during the 100-year 24-hour storm event should not exceed the current allotment of 33 cfs.
- **Crosswinds.** The Crosswinds hydrology report indicates that the 25-year runoff flow is estimated at 4.3 cfs. This development must provide the calculations for the 100-year runoff flow, and which should not exceed the allotment of 13.4 cfs.
- **Redwood Tech.** The hydrology report from this development indicates a 100-year storm runoff of 21.6 cfs.
- **Future Development north of Redwood Tech.** This study accounts for the development from the lands north of Redwood Tech, with an estimated additional runoff amount during the 100-year storm event of 17.9 cfs.

4.2 Long-Term Growth (South of Half Road)

Runoff flows tributary to the Madrone Channel and exceeding the 120 cfs during the 100-year 24-hour storm event, will require a parallel undercrossing improvement along the Madrone Channel as it crosses under Tennant Avenue. Morgan Hill should consider requiring long-term developments south of Half Road and north of Tennant Avenue, to contribute towards constructing a parallel pipeline crossing under Tennant Avenue. Until this proposed crossing has been constructed, these long-term developments should be required to construct retention facilities for 100-year 24-hour storm events.

Runoff flows tributary to the Madrone Channel and exceeding 120 cfs during the 100-year 24-hour storm event, will require a parallel culvert improvement along the Madrone Channel as it crosses under Tennant Avenue.

Also, as previously mentioned, and prior to constructing this culvert improvement, Valley Water will be requiring a study be completed to determine the impact of this improvement on the downstream segments of the Madrone Channel.

5.0 CONCLUSIONS AND RECOMMENDATIONS

This letter memorandum reviewed and updated the pipe size requirements for the future Half Road storm drain outfall, and reviewed the Madrone Channel constraints as evaluated by the August 2022 Kasraie hydrology report, and includes the following conclusions and recommendations:

- **Morgan Hill is Actively Managing Runoff Impact to Downstream Waters.** Since the 2018 Storm Drain Master Plan (2018 SDMP), the City of Morgan Hill has been pro-active in requiring developers to construct detention facilities (usually designed for 25-year 24-hour) to mitigate the 100-year storm runoff impacts from the downstream receiving waters. In some cases, like Sebastian North, the developer was required to retain for 100-year 24-hour storm events.
- **Madrone Channel Remaining Capacity.** The Kasraie hydrology report concluded that there is approximately 120 cfs of remaining capacity in the Madrone Channel, at the bottleneck located at Tennant Avenue, to accommodate runoff flows from future or imminent developments, while maintaining freeboard requirements. Based on the available land use inventory shown on **Table 1**, this equates to 0.42 cfs per acre.
- **Imminent Growth North of Half Road can use the 120 cfs Remaining Capacity.** The analysis estimated this 120 cfs excess capacity can be distributed on existing undeveloped lands north of Half Road and which are considered imminent growth, including the Redwood Tech and Crosswinds Projects. During the 100-year 24-hour storm event, a runoff flow rate of up to 0.42 cfs per acre, can be allotted to these imminent developments, without exceeding the 120 cfs excess capacity in the Madrone Channel.

Imminent Growth North of Half Road can develop and use the 120 cfs Available Capacity in the Madrone Channel.

- **Long-Term Growth South of Half Road Require**

Channel Improvement at Tennant Avenue. Runoff flows tributary to the Madrone Channel and exceeding 120 cfs during the 100-year 24-hour storm event, will require a parallel culvert improvement along the Madrone Channel as it crosses under Tennant Avenue. Morgan Hill should consider requiring long-term developments south of Half Road and north of Tennant Avenue, to contribute towards constructing a parallel pipeline crossing under Tennant Avenue.

Long Term Growth South of Half Road requires culvert improvement at Tennant Avenue.

It should be noted that, prior to any such culvert improvements, Valley Water will require a study to determine if this culvert improvement results in increased flooding, during 100-year storm events, in downstream channel reaches. Until this proposed crossing has been constructed, these long-term developments should be required to construct retention facilities for 100-year 24-hour storm events.

- **Revised Outfall Pipe Size Requirement at Half Road.** Based on the revised Half Road tributary area, and based on the City effectively managing runoff by requiring 25-year detention facilities from developers, the recommended revised Half Road outfall size is at **42 inches**. This size continues east to the point of connection from the Crosswinds development, it then continues eastward on Half Road as 36 inches, then as 24 inches.

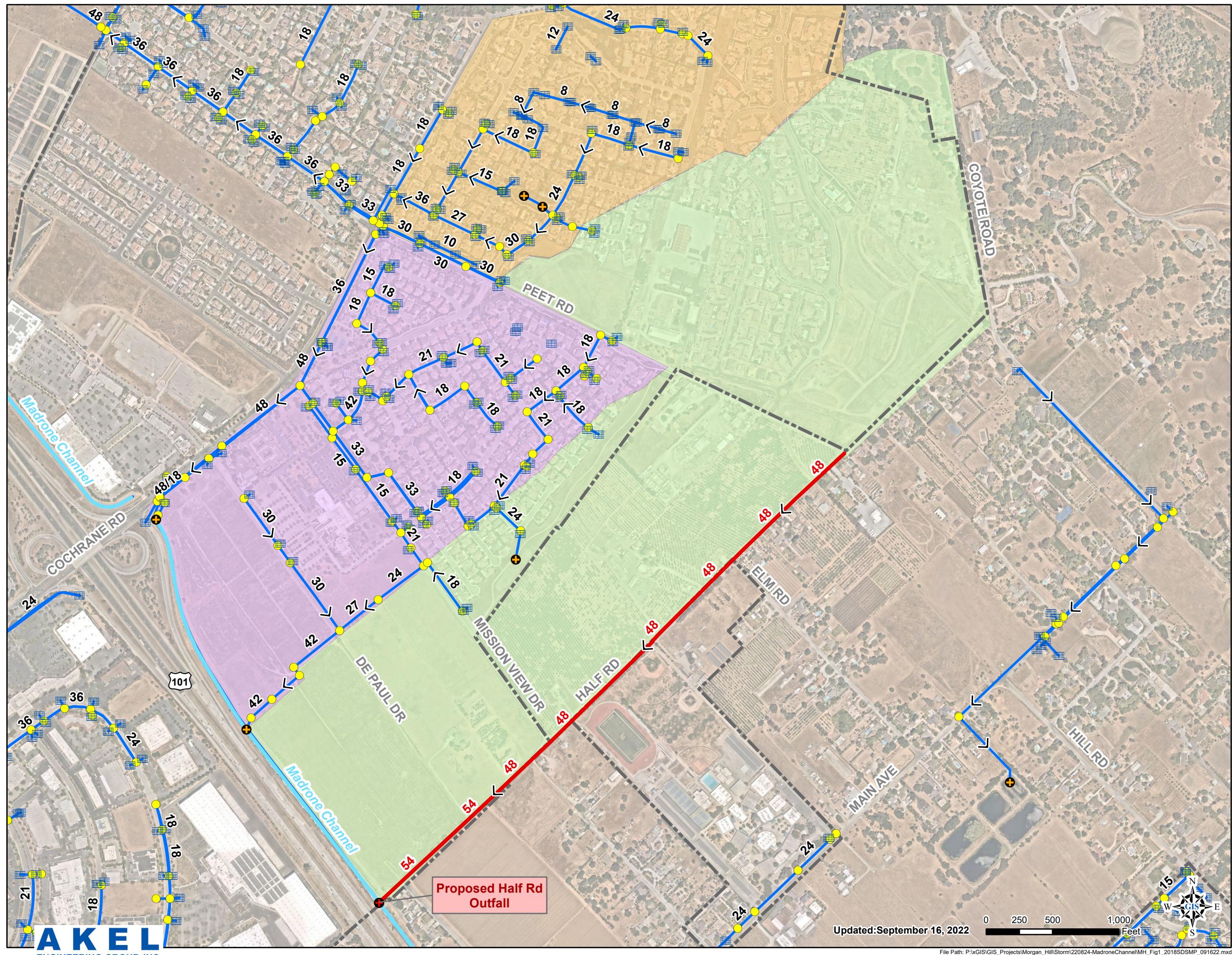
Sincerely,

AKEL ENGINEERING GROUP, INC.



Tony Akel, P.E., D. WRE
Senior Principal





Legend

Half Road Proposed Improvements

- Outfall
- Pipes

Tributary Area

- Cochrane
- Coyote
- Half Rd

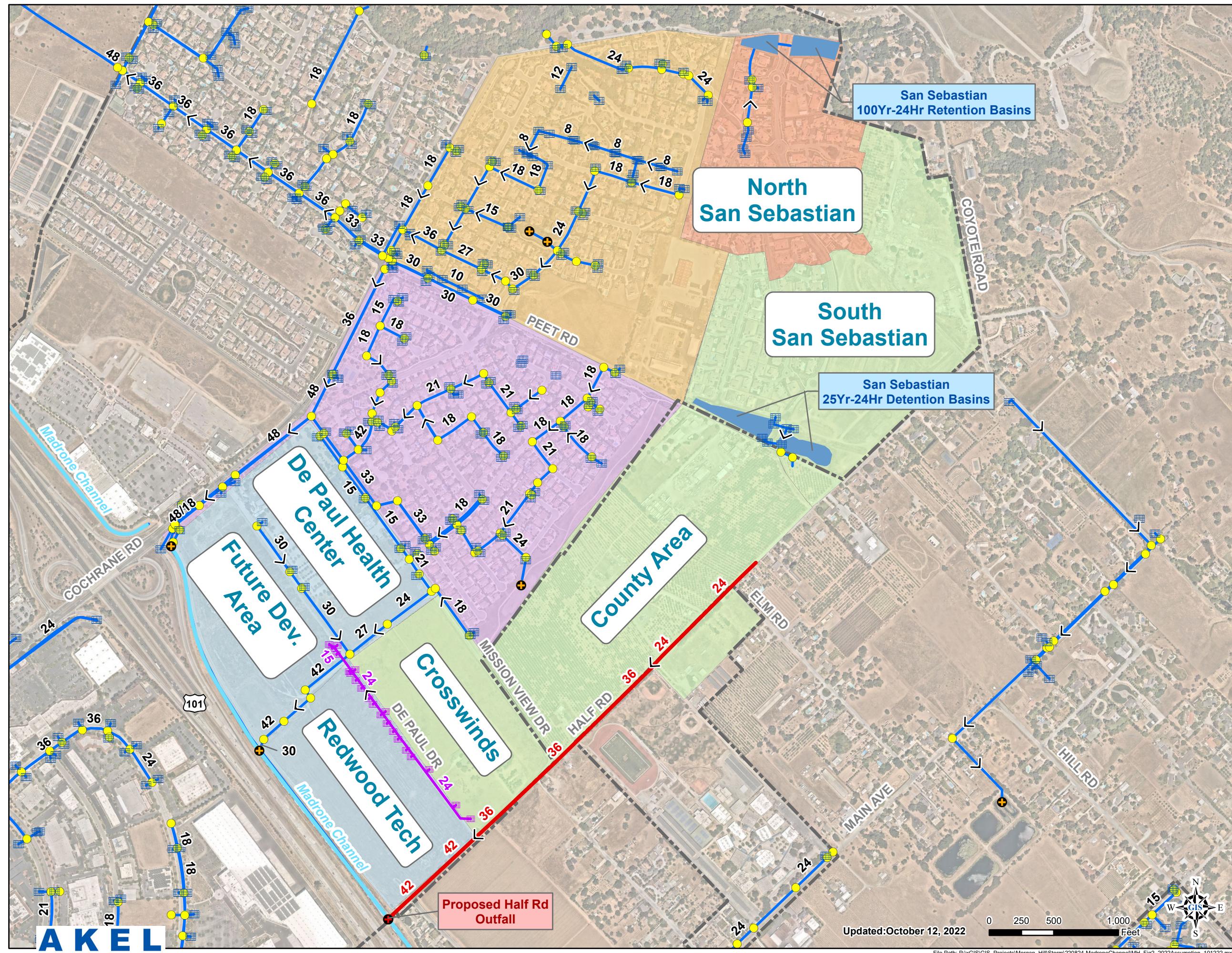
Existing System

- Inlet
- Manhole
- Pipes
- City Limits

PRELIMINARY

Figure 1
2018 SDSMP Assumptions
Half Road Tributary
Area Review
City of Morgan Hill





PRELIMINARY

Figure 2
2022 Amended Assumptions
Half Road Tributary Area Review
Floodplain Study
City of Morgan Hill

Legend

Master Plan Amendment Proposed Improvements

- Outfall
- Pipes

Redwood Tech Proposed Improvements

- Inlet
- Pipes

Tributary Area

- North San Sebastian
- Cochrane
- Coyote
- De Paul
- Half Rd

Existing System

- Inlet
- Outfall
- Manhole
- Pipes
- San Sebastian Retention/Detention Basins
- City Limits



Table 1 Anticipated Runoff From Imminent Developments n/o Half Road

Half Road Tributary Area Review

City of Morgan Hill

PRELIMINARY

Development Name	Land Use Inventory					Runoff Flows			Comments	
	Phased Residential Development (acres)	Light Industrial (acres)	Agriculture (acres)	Vacant (acres)	Total (acres)	Peak Flows Based on 0.42 cfs/acre ¹ Allotment (cfs)	Post-Development Flows			
		25-Year Event (cfs)	100-Year Event (cfs)							
Half Road - Tributary Area										
South San Sebastian ²	81				81	34.2	3.0	22.9	100-year proposed flow is below Allotment.	
County Area		13	59	7	79	33.3	n/a	Limited to 33.3 cfs	100-year runoff flow from this area should not exceed the allotment of 33.3 cfs.	
Crosswinds ³				32	32	13.4	4.3	<i>not in report.</i> Limited to 13.4 cfs	The 100-year flows not included in hydrology report. Stormwater runoff during 100-year events must not exceed 13.4 cfs.	
Subtotal - Half Road - Tributary Area					193	80.9		69.6	This subtotal is tributary to the Half Road Drainage Outfall, and assumes Crosswinds runoff will be less than 13.4 cfs.	
De Paul - Tributary Area										
Redwood Tech + Undeveloped Area to north + De Paul Health Center ⁴					47.5	20.0	12.1	21.6		
Future Dev. Area n/o Redwood Tech + Lands of Lee ⁵					42.5	17.9		Limited to 17.9 cfs		
Subtotal - De Paul - Tributary Area					90	37.8	12.1	39.4	This subtotal is tributary to an existing 30" outfall	
Total Undeveloped Lands N/O Half Road					Allotment based on 4.2 cfs/acre		Actual			
Total					283	118.7		109.0	The current total runoff flow during the 100-year event is at 91.2 cfs.	
Madrone Channel Remaining Capacity (w/ Freeboard) per 2022 Kasraie Study										
Kasraie Study						120.0			The maximum available capacity at Tennant Avenue is at 120 cfs , with freeboard in the Madrone Channel, per the 2022 Kasraie hydrology study	

Notes:

1. Source: 2022 Madrone Channel 2D Floodplain Study by Kasraie limits at 120 cfs. Allotments are based on undeveloped lands n/o Half Road not exceed 120 cfs.
2. Post-Development proposed flows extracted from Post-Construction Stormwater Control Plan for San Sebastian dated March 2021.
3. Post-Development proposed flows extracted from Post-Construction Stormwater Runoff Management Plan for The Crosswinds dated August 2020.
4. Post-Development proposed flows extracted from Stormwater and Hydrology Report for Redwood Technology Center at 101 dated June 2020.
5. Accounts for developments n/o Redwood Tech and to the Land of Lee.

A K E L
ENGINEERING GROUP, INC.

10/18/2022