# Flooded With Problems

## Stormwater Management on the SMC Coast

## Situation, Causes, Solutions and Recommendations

### Agency Review Draft - Jan. 8, 2025

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# I. Executive Summary

## *A. Purpose and Scope*

The storm of Dec. 31 – Jan. 1, 2023 on the San Mateo County Midcoast overwhelmed fundamental systems central to our civilization: power, telecommunications, transportation, and sewer. Most of those systems have agencies and accountability well-defined to cope with the damage and restore basic functionality, which was done - albeit with delays stretching to a year. However, a principal cause of the damage does not seem properly managed to mitigate future damage: stormwater. Note that other large storms - e.g. in Feb. 2017 and Oct. and Dec. 2021, and previously - also caused damage, and the MWSD FEMA grant request cited 5 instances of large storms in the past 5 years. This report, prepared in consultation with longtime residents, current and former public officials, and consulting professionals *(on an unpaid, informal basis),* describes some of that damage, identifies root causes, and proposes solutions.

What we are trying to prevent is best illustrated by these videos:

a. Urban Kayaking in Pacifica:
https://drive.google.com/file/d/1eIbZa4XyF3D9Xa4TjOzyDkWt9Nai30rL/view?usp=drive_link

…This waterflow is the result of cumulative construction of impermeable surfaces, coupled with climate change-driven changes in rainfall patterns and a history of inadequate stormwater management.

b. Debris Flows:

https://www.facebook.com/reel/406079792524406

This video shows Ashville, NC in Sept. 2024, but a similar slide killed 3 children in Pacifica in January, 1982[1], for which we have no video. This is the result of overbuilding in landslide risk areas, coupled with climate change.

There are five principal infrastructure systems which support civilization on the Midcoast: water, telecommunications, power (gas & electricity), roads, and sewer. The Midcoast Community Council (MCC) addressed telecommunications deficiencies in its report of Coastside Communication Resilience: 4/13/23 report, and the wires and poles and equipment providing telecommunications are also vulnerable to the storms and flooding reported herein. Electrical service as well continues to fail routinely in our storms. While saturation of soils, which weakens the hold of tree root systems, is discussed herein, a detailed analysis of telecommunication and power system vulnerabilities is outside the scope of this report. Water supply and water quality are also both affected by stormwater. While we mention issues with water quality caused by stormwater in this report, a detailed analysis of water quality and quantity is also outside the scope of this report.[2] The impact on Midcoast roads is discussed, especially in Chapter II-F on Highway 1 (Hwy 1, officially, SR-1). The impact on our sewer systems is the thread linking the entire coast from Montara to Moonridge, and is both analyzed in

[1] *"The January 3-6.1982, storm caused 475 landslides in Pacifica, Calif."* Landslides, Floods, and Marine Effects of the Storm of January 3-5, 1982, in the San Francisco Bay Region, California Professional Paper 1434 By: Gerald F. Wieczorek Edited by: Stephen D. Ellen https://doi.org/10.3133/pp1434

[2] County efforts to manage stormwater POLLUTION are outlined here: https://ccag.ca.gov/programs/stormwater/

Chapter II-C, and is the reason we included several Half Moon Bay (HMB) neighborhoods in this report. What happens in Half Moon Bay doesn't stay just in HMB.

This report is derived from residents' observations and complaints reported to us, and from their - in some cases extensive - documentation of longstanding stormwater hazards and damages. As a report prepared by lay personnel, this report requires professional review. What has impressed us, as we gathered information and prepared this document, was the level of concern and effort residents had already evidenced. We recommend an initial Peer Review of this report by a qualified technical consultant before presentation to the County for action.

This is not a comprehensive survey, but is illustrative of stormwater problems which have existed in the region for decades, and which threaten to worsen if not addressed by a combination of improved science, policies, and infrastructure. Our hope is that this report will motivate effective, collaborative, and professional action from our government to avoid both damaging the tax base and creating the next generation of homeless persons because of the unmitigated effects of stormwater as described further in this report.

## *B. Summary Of Findings*

Residents of the San Mateo County Coastside are being flooded out of their homes, and having them crushed by falling trees derived from unmanaged stormwater, and/or spending thousands of dollars to reduce or avoid damage to their homes and property. Standard homeowner insurance policies provide no insurance for external flooding, so these risks are born entirely by the property/homeowners and range up to $200,000 in some instances. The stormwater management and drainage policies the County is following derive from both outdated science and from an intentional bias in favor of new construction of impermeable surfaces. As of this writing, there is neither a comprehensive Coastside Stormwater Management System in place nor a development plan to produce one. Current funding mechanisms are inadequate to create and maintain a stormwater management system that could handle the climate-change induced extreme rainfall that is now routine on the Coastside.


*Figure 1 Coastside Watersheds*

This report reviews the stormwater problems in 8 neighborhoods Coastside *(with potentially more to come in the next draft),* and in the sewer system and highway which tie these neighborhoods together. The good news is that it is possible to build a resilient stormwater management system which has survived the largest storms in the past 40 years. This is documented at the Ocean Colony Homeowners Association (OC) in Half Moon Bay (HMB). The contrast between OC's approach to design and management, and that created by the County is both stark and dangerous.

At Moonridge, developed in 1999-2001 on unincorporated County lands, routine annual flooding became disastrous and unmitigated in the New Year's Storm of 2023, flooding residents out of their homes. That development was permitted for construction in a flood plain. Drainage holes on medians and yards were totally inadequate. Yet, across Hwy1 from Moonridge, Ocean Colony experienced NO drainage problems in this same storm, having created AND MAINTAINED a drainage system since the late 70's. Ocean Colony proves stormwater management can be done properly. Moonridge proves the County and MidPen Housing do not (yet) know how to do it, or are unwilling to fund it. Many of these stormwater issues have been communicated to the County in MCC meetings, and via the CRISP survey efforts in materials such as the July 24, 2024 CRISP priorities document.

The report details a number of recommendations, including organizational changes and assignments, changes in permitting and design standards and policies, and funding approaches. Specifics are contained both in neighborhood chapters and in Chapter IV. Whether our civilization can continue on the Coastside will depend upon the outcome of a race between the forces of climate change and the response of our fragmented governance. Let us hope that this report motivates the latter to come together to address the former via more realistic and effective stormwater management.

### *C. Organization of Contents*

Chapter II - Stormwater Conditions on the Coast reviews the stormwater issues faced by Coastside neighborhoods participating in this report. Each neighborhood included has been toured by members of the MCC together with residents, and/or geologists, and/or local officials.

Chapter III - Current Stormwater Organizations, Policies, and Science summarizes our current understanding of County and Regional policies and practices for managing stormwater and allowing additional construction of impermeable surfaces. It also describes the deficiencies of current stormwater science and management policies, and the National Academy of Sciences' 2024 direction for improvement thereof.

Chapter IV - Conclusions and Recommendations summarizes the implications of the preceding chapters and contains a series of recommendations to halt further stormwater damage, and – to the degree we can adapt to climate change – to prevent future problems.

Chapter V - Process Notes describes the steps to produce this report, both those already taken and those recommended going forward to produce the final report.

## II. Stormwater Conditions on the Coast

This section of the report describes stormwater issues in a handful of neighborhoods Coastside. The findings here inform our comments on current stormwater practices in section IV, and lead to the conclusions and recommendations in section V.

### *A. Ocean Colony: A Success Story*

Ocean Colony (OC) is a gated homeowners association (HOA) south of Half Moon Bay, on the west side of the Highway 1, near the beach bluffs. It was constructed in the late 1970's to the early 1980's, and created its own stormwater management system, which it has maintained since, funded by HOA dues.

> Resilience is not an inborn character trait for most people. It is learned, practiced, and planned. As an example, we can look to Ocean Colony's storm drain system. There were few flooding zones in Ocean Colony, and those mostly from external storm water. Why was Ocean Colony sparred? The answer is, we weren't. But we were prepared with a forward-thinking storm system designed in the 1970s with the capacity to handle even the heaviest rains. The preparation was not merely the pipes flowing under the fairways – it was also the design of the streets, which carry the water from nearby homes into the storm drains. And an original design is worth little without constant attention. The Association annually maintains the storm drains to keep them flowing. Homeowners should do likewise with their gutters and downspouts. All this constant attention creates resilience.

During the storm of Jan 1, 2023, Ocean Colony reported no flood damage. Two adjacent golf courses experienced flooding – as designed. The excerpt above from the HOA newsletter explains that Ocean Colony was not "spared", but it was resilient by both design and management.

To learn from OC's efforts, the MCC has reached out to the HOA President and Management[3], and received the information below. Our hope is that their designs, maintenance practices, and costs will inform successful stormwater management throughout the Midcoast.

*"From a storm water perspective, Ocean Colony is somewhat of a unique community because the Old Course has several irrigation/retention ponds into which storm water drains through underground and designed surface systems connected to streets, sidewalks, fairways, residential properties, parking lots, commercial areas, homeowner common areas and other locations. These ponds built in 1973 can still retain about 3.5M gallons of water which is 60% of their original holding capacity (the reduction due to siltation) and are located throughout the community so that in major storm events no one area gets inundated. The ponds are interconnected through underground pipes so water can be directed and pumped between them. If, and when, the ponds reach capacity (not very often) we can flood the golf fairways or excess storm water can be discharged through the underground system to an outfall at the ocean. The ponds also function as irrigation ponds so we can fill them to capacity in the "bridge months" of November and March/April with early or late storm water so as to lower our*

[3] MCC letter of May 2023: https://midcoastcommunitycouncil.org/s/2023-05-10_MCC-letter_Ocean_Colony.pdf

*use of well and potable water. And, before the winter rains, we try to use up most of the pond water so they have maximum holding capacity once the rains start.*

*Having built the last 120 homes in Ocean Colony, we are big proponents of closed storm water systems instead of residential open systems, splash blocks, backyard retention, water barrels and other current approaches. We have been able to persuade the City* [HMB] *and water boards that we can direct a significant amount of the storm water from roofs, backyards, driveways, walkways and other impervious surfaces into collected underground systems to the golf ponds. In all these subdivisions we have built underground microfiltration equipment that can mostly filter oil, benzene, hydrocarbons and other contaminants before entering the ponds. Additionally, the ponds themselves function as filtration/sedimentation basins as the water in them has a 7-10 day turn around period before irrigation discharge. In coordination with the Ocean Colony Homeowners Association, we maintain all storm water inlets, outfalls, underground storm piping, the microfiltration systems on a regular basis or as needed to keep the systems properly functioning.*

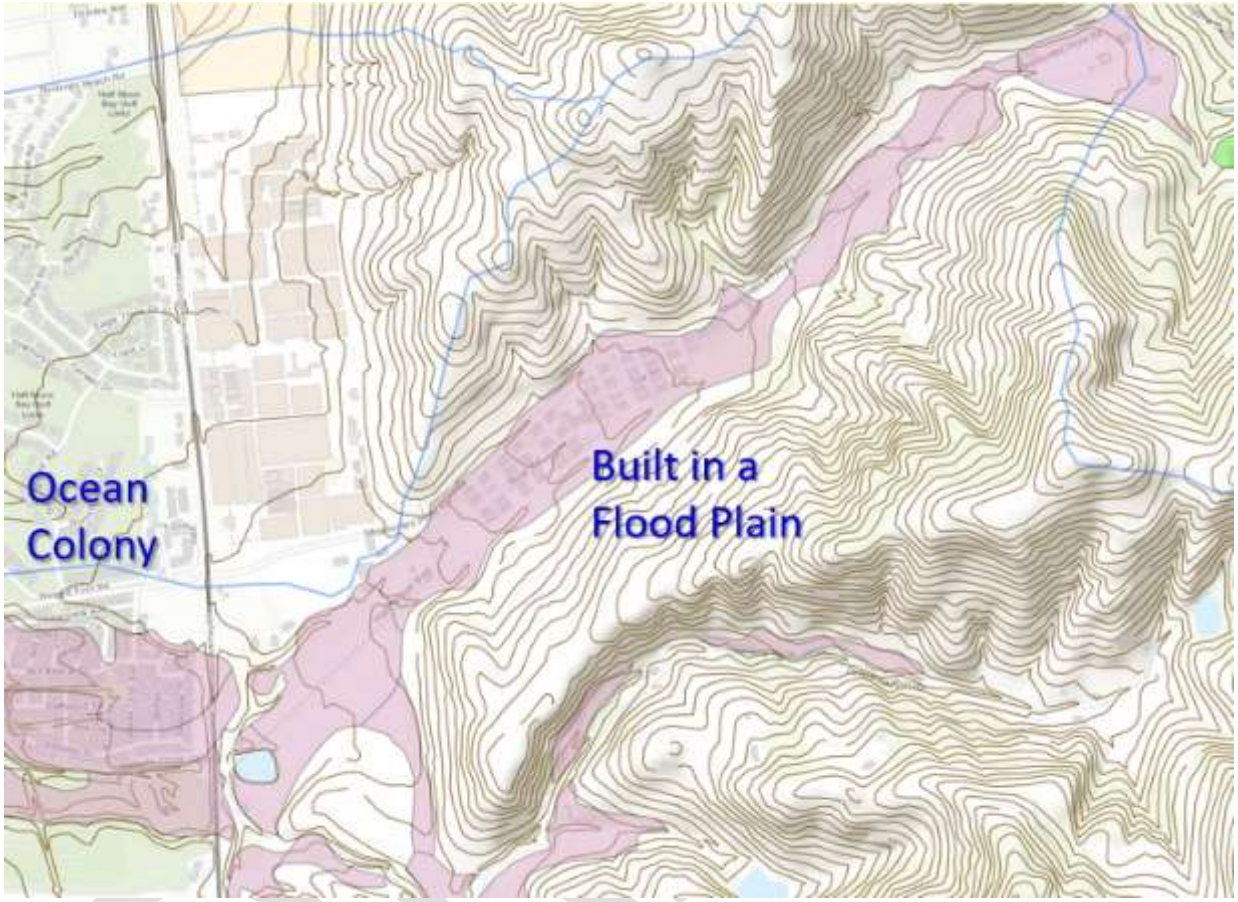
*Bottom line: Ocean Colony functions well from a storm water perspective because it has a unique and well designed and maintained closed storm water community wide system. That system includes ponds, extensive inlets and underground piping, interconnected components that can be controlled, flood back-up areas, and excess storm water discharge capabilities."*

We have received no cost information, but the system described above is far and away more advanced than current County and City practice, which, as this reports details, is not working.

## *B. Moonridge: An Unmitigated Disaster*

To the east of OC is an affordable housing development, Moonridge, owned by MidPen Housing. Moonridge is on the east side of Highway 1, as shown in the map. During the 1/1/23 storm, housing units were flooded on the first floor, damaging belongings and forcing residents upstairs for safety, and displacing them until repairs could be made. Supervisor Mueller visited the site shortly after the storm and provided the enclosed tweet/picture.

Moonridge was built in a flood plain, as shown in the map. We toured the site with then-Vice Mayor of HMB Joaquin Jimenez. He showed us a large gash on the hillside north of Miramontes Point Road, near the East end of the housing complex. Water had spilled down from that hill, flooded over the road, and entered the “bowl” in which the housing was built. After the storm, Bobcat tractors had been used to scour out a ditch on the north side of the road, to direct water to the west along the road, to

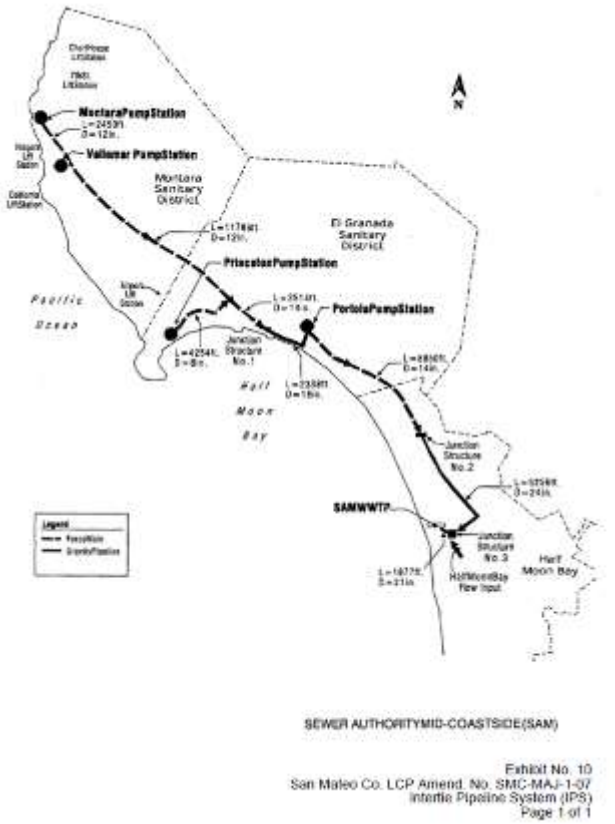



drain away from the housing. In the lawns surrounding the housing units there are small ‘weepholes’ apparently intended to drain water under the housing. They lacked any domed screens to prevent clogging, and were clearly inadequate to the drainage required for that storm. Residents reported frequent flooding in storms. Mr. Jimenez said that one solution discussed was to create a culvert from the rear of the road, running approximately north to south under the road and the lawns, to carry stormwater to a creek on the south side of the complex. At this writing we are unaware of any committed solution, but will update this report as we learn more.


We also visited the Canada Cove neighborhood, West of Highway 1, which is downstream of Moonridge and alongside the creek into which Moonridge runoff mostly occurs. This neighborhood also appears to be in the flood plain. Residents reported that the creek had risen 12' during the storm, not quite overtopping into housing, but coming close. The concern is that any drainage solution at Moonridge which speeds flow to the west and into the creek by Canada Cove could create damage there.

## *C. SAM: Flush with Challenges*

1. Background/Context

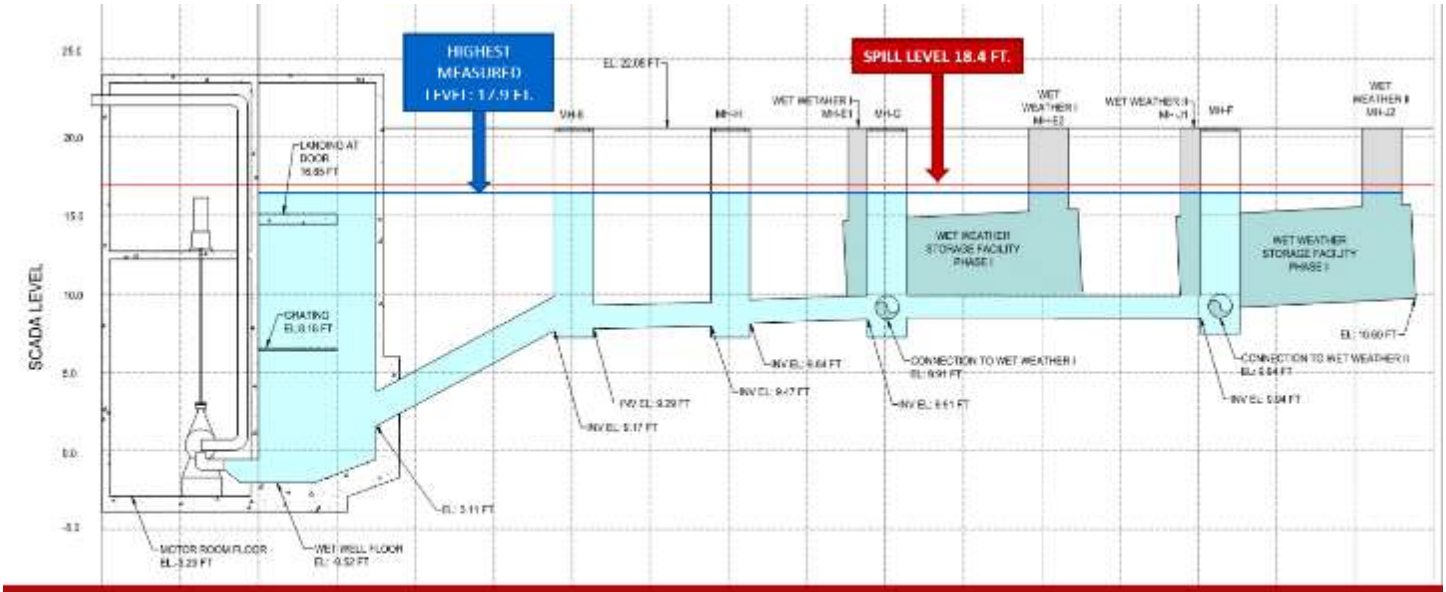



Businesses and residents on the coast from Montara to Moonridge are linked to a sewer processing plant in HMB, called Sewer Authority Midcoastside (SAM), and owned by a Joint Powers Authority (JPA) consisting of HMB, Granada Community Services District (GCSD), and Montara Water and Sanitary District (MWSD). Formed in 1976 and constructed in the early 1980's, the sewer system includes the 'collection systems' in each of the member agencies' neighborhoods, a sewer processing plant in HMB, and an Intertie Pipeline System (IPS) used to bring sewage from the northern member agencies into the plant (map at right).

The plant is adjacent to Pilarcitos Creek, and downstream from two SFPUC dams[4] on that creek. The SAM plant was cited in the 2018 San Mateo County Sea Level Rise Vulnerability Assessment as "**highly vulnerable** to the impacts of sea level rise".[5] The description in that report was precient: *"The Sewer Authority Mid-Coastside Wastewater Treatment Plant (SAM Plant) is highly vulnerable to the impacts of sea level rise. The facility's essential power distribution system is very sensitive to inundation, and would cause a loss of service at the plant if flooded. Adaptive capacity is low as there are no other plants to treat wastewater from this service area, and the power system redundancies are also low-lying. Exposure to coastal flooding is low; however, overall exposure is moderate* ***as the plant is presently subject to groundwater intrusion, and can be vulnerable to creek backup*** *caused by heavy rainfall that coincides with high tides".* Exactly those problems surfaced during several storms written after the report was prepared.

The IPS spans approximately 8 miles, and is pressurized for portions of its length. Pressurization is necessary to raise the sewage from low lying sewage collection areas (such as Princeton – Pillar Point Harbor) to heights sufficient to allow it to flow down to the Plant. Because of this pressurization, the IPS is also refered to as the "Force Main": a main pipe using force to move sewage. In particular, sewage from Montara has to rise over hills to reach El Granada, from which it can flow down to the Plant. The IPS also has tanks, called Wet Weather Storage (WWS) to hold sewage in the event that the pumps and pipes cannot move the sewage fast enough to the plant. The diagram below shows the design of the WWS in the Burnham strip.

[4] Pilarcitos and Stone (Pine) Dams: The Saved and the Dammed
[5] Item #2, page 10 of 123 of the 2018 San Mateo County Sea Level Rise Vulnerability Assessment




The IPS has benefited the SAM JPA in five (5) ways:

1. It allowed HMB and El Granada to upgrade failing sewer plants at less cost than doing it themselves, and split the costs of property, construction, and operation with its neighbors. At the time of formation, Montara had a modern sewer plant, well under capacity, but HMB and GCSD were polluting what became a Critical Coastal Area (CCA), the Fitzgerald Marine Sanctuary.

2. It gives HMB protection against severe wet weather events, when SAM plant operators can turn off the flow from the north and hold the sewage in wet weather storage at the Walker tank in Montara, so that HMB can consume 100% of the plant's capacity. This has happened several times in recent memory.

3. The IPS also serves all parts of HMB proper north of the SAM plant, including the "Cherry Stem" up to the Pillar Pt. Harbor – thus parts of HMB are served by GCSD sewers.

4. The IPS allows SAM staff to perform maintenance on the system by shutting parts of it down. As HMB has no wet weather sewer storage of its own, tanks in the IPS can be used to hold back sewage at the WWS pumps until work is done. This has occurred several times, e.g. when the IPS had breaks and had to be fixed. Also, while laying new force main, or while doing major plant repairs, sewage can be held upstream. Similarly, when major plant electrical work must be done, sewage has been held upstream from the Plant in the IPS plant until processing can be restored.

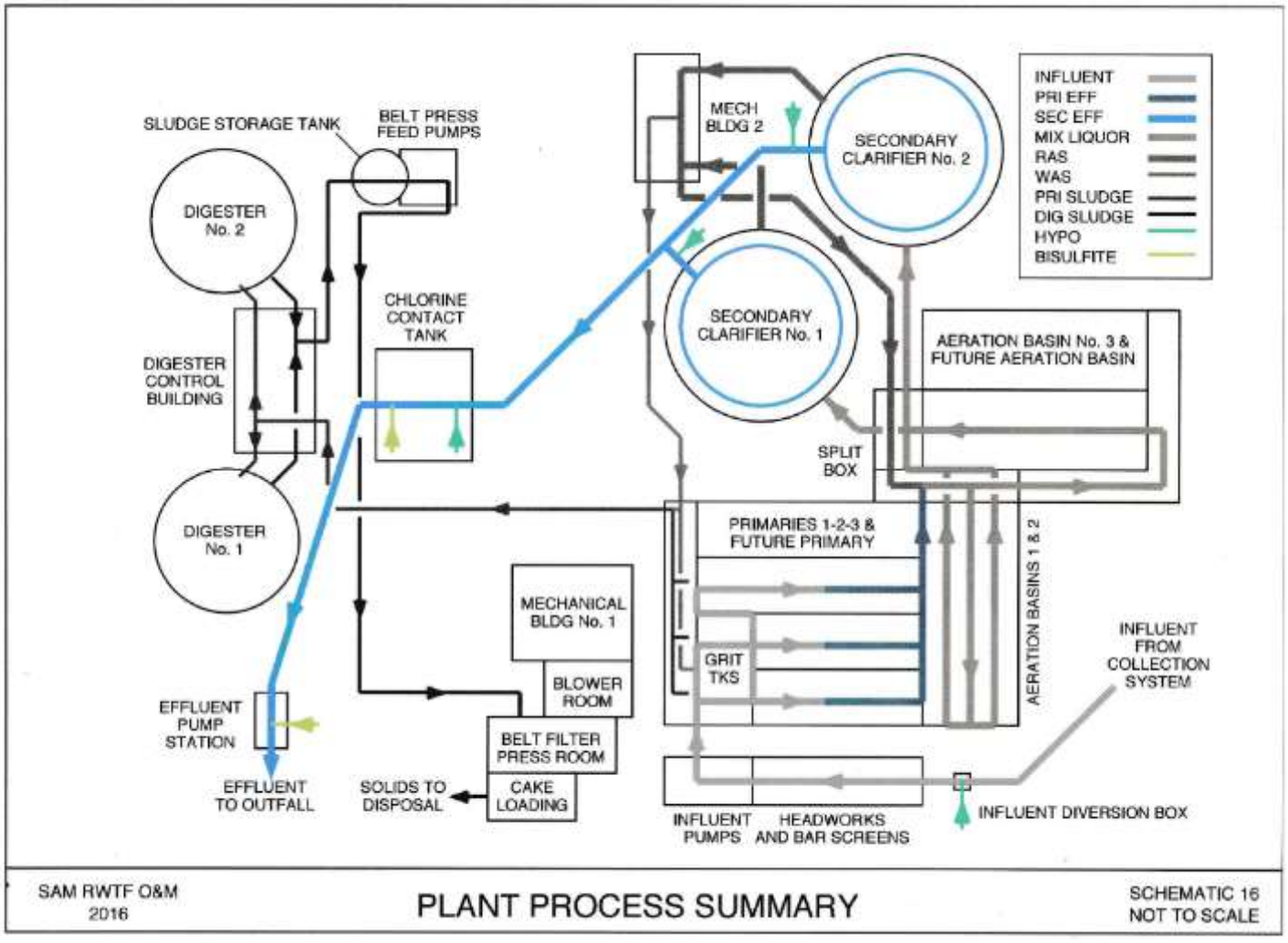
5. The IPS has served as an equalization basin to reduce flows while SAM processes a backlog of waste and/or to even out flows (e.g. during a drought) so that a minimum fluid volume is always available to keep sewage moving.

The capacity of the SAM system is defined by several metrics as shown in the chart at right.

SAM WWTP's design capacity

- Average Daily Dry Weather Flow: 3.69 MGD
- Average Day Maximum Month Flow: 5.0 MGD
- Peak Day Wet Weather Flow: 9.0 MGD ★
- Peak Hourly Wet Weather Flow: 15.0 MGD

MGD refers to Millions of Gallons per Day, which is a measure of the rate of flow. The Plant is designed to process a maximum daily average of 5 MGD over an entire month. When flows peak, the Plant is designed to handle 9 MGD in a single day, or for a single hour, the Plant can handle flows which would reach 15 MGD if they persisted for an entire day, meaning 0.625 MGD in a single hour. The plant has several repositories in its design which can hold sewage while processing - including aeration basins, clarifiers, and digesters, allowing it some degree of flexibility.



For this discussion, we shall limit ourselves to discussion of the capacity of fluid flow, which is different from the "load" of pollutants to be removed[6]. The fluid flow is affected most by wet weather, because excess water enters the collection systems and pipes through a variety of cracks and holes (e.g. manhole covers) caused by stress and erosion over the years. Water also enters via unapproved property drainage connected to the sewer "laterals" or pipes which drain from buildings to the sewer mains in the streets. This excess fluid is called I&I – Infiltration and Inflow[7], and it is the mechanism by which stormwater can overwhelm the Plant.

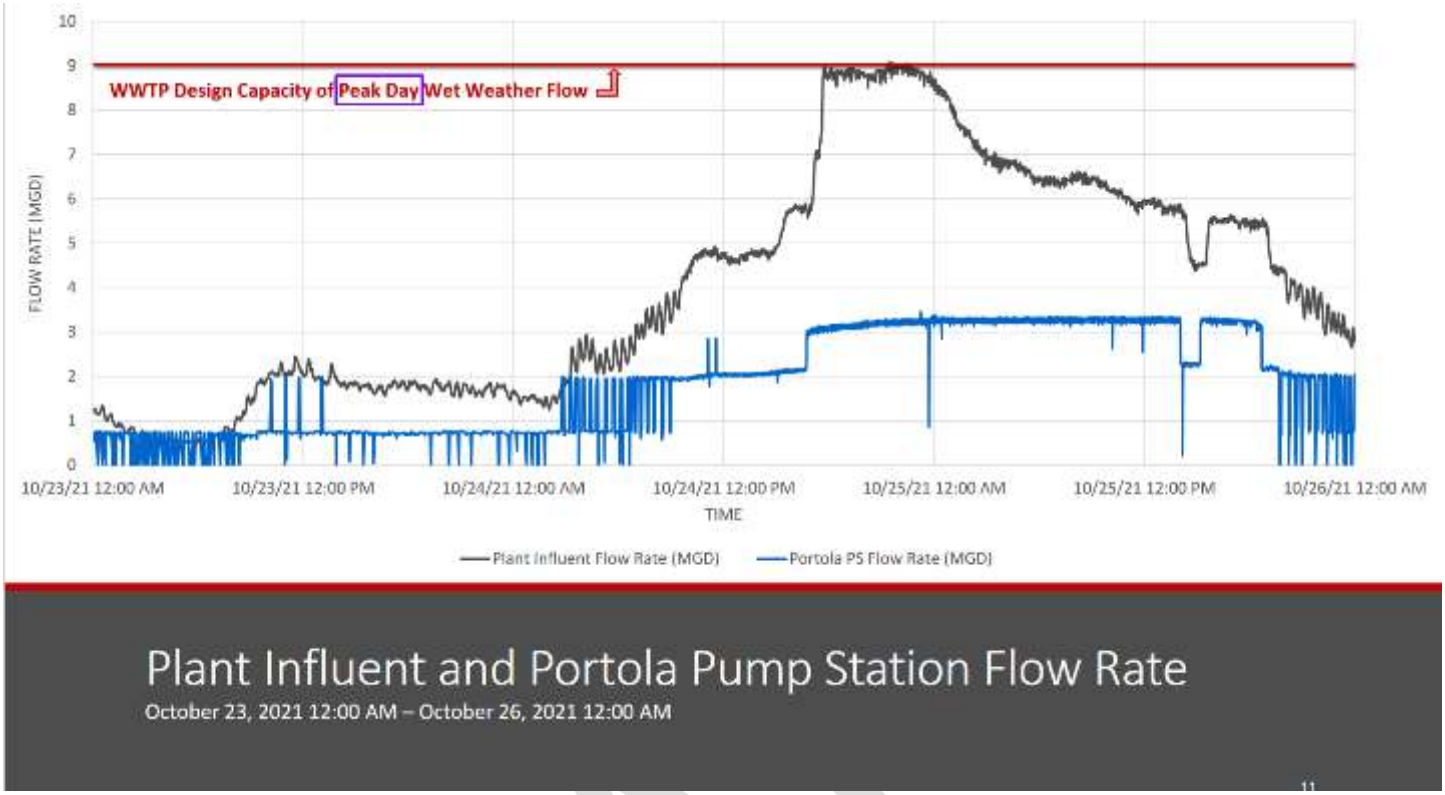
2. Stormwater Vulnerabilities

The SAM system has already exceeded its design capacity during wet weather storms each of the Decembers 2021 and 2023-4, and come close several other times. Sewer system overflows (SSOs) have been numerous, with the spill in Jan. '23 being 3 to 4 million gallons due to an overstressed Intertie Pipeline System (IPS). SAM has a long history of SSOs, most of which have been directly attributable to failing and/or inadequate infrastructure. A total of 101 SSOs occurred in the SAM service area from January, 2011 to May, 2017.[8] The previous largest of these spills (344,000 gal in March 2017) resulted in a $300,000 fine and regulatory enforcement action by the San Francisco Regional Water Quality Control Board (RWQCB) directing SAM to complete replacement of portions of the IPS and add more sewage storage capacity in order to reduce excessive wet weather flow into the SAM treatment plant. IPS sections 1-3 were replaced in 2018 and SAM also initiated a preventative maintenance program. Wet weather sewage storage (WWS) capacity was also increased from 200,000 gallons to 400,000 gallons next to the Portola Pump Station in 2021. This storage capacity, along with the 434,000 gallon capacity of the Walker tank at the Montara Pump Station, allows SAM greater flexibility in regulating flow into the plant from GCSD and MWSD. However, since HMB has no storage capacity and HMB is now routinely averaging more than 60% of the total sewage flow into SAM, the risk of overflows during significant storm events remains high. Within 2 months of adding


[6] For a discussion of organic strength of wastewater see: https://www.thewastewaterblog.com/single-post/2019/01/13/bod-cod-and-toc

[7] Infiltration/Inflow (I/I or I&I) is the process of groundwater, or water from sources other than domestic wastewater, entering sanitary sewers. I/I causes dilution in sanitary sewers, which decreases the efficiency of treatment, and may cause sewage volumes to exceed design capacity. Although inflow is technically different from infiltration, it may be difficult to determine which is causing dilution problems in inaccessible sewers. The United States Environmental Protection Agency defines the term infiltration/inflow as combined contributions from both.

[8] See Midcoast ECO's SAM Status Update and SAM/MWSD Flow Analysis Report – March 7, 2018 for details.




WWS capacity of 200,000 gals on the Burnham Strip, on October 25, 2021, the Portola tanks were filled to within 6 inches of overflowing during a significant storm event. Furthermore, from June, 2017 to December, 2022, there were 28 additional SSOs that spilled a total of over 10,000 gallons of raw sewage with less than half of that volume recovered.

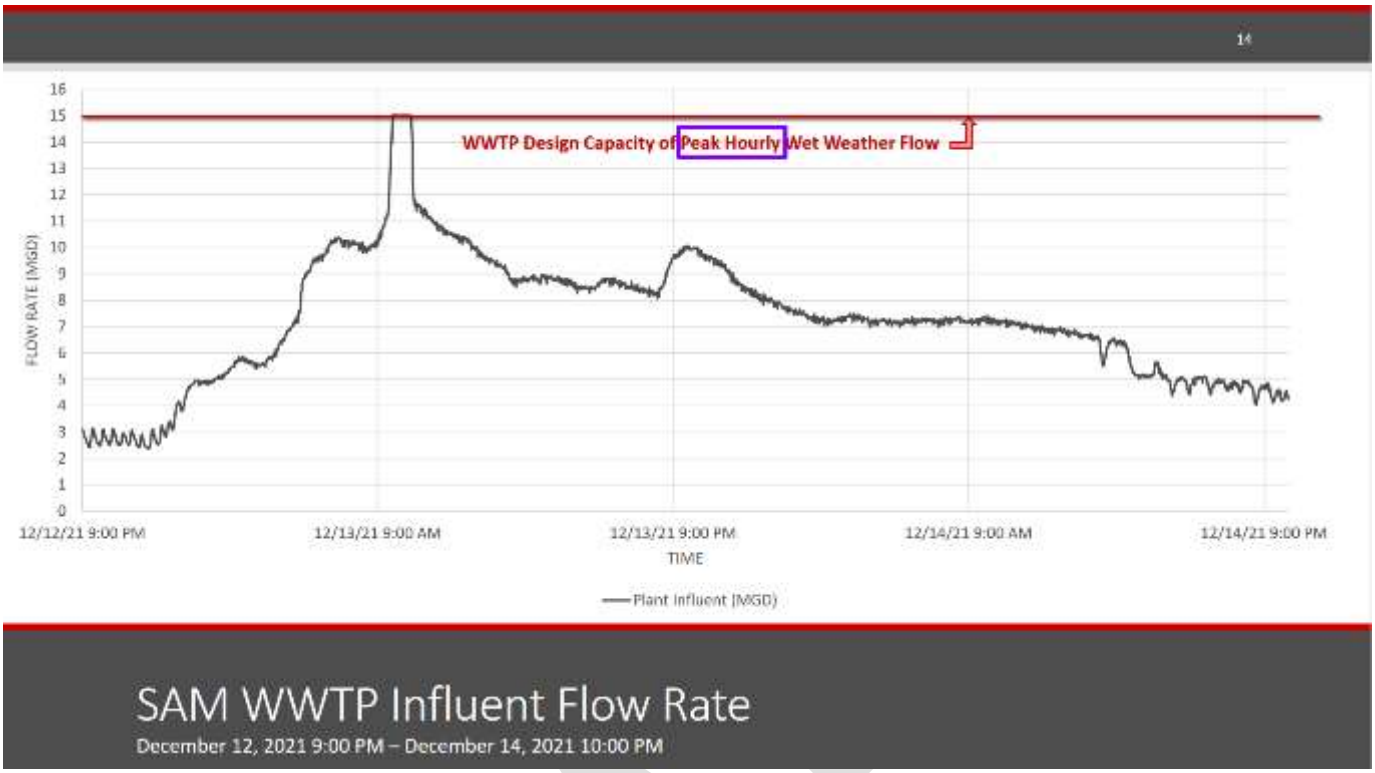
The plant has been challenged to the point of catastrophic failure on at least two occasions in the last few years. In December 2021, a storm caused an overflow at the plant, which nearly shorted out the entire electrical building. The flows that day exceeded the ability of plant instrumentation to measure them, which had been set at 15 MGD, per the expected maximum hourly flow. This overflow occurred in spite of the fact that the upstream flows from the IPS were held back in the WWS tanks. Following this event, the instrumentation at the plant was recalibrated for higher volumes, even though they exceeded the peak design capacity of the plant.

## Storm Event December 12 – 16, 2021

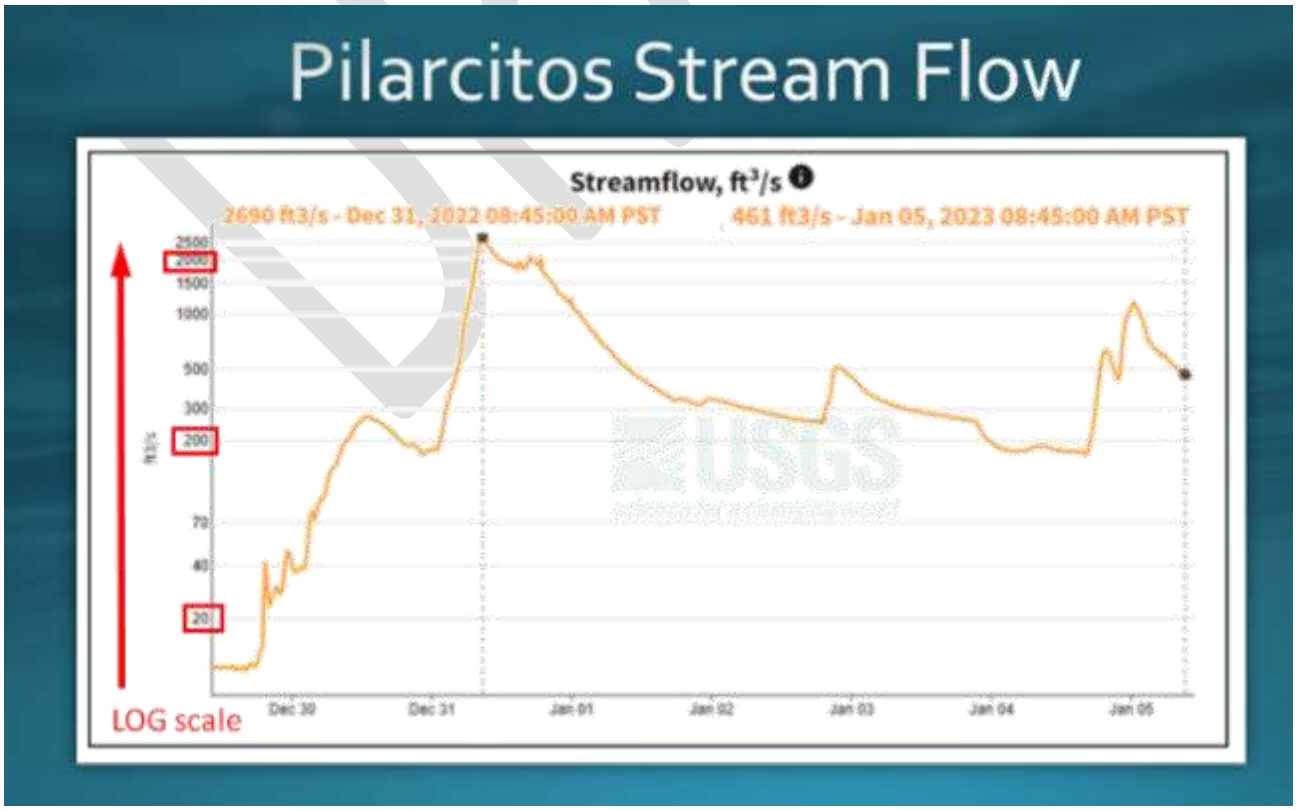
- Total rainfall of 6.66" at the Plant
- Maximum rainfall recorded at 4.71" on December 13, 2021
- Maximum influent flow recorded at **15 MGD*** for almost 1 hour at 9:37 am on December 13, 2021

*The influent flow rate was likely to be higher than 15 MGD because the flow sensors are calibrated to measure a maximum of 15 MGD

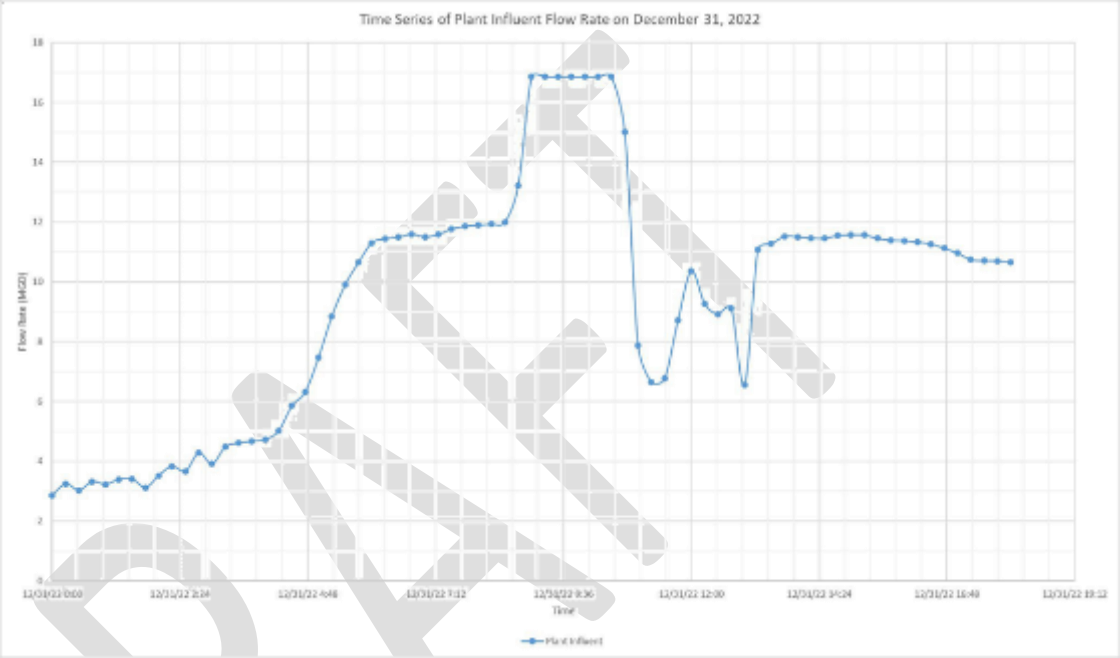
- Wet Weather Storage Facility reached a level of 17.2 ft. on 11:49 AM on December 13, 2021




On December 31, 2022 to Jan. 1, 2024 (the New Year's Eve Storm), a major storm event caused Pilarcitos Creek to flood into the plant, resulting in a partial shutdown and near total failure (details in this article). As shown below, (note the LOG scale on the Y-axis) the creek flow increased 200-fold during a 2 day period. Whether additional water was released by SFPUC from upstream dams, or the



flow suddenly increased on Day 2, is unclear. Operators curtailed SAM's IPS flow from GCSD and MWSD, which caused an overflow of the Walker tank in Montara and sewage overflow into the ocean for several hours. Once again, the instrumentation at the Plant was inadequate to measure the peak flows, estimated at 20 MGD. The next day, major breaks in the IPS in Moss Beach produced additional SSOs of an estimated 3 to 4 million gallons. The associated costs for these unplanned emergency repairs have already exceeded $1 million as of the beginning of 2023 and the risks for further impacting events remain. Fines by the RWQCB remain to be determined.




Note that the SAM plant has sufficient capacity during DRY weather conditions. The problems occur during WET weather, when inadequate stormwater management creates I&I throughout the collection systems feeding the plant. One example is Moss Beach stormwater which flows down Stetson which runs into a storm drain and then, uncontained by pipes or culverts, runs through the property at 2015 Carlos St. and lands directly on a sewer manhole cover, and drains down Carlos to Etheldore, flooding that intersection rapidly during rainstorms. Other examples are throughout HMB, which has no WWS to buffer inflows. As a result, even when sewer flows are held in WWS on the IPS, the plant still floods. *"…the percentage of peak flows from HMB system entering the SAM Plant increased further for storms with antecedent rainfall. This is because antecedent rainfall saturated the soil and increased ground water infiltration into the HMB sewer system, leading to a higher peak flow from HMB system during the storm event than the other two agencies."*[9]

Further, according to a San Mateo County Sea-level Rise Vulnerability Assessment from 2018, the SAM sewage treatment plant is highly vulnerable to sea level rise and creek backup and is subject to ground water infusion in the event of flooding. Inundation would likely cause a loss of service. For these reasons, the plant's adaptive capacity was rated as "low". And this is part of what we witnessed on 12/31/23 when the creek overflowed.

[9] . These findings were confirmed by reports and presentations to SAM by Climate Adaptive Systems, LLC on 2/23/24 et. Seq.

Also, the SMC 2021 Multijurisdictional Local Hazard Mitigation Plan lists Pilarcitos Dam as Extremely High Hazard. Built in 1866, it has been long flagged as a vulnerability, in this case to both the City of HMB and the SAM Plant.[10] On Figure 8-2 therein, the Inundation Area includes a central portion of the City of HMB, and crosses Hwy 1. The multiple calculations of property values vulnerable in that document are not broken out for the Midcoast or HMB regions.

The linkage between stormwater in HMB and the vulnerability of the SAM plant is one reason we have included stormwater observations from several HMB neighborhoods in this report. Unless I&I is controlled in HMB, the current SAM system faces recurrent and potentially catastrophic damages, which would cripple civilization on the Coast. In addition, the WWS expansion on the Burnham strip in 2021, which was limited to 200,000 gals instead of 400,000 gals due to HMB reservations and a pending lawsuit, must be expanded once again.

HMB seems to be aware of the I&I issues, at least in part. For example, on Wavecrest a few years back the City "domed" a number of the manholes on the sewer pipes extending from Ocean Colony and the Ritz, to elevate them above the standing water on those lands, which persists for weeks during the rainy season (photo below). Note that some of them have developed cracks.

Further, as a result of the PG&E gas pipeline explosion in San Bruno on Sept. 29, 2010, PG&E was required to undertake a camera survey of sewer pipes. We obtained a copy of the report given to GCSD, and we spoke to the firm sub-contracted by PG&E to do the HMB survey, as well as to the technician in the field doing the HMB survey as he was working. Thus, we have reason to believe HMB has a detailed understanding of sewer pipe conditions throughout the City, but we have not received a copy of the report.

The C/CAG seems aware of these stresses in HMB as seen in a concept design prepared for stormwater capture and treatment in the lands south of the SAM access road.

Finally, note that I&I increases the sewer costs for each resident, as the volume of sewer flow is a basis for charging to each local agency. There have been several reports of unpermitted connections to the sewer system, presumably in an attempt to channel drainage off properties vulnerable to flooding. The lack of adequate stormwater management is thus a cost burden to all sewer ratepayers.

[10] Table 8.1 pp 8-5 of SMC 2021 Multijurisdictional Local Hazard Mitigation Plan

## *D. 2nd St. Montara: Down a Creek Without a Paddle*

1. Background

Homes on 2nd Street in Montara experience substantial flooding during rainstorms. One resident claims she spent over $100,000 of her money to protect her house from the upstream flooding which has continued to intensify over the years. The storm flow comes down from the top of the hill on 6th. There is no stormwater channel in some sections, which results in deep channeling and runoff down 2nd. The width of the road has been narrowed by repeated flooding. To add insult to injury, there is no prepared stormwater channel for the recent new construction on 3rd, and the County has approved new construction in this area for 370 2nd St. and on 3rd Street without acting on the longstanding drainage issues. Since 2005, the increased runoff in, around and over 2nd Street has resulted in flooding and monetary damage to 2nd Street homes and the primary access road. In Kanoff Creek (aka: The Ditch) there has also been willow expansion, increased sedimentation, and significant road


erosion. These issues are documented in the Presentation in Exhibit 1 highlighting stormwater issues on 2nd Street, Montara.

The history of stormwater impact on 2nd Street in Montara goes back to at least the late 1990's. In the late 1990's/early 2000's new housing was approved. Runoff from those homes and sections of the Montara watershed were directed to open space along 2nd Street. Recent additional development behind homes on 3rd Street between LeConte and East, has increased the creek runoff causing:

- Significant untreated runoff is deposited into the Monterey Bay National Marine Sanctuary.
- Continued erosion of 2nd street and loss of roadway - a serious safety hazard which impacts access to home and property.
- Increased liability issues for homeowners and county.

- Increased risk to exposed water and sewer lines due to roadway erosion.

These pictures show the loss of roadway due to repeated stormwater damage:


There have been multiple local, regional and county-wide meetings, producing documentation and reports that highlight stormwater issues along 2nd Street. However, no relevant stormwater infrastructure has been created. Instead, small-and large-scale “development” continues, with increased run-off directed through the county infrastructure, down to 2nd Street. The result is the channel continues to erode the road, water and sewer lines are being jeopardized, and overflow from the creek floods 2nd street. The problem has gotten worse with every major storm.

Residents state the “100-year flood” is now the “every few years flood”, and the lack of action has exacerbated a problem that was far less in 2007, and now is significant. Since 2007 local and regional representatives and county staff have acknowledged that this is a problem that needs to be addressed, but there has never been funding to address the problem.

Residents believe the County strategy seems to be to wait until there is no road access and no water and sewer lines on 2nd Street, which would trigger some emergency funding. Residents believe that there are recommendations, plans, and lower cost strategies that can and should be implemented before the worst happens. If action is not taken, this will be a much more expensive and difficult problem to address and will undermine MWSD’s water and sewer infrastructure, as well as residential properties.

MWSD has already had to replace sewer lines in the 2nd street area because of flood-related damage.

2. History

- In the late 1990's/early 2000's new development was approved. Runoff from those homes and sections of the Montara watershed were directed to open space along 2nd Street.
- In 2005 significant runoff from the county systems flooded homeowner's yards, road surface and creekside of 2nd Street
- 2007 to 2009 Midcoast Stormwater Drainage Committee (MSDC) was convened to study the extent of drainage problems on the Midcoast. The report stated that the County runoff infrastructure was inadequate to handle the amount of runoff currently flowing through the system, and specifically listed/named 2nd Street as the #1 project priority to be addressed. 2009 HMB Review article on the problems.
- Additional flooding episodes have occurred in 2008, 2014, 2015, 2022, and again in 2023.
- 2009 Approval received from DPW to develop a conceptual design report including environmental review to improve drainage on 2nd Street, Kanoff Street, and East Avenue in Montara. In June, 2009 Final Report recommendations approved by Board of Supervisors. **Result:** Drainage Study Completed.
- 2010 "Drainage Improvement Study for the 2nd Street, Kanoff Street and East Avenue Areas of Unincorporated Montara, County of San Mateo, California prepared by Creegan & d'Angelo" **Result:** No elements of the plan were ever started or completed.
- 2010 DPW Vegetation Recommendation and Approval for 2nd Street Ditch. These recommendations were approved by Dept of Bldg and Planning which authorized vegetation

*Figure 3 Gully on "East" between 4th and 3rd Sts.*

management and sediment clearing in Kanoff Creek. Approval was completed by necessary parties and work was to be completed in the fall of 2010. **Result:** No clearing of vegetation.

- 2023 May: Supervisor Mueller and his team did a site visit to view and assess the damage being done by stormwater on 2nd Street in Montara. **Result:** Meetings and discussions regarding next steps. Supervisor Mueller identified his office as the lead for exploring options to address this issue.
- 2023 September: RCD staff and a contingent of 2nd Street residents met on-site to tour the areas impacted by flooding and erosion from upslope runoff. The tour included the creek alongside 2nd Street and stormwater infrastructure in the immediate area impacting 2nd street and the surrounding area. **Results:** RCD Produced recommendations and ideas for addressing the stormwater flooding occurring on 2nd street and also developed a proposal and is pursuing funding to address this issue which unfortunately was not funded. RCD notes and design proposal are included in section D.3 below.
- 2023 July: MCC Stormwater Management on Midcoast Presentation. In that report it was noted that 2nd Street residents have documented concerns about stormwater since 2007. Since that time only reports, and no stormwater management construction, has resulted despite one resident on 2nd Street spending over $100K to preserve her house. There is also an increasingly deep ravine on East Street between 4th and 3rd Street, that is now concerning and dangerous to nearby residents. **Result:** Initial report and continued discussions and evaluations of ways to address stormwater flooding on the mid-coast.
- 2024 May: Meeting with Supervisor Mueller's office, DPW and RCD staff to discuss where we are and what are actionable next steps. **Result:** DPW will do a site inspection to see what is possible in the future to address this issue. However, it was noted that there is no funding available through the county to address this issue. Ann Stillman was sent historical and current documentation regarding 2nd Street.
- 2024 July: Montara resident submitted a project proposal to CRISP to address stormwater issues in and around 2nd Street in Montara. In addition, the MCC also submitted a letter and table of projects for CRISP. The 2nd street neighborhood is item 4 on that list.
- 2024 November: Supervisor Mueller and Ann Stillman from DPW met and discussed the status of the stormwater project(s) with residents. Ann shared that her team is working with RCD on planning improvements. The Supervisor will be meeting with RCD to receive an update.
- 2024 November: A water gauge and a camera were set up in Kanoff creek near Farallone View School. Details for this work should be provided by RCD, residents are assuming this was done by the engineering firm they are contracting with for the report.

***Sept. 2023 Attendees:***

2nd Street Residents
Sue Curran
Mary-Anna Rae
Bruce Hulgren
Patrick Kobernus
Henry Poon

Peter Bove
Mary Duffy

RCD Staff
Joe Issel - Director of Stewardship
Noah Katz – Water Quality Program Manager
Jim Robins- Senior Technical Director

3. Alternatives and Design Considerations

RCD Notes and comments from residents and MWSD are combined below in a discussion of potential solutions and decision criteria. In addition, Exhibit 6 from a resident biologist provides historical detail on the creation of this flooding problem, and additional design solutions, some of which overlap the RCD approach, which follows.

*a) Assessment of Issues:*

1. Water is directed to the 2nd street channel via County culverts, ditches, and roadways, as well as private property, to the channel on 2nd Street. This increase in storm water runoff to this area is likely one of the main sources of the 2nd Street flooding and erosion issues.

2. The lack of maintenance, armoring, and capacity of the drainage channel (the creek/ditch/channel along the north side of 2nd Street) where upslope water is being deposited is contributing to erosion of 2nd Street and a reduction in the capacity of the channel to convey water downstream.

3. Downstream of 2nd Street has not been observed by RCD staff recently, however, reports from 2nd Street residents indicate that water sometimes is slowed down or backed up into 2nd Street. This is likely due to the downstream channel capacity reaching its limit or potentially coinciding with high tides that might decrease the ability of the channel to drain

An elaboration on point 2 above provided by residents is that the County is not PROACTIVELY maintaining the drainage channel where this water is being deposited, and it has now become overgrown with willows*. "We are also fans of the willows along the creeksides, but the willows are clogging the main channel and sending water over and onto 2nd street. This happens in large part because of the sand collected in and around the base of the willows in the main channel."* Per another resident*: "It took a call from our neighbors "downstream", to the maintenance yard, to get them to clear out the channel that is on county property. If they neglect to clear out the channel there, water will back up along 2nd street. So it doesn't appear they are highly motivated to handle any part of this problem.*"

*b) Short Term RCD Approach:*

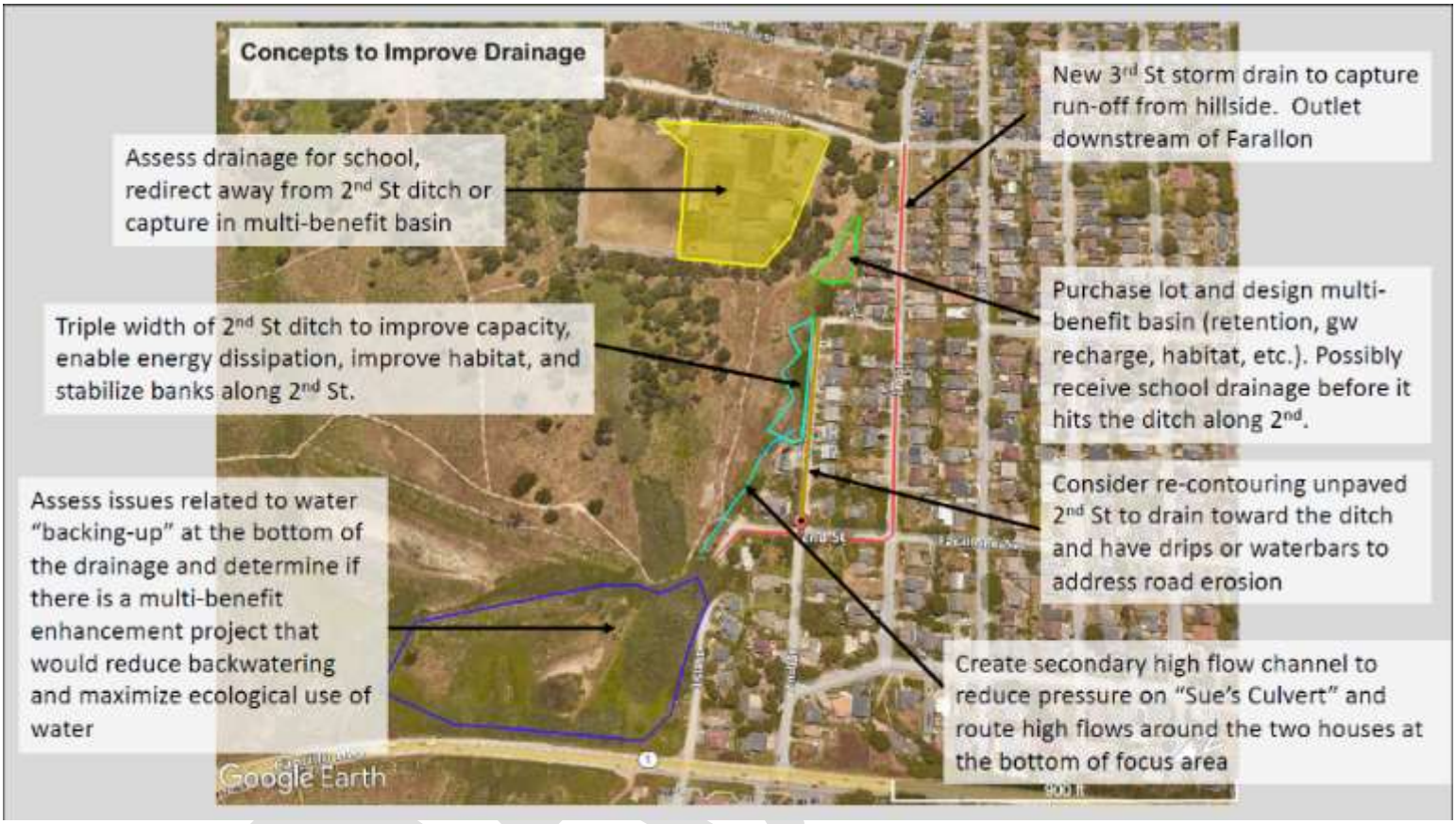
1. For the near term clearing a path and armoring parts of the channel, which might require emergency permits, through the willows in the 2nd street creek would help with the water coming over the banks of the creek and with erosion of the channel. RCD advised that willows are kept in certain locations to limit further erosion of the road and homeowner's property. The RCD cautions that without adequate study and design, these efforts could increase erosive forces in the channel and downstream. However, the RCD also recognizes the need for immediate action.

2. RCD to reach out to Supvr. Mueller's office and ask that funding be provided through the Measure

K funds. These funds are in part to be allocated for emergency response issues in SMCO.

3. During rains, be sure to video and take photos of the flooding.

*c)* Longer Term RCD Ideas *(See map of concepts to improve drainage)*




1. Secure funding to update the assessment that was done by Creegan + D'Angelo Infrastructure Engineers in 2011.

   a) Include an assessment of issues related to water "backing-up" at the bottom of the drainage and determine if there is a multi-benefit project that would reduce backwatering and maximize ecological use of water.

   b) Evaluate purchasing the lot above 2nd Street and investigate design options for a multi-benefit basin (water retention, groundwater recharge, habitat, etc.). This could help slow down and filter some stormwater that's flowing down from the school before it reaches the channel along 2nd Street. According to residents, years ago this was a catch basin that collected a significant amount of runoff and allowed water to percolate into the water table. The County might be interested in purchasing that property from the current owner. This could create a win-win for the county as well as the owner given the owner cannot build on wetlands (which this basin once was).

   c) Assess drainage on the school and identify opportunities to direct it away from 2nd street and/or capture in the multi-benefit catch basin described above.

2. Suggest all culverts along 2nd street be cleared out so water can flow into the creek and not into homes.
3. Evaluate re-contouring unpaved 2nd Street to drain towards the channel and installing water bars or rolling dips to help address road erosion.
4. As pointed out in the Creegan + D'Angelo, 2011 report, it appears that installing a pipe running down 3rd Street to capture runoff from the hillside starting at the intersection of Kanoff and LeConte and outletting downstream of Farallone would divert a significant amount of water from 2nd Street.
5. RCD submitted a pre-application to a NOAA grant program requesting funds to initiate this work but did not receive funding. In the meantime, the RCD continues to keep an eye out for funding sources. RCD was awarded Measure K funding and some of that will can be allocated to create an updated report regarding stormwater runoff in Kanoff creek.

4. Evaluation of Alternatives:

The obvious cause and effect here is the sealing of soil surfaces with impermeable surfaces and the resulting property damage. The flooding and erosion issues created by runoff from sealed surfaces into Kanoff Creek is most visible on Second Street. However, a focus on Second Street without addressing the remainder of the dewatering system seems problematic. Runoff is introduced from East to West starting from Tamarind Street and the upper Kanoff Street section all the way to HWY 1. Starting at Le Conte Street, a number of drainage ditches crossing 3rd street and paralleling East and Farallone Street deliver runoff from the entire west side of Montara, from first to 10th street, as well as from Farallone View School, into Kanoff Creek.

Today most of the water in Kanoff Creek is unnatural runoff that can't percolate into the ground and replenish the aquifer. However, creeks are natural ditches that drain a defined watershed, like Kanoff Creek. Geomorphology, soil types and vegetation along "Farallone View Valley" further indicate that Kanoff Creek is a natural stream that is currently also used as runoff ditch.

Kanoff Creek's artesian(!) spring does flow even through the dry season and drought years. It is mainly unknown and currently doesn't reach the surface because a very expensive French drain system under 3rd/Kanoff between Le Conte and Tamarind street redirects and disperses the water back into the ground. SMC Public Works has the "as build" documents.

MWSD has water and sewer lines and services along Kanoff Street. Flooding can contribute to unwanted Inflow and Infiltration (I&I) into our sewer system that potentially can overwhelm pipes and result in sewage spills. Flooding can be a health concern for our water system if a secondary issue like a water leak results in a pressure drop in customers' or District water lines. While damage to MWSD's facilities due to flooding has been minor**, the erosion in the upper section of the creek has damaged the sewer trunk line within Kanoff street so severely that the line needed replacement**.

It should be understood that changing the flow characteristic of one section of a stream impacts the entire geomorphology of the river from spring to river mouth. Flow improvements in a lower section of a stream impact the streams gradient, flow velocity, and sediment transport. Increasing flows in one section without taking the upstream areas into account can lead to higher velocity of water flow and enhance the stream's energy and its capacity to erode riverbed and banks upstream. With the

increased velocity, the river's erosive power is amplified, which leads to intense vertical erosion and the creation of gorges - as is observable in Kanoff Creek just west of Le Conte Street. Due to shifting sediment loads and transportation[11], the flood risk increases even for upstream creek sections after flow "improvements" are made.

Addressing one section of Kanoff street is simply shifting the problem to other areas. Only by addressing the entire profile of the dewatering system can drainage be improved to avoid property damage due to storm water runoff. Backwater effect", or "backwater curve" is the hydrologic term used to describe the influence that downstream conditions, such as changes in flow capacity, obstructions, or modifications to the river channel, have on the water levels and flow characteristics upstream. If one alters the conditions of a stream anywhere the entire flow profile of the stream is affected. Engineers usually work with hydrologic models to predict and analyze the backwater effect of stream alterations, which approach seems necessary in Montara.

In recent conversations with the RCD, the great potential of expanding the already existing wetland areas in the East Street section of Kanoff Creek was mentioned [this is also detailed in Exhibit 6]. The idea being to slow down runoff and allow flooding in this area to reduce the volume of water downstream by retention and ground infiltration. This approach would have the benefit of aquifer restoration, prevention of saltwater intrusion into the aquifer which supplies Montara water, and would help private well owners in the area that experience elevated salinity levels in their wells.

An initial design alternative to line portions of Kanoff Creek with concrete raises serious concerns. Concrete lining of drainage ditches is a common practice to avoid erosion. However, concrete lining of streams that flow continuously for months during the wet season and for weeks after rain events is not good practice for obvious environmental reasons and for the devastating backwater effect significantly changing the unlined portion of the creek. It should be noted that the fractured granite prevalent in Montara is what allows rapid replenishment of MWSD's water supply, and which results in continued draining for months at times after storm events.

The community should decide now if the entire creek should be concrete lined and serve as drainage ditch to dewater the watershed as fast as possible, or if the creek should be restored and the natural flood plains expanded on. A creek restoration would avoid further damage to property along Kanoff Street and benefit the environment by decreasing total water flows, increasing aquifer recharge, preventing salt water intrusion, reducing sediment loads into the Monterey Bay Marine Sanctuary, and increase plant and animal diversity. MWSD indicated support for this approach.

MWSD staff has discussed the restoration approach with RCD's Noah Katz (who has since left), and is concerned about the current concrete lining design approach. Concrete lining of the entire creek would prevent property damage along the channel, but have quite opposite environmental effects. A partial concrete lining has not only negative environmental effects, but knowingly shifts the property damage to other areas, increasing flooding and erosion risks downstream and upstream. MWSD would not support this design, and MWSD is the primary stakeholder in watershed management in Montara.

[11] Transportation effects: Changes in flow velocities and water levels upstream due to downstream modifications can alter sediment transport dynamics. Increased flow efficiency can lead to more erosion upstream as the stream adjusts to carry more sediment downstream, i.e. erosion is transporting material.

***RCD plan – impact considerations:***

With funding there would be an opportunity to begin to address the stormwater issues in Montara. It is believed that ideally one would start upstream and work your way downstream when addressing a watershed issue. However, we have an opportunity to pilot an RCD plan that slows down and captures stormwater before it enters the Fitzgerald Marine Reserve Critical Coastal Area (FMR CCA). The proposed plan would benefit the aquifer, help to protect vital sewer and water lines, and clean out some of the wastewater before heading to the ocean.

However, residents did hear from RCD that they would be recruiting and selecting a design firm to "refresh" the 2011 design plan. Resident notes from that call are as follows:

- There is measure K funding remaining and some would be applied to 2nd Street stormwater issues
- Funds must be used within a year
- Outcome will be to use the funds to refresh the 2011 design plan
- RCD has an engineering team they like to work with to do the plan
- Should also include environmental impact
- Engineering firm will come out for a site visit
- Will be looking for funding for the implementation
- May be able to help with emergency response ideas and action

5. Maps and details of Stormwater drainage in Montara

- Culverts
- Drainage map - North Montara
- County System water diversion towards 2nd Street
- Map of Artificial and Natural Hydrology for Montara
- Caltrans wetland restoration project

6. Conclusions & Recommendations:

- Continue RCD's funding initiative to obtain Measure K funds for engineering assessment and design.
- Proactively maintain current drainage to avoid spillover damage
- Consider the entire Montara watershed in design of solutions beyond RCD's initial design, such as those described in Exhibit 6.
- Involve MWSD in the design review process
- Need for both Hydrologist and Geologist sign-off on stormwater system designs

## *E. El Granada: Quandary in the Quarry (Park)*

*Note: The numbered photographs referenced in this section are available for download HERE, and will be appended as Exhibit 2 to this document.*

1. Introduction

El Granada, like the rest of the Midcoast, suffers from a decades-long lack of an adequate and integrated stormwater management system. This results in endangering the health and safety of neighborhoods and their residents from the repeated flooding of residential streets and properties from stormwater runoff. Stormwater runoff encompasses rain water runoff from both impermeable (streets, driveways, etc.) and permeable (landscaping, undeveloped lots/areas, etc.) surfaces as well as diverted drainage from erosion control.

During and after the storm in early March, 3/10/2023 thru 3/12/2023, observations were conducted throughout El Granada to determine stormwater runoff conditions. This was not the most severe storm in recent history, but it provided an opportunity to photograph the drainage pathways for this report. Those photographs, with explanations, are contained in Exhibit 2 and referenced in the discussion following. The results were mixed. El Granada, as a whole, has very "limited controlled runoff" yet a very few areas did display runoff that was controlled. The term "limited controlled runoff" is used because the vast majority of stormwater runoff in El Granada does ultimately end up in a controlled underground storm system that comfortably handles the stormwater volume. Still, to do so, the stormwater must flood down residential streets long distances, above ground, to get to a controlled underground storm system storm drain. This results in health & safety concerns for residents as well as, during runoff at flooding levels, residential streets that are difficult to traverse and limit pedestrian access to sidewalks & handicap access ramps.

Four areas were identified as examples of uncontrolled stormwater runoff requiring immediate corrective action, with the eventual goal to develop an action plan to manage stormwater runoff El Granada-wide and, hopefully, more broadly for the Midcoast. The four example areas listed in degree of severity (most to least) are:

a. Santa Maria Ave. & Columbus St – stormwater runoff from Quarry Park

b. Ave. Portola – stormwater runoff from the Highlands

c. Ferdinand Ave. – stormwater runoff from Ave. Del Oro & San Carlos Ave

d. Sonora Ave. – stormwater runoff from Ave. Granada & Solano Ave

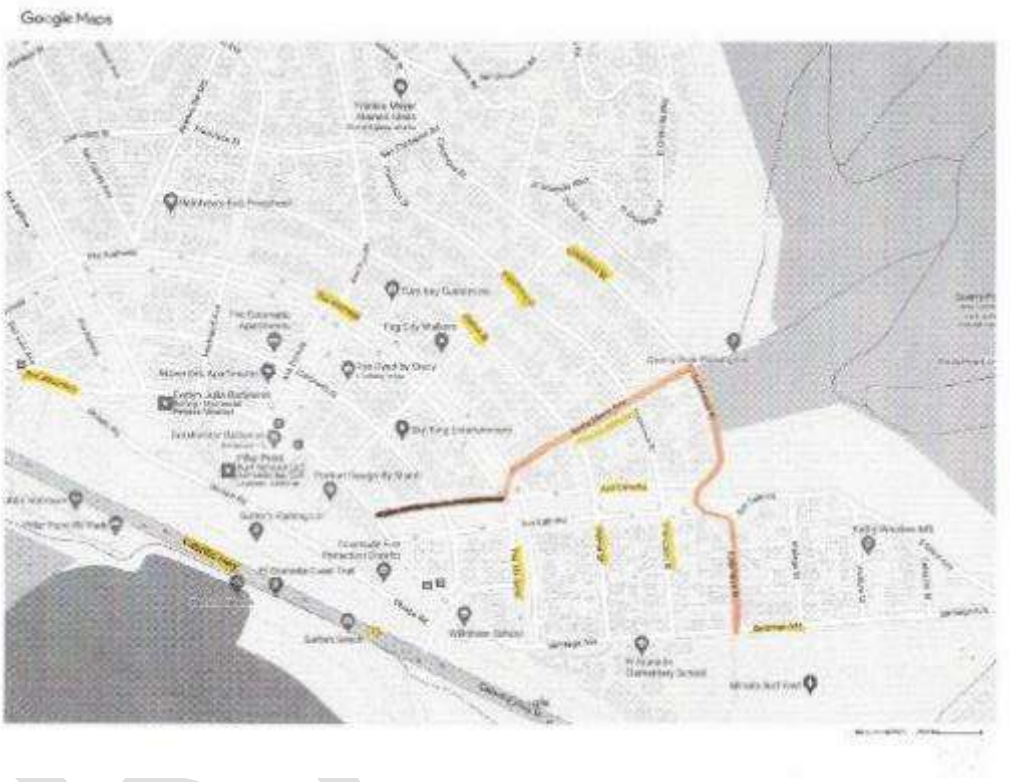
Each area is discussed individually below.

2. Observed Examples of Uncontrolled Stormwater Runoff in El Granada

*a) Santa Maria Ave. & Columbus Street – stormwater runoff from Quarry Park*

Two stormwater flows originate in and exit San Mateo County's Quarry Park and flood onto residential streets near the Park's entrance. The larger flow down Santa Maria consists of the Park dam's spillway overflow, diverted drainage from erosion control, and common rain runoff. The lesser flow down Columbus consists of diverted drainage from erosion control and common rain runoff.

The two flows exit the Park at the intersection of Santa Maria Ave. & Columbus St near the Park's entrance (see Photos 03, 07, & 18 in Exhibit 2). The larger and more impactful flow floods down Santa Maria whereas the lesser flow, until recently, also primarily flooded down Santa Maria with a much lesser impact to Columbus. Recently though, because of the quantity of flooding stormwater, such as after the January 2023 storm (see Photos 18 to 25), the SMC Parks Department diverted the lesser flow down Columbus (see Photos 01 to 05). This helped reduce the flooding down Santa Maria and its impact to homes on that street and, for which, the residents were greatly thankful[12]. Nonetheless, this newly increased diverted flow adversely effected the health & safety of residents on Columbus with Park flows flooding down 3 blocks (approx. 1,200 linear ft.) to a pseudo storm drain at Santiago Ave. then under that road to openly run into a meadow on the road's western side (see Photos 05 & 06).




As noted, by consulting geologists in Appendix B to the approved Quarry Park Master Plan + Appendices FINAL, November, 2022[13], the Park's runoff and drainage onto Santa Maria at the Park's entrance represents:

> *"The majority of the Park's drainage area evacuates . . . into the residential area downstream at this location. . . . [A]nd poses an increased potential for contributing to damages to downstream residential and city [ie, municipal] properties…*
> *…There is no obvious effort to manage this runoff in any form of designed drainage structure ever. During field investigations, stream flow was observed traveling*

[12] But the lesser flow still required septugenarians to sandbag in front of their homes and on the corners of Santa Maria.
[13] Quarry Park Master Plan + Appendices FINAL. See also https://www.smcgov.org/parks/quarry-park-master-plan-development - The final Master Plan (MP) was dated November 2022 and later approved by the Board of Supervisors in Dec, 2022.

*across and down the paved road, choosing its' [sic] own flowpath. Anecdotal accounts from residents report flow exiting the Property [ie, Quarry Park] has resulted in flooding a large portion of the neighborhood during peak storm events."*[14]

Because of potential flooding from Quarry Park each year, residents down Santa Maria and its cross streets are required to sandbag each winter to protect their homes and property from impending storms' stormwater runoff.

The Park's larger stormwater flow onto and down Santa Maria starts at the Park's entrance then floods over cross streets beginning with Columbus, then to Francisco, then to Palma into a pseudo storm drain at the end of Santa Maria at intersection with The Alameda (see Photos 07 to 12). The stormwater runoff then floods under the east side of The Alameda to an open-air ditch in its median to a new catch basin at Ave. Cabrillo (see Photos 13 & 14). At the Ave. Cabrillo catch basin, stormwater enters an underground storm system flowing down Ave. Cabrillo to a storm drain as part of the underground storm system at Ave. Alhambra (see Photos15 to 17). This process catches all of the runoff down Santa Maria even when the lesser flow from the Park is not diverted by the Parks Dept. - but the flooding is much more intense getting to the drain in that case.

Until a 2018-2019 Midcoast Drainage Project[15] put in the catch basin at and underground piping down Ave. Cabrillo, stormwater runoff had flooded above ground down Ave. Cabrillo to the storm drain at Ave. Alhambra (down 2 residential blocks, approx. 600 linear ft.) as it still does above ground down Santa Maria (down 3 residential blocks, approx. 1,000 linear ft.) to a pseudo drain at its end.

Update – On April 15, 2023, even after a month of no rain, both flows exiting Quarry Park showed steady and significant runoff. However, both were now running down Santa Maria since the lesser flow was no longer being diverted down Columbus. (See Photos 70 to 73)

Furthermore, of concern to homeowners on Santa Maria & Columbus is additional flooding from future erosion control treatment improvements planned within Quarry Park. The erosion control treatment improvements planned, particularly for culverts[16] and ditches, are designed to dump more Park drainage runoff onto residential streets, not reduce it (see example in footnote[17]). With treatment improvements planned at 74 locations[18], there is potential for a lot of added stormwater

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[14] MP, Appendix B, at p.321 (Photo 35, AOC 2 caption), pdf p.333 & at p.224 (Area of Concern 2), pdf p.236. Note that Appendix B is a copy of a 2018 report Quarry Park Watershed Assessment and Erosion Prevention Planning Project.

[15] https://www.smcgov.org/publicworks/midcoast-drainage-project-avenue-cabrillo-avenue-alhambra-alameda-el-granada-area and https://static1.squarespace.com/static/613d069a1c250f668bd42feb/t/641d205efb09e866f64565e8/1679630430797/2018-02-27-AvCabrillo-drainage-BoS-srt.pdf

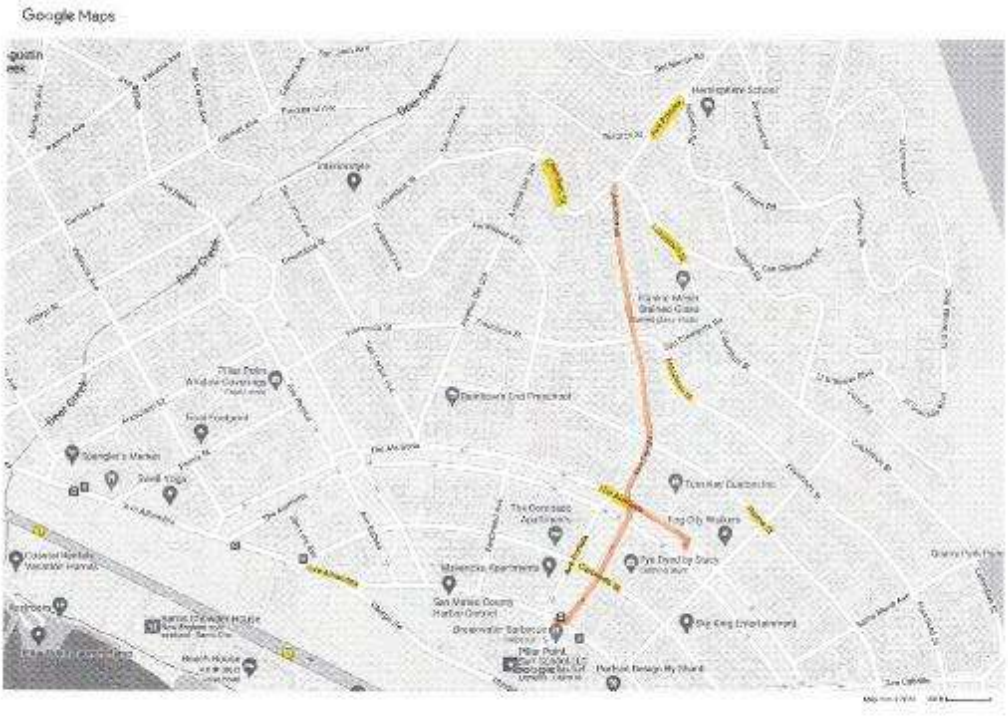
[16] MP Appendix B at p.216, pdf p.228 (crossing culverts are sized to convey 100-year peak storm flow)

[17] See for example, location #23, MP Appendix B at p.259, pdf p.271 - The improvement directs construction of a larger culvert and enhanced channel [ditch] definition to "contain the seasonal high flow volumes" – resulting in increased runoff onto Columbus St. and then Santa Maria Ave.

[18] MP Appendix B at p.217, pdf p.229; Table B1 starting at p.246, pdf p.258; & Table B2 starting at p.275, pdf p.287 and MP at p.95, pdf p.107

drainage runoff from the Park[19] down residential streets and, in turn, to flood the surrounding neighborhood even more. (See footnotes 24 & 25 below, referencing the GIP, for a discussion of measures that could reduce the increased flooding if incorporated into the treatment improvements planned for Quarry Park).

*b) Ave. Portola – stormwater runoff from the Highlands*

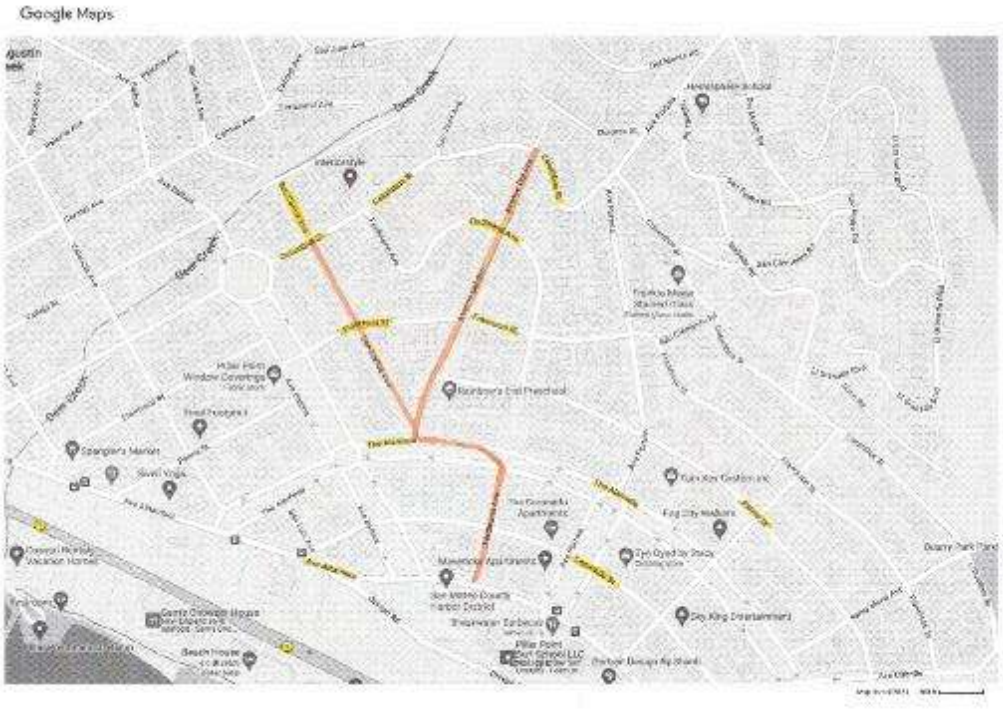



Following the path of stormwater runoff that flooded down Ave. Portola, after the March, 2023 storm, to its source showed it originated at the intersection of Ave. Portola & Columbus St. It flowed from a large pipe under and culvert at Columbus that bellowed stormwater from the Highlands above (see Photos 26 & 27). The stormwater then flowed down Ave. Portola in deep open-air ditches occasionally passing through pipes under residential driveways and flooding over Francisco and Palma Streets to The Alameda (see Photos 28 to 32). It then divided into two directions. One flooded down The Alameda towards Isabella Ave. to a pipe under the eastern side of The Alameda to a culvert in its median (see Photos 33 to 36). The second down Ave. Portola and over Coronado St to a storm grate and drain that are part of an underground storm system at Ave. Alhambra (see Photos 37 to 39). For approx. 1,800 linear feet down Ave. Portola and approx. 300 linear feet down The Alameda, stormwater floods down the residential streets and into neighborhoods without abatement.

Update – On of April 15, 2023, there was little runoff evident in the Ave. Portola flows, as contrasted to Santa Maria, which continued for months.

[19] MP, Appendix B, Section 6.2.1 at p.220, pdf p.232 and Sections 6.2.2 & 6.2.3 at p.222, pdf p.234

*c) Ferdinand Ave. – stormwater runoff from Ave. Del Oro & San Carlos Ave.*



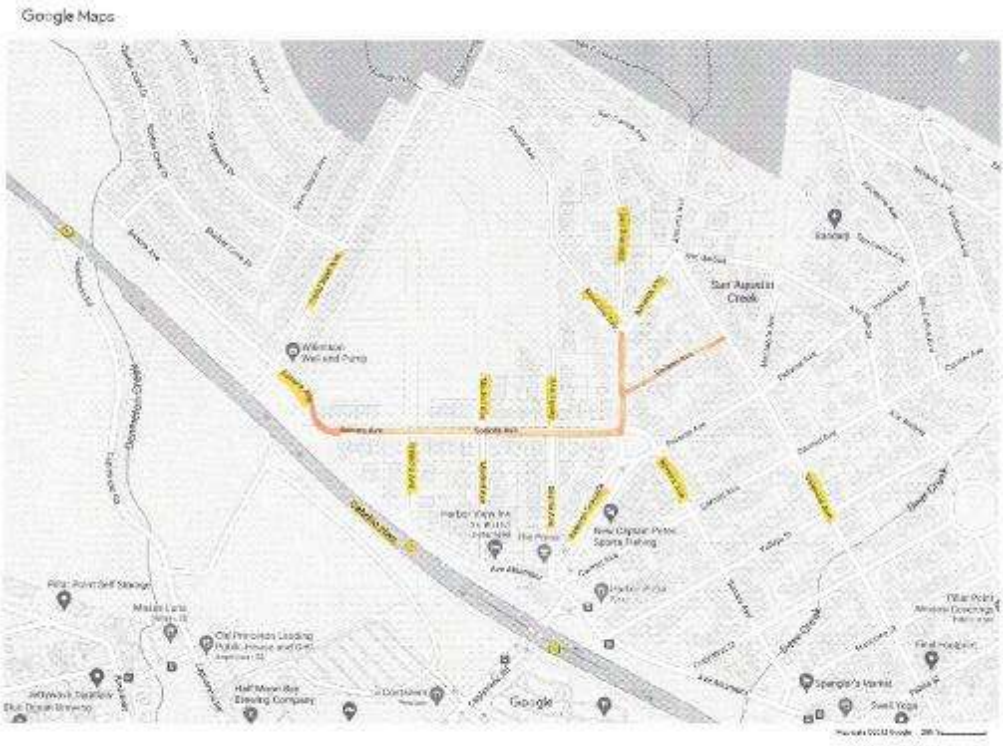

Residential streets Ave. Del Oro & San Carlos Ave. converge at The Alameda and so does their stormwater runoff (see Photo 50). The runoff then floods down The Alameda next crossing over the eastern side of The Alameda to a diagonal open-air ditch in its median then over the western side of The Alameda to lower Ferdinand Ave. (see Photos 51 to 54). Finally, the runoff floods down lower Ferdinand crossing over Coronado St to a storm drain as part of an underground storm system at Ave. Alhambra (see Photos 55 & 56).

Observing the March ’23 stormwater runoff flooding down Ferdinand to its source showed it originated from Ave. Del Oro & San Carlos Ave. The runoff started at Columbus that crosses both streets *[Columbus crosses both Del Oro & San Carlos and Columbus is where the runoff begins for both Del Oro & San Carlos.]* then flowed to where Ave. Del Oro & San Carlos Ave. converge at The Alameda. (See map above.) Runoff from Columbus down Ave. Del Oro flowed in open-air ditches and through pipes under residential driveways and two cross roads. The flooding crosses over upper Ferdinand Ave. but under Francisco St and Palma St from Columbus to The Alameda convergence (4 residential blocks, approx. 1,200 linear ft.) (see Photos 40 to 44). The runoff down San Carlos Ave. flooded down the edges of the street crossing over Francisco from Columbus to The Alameda convergence (2 residential blocks, approx.. 1,000 linear ft.) (see Photos 45 to 49). The runoff from the street convergence then flooded down to and across The Alameda to lower Ferdinand to an underground storm system storm drain (an additional 3 residential blocks, approx. 900 linear ft.) (see Photos 50 to 56). There was very little runoff from above Columbus (see Photos 40 & 45).

A stormwater drainage project is next planned for Ferdinand Ave[20] but again, like Santa Maria Ave. stormwater flooding, it only addresses the problem from The Alameda to Ave. Alhambra. The project does not address runoff from The Alameda to the sources of the flooding down Ave. Del Oro & San Carlos Ave. – leaving that to flood over residential streets and continue to expose residents to health & safety fears associated with the flooding.

Update – On of April 15, 2023, there was almost no runoff evident in the Ferdinand example, again, in contrast to Santa Maria.

*d) Sonora Ave. – stormwater runoff from Ave. Granada & Solano Ave*




Observation of March '23 stormwater runoff on Sonora Ave[21] showed flooding runoff from two opposite directions. The single underground storm system storm drain located at the end of Sonora near where it curves towards Coral Reef Ave. was receiving flooding runoff from both its right as well as left sides (see Photo 64). Runoff was flooding not only down Sonora from Ave. Granada to the drain (see Photos 57 to 64) but also beyond the drain from the curve back to the drain (see Photo 65). The source of the flooding back to the drain was a large pool of stormwater runoff on the north-east of the curve behind a number of residences (see Photos 66 & 67). Runoff overflow from that pool not only flooded into the storm drain but also flooded the entire roadway at the curved portion of

[20] https://www.smcgov.org/publicworks/ferdinand-ave-drainage-improvements-project

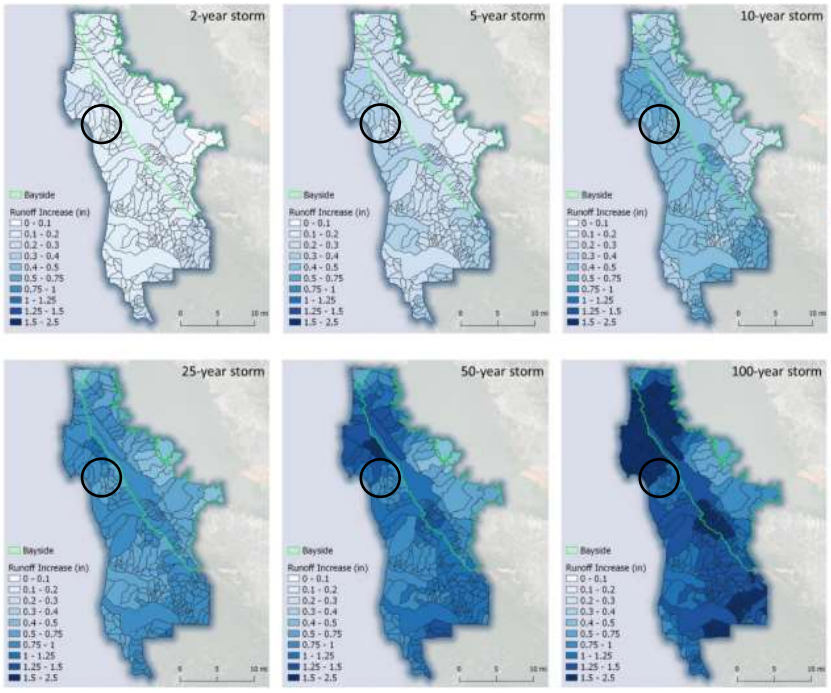
[21] Fitzgerald Marine Reserve Critical Coastal Area (FMR CCA) watershed studies and reports included the northern tip of EL Granada and contained Sonora Ave. but the El Granada watershed (including Sonora Ave) was **not studied** in those endeavors. However, El Granada and other Midcoast town storm drains were inventoried and mapped as part of that work

Sonora (see Photos 64 to 67). The area with the pool behind the homes was discovered to be wetlands (see Photos 67 to 69).

The stormwater runoff flooding down Sonora from Ave. Granada appeared to consist of street runoff from Sonora as well as runoff from the convergence of Ave. Granada, Madrona Ave, and Almeria Ave. supplemented by runoff from Solano Ave. The individual runoff of the three converging streets did not appear significant in the March '23 storm until combined. This combined runoff, supplemented by runoff down Solano, then flooded down Ave. Granada in deep open-air ditches occasionally passing through pipes under sandbagged residential driveways and flooding into Sonora (3 residential blocks, approx. 900 linear ft.) (see Photos 57 & 58). Once at Sonora, the flooding stormwater flowed from Ave. Granada over Sonora cross streets Sevilla Ave, Madrid Ave, and Presidio Ave. into the underground storm system storm drain at the westerly end of Sonora towards Hwy 1 (4 residential blocks, approx. 1,200 linear ft.) near where it curves toward Coral Reef Ave. (see Photos 59 to 64). [Flooding from the large pool of stormwater runoff, on the north-east of the curve behind homes on Sonora, to the underground storm system storm drain is shown in Photos 64 to 67.]

Update – On of April 15, 2023, there was no runoff evident in the Sonora example, again, in contrast with Santa Maria, where runoff persisted for months.

3. Climate Change




## Climate Change

- Modeled countywide changes in precipitation using 10 Climate Change Models from CalAdapt at an 8.5 RCP and downscaled to county grid
- 24% increase in storm depth for a future 10-year storm on bayside

C/CAG City/County Association of Governments of San Mateo County

Climate Change will exacerbate the flooding of residential streets and properties from stormwater runoff in El Granada and the Midcoast.[22] The C/CAG slide above forecasts dramatic precipitation increases and, in turn, their stormwater runoff over different periods of projection. Bottom-line rain

[22] Slide from presentation given to Midcoast Community Council (MCC) on 4/26/2023 by Reid Bogert, Senior Stormwater Program Specialist at City/County Association of Governments (C/CAG) – **circle** added to approximate. El Granada area)

levels are projected to dramatically increase in the future as will stormwater runoff flooding in El Granada and the Midcoast.[23]

4. El Granada: Conclusion

The four EG neighborhood examples display a lack of an adequate and integrated stormwater system in El Granada endangering both El Granada neighborhoods and the health & safety of their residents. What was once adequate for stormwater runoff trickling down unpaved residential streets in El Granada has risen to flooding – dangerous to both vehicles and pedestrians - as San Mateo County has sanctioned more development together with the increase in severity of winter storms. San Mateo County has attempted to address the issue - but only selectively and minimally. Fortunately, runoff and drainage flooding in El Granada ultimately does end up in a storm drain that is part of a controlled underground storm system, and the underground system comfortably handles the aggregate stormwater runoff, but getting those flows there safely is the challenge.

Stormwater runoff encompasses rain water runoff from both impermeable (streets, driveways, etc.) and permeable (landscaping, undeveloped lots/areas, etc.) surfaces as well as diverted drainage from erosion control. The decades-long method of controlling stormwater runoff with open-air ditches and simply running down residential streets only results in repeated flooding of both the streets as well as adjacent residential properties during ever occurring severe storms from climate change. This is a poor substitute for an adequate and integrated stormwater system in El Granada. Moreover, the entire Midcoast faces the same issues and concerns with stormwater as El Granada does and all must be integrated into any stormwater management and planning efforts.

As a last note, the Santa Maria Ave. & Columbus St example presents a unique opportunity to address stormwater flooding that the other three examples do not. That is, since the flooding originates from Quarry Park, such flooding can be addressed both within the Park[24] [25] as well as

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[23] As noted in earlier footnotes above, erosion control treatment improvements planned for crossing culverts in Quarry Park are sized to convey 100-year peak storm flow. That flow through related ditches is anticipated to evacuate the Park down the residential streets and, in turn, to flood the surrounding neighborhood even more. (See footnotes 27 thru 31 – referencing the MP.) Add to that the 100-year storm increases projected in the C/CAG slide and only disaster looms for El Granada residents near Quarry Park unless corrective actions are taken now.

[24] Although the 2019 SMC Green Infrastructure Plan (GIP) focuses on developed urban areas, similar approaches and methods could be used in undeveloped Quarry Park to retain rainwater within the Park and reduce stormwater runoff as well as drainage from flooding into residential streets. The GIP focuses on developed urban portions of the unincorporated San Mateo County and leverages previous countywide stormwater planning efforts described in the 2017 Stormwater Resource Plan for San Mateo County (SRP). (GIP p3, pdf p10). The GIP integrates GI measures into developed public buildings, **parks**, parking lots, and rights-of-way. (GIP p17, pdf p24). However, urban open space, such as public **parks** and underutilized or vacant land in developed communities are considered for larger drainage projects. (GIP p3, pdf p10). GI measures provide benefits to stormwater runoff by treating stormwater for pollutants before it enters the storm drain system, capturing & storing treated stormwater for constructive use or infiltrating it back into the groundwater table as well as reducing flooding and **erosion**. (GIP p17, pdf p24)

[25] As an example of park land use to protect a surrounding community from flooding, see the Twin Pines Park Concept Project within the GIP. (GIP p139-140, pdf p146-147). That project captures primarily residential stormwater runoff from a 30-acre area that drains directly to Belmont Creek. The associated pollutants are treated, as well as captured flows retained and stored underground - charging groundwater and alleviating flooding in the lower portion of the creek. This would be even more important Midcoast where our storm drainage impacts a CCA.

outside its boundaries. The Parks Department, so far, has chosen not to do so within the Park. On the contrary, it responded in the approved Quarry Park Master Plan: "The County Parks Department has limited ability to modify the amount of [Park] runoff … aside from … [planned] erosion/sediment/culvert [treatment] improvements discussed in this Master Plan."[26]

Mercilessly, the QP Master Plan erosion control treatment improvements planned, particularly for culverts[27] and ditches, as well as the risk reductions regarding the dam[28], **are all designed to dump more Park drainage runoff onto residential streets, not reduce it** (see example in footnote[29]). With Park treatment "improvements" planned at 74 locations[30], there is potential for a lot of added stormwater drainage runoff from the Park[31] down the residential streets and, in turn, to flooding the surrounding neighborhood even more.[32]

Note that the MCC in an 11/30/22 letter to the BOS recommended approval of the Nov, 2022 QP MP **but also recommended addressing the stormwater flooding issue from QP** – and that has not been done by the County.

5. Recommendations

San Mateo County must take immediate action to create an adequate and integrated Stormwater Master Plan for the Midcoast (see pp. 77-78) of which El Granada would be an element. Specific to El Granada, the Plan would:

a. Identify areas at risk for stormwater flooding that pose a hazard and danger to the health and safety of El Granada residents and potential damage to their property – hopefully this report will help with that task.

b. Prioritize the identified areas, at risk from stormwater flooding, based on the level of hazard and danger each area poses – The "Santa Maria Ave. & Columbus Street" neighborhood above, in particular, has been repeatedly subjected to severe stormwater flooding levels from Quarry Park, dangerously flooding sidewalks, access ramps, & street intersections, damaging residents' property, and restricting residents entry to their homes.

[26]MP at p.79, pdf p.91

[27] MP Appendix B at p.216, pdf p.228 (crossing culverts are sized to convey 100-year peak storm flow).
[28] See p.95 of the QP MP mentioned above - first item under the 0-5 year time period in the table on p.95.
[29] See for example location #23, MP Appendix B at p.259, pdf p.271 - The improvement directs construction of a larger culvert and enhanced channel [ditch] definition to "contain the seasonal high flow volumes" – resulting in increased runoff onto Columbus St. and then Santa Maria Ave.

[30] MP Appendix B at p.217, pdf p.229; Table B1 starting at p.246, pdf p.258; & Table B2 starting at p.275, pdf p.287 and MP at p.95, pdf p.107

[31] MP, Appendix B, Section 6.2.1 at p.220, pdf p.232 and Sections 6.2.2 & 6.2.3 at p.222, pdf p.234

[32] However, Green Infrastructure measures to reduce stormwater flooding and erosion discussed in the 2019 GIP under footnotes 24 & 25 above are available to incorporate into the erosion treatment improvements planned for Quarry Park and, thereby, protect the Park's neighbors from its flooding runoff.

c. Develop solutions to the stormwater flooding for the prioritized areas at risk – Luckily, for the four flooded El Granada areas identified, any solution considered can incorporate an existing underground storm system. For each area the above-ground flooding stormwater ultimately ends in a storm drain that is part of a controlled underground storm system - but getting those flooding flows into the drains safely is the challenge.

d. For example, the severely flooded "Santa Maria Ave. & Columbus Street" area with stormwater flooding above-ground down 3 blocks of Santa Maria Ave. enters a catch basin at The Alameda & Ave. Cabrillo and then flows down Ave. Cabrillo into an underground pipeline to the Ave. Alhambra storm system. The catch basin, underground pipeline, and ultimate storm system comfortably handle the stormwater volume of the flooding above-ground runoff down Santa Maria even when Quarry Park stormwater is not diverted - but getting that stormwater safely to the catch basin, etc. is the challenge. And, this area presents a unique opportunity for solution that the other three identified areas do not. That is, since the flooding originates from Quarry Park, such flooding can be addressed both within the Park as well as outside its boundaries. This includes reducing increased future flooding from erosion control treatment improvements planned within Quarry Park that have the potential to dump a lot more Park flooding runoff into adjacent El Granada neighborhoods.

e. Determine funding needs and sources necessary to apply the stormwater flooding solutions developed then obtain that funding.

f. Apply the stormwater flooding solutions developed to eradicate the continuing hazard and danger to the health and safety of the El Granada community and its residents as well as damage to their property.

Until required solutions to the El Granada flooding are completed:

g. Continue to divert some stormwater runoff at the mouth of Quarry Park to along Columbus Street and, in turn, reduce flooding levels down the more severely impacted Santa Maria Ave.

h. Manage water levels of the over 750,000-gallon earthen dam within Quarry Park to allow it to accept significant stormwater runoff during storms. Such management would reduce severe stormwater flooding down Santa Maria Ave. and lessening the need to divert stormwater down Columbus Street. The most severe flooding occurs after the dam is at full capacity and all its captured stormwater runoff simply overflows into the dam's spillway (aka overflow channel) and floods into the adjacent El Granada neighborhoods.

   Further, managing the water level of the dam also would both reduce the volume of impounded water and hydrostatic water pressure on the dam beneficially increasing the earthen dam's safety.[33]

6. El Granada: Supporting Documents and Studies

[33] MP Appendix C, Dam and Reservoir Assessment, at p.338, pdf p.350"

There have been many studies and reports done over the years, and even a committee[34] formed, that focused on stormwater in San Mateo County (County) and the Midcoast. Of particular coverage, by these studies and reports, was the Fitzgerald Marine Reserve Critical Coastal Area (FMR CCA) watershed and its Area of Special Biological Significance (ASBS). The County either led or participated in most of these studies and reports. However, no integrated Stormwater Management System has been developed and actively implemented to address widespread flooding in El Granada or the Midcoast.[35]

The FMR CCA and associated ASBS studies and reports did not cover the El Granada watershed, but do contain valuable research and lessons learned[36] that translate for development and implementation of an adequate and integrated Stormwater Management System for El Granada and the Midcoast. Additionally of significant worth was the development of stormwater Best Management Practices (BMPs) and a Green Infrastructure Plan (GIP). The BMPs control pollution and minimize stormwater runoff,[37] and the Green GIP presented methods to better retain stormwater and reduce flooding events as well as prevent stormwater erosion and pollution[38]. The County's planned Pillar Point Harbor CCTV Project adds yet another helpful study. The Project includes inspection of storm drain pipes and associated manholes and other structures within El Granada to determine if there are any defects or illicit connections to the existing underground storm drain system.[39] This information can then be used to update and correct the inventoried and mapped storms drains completed as part of the 2013 Midcoast Storm Drain Inventory and Assessment Project Drainage Report to the 2016 Fitzgerald ASBS Pollution Reduction Program Final Project Report *(see footnote 35).*

With the many studies and reports available, the building blocks exist to develop and implement an adequate and integrated Stormwater Management System to address widespread flooding for the Midcoast, of which El Granada in as element.

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[34] The 2007 Midcoast Stormwater Drainage Committee (MSDC) formed for a few years produced a 2009 Final Report but it only identified and prioritized drainage problems in Montara, Princeton, Moss Beach, and Miramar **not El Granada** - and its recommendations only identified drainage improvements for limited areas in Montara.

[35] The 2009 MSDC Final Report did recommend preparation of a "Midcoast Stormwater Master Plan" that very much mirrored the integrated Stormwater Master Plan suggested in this MCC report, but such a plan was not located in our research. If available, it may be of great help in developing an integrated Stormwater Master Plan for El Granada and the Midcoast.

[36] For example, the FMR CCA included the northern tip of EL Granada but the El Granada watershed was not studied. However, El Granada-and other Midcoast town storm drains were inventoried and mapped as part of that work (see Appendix C - 2013 Midcoast Storm Drain Inventory and Assessment Project Drainage Report to the 2016 Fitzgerald ASBS Pollution Reduction Program Final Project Report). And, as an additional example, the 2011 Montara Drainage Improvements Study (ultimately unfunded) discussed some stormwater mitigation and funding alternatives.

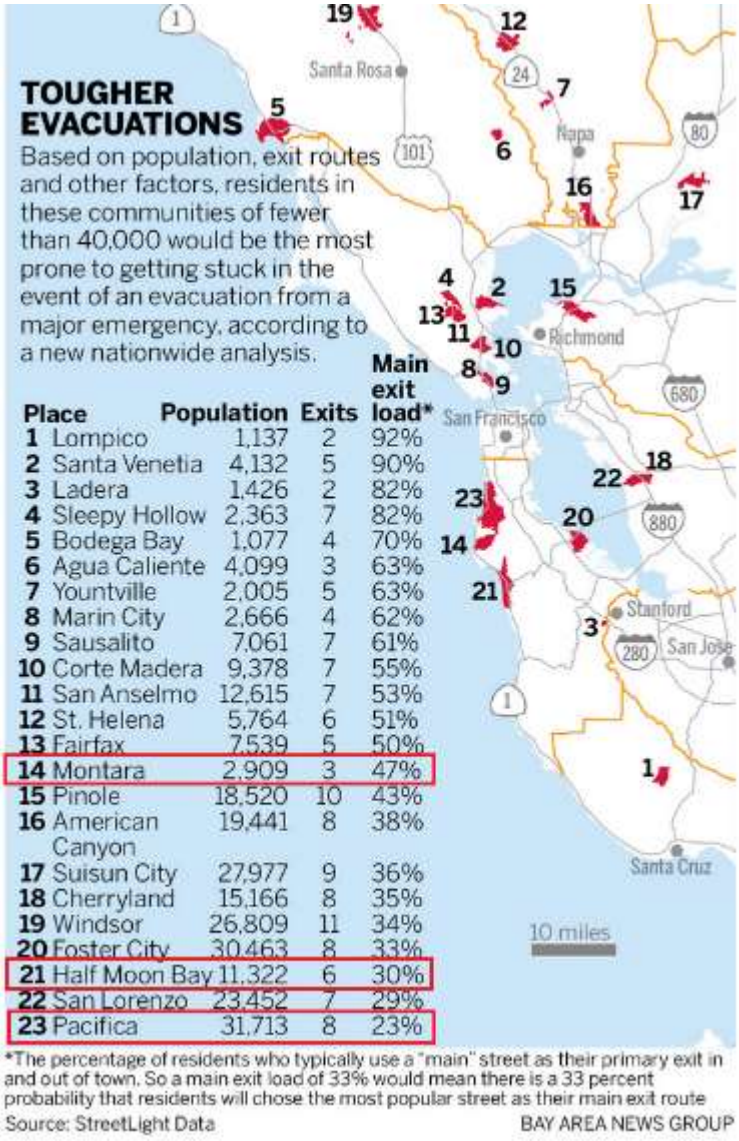
[37] For example, Appendix C - 2013 Midcoast Storm Drain Inventory and Assessment Project Drainage Report to the 2016 Fitzgerald ASBS Pollution Reduction Program Final Project Report identified Best Management Practice (BMP) measures to reduce stormwater pollutants and as a basis for designing stormwater improvements to minimize stormwater runoff. The main report also included testing the effectiveness of several types of stormwater BMPs.

[38] See 2019 San Mateo County Green Infrastructure Plan (GIP)

[39] https://www.smcgov.org/publicworks/pillar-point-harbor-cctv-project

## *F. Highway 1: From Fast Lane to Slow Boat*

Like Lahaina, and worse than Paradise, the Midcoast has only one (1) exit route. This vulnerability has been documented for years to San Mateo County (Surviving The Next MidCoast Disaster) and to Caltrans. Streetlight Data has flagged our Midcoast as among the worst exit routes in the state and includes Montara, Pacifica, and Half Moon Bay among 675 U.S. communities with limited evacuation routes The Midcoast is vulnerable to a suite of potential disasters: wildfire, earthquake, tsunami, sea level rise, and the topic of this report: flooding from stormwater.




When storms flood the small amounts of exposed soil near our roads and homes, the saturation weakens the hold of roots of very tall (~100') old trees, typically eucalyptus and cypress, and accompanying winds can blow them over. The MCC has heard repeatedly from residents in El Granada where trees have crushed their homes, or almost done so, and who lie awake worrying about the potential thereof. Falling trees are most noted in the El Granada medians, but have occurred throughout Montara and Moss Beach as well, downing powerlines with unfortunate regularity after storms, and resulting in power outages of days or even a week in Montara.

1. Evacuation: Tree Blockages

Of greatest concern in this chapter are stormwater-caused blockages of Hwy 1, which is the only route in/out for First Responders and potential evacuees from the Midcoast. To attempt to mitigate the risk of falling trees on Hwy 1, the MCC filed tickets on July 13, 2021 with Caltrans for 3 locations on Hwy 1: Medio Ave. Miramar (CSR Ticket Number: 851071), Frenchman's Creek, HMB (CSR Ticket Number: 851069), and Hwy 1 north of the Lantos Tunnel (CSR Ticket Number: 851068). Those tickets requested immediate clearance of such trees. The MCC also worked with residents and the County Planning to successfully reduce the cost of tree removal permits for wildfire risk reduction. Caltrans did remove some trees at Medio Creek and Frenchman's Creek, apparently to the extent of their right of way. However, the adjacent trees remaining are sufficiently tall to still block the highway if they fall over it. Issues of property ownership appear to be preventing further remediation, though we have received no responsive communication.

Note that the New Year's Eve storm did fell a tree on Hwy 1 north of Lantos Tunnel after, blocking the road. We are aware that Dave Cosgrave of OES has researched this evacuation bottleneck and that a complex web of land ownership seems to be blocking action. No clearance of other trees which could fall from that hillside is apparent. We have also raised this issue with then-Mayor Bigstyck of Pacifica, who agreed the concern because residents in southern Pacifica might also need access to that route out (South). Any of earthquakes, wildfires or stormwater with accompanying winds can fell trees which block this narrow tree-lined evacuation route.

Additional tree blockages of Hwy 1 have been caused by mudslides in southern Montara and Moss Beach. In the New Year's Eve storm, one lane of Hwy 1 was blocked, slowing our access to the SAM plant (which had flooded). Two other mudslides in that area also occurred but did not fully block the northbound lane.

2. Evacuation: Stormwater-related Blockages and Floods

The major road blockage occurred 1/1/23 on Hwy 92 east of HMB, due to a large sinkhole.[40] This was caused by insufficient drainage under the road, which leeched away the foundation soils. The road was reopened in both directions on Jan. 26th. Full repairs took about a year. During the period of the blockage, and limited 2-way use, HMB as well as Midcoast evacuation was further limited.

Also during 1/1/23, Hwy 1 was flooded at the HMB airport, resulting in a small lake across from the farms. Cars and trucks with sufficient ground clearance were able to pass, albeit slowly. While we were at the flooded SAM plant, we interviewed the foreman of the Andreini Bros. construction crew who was building a dike to protect SAM. He noted that his crew was hired to clear the culverts under Hwy 1 at the airport, but that they could not do a thorough a job as needed *"because of the snakes and frogs and critters."* This indicates that wildlife which had used the Hwy 1 culvert as a habitat of opportunity were – by some regulation – preventing essential maintenance on those culverts.

Hwy 1 at Montara State Beach has also experienced flooding as culverts were inadequate to pass the stormwater in recent storms. Work has been underway.

Hwy 1 south of the Lantos tunnel also experiences flooding during storms, most recently 11/24/24, as shown here. https://nextdoor.com/p/2pFmrPJcnphL?view=detail

Of concern is not just the blockages caused by highway flooding, but the potential damage to the roadway when waters exceed the width of the culvert headway and drainage channels, putting pressure on the road base layers and potentially leeching out supportive materials.[41]

A related concern is the adequacy of Hwy 1 drainage going forward. The SR1 Multi-Asset Roadway Rehabilitation Project is planned to rehabilitate 6 miles of the essential Midcoast artery, but not all of it. We are concerned whether Caltrans' specifications for drainage are adequate for the Climate Change storms we have experienced. Inquiries regarding those design criteria have been pending with Caltrans since 10/18/24. Note that *"…of note in the CCC staff report discussion: "To be clear, all of these improvements are probably best understood as temporary, as ultimately this stretch of highway will likely need to be relocated inland or substantially modified due to coastal hazard risks at*

[40] Geologists say void in Highway 92 not technically sinkhole

[41] The Base Layer Forms the Foundation for the Road Surface

*Surfer's Beach, including ongoing erosion that is accelerating with sea level rise. In fact, Caltrans is already undertaking, as required by an existing CDP (1-98-057-A3), sea level rise adaptation planning for this stretch of highway, with an analysis and plan due June 2025, where Caltrans has already dedicated funds to a potential adaptation project here, with project development planning underway*."[42]

So, in addition to the immediate project, we should evaluate the longer term highway plans in light of the new science and data discussed below.

3. Evacuation Needs Summarized

To our knowledge, no formal evacuation plan is in place or in development for the Midcoast. Per the DEIR for the Cypress Point Project, "Evacuation routes are not specifically identified in San Mateo County. The County General Plan states that "the County does not actively promote the preparation of disaster response plans for major fires that specify evacuation routes, identify areas that may be isolated, and define reconstruction policies." A small practice evacuation has been recently held from the top of EG Blvd. to the grammar school.

The part of this that makes sense is that depending upon the disaster, residents will need to relocate to different areas (high for tsunami, presumably closer to water for wildfire). However, failing to develop and publicize contingency plans for a suite of known problems, is planning to fail.

The tsunami warning of Dec. 5th was a useful illustration of this problem. Hwy 92 was clogged with fleeing cars, unable to progress. There was a serious accident on Hwy 1 in El Granda, with details pending.

By permitting continued population expansion Coastside the County is compounding an already unacceptable evacuation risk in the Midcoast which has five (5) major disaster vulnerabilities on the Midcoast: sea level rise, flooding, tsunami, wildfire, and earthquakes. Montara is already rated the 14th worst evacuation situation in the state. Note that there is legal precedent for halting construction because of evacuation risks, see: https://mendofever.com/2024/11/02/court-halts-luxury-development-in-lake-county-over-wildfire-risk-failures/.

## *G. Moss Beach: Not Singin' In The Rain*

Moss Beach has long had flooding issues, which the New Year's Eve storm emphasized have reached a new level, and which in coming years threaten to worsen further.

1. Existing Stormwater Management Problems

Here are testimonials from several parties about existing stormwater problems in Moss Beach:

[42] https://midcoastcommunitycouncil.org/home/ccc-approves-sr1-multi-asset-roadway-rehab-project

A. As shown in the following pictures from Mar. 12, 2023[43], the areas adjacent to Hwy 1 in Moss Beach between California and Vermont regularly flood during storms. Water coursing down the hill terrace to the northeast is funneled by Carlos St. and Sunshine Valley Rd. to this area and storm drains have long been insufficient to control the accumulation.

B. The picture below shows the home destroyed by a falling tree after the New Years' Eve storm of 2023:

[43] Pippin Cavagnaro, Nute Engineering, email 5/5/23.

C. As stated by the MWSD sewer engineer:

*"These are pictures taken by SAM staff the morning of March 12, '23* [cited above]. *Storms flooded north Moss Beach, and the landscape in that area does not appear to have any organized way to manage water accumulation and flow. Excessive water accumulation negatively impacted traffic safety, the MWSD sewer system, private yards and homes….*

*Other problems existed across HWY 1 where the water needs to flow under the Highway in culverts which have become plugged and overwhelmed several times... Areas along Carlos Street have had significant flooding that negatively impacted the Sheriff station, traffic safety, many other businesses, and the MWSD sewer system in that area, causing overwhelming infiltration which added extra water pressure in the sewer pumping system and contributed to significant extra stresses in the IPS pipeline SAM owns. This water backing up the neighborhoods ultimately has to be treated and pumped out the SAM sewer plant, a function for which the sewer system was not designed to handle.*

*Also, the new plant filled drainage "filters" placed in gutters the County has installed or required developers to install in areas in Moss Beach and south end of Birch Street, or areas the County appears to have stopped cleaning out the weeds appear to not flow well either. These systems are intended to capture oils, debris, and garbage, and while that sort of works in light rain, in heavy rain*

*the system are overwhelmed causing water to back up and flood the streets and sewer manholes taking the garbage with it."*

B. A prior MCC councilmember who lives at 2015 Carlos St. pointed out a storm drain on Stetson which had no conductive piping, but merely channeled water downhill onto a widening gully onto her property, which passed that water directly onto an MWSD sewer manhole cover on Carlos St., contributing to the infiltration problem cited above, and which water then drains down Carlos to Etheldore, contributing to flooding that intersection rapidly during rainstorms.

C. A current MCC councilmember was flooded out of her Moss Beach home in the New Years' Eve storm 2023. As of this writing she has yet to return.:

*I wanted to provide information regarding flooding that I experienced at my home in Moss Beach. I live on Kelmore Street. The Street above my home was paved years ago by residents of Sierra Street but is not a county road. There are no storm drains thus any stormwater runs down in to my yard. This year the storms overwhelmed the yard causing flooding in my home, a hole in my driveway and significant erosion in my backyard. Had there been appropriate drainage infrastructure in place this most likely would not have happened. I am currently renting elsewhere while repairs are made.*

*Best,*

*Ann*

D. Note the MWSD FEMA report from August, 2022: https://www.coastsidebuzz.com/wp-content/uploads/2023/01/MWSD_FEMA_applic_2022_relocateWaterSewer.pdf

*"a. This last year for example, rainfall intensities of 8 to 12 inches per hour happened with storm events of 5 to 8 inches in a day (see Picture 7).*

*b. Picture 7: Cumulative rain events. Notice 2022 storms were 3, 5 and even 8 inches per event with 12 inches per hour intensity, far higher than the last two years shown which are more incremental storms of 1 or 2 inches (as was the case historically).*

*c.* ***These high intensity rain events used to be considered 20 year or even 100-year events, but have happened 5 times in within the last approximately five years, with three significant events this year alone."***

Note further that this report was prepared BEFORE THE New Years storms of 2023.

2. Upcoming, Exacerbated Stormwater Risks

In addition to the longstanding flooding problems in Moss Beach, residents expect more flooding with the Cypress Point project by MidPen Housing (the Project), which will increase impervious surfaces on-site by approximately 143,254 square feet. This is likely to cause much more flooding, as explained below.

Currently, according to local residents who provide the following information, the Project site serves as an "ad hoc stormwater retention basin", which reaches 2 feet of depth near the MWSD water tanks during storms. A longtime resident's description of the drainage is as follows:

*"Area from the crest of Buena Vista* [technically, this is 18th St. on County parcel maps] *to the Carlos exit.*

*Blue lines illustrate water run off directions. Downhill slope is right to left* [East to West] *through Cypress Point Project. Primary final drainage exit is at the Carlos exit. There is severe road erosion all along the road that runs in front of the water towers due to volume of water run-off every winter. The upper hill run-off joins the Carlos and upper streets draining on to Highway 1. Result is often seen as water rushing out of the Carlos St exit and soil/rock deposits on the road. Additional drainage from Buena Vista goes down Lincoln St toward the creek or open area. Result is a large water pool in the open area that flows down the side road; or into the creek. Additional pooling occurs right of the two water towers. All runoff drains into the ocean.*

*Almost all runoff from the property flows into Montara Creek and subsequently into the Fitzgerald Marine Reserve. It only seems prudent that a large earth-moving project like this should require a robust plan to control stormwater runoff and provide reasonable assurance that development will not make the situation worse."*

Another nearby resident notes:

*"The water that flows down Buenavista flows out onto Carlos and follows the downward slope along the east side of Carlos towards 16th and the creek, making a mess. Also, historically the water pools a lot between the proposed entrance to the site and along that north end of Carlos where they plan to construct two large buildings. By the way, a dry picture of Buenavista down from the water storage tanks will show a significant gully that gives an idea of how much water flows down ….*

*There are two storm water receptors on the east corners of Carlos/Sierra Streets that say they flow to the ocean - they receive some of the water that comes down Sierra and nothing from this site — except for January '23 when a bit of the excessive water from the site flowed over my driveway wall and onto the [Carlos] street, first time in our 33 yrs here. And some of the water could flow down the embankment that runs in front of my house and down to the highway — that area is primed for slides and has many trees vulnerable to falling onto the highway, certainly came close this winter."* In fact, closer to 16th street, trees did fall onto Highway 1, blocking half the road on 12/31/22.

Here are excerpts from the Cypress Point DEIR on the bio-retention ponds design and slope stability:

Discussion in Section 3.3 Biological Resources: p. 167 “The bioretention areas would be sufficient to contain peak flows from a 2-hour, 10-year storm event, as required by the municipal regional permit and HM. Therefore, stormwater during operation would not enter Montara Creek and no impact would occur.”

Discussion in Section 3.4.1.3.4 Slope Stability and Landslides: p. 177 “However, according to the Hazard Viewer map from ABAG118 and the Planning and Building Map Viewer from the County of San Mateo (County),119 the ravine to the north of the project boundary is susceptible to rainfall and seismic–induced landslide hazards (Figure 3.4-2).”

Appendix F, Pg 5: “Notable hydrophilic plants (pampas grass) are abundant on the eastern part of the lower terrace; these pampas grass likely grows where surface run off from the relatively steeper and impermeable upper terrace accumulates within the relatively thicker soil and low-angle down-slope terrace deposits” This observation has implications for the design of stormwater management on the Project site, because it demonstrates the land currently serves as a retention pond, mitigating and holding the runoff which would otherwise deluge downhill residences on Carlos St., and Highway 1.

Further, a geologist/hydrologist familiar with the region who spoke with us – citing that a conflict of interest prevented him from speaking on the record – pointed to the implications of the USGS report on a major 1982 storm.[44] That storm caused 474 debris flows (mudslides/landslides) in Pacifica, one of which killed 3 children and destroyed houses. However, on Montara Mountain, where the soil includes a lot of fractured granite, there were far fewer debris flows: *“In the Montara Mountain area of San Mateo County, only 1 percent of the debris flows mapped in areas visible in both sets of photographs are attributable to the period after the January 1982 storm (C.M. Wentworth, oral commun.,1985).”* The fractured granite is what allows MWSD to maintain an aquifer which replenishes regularly – in most years – with rainfall. He referred to this soil as a ‘tremendous sponge’. The geologist pointed out that similar soil exists in the area of Moss Beach which the Cypress Point project will cover with impermeable surfaces. Given that the project site is already an important retention basin for stormwater flows from ~11 uphill acres, one that the storm of Jan. ’23 already overwhelmed causing Hwy 1 to be partially closed, loss of that soil absorption could exacerbate damages to the neighborhood and to Hwy 1. The stormwater design of that project included the site and only one (1) acre more in its capacity planning, and followed County design guidelines for a 10 year storm, which guidelines do not reflect the reality of size and frequency of Midcoast storms, as we will cover below in the chapter on current design approach and science.[45]

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[44] USGS report, pgs. 84, 135, 138, & 147: https://doi.org/10.3133/pp1434,

[4545] Email from Mike Schaller, SMC Planning
The information you are inquiring about was submitted as part of the 2022 CDP application and can be found on the Cypress Point Project's webpage:
https://www.smcgov.org/planning/cypress-point-affordable-housing-community-project-2022-cdp-application
Specifically:
Document 11 - Hydro-modification management memo (prepared by BKF Engineering)
^^ https://www.smcgov.org/media/131276/download?inline=
**The goal of the HM program is to control the n post-project flow to match pre-project runoff flow rate and duration from 10 percent of the pre-project 2-year peak flow up to the pre-project 10-year peak flow.**
Document 10 - Bio Sizing Calculations https://www.smcgov.org/media/131271/download?inline=
^^ 3 basins totalling 142,258 sq ft of impervious space
The drainage control features are shown on pages C6 an C7 of the Project plans (Document 6):

Further, as was noted by a Calif. State geologist we spoke with, the DEIR for the Project was signed/stamped by two Geotechnical engineers, but NO GEOLOGIST. He stated that such an omission would not have been allowed in other counties in which he works. The absence of a geologist evaluating this project, especially in light of the potential cover-up of extremely absorbent soils cited by the hydrologist, creates a serious stormwater risk for the area.

The important observation is that this Project's land buffers what would otherwise be an immediate, direct runoff of stormwater. The implication for adequate design of this Project is that it must not only sequester the added runoff created by over 140,000 sq ft of new impermeable surfaces, but also continue the watershed sequestration performed by the existing land condition, otherwise significant runoff can jeopardize neighbors and the roads below, likely increasing I&I to a sewer plant already exceeding capacity in two recent Decembers, and flooding Montara Creek.

During New Years Eve storm of Jan. 2003, SAM flooded and had to be shut down, resulting in sewage backing up and a major IPS pipe burst in Moss Beach, causing raw sewage to enter the ocean, violating the Clean Water Act. (See also comments in the chapter on SAM)

In addition, the I&I from the MWSD and GCSD service areas came within 6" of overflowing the recently expanded wet weather storage in Burnham Strip on Oct. 25, 2021. This Project will directly impact that storage facility and the IPS; it is reasonably foreseeable that the Project will necessitate additional WWS before occupation commences or else the remaining 6" safety margin could be consumed and sewer system overflows occur in El Granada. Such extra WWS will require a GCSD land lease, and disrupt their plans for a community center.

These sewer-related flooding episodes emphasize the criticality of preventing more stormwater flows from the Project site.

Additional Notes from Neighboring Resident:

> On Nov 9, 2024, at 9:19 AM, Dolores Silva <dsilvagates@gmail.com> wrote:

*> I am concerned that their bio-retention ponds and other plans that are aiming to catch runoff might not be sufficient — they did not address this concern that our consultant raised in his 'expert' review. Whether any flooding would come towards my house is difficult to assess. To date, the slant of the property directs the flow just north of our property, out the proposed entrance to the complex so we have been spared. The only time in our 34 year experience we had water running down to our house was in that major year-end storm a couple of years ago* [New Year's Eve 2023]. *As you know, storm water flows down that 'street' that they will build over and supposedly have planned to somehow manage. To what extent the slant is changed or the new impermeable surfaces, removal of flora, and creation of new paths change the flow, or what climate change now indicates for rainfall — these questions were never addressed. If the water continues to flow out the entrance or if some of it gets diverted to Sierra Street downward, it could also affect the CalTrans median in front of my house and continue to overflow to the highway along the embankment or down towards Carlos St/Hwy 1 intersection. There are many trees on that slope edge that are already heading down in a big storm.*

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https://www.smcgov.org/media/131226/download?inline=
Page C6 shows locations of Bioretention areas
Page C7 shows details of the biorention areas (including cross sections)

*The water that flows down Sierra to Carlos St easily overflows the storm drains on our corner and what does go down the drain often cause overflows down Carlos St."*

Also important to note that the property at 1993 Carlos St. has a well and septic tank that may be affected by stormwater runoff from the Project.

The feasibility of controlling stormwater runoff in the Moss Beach Project is highly questionable,

**Table 1-5. Projected climate impact on cumulative subwatershed precipitation depth**

| Region | Scenario | 6-hour Precipitation Depth (in.) by Return Period | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2-yr | 5-yr | 10-yr | 25-yr | 50-yr | 100-yr |
| Ocean | Historical | 1.76 | 2.18 | 2.49 | 2.91 | 3.24 | 3.56 |
| | Median (RCP 8.5) | 1.96 | 2.51 | 3.00 | 3.76 | 4.38 | 5.03 |
| Bayside | Historical | 1.58 | 1.96 | 2.23 | 2.60 | 2.88 | 3.15 |
| | Median (RCP 8.5) | 1.73 | 2.20 | 2.63 | 3.28 | 3.81 | 4.38 |
| Countywide | Historical | 1.69 | 2.09 | 2.39 | 2.79 | 3.10 | 3.40 |
| | Median (RCP 8.5) | 1.87 | 2.39 | 2.86 | 3.58 | 4.16 | 4.78 |

Already 6, 7 and 8" storms in Midcoast

certainly on the Midcoast. An SSMP study performed by the County[46] documents the inability of Green Infrastructure (GI) approaches to stormwater management to handle storms such as those now annual on the Midcoast. It appears that the GI approach to stormwater management is proposed for this Project. In that SSMP study, the Design Storm assumed was 5.03 inches for a 100 year storm. The modeling shows that for that level of storm rainfall – which is now occurring approximately bi-annually - only 3.3% of runoff would be captured (chart below). That is clearly unacceptable control for the safety of the neighborhood, for Highway 1, and likely for the water quality in Montara Creek and the Fitzgerald Marine Reserve - where the water would be discharged - a region which is an ASBS, an ESHA, and a CCA.

[46] Climate Adaptation Risk Analysis for the San Mateo Countywide - Sustainable Streets Master Plan Technical Memorandum https://ccag.ca.gov/wp-content/uploads/2021/02/Appendix-A-SSMP-Climate-Change-Report-FINAL.pdf

Table 2-3. Runoff captured by GI in the bayside subwatersheds

| Climate Change | | 6-hour Runoff Depth (in.) by Return Period | | | | | |
|---|---|---|---|---|---|---|---|
| **Model** | **Implementation Scenario** | **2-yr** | **5-yr** | **10-yr** | **25-yr** | **50-yr** | **100-yr** |
| Runoff Depth Captured by GI | | 0.040 | | | | | |
| Historical | Runoff Depth | 0.97 | 1.30 | 1.56 | 1.90 | 2.17 | 2.44 |
| | % Capture | 4.1% | 3.0% | 2.5% | 2.1% | 1.8% | 1.6% |
| Median (RCP 8.5) | Runoff Depth | 1.10 | 1.53 | 1.94 | 2.56 | 3.07 | 3.62 |
| | % Capture | 3.6% | 2.6% | 2.0% | 1.5% | 1.3% | 1.1% |
| ***Runoff Increase*** | | ***0.133*** | ***0.225*** | ***0.375*** | ***0.657*** | ***0.895*** | ***1.19*** |
| ***GI offsets the impact of climate change by*** | | ***29.9%*** | ***17.6%*** | ***10.5%*** | ***6.0%*** | ***4.4%*** | ***3.3%*** |

Note also the question of whether the new Project is sufficiently set back from the Creek. OneShoreline has issued guidance *(which is not yet a regulation)* for a 35' setback called a Creek Buffer Zone[47].

*"OneShoreline's Creek Buffer Zone of 35 feet from the Top of Creek Bank (70 feet total in additional creek width when implemented on both sides) provides additional space and flexibility in the types of flood protection infrastructure that can be used to protect from increased storm runoff and sea level rise.* ***A 35-foot Creek Buffer Zone is a minimum standard, and jurisdictions are encouraged to include a Buffer Zone greater than 35 feet where feasible to provide greater flexibility for natural infrastructure and to accommodate habitat migration."***

3. Potential for Pollution of Fitzgerald Marine Reserve

The stormwater management issues in Moss Beach, both current and anticipated, also threaten to pollute in Montara Creek and the Fitzgerald Marine Reserve, where the water would be discharged, a region which is an ASBS, an ESHA, and a CCA.

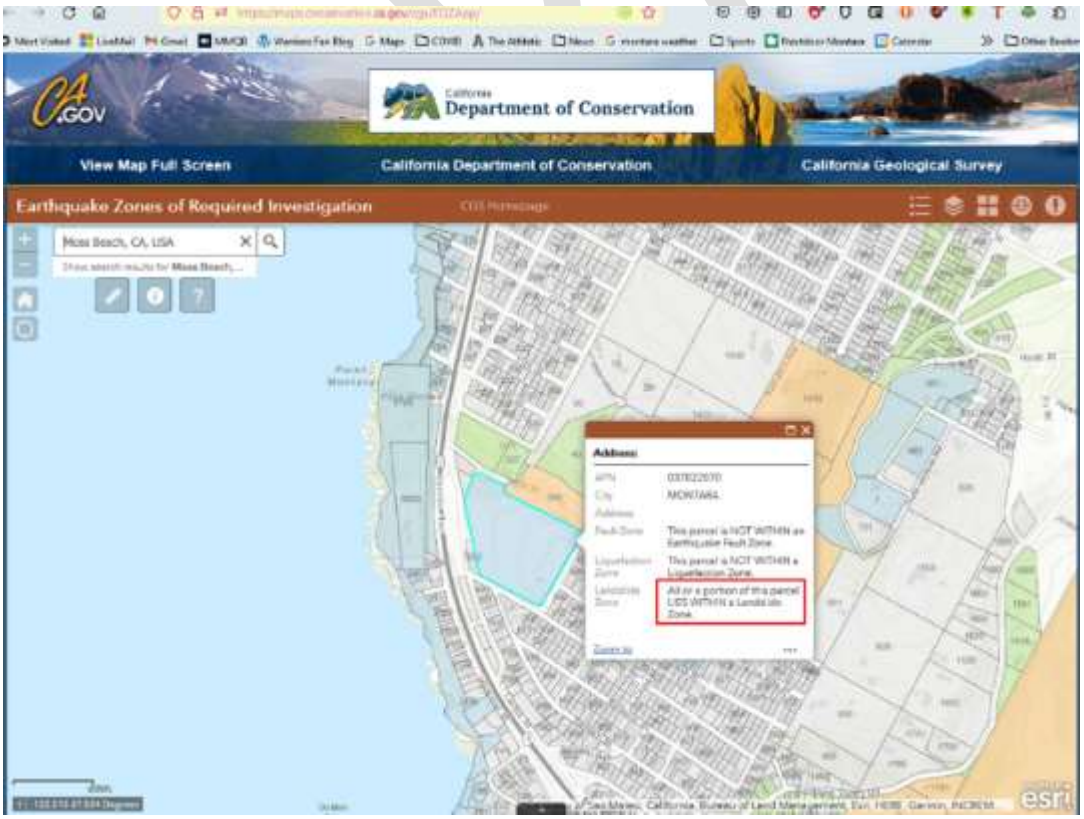
[47] https://oneshoreline.org/wp-content/uploads/2023/09/OneShoreline-Planning-Policy-Guidance-Final-June-21-2023-For-Web.pdf page 34 item 2.

Note that drainage from Carlos and Stetson drains direct to the ocean:


Fig 2A of the Project DEIR shows 4 seepage locations, primarily on southwest side. This thus contradicts the statement in other parts of the DEIR that drainage will be into Montara Creek at the NE, and implies the Project instead could result in more runoff into SW roads and properties, exacerbating excessive unmanaged stormwater there, and increasing risks to those properties and to San Vicente Creek to the South.

There is also the potential for the unmitigated stormwater from the Project to cause land/mudslides adjacent to the Project. In Pg 11 5.2.5 of the DEIR - *"we conclude the potential for landsliding at the site under both static and seismic conditions is low because of the lack of evidence of historic slope instability on the site, the high shear strength of the soil and weathered bedrock underlying the site and the apparent absence of any significant seepage on the slope faces."*

This observation is contradicted by newer maps (presented below) showing the landslide zone on the north edge of the Project site. To resolve this, a certified geologist should review and sign the report, or modify the findings.

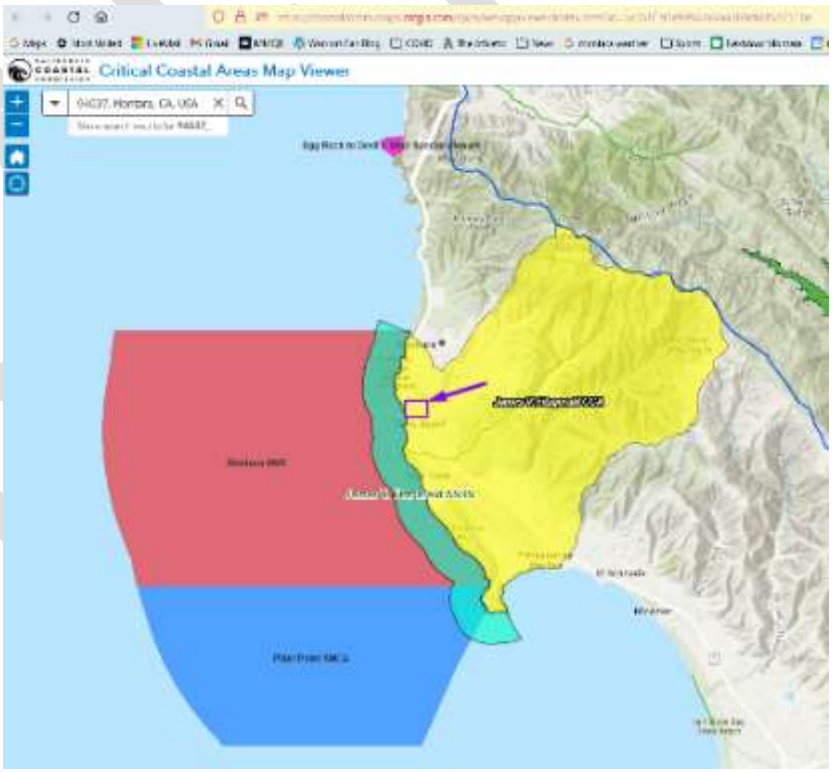


We have concerns that the stormwater management for the Project is inadequate to prevent significant pollution and disruption of the natural environment in Montara Creek and downstream in the James V. Fitzgerald Area of Special Biological Significance, shown on the map below.

*e) Hazardous materials at Cypress Point:*

The Cypress Point Project site was a former WWII military training facility, using top secret drones, and anti-aircraft munitions with no history of appropriate environmental assessment or cleanup. In addition, it has been essentially abandoned for the last 60 years and has been subjected to decades of illegal dumping of appliances, furniture, motor oil, diesel fuel and trash. The site also lies directly above Montara Creek, which drains into the federally protected Fitzgerald Marine Reserve.

In the Planning Commission meeting on the Project's EIR scope, residents pointed out the inadequacy of the previous limited studies that assessed hazardous materials at this site - studies that were used to justify the zoning change. At that time, residents recommended a more robust study for the EIR that would better evaluate toxic contaminants exposure and risk to current and future residents. We were led to believe and had assumed that such a study would be undertaken as part of the EIR. Unfortunately, no such study was done. Instead, the DEIR proposes that a construction contractor will somehow take care of any hazardous materials, with no protocol or plan provided. This does not give the community confidence that the site will be appropriately cleaned up or that hazardous materials can be removed safely.




As further evidence of hazardous materials, there is also a 1989 letter to the property owner from a contractor who found asbestos on the site and notified the owner. Residents have also reported seeing fragments of asbestos on the site. Yet no testing for asbestos has been done - only for lead. In fact, the AEI report in Appendix H of the DEIR says *"AEI did not observe building components likely to contain suspect asbestos containing materials during the site reconnaissance."*

In conclusion, the Project's proposed storm drainage system design is undersized for today's climate and thus risks additional soil erosion and site runoff of any site hazardous materials into Montara Creek and the Fitzgerald Marine Reserve.

## *H. Roosevelt Beach: Caught Between Waves and Woes*

This area of Miramar is part of HMB, and is not MCC jurisdiction, but residents contacted us because of two types of flooding in two ditches, and because of the loss of a valued Coastside recreation facility at Roosevelt beach. The storm drainage has been so compromised that it damaged the culvert at the west end of the beach parking lot, and the adjacent road. It appears that rather than repair the culvert and roadway, the decision made was to close the road, blocking off access to a valuable beach parking lot and to close the restrooms at the end of the parking lot (presumably due to lack of access for septic services).


The two ditches involved are the Roosevelt ditch to the north, and the Pullman ditch shown on the map. In both ditches, residents report winter flooding which has overtaken the first floor of their homes (e.g. Rossi residence at 2804 Champs Elysee Blvd), or reached their foundations.

In addition, there is water discharge in both ditches even during dry months. This dry month discharge is variously reported as: greenish, with an oily sheen, and smelly. Further, vegetation in those ditches grows extremely rapidly following those dry month discharges, and a nightime luminescene has been observed in the ditches. The suspicion is that Rocket Farms is discharging water including nitrates and other potentially toxic chemicals from time to time.

Rocket farms has an impermeable surface of approximately 800,000 sq ft with a one third rule of capturable rainfall of 3 million gallons (from HMB rain estimates) over a year. Source: https://myrainplan.com/ and Exhibit 3.

Estimated from the rainfall captured on a resident's 1,000 sq ft property during the cyclone bomb and atmospheric river of the 10 days in late March, 2023, 600 gallons of rain were captured. On a pro

rata basis, Rocket Farms would have experienced over 480,000 gallons (800x600) of rainfall that could have been captured to alleviate Roosevelt flooding .... captured potentially by four 100,000 gallon cisterns (a practical size costing $70k per cistern). Note that estimate this is a significant portion (16%) of the 3 million gallon volume experienced over a year. The question is what are the means that could be used on the east side on Highway 1 to capture these episodic high volumes of water? What would the cost be of the gutters and plumbing to direct runoff to cisterns for holding and gradual release?

The Hydrologist report (Evaluate cause of flooding and standard of care – Rossi Residence Location of Incident: Half Moon Bay, California)[48] indicates that the culverts on the Pullman ditch are inverted in sizing from proper engineering. The westmost culverts, which could carry the most water flow, are SMALLER than the culverts to the est, resulting in backups and erosion from overflows. Two other observations are interesting:

- The December, 2021 storm is cited as a 1,000 year storm in that location, further indication that Climate Change in the Midcoast exceeds NOAA standard observations
- A hydrology report by Ashley for Stoloski & Gonzalez dated Feb. 2010, which was apparently used to justify construction on parcels in this area, depicted a new 48" culvert from Hwy 1 to the Naples State Beach, which was never built. Had it been installed, it would have exceeded by 78% the capacity of any existing culvert on the Pullman ditch, and likely mitigated the current flooding to downstream residences.
- The Ashley report relied on reports that "all" surface stormwater at the greenhouse enterprise is used for irrigation, and excess flow is retained in onsite storage basins." This assumption appears invalidated by storms of the past few years. Adhering to that stipulated assumption would also mitigate the flooding apparent in this location.

At the Roosevelt ditch, very large eucalyptus trees line the watercourse. In recent storms with saturated soil, winds have blown over trees which are about 9' in base diameter. Had those trees fallen in another direction, they would have landed on nearby houses with consequential damage. It would appear that mitigation of flows which might contain fertilizers and reduction of soil saturation during storms (e.g. by conveyance downstream) is necessary to protect nearby homes.

The City of Half Moon Bay (HMB) has prepared a 2016 Storm Drain Master Plan which includes these ditches. It appears to rely on a definition of a 10 year storm, and on page 4-8 shows an assessment of "no flooding" in green circles. The rainfall distribution pattern for the Half Moon Bay Storm Drain Master Plan was obtained from the County Drainage Manual available at that time. It is unclear that the report used rainfall data representative of actual conditions in the area studied. No estimate of the compound probability of flood exceedance over a 10 year or other period are apparent in that master plan, a deficiency which NOAA and NWS is now addressing (refer to Conclusions and Recommendations). Certainly recent residents' experience belies the accuracy of the assessment in the HMB storm drain master plan.

A recent article [Dec 22, 2021 Updated Aug 14, 2024] by a resident of the area https://www.coastsidenews.com/opinion/we-need-to-better-manage-drainage-to-stay-out-of-ditch/article_757645a1-bf62-517d-816e-64b132d88625.html contains more history about the area and bemoans the lack of a Phase 2 Storm Drain Master Plan which would cost the mitigations

[48] Also attached as Exhibit 4.

required, and the failure to address the flooding. A related article [May 9, 2023 Updated Aug 13, 2024]: https://www.coastsidenews.com/opinion/letters_to_editor/we-must-understand-city-watersheds-to-manage-them/article_1b5e3afb-3da4-5500-bed4-e1d65cbad918.html notes that the Pullman ditch has almost tripled in depth and width in the last three years, and suggests immediate solutions, including storing water on the land and in storage tanks. Given the potential for polluted runoff from Rocket Farms, which contains the proximate impermeable surfaces, some form of treatment might also be required. Sampling and testing of suspect water flows should begin immediately, because the quality of that water, in addition to the quantity, would affect the design of solutions in this area.

## *I. Kehoe Watercourse: Home Sweet Floodplain*

1. What's gone wrong?

Starting in the sixties, the City of Half Moon Bay made a strategic decision to promote development by "reclaiming" lands through which large volumes of water seeped to the coast. The resulting accelerated flows of water had to go somewhere, and a cascade of myopic City planning decisions over decades have combined to cause flooding, erosion, sedimentation, and substantial environmental damage, and have resulted in ongoing public and private expense and polarizing litigation. SAM and private property are at risk. The City failed to hold accountable a developer who installed a drainage system adjacent to Highway 1 without producing a coastal development permit (CDP). The City permitted a neighborhood's stormwater drainage to drain to an outfall that mixes with concentrated entrenched upstream flows in a geologic unit long known to contain highly erodible alluvial soils. The City itself contracted with the California Conservation Corp to perform 600 hours of removal of in-stream pools and vegetation during the rainy season in channelized and natural portions of the Kehoe Watercourse without a CDP.

2. Who was/is being flooded, eroded or sedimented?

Construction on the uphill half of the Grandview neighborhood was suspended when the lower portions of Grandview were flooded after neighborhood construction diverted flows from an adjacent watershed into the lower Grandview and the Kehoe Watershed. The water table in portions of the Casa del Mar neighborhood (Kehoe Estates, Casa del Mar, Imperial Bay and St. John subdivisions) rose, and Kehoe Avenue sunk. Some residents with high water installed sumps, further converting subsurface flows to entrained flows in gutters and culverts, much of which drains into the Kehoe Watercourse. An outfall which deposits much of the Casa del Mar runoff into the Kehoe Watercourse has failed.

3. What environmental damage is being created?

The entrained flows created by development erode the unconsolidated soils, threatening habitat, lowering water tables, degrading wetlands, and likely compromising water quality in watercourses emptying into Half Moon Bay, whose water quality has been cited by the RWQCB as impaired. Pilarcitos Lagoon has been completely lost to sedimentation. Soils eroded from the Kehoe Watercourse have been deposited adjacent to the SAM Plant, reducing its berm's capacity to prevent flooding during heavy storm events (and which likely caused part of the overflow on 1/1/23, though SAM has now constructed a higher berm).

Unpermitted grading and a berm have directed water with agricultural pollutants away from pollutant-absorbing sheet flow and groundwater paths into Pilarcitos Creek, directing it to the Landstra parcel and into the Kehoe Watercourse (whose Local Coastal Program land use designation are Open Space for Conservation and Greenbelt Stream Corridor, respectively, and both of which have been confirmed by the City to be habitat for federally protected CRLF and SFGS - , which are protected under federal, state and local law. Unpermitted farming on public and private land, and the loss of water to recharge have diminished the habitat for these same species south of the SAM Plant driveway. The redirected watershed flows east on both sides of Highway 1 have rapidly eroded the banks of the Kehoe Watercourse.

Entrenching of the watercourse has allowed groundwater to exfiltrate. Wetlands are damaged or destroyed either by lowering water tables and drying some wetlands above, or by burying riparian wetlands with sediments brought from upstream.

4. What has it cost in damage and/or in future?

Entrained flows of stormwater accelerated by culverts and channels…

- Contribute to bursty storm water flows and sedimentation beside SAM, increasing the threat of inundation, and the urgency of spending funds to mitigate that risk.
- Has caused upcutting in the Pullman Watercourse that will necessitate expenditure of state funds to stabilize the parking and trail.
- A state court found that The City of Half Moon Bay conduct of unpermitted destruction of vegetation in the Kehoe Watercourse was a knowing and intentional violation of the Coastal Act.
    - Even though the plaintiff dismissed the fines, the City incurred legal fees of nearly half a million dollars as a result.
    - The City remains responsible for the cost of restoration projects.

One resident notes: *“On the west side of Highway 1, the flows entrained into the Kehoe Watercourse have produced incision and channel widening and threatened bankside vegetation. The flashy flow of waters from the Sea Haven subdivision are eroding the banks of the channel through which it passes between Casa del Mar and the California Coastal Trail. And the eroded sediment passing through these channels has filled the lagoon, with obvious implications for the anadromous fish that used to depend on it.”*

## *J. Seal Cove: Slip-Slidin' Away*

Anyone who has driven to the Moss Beach Distillery over the years has noticed the changes. After the New Year's Eve storm of 2023, residents and SAM employees reported settling and cracks in roads as much as 18-20" vertically. County DPW has regularly patched many of the roads in the area. The question for this report is: is this a stormwater problem, or something else? Based on what we have read and seen the answer is: Both.

MCC has held a site visit with a retired geologist and received his comments; held two tours with several neighbors and heard their testimony, and has received copies of County reports on conditions in this area (Exhibit 7).


The complication in Seal Cove is that both geologic forces AND stormwater are at work, and it is difficult to apportion the causality. What is clear is that: 1) roads and homes are regularly settling, causing damages to home and MWSD infrastructure[49], and 2) rainfall exacerbates the slippages and settling – though rain may not be the only cause. *"Regarding ground movement in the area, active landslide movement is undoubtedly the primary cause, irrespective of rainfall, which only contributes to activation. Less rainfall and better control of drainage may slow landslide movement but will not stop it."*[50]

The map at right shows nearby liquefaction and earthquake risks.

MWSD provided this comment as well as the report in Exhibit 7:

*"Water is not the cause, however, water lubricates the fault line and expedites the slippage. Groundwater is an issue. Stormwater that gets in the ground at or around the fault lines is then also groundwater, or is raising the groundwater level."*

Per the retired research geologist in Moss Beach:

*"The on-going deep-seated landsliding in the Seal Cove area, that is tearing homes apart and damaging the infrastructure of roads, water lines and sewer connections is not the direct result of storm runoff and poor drainage from climate change onset in the last 2 yrs. The unprecedentedly wet winters, of course, have certainly contributed to landslide activation, but the Seal Cove area has been failing continuously for > 30-50 years and this is well known in the geologic community.*

[49] In a related matter, PG&E gas lines have repeatedly leaked in the area, likely also due to earth movement. Once a resident was asked when reporting a leak: "Is there Press on the scene." Echoes of San Bruno…

[50] Comment from geologist reviewer.

*Water infiltration into the landslide slip surfaces probably can be argued as contributing to current slide movement, but this is an ongoing process that has been going on for many years. I do agree that San Mateo County has pointedly looked the other way in granting building permits in this area for many years…*

*Figure 4 Adapting to Reality*

*In the Seal Cove area and probably in many other areas, the problem of water accumulation and flooding was more a problem with the ground being so saturated that water was unable to sink into the ground, rather than impermeable man-made surfaces. Also, surface runoff on Cypress Avenue was blocked from going anywhere due to inadequate diversion of surface water, so that the water pooled up. Also contributing to the flooding of homes and streets in Seal Cove is the topography. For example Park Way, which runs WNW-ESE along the base of a slope parallel to a trace of the Seal Cove fault, is a trough-like topographic low, where water accumulates and pools up, particularly at the intersections with Orval, Marine Blvd and Alton. I think it can be argued that this pooling of water is more the consequence of the topographic low and soil saturation than "impermeable surfaces. Again, one can point to poor planning by developers years ago, to provide adequate drainage for "2023-like rain events", which also reflects on the County DPW and permit approval policy. It seems too bad that all this water could not have been captured and stored in aquifers or tanks for use in agriculture or similar use."*

Per the 2006 County memo:

*"Surface ditches are the most effective drainage system for the area, as subsidence and heaving on or near Ocean Boulevard could divert water from underground drainage systems in the underlying faults or slip planes. <u>We do not believe we can control the erosion in this area</u> based on the conclusions reached in the original 1971 geotechnical report as described in the History section of the memo.*

*Your Board authorized the study of the Seal Cove area in 197l. The study concluded that the area was subject to geologic instability due to:*

1. *Existing active landslide masses underlying the area*
2. *Sea cliff erosion due to the effects of the wave and tidal action*
3. *Shallow groundwater, which adversely affects slope stability, seismic stability and surface drainage*

4. *Seismic hazards due to close proximity of the Seal Cove Fault[51]"*

***The quotes below are from the GEOLOGIC SUMMARY OF CONDITIONS ALONG OCEAN BOULEVARD, MOSS BEACH attached to the Sept. 6, 2006 letter attached as Exhibit 7.***

*"There are other signs of continued and, in some places, accelerated landslide movement in the Seal Cove area. The slide that includes the Distillery restaurant, its parking lots, and several nearby homes, is very active and movement continues to cause cracking and deformation in pavement and structures.'*

*"The most significant contributing factor to the current landslide movement is probably water from surface drainage and rain during the very wet winter of 2005-2006. The uncontrolled drainage that exists through some properties along Ocean Boulevard, and landscape watering in this area will continue to be a problem even if future rainy seasons are not as severe."*

*"Recommendation #4: Provide control of drainage from the paved and developed portions of the Seal Cove area away from the two landslides.[52] Failure to do this will probably result in continued movement in these areas, and possible headward migration of the scarps."*



[51] Memo from DPW to SMC Board of Supervisors Sept. 6, 2006 – attached as Exhibit 7

[52] Per a geologist reviewer: *"The "2" landslides referred to here, are actually one and the same landslide block that continues through the neighborhood for some distance south of the Distillery, nearly to the end of Ocean Blvd.… The landslide block boundary may be controlled by zones of weak rock associated with the numerous Wide Seal Cove/San Gregorio fault zone, known from various geotechnical reports."*

Other issues:

We found that stormwater is draining directly into the Fitzgerald Marine Reserve Critical Coastal Area from unmanaged gullies, for example at the west end of Madrone and elsewhere along the closed Ocean Blvd. Also, there is a roadside ditch adjacent to the Fitzgerald Park on Cypress Ave. where there is a catch basin large enough for a small child to fall in. We could not find the outlet for this, but presumably it exits to the west near the stairs of the Seal Cove Trail, which would mean that, again, untreated stormwater is being discharged into the Marine Reserve.

*Figure 5 Overlarge Catch Basin Opening on Cypress*

1. Conclusion and Recommendations:

This is a complex geological and stormwater situation, requiring professional analysis. What we can conclude is this:

1. Continued construction in this area is adding disproportionate cost burden to local utilities and to the County DPW. The problem has been well known for many years, yet development in areas prone to these problems has continued to be approved by the County. Impact fees for construction and utility services in this area should be increased to cover those costs, rather than be subsidized by other rate and tax payers.

2. Stormwater is not controlled in ditches or gullies (as in Montara) in much of Seal Cove.

3. Unmanaged stormwater is exacerbating the earth movements in the area. It is understood that that better stormwater management will not stop ground movement in the Seal Cove area, but may slow it. In conjunction with item 2, and depending upon the concerns for water quality which might be expressed by C/CAG and the RWQCB, consider construction of at least roadside gullies, culverts under residential driveways to allow gully flows to continue, and a method for retaining and treating such stormwater before discharge into the FMR CCA.

4. Place rods on the Cypress Ave. catch basin to prevent small children from accidentally falling into the culvert.

5. Reconsider and justify the financial impact of allowing continued construction in this area. Are the permit fees and property taxes sufficient to offset the extra costs and risks to existing property and water quality?

## *K. Additional Neighborhoods With Stormwater Problems*

1. Montara, Cedar St.

A 30 year resident reports longstanding addition of more homes has led to regular flooding on Cedar St. Spurred by requests from the Midcoast Community Council in 2006, and following two years of design work and permitting, around 2009 the County did add drainage culverts on the 1200 block of Cedar St. to remove what had become a block-long puddle, but several properties remain flooded (although the street is better). A walking tour of the area shows several houses with extensive pipe and pumps at work to try to clear water, even days after rains. Conflict between neighbors has resulted in threatened lawsuits. Some residents have spent upwards of $60,000 between drainage, damages, and attorneys. Additionally, the culvert on the east side of Cedar has an opening large enough to swallow a small child who might slip and be conveyed underground. With more construction underway, additional flooding is to be expected on low-lying properties.

Recommendation: Place rods on the Cedar St. catch basin to prevent small children from accidentally falling into the culvert.

2. Deer Creek, El Granada

There are resident concerns about flooding that we are researching for the next draft. Exhibit 8 is an example.

3. The Proposed Hyatt property in HMB

This was raised as a concern by HMB residents, but we have not had a site visit for inspection. At present we lack sufficient local knowledge to include. Planning to omit this region in this version of the report.

4. Clipper Ridge: Rain Check

Had site visit with resident, and took photos. Time may not allow completion in time for inclusion in this version of the report.

# III. Current Stormwater Organizations, Policies, and Science

*[This chapter and the next will require peer review. It was assembled by lay reviews of presentations and web research, and may not be current and correct. Several of the conclusions depend upon correct understanding of the status of Current Stormwater and Drainage Policies.]*

## *A. Organization and Current Policy*

1. Policies and Programs

Stormwater management and drainage construction in San Mateo County, California, are governed by several policies and programs across several agencies:

1. National Pollutant Discharge Elimination System (NPDES) permit: San Mateo County operates under a regional urban stormwater NPDES permit, which regulates stormwater discharges into local waterbodies.
2. Municipal Regional Stormwater Permit (MRP): This permit outlines the State's requirements for municipal agencies in San Mateo County to address water quality and flow-related impacts of stormwater runoff.
3. San Mateo County Stormwater Resource Plan (SRP): This comprehensive document aims to identify and prioritize opportunities for better stormwater utilization countywide.
4. Erosion and Sediment Control Plan: Required for all projects involving site disturbance that need demolition, grading, or building permits.
5. Stormwater quality control requirements from the Municipal Regional Stormwater Permit (MRP): Enforced by the San Mateo County Planning and Building Department in collaboration with the San Mateo Water Pollution Prevention Program (SMCWPPP).
6. Surface water runoff flow control requirements: Enforced by the San Mateo County Planning and Building Department for private properties. (https://www.smcgov.org/planning/surface-water-management)
7. Areas of Special Biological Significance (ASBS) requirements: Enforced for coastal projects to protect designated ocean areas. [Part of the MRP requirements specific to the County.]
8. Low Impact Development (LID) requirements: All Regulated Projects must implement LID source control, site design, and stormwater treatment onsite (https://www.smcgov.org/planning/stormwater-treatment-requirements).
9. San Mateo County Drainage Manual: Updated from a 2019 Draft in March, 2023 this manual establishes three levels of drainage review (Basic, Prescriptive, and Standard) based on project complexity. Among the key provisions of this manual are:[53]
    1. The post-development stormwater runoff peak flow and volume must be less than or equal to the undeveloped stormwater runoff peak flow and volume at each point of

[53] Pp 45-46, County Of San Mateo Drainage Manual March 2023

discharge from the project parcel, unless an alternative discharge point is otherwise approved by the County.

2. Conveyance systems must be adequately sized and designed to accommodate design flows.
3. Stormwater treatment measures shall be sized and designed per the design criteria provided in the SMCWPPP C.3 Regulated Projects Guide (see APPENDIX 2, Reference Documents).
4. Design Storm: Projects shall use a minimum **10-year design storm** for all peak flow and volume calculations.
5. Storm Duration: The standard storm duration shall be equal to **1 hour**.
6. Rainfall Intensity: Rainfall intensity shall be determined using the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 data, which can be accessed via the Precipitation Frequency Data Server (PFDS). This is an update from the 2019 draft manual rainfall reference, now containing data on storms up to 1,000 year 'recurrence intervals' – the prior limit was 100 years.

10. Green Infrastructure Plan: Approved in September 2019, this plan explains how the County will incorporate green infrastructure into unincorporated communities[54].

The San Mateo Water Pollution Prevention Program (SMCWPPP) is a program of the City/County Association of Governments (C/CAG), which supports the 20 cities/towns and County of San Mateo and the San Mateo Flood and Sea Level Rise Resiliency District in complying with the San Francisco Bay Municipal Regional Stormwater Permit administered by the San Francisco Bay Regional Water Quality Control Board. Those entities share a common National Pollutant Discharge Elimination System (NPDES) permit, also referred to as the Municipal Regional Permit (MRP).

The SMCWPPP program provides extensive information for C.3 Regulated Projects, which are applicable to new development on a county-wide level, on its Flows to Bay website, including:

- C.3 Regulated Projects Guide
- Hydromodification Management (HM) Requirements
- Biotreatment Soil Mix Supplier List
- C.3 Sizing Worksheets
- Operation and Maintenance Requirements[55]

The C.3 Regulated Projects Guide is a comprehensive guide that provides detailed information on stormwater management requirements for regulated projects in San Mateo County.

[54] https://www.smcsustainability.org/water/stormwater/

[55] This is a partial list from the website, and also includes other planning efforts and resources including the GI Design Guide, Sustainable Streets Master Plan, Stormwater Resource Plan, Regional Collaborative Program, OneWatershed Framework (under development) to support multi-scale green stormwater infrastructure implementation.

The C.3 Regulated Projects Guide:

1. Outlines the requirements for Low Impact Development (LID) techniques in new development and redevelopment projects.
2. Includes information on Hydromodification Management (HM) Requirements.
3. Provides guidance on biotreatment soil mix, C.3 sizing worksheets, and operation and maintenance requirements.
4. Contains specific appendices, such as Appendix J, which provides information on Special Projects that may receive LID treatment reduction credits.
5. Includes Appendix L, which details site design requirements for small projects (C.3.i).

2. Departments and Agencies Involved:

This guide is a crucial resource for understanding and implementing stormwater management regulations in San Mateo County, and it should be consulted by developers and project managers working on regulated projects in the area.

*a) San Mateo County Planning Department:*

Author of the San Mateo County Drainage Manual, and administrator of the permitting processes for building. The department receives fees for permitting which fund the reviews and inspections involved. Some of those fees are passed to DPW for their inspections.

*b) San Mateo County Department of Public Works:*

Constructs and maintains stormwater facilities in the unincorporated areas, and inspects construction.

*c) The City/County Association of Governments of San Mateo County (C/CAG):*

Coordination of the MRP and providing compliance support to co-permittees in the County. Additional planning support for green stormwater infrastructure implementation.

*d) San Mateo Resource Conservation District (RCD)*

When funded and directed by the County, RCD has been instrumental in planning and implementing tactical projects in a variety of natural resource management contexts. For purposes of this report, their work in flood mitigation and watershed restoration in Pescadero, and recently their involvement in the stormwater management design on 2nd St. in Montara are of note.

*e) OneShoreline has the charter to address flooding in San Mateo County.*[56] [57]

*"While weather extremes in recent years have impacted these key aspects of our communities, until recently climate change has not materially impacted the planning documents that guide them and local decision-making regarding where and how development should occur."*[58]

[56] History of OneShoreline is here: https://oneshoreline.org/our-history/
[57] Section 3.7.5 of AB-825 San Mateo County Flood and Sea Level Rise Resiliency District. (2019-2020), which includes the right of eminent domain to effect its mission.
[58] https://oneshoreline.org/wp-content/uploads/2023/09/OneShoreline-Planning-Policy-Guidance-Final-June-21-2023-For-Web.pdf page 1

*"At OneShoreline, two core concepts drive our work to make this happen:*

- *we can no longer plan our future by looking in the rear-view mirror, and*
- *we are all in this together"*[59]

Unfortunately, OneShoreline's efforts have been focused on the County Bayside, and NOT the Coastside.[60] Nonetheless it is likely relevant that their Planning Policy Guidance June, 2023 includes the following recommendations *(selected segments)*:

> *I. **Stormwater Drainage:** Changes in hydrology due to climate change, including changes in extreme precipitation events like atmospheric rivers, shall be incorporated into the design of any new stormwater drainage infrastructure.*
>
> *1. **Peak Flow Rate and Volume Control Design Criteria.**[61] The post-development stormwater runoff peak flow rate and volume must be less than or equal to the undeveloped stormwater runoff peak flow rate and volume at each point of discharge from the project parcel, unless an alternative discharge point is otherwise approved by [City/County] staff. Peak flow rate and volume calculations showing existing and future discharge rates must be submitted for review and approval.*
>
> *a. Undeveloped Conditions Assumptions. If undeveloped conditions of the project site are unknown, a runoff coefficient of C=0.3 shall be used for undeveloped peak flow calculations, per the County of San Mateo Draft Drainage Manual.*[62]
>
> *b. **Design Storm.** New and/or substantial private construction shall use the future 10-year design storm for all runoff peak flow and volume calculations, using the "Median (RCP 8.5)" scenario from the Climate Adaptation Risk Analysis for the San Mateo Countywide Sustainable Streets Master Plan.*[63]
>
> *c. **Storm Duration.**[64] New and/or substantial private construction shall use at least a 6-hour storm duration for all runoff peak flow and volume calculations. If the time of concentration for the tributary drainage area for which the calculations are being performed is greater than 6 hours, then the storm duration shall be at least equal to the time of concentration.*
>
> *d. **Rainfall Intensity**. New and/or substantial private construction shall use rainfall intensity data derived from the rainfall depth data, using the "Median (RCP 8.5)" scenario from the Climate Adaptation Risk Analysis for the San Mateo Countywide Sustainable Streets Master Plan.*[65]



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[59] Ibid, page 1
[60] Ibid, table on Page 2
[61] County of San Mateo Draft Drainage Manual. December 2019, page 46. https://www.smcgov.org/planning/drainage-manual
[62] Ibid, Page 49
[63] Climate Adaptation Risk Analysis for the San Mateo Countywide Sustainable Streets Master Plan. C/CAG. https://ccag.ca.gov/wp-content/uploads/2021/02/Appendix-A-SSMP-Climate-Change-Report-FINAL.pdf. Table 1-5 on PDF page 14
[64] County of San Mateo Draft Drainage Manual. December 2019, page 46; HEC-HMS Technical Reference Manual. USACE Hydrologic Engineering Center *[links in original document no longer work]*
[65] Climate Adaptation Risk Analysis for the San Mateo Countywide Sustainable Streets Master Plan. C/CAG. https://ccag.ca.gov/wp-content/uploads/2021/02/Appendix-A-SSMP-Climate-Change-Report-FINAL.pdf. Table 1-5 on PDF page 14.

*2. **Stormwater Management Feature.**[66] If it is determined that the post-development runoff peak flow rate and/or volume exceeds the undeveloped runoff peak flow and/or volume for any point of discharge, an on-site Stormwater Management Feature must be designed and incorporated into proposed new and/or substantial private construction to reduce runoff peak flow rate and volume to undeveloped conditions.*[67]

On 12/2/24 we received the following email from OneShoreline, outlining new efforts to improve the analysis (and presumably policy) of stormwater management going forward:

*I'm the new Director of Projects at OneShoreline. Len has asked me to get back to you regarding ongoing OneShoreline work to develop guidelines for climate science-informed basis of stormwater design. You're asking excellent questions about a topic that is really the leading edge of applying regionally scaled climate science to infrastructure policy. Here's a rundown of what we're aware of:*

- *The resource you shared, Atlas 14, is the commonly used design storm basis within the U.S. Atlas. Atlas 15 is underway and will provide a national precipitation frequency analysis accounting for climate change. Timing of this update is 2027+.*
- *California's 4th climate assessment developed IDFs using the LOCAv1 regional downscaling of CMIP5 projections (AghaKouchak et al, 2018). My understanding is that the California climate science data collaborative considers this a somewhat deprecated approach that does not effectively capture the low probability, high intensity events resulting from Atmospheric Rivers.*
- *The attached paper analyzed future changes in extreme precipitation. This is based on the regional LOCAv1/CMIP5 projections. The methodology did not assess changes in frequency, so on its own could not be used in lieu of the Atlas 14 IDFs. However, it is enlightening w.r.t. atmospheric river intensity and storm-totals.*
- *As Reid [Bogert of C/CAG] noted, OneShoreline is contracted with Pathways Climate Institute to develop climate change-informed IDF curves for San Mateo County:*
    - ***Near-term:** Pathways will provide regional downscaling of the LOCAv1/CMIP5 projections, including low probability, high intensity events (atmospheric rivers). The results will provide a localized, climate change-informed alternative to the Atlas 14 basis.*
    - ***Summer/Fall 2025:** Pathways and their research partners intending to publish peer-reviewed IDF curves derived from the LOCAv2 projections, which are based on CMIP6. This would supersede the LOCAv1/CMIP5 analysis.*

*In short, we have some work underway to develop the climate science basis for recommending updated design storms. This work will be integrated into Planning Policy Guidelines for Resilient Public Infrastructure, which would be made available to infrastructure agencies and undergo a public review/comment process.*

*Happy to chat more about this if this opens up more questions for you.*

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[66] County of San Mateo Drainage Manual. DRAFT December 2019, page 46. https://www.smcgov.org/planning/drainage-manual

[67] https://oneshoreline.org/wp-content/uploads/2023/09/OneShoreline-Planning-Policy-Guidance-Final-June-21-2023-For-Web.pdf pp. 38-39 has the complete text, only portions of which are included here.

*Best regards,*

***Summer Bundy, ENV SP*** *(she/her)*
*Director of Projects*
*San Mateo County Flood & Sea Level Rise Resiliency District (OneShoreline)*
*1700 S. El Camino Real, Suite 502 | San Mateo, CA 94402*
*sbundy@oneshoreline.org*
***m*** *650-294-0752*

## *B. Adequacy of Current Stormwater Standards*

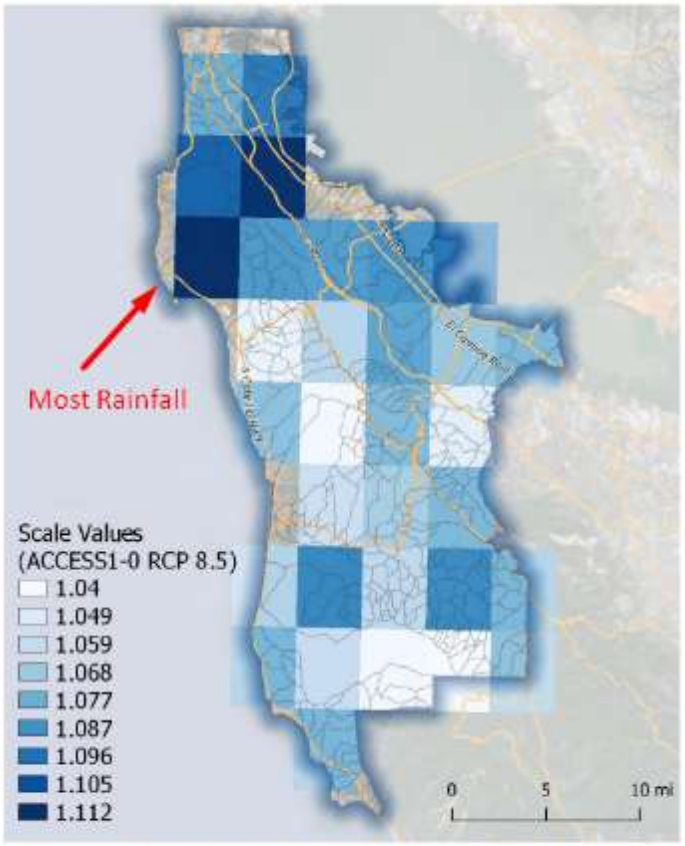


Figure 1-8. Example ratios of future to historical precipitation for GCM ACCESS1-0, RCP 8.5 for a 10-year, 6-hour storm

At the most basic level, it is clear that the current stormwater standards do not provide protection on the Coastside. We are on the front lines of the prevailing rainstorms from the W and NW, and in the highest precipitation area of the County, unshielded by the Coastal Range, as shown in the County's SSMP map at right:[68] Thus our stormwater protections must be more robust than those elsewhere in the County.

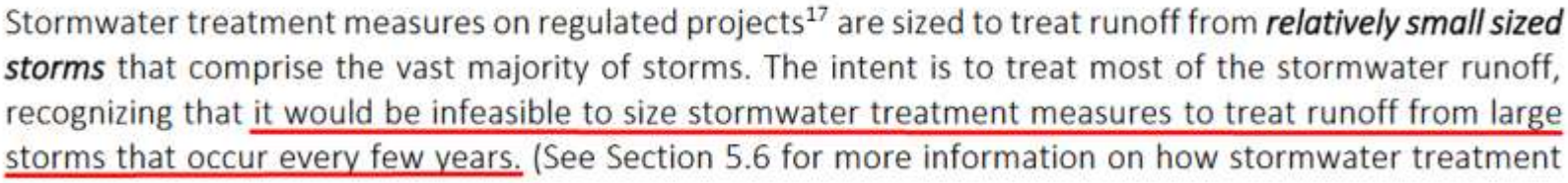
Science and regulations have badly lagged the Climate Reality we have all experienced. For example, the most recent NOAA "Atlas" of precipitation, on which most stormwater conveyance and treatment facility designs are based, is dated 2014. And that NOAA standard was not included in the County's Drainage Manual until July, 2023 – previously it used much older rainfall data for storm drain infrastructure design standards . Those rainfall statistics are based on years of data before Climate Change impacts increased. If we want to be safe, we cannot wait for the statistics we use to catch up to the reality we are experiencing.

For example, the County SSMP analysis UNDERSTATES the stormwater burden in the Moss Beach Area. That study assumes a climate change path of RCP 8.5, and we are already tracking slightly WORSE than that *("Although these are estimated future trajectories, comparisons to actual emissions levels at the time of the IIASA study suggest that observed emissions have been outpacing the RCP*

[68] Climate Adaptation Risk Analysis for the San Mateo Countywide - Sustainable Streets Master Plan Technical Memorandum

*8.5 scenario (Figure 1-7)."*[69] Further, empirical experience in the Midcoast shows that we have already experienced a number of 6" to 8" 24-hour storms.[70][71]

Another example of questionable regulation is in the C.3 Regulated Project Guide, which states *(see screenshot below) "it would be infeasible to size stormwater treatment measures to treat runoff from large storms that occur every few years."* Yet those large storms are the ones which cause the majority of the damage, and against which we must protect. [72]



Stormwater treatment measures on regulated projects[17] are sized to treat runoff from ***relatively small sized storms*** that comprise the vast majority of storms. The intent is to treat most of the stormwater runoff, recognizing that it would be infeasible to size stormwater treatment measures to treat runoff from large storms that occur every few years. (See Section 5.6 for more information on how stormwater treatment

The logic behind that conclusion of "infeasible" is that it would be too EXPENSIVE to fully control the stormwater risk (in this case pollution), which allows developers higher returns and forces everyone else to take the increased risk to health, safety and the environment. Clearly another feasible alternative is to NOT BUILD a project if it cannot mitigate risk to a reasonable level of safety, expressed (as is done for tsunamis and earthquakes) as a compound probability over time. Given that the Midcoast, suffering from the cumulative impact of years of permitting impermeable surfaces without added stormwater management capacity, together with Climate Change, is already experiencing major threats to homes, health and safety, we have passed a tipping point and we can no longer accept low levels of protection from modest storms. We require significant protection from major storms.

Perhaps the major issue with the MRP and related policies is that they seem to have focused more on water quality/pollution, and less on damage from flooding in the past. Certainly, the recent effort at the Orange Memorial Park Regional Stormwater Capture Project appears to blend the two objectives. Going forward on the Coastside, the SMC Drainage Manual and OneShoreline – when updated for current rainfall data - might be the best hope for official policies and projects which protect us from debris flows, flooding, and I&I affecting the sewer plant.

Note that stormwater flooding protection has been proven possible, in the Ocean Colony HOA of Half Moon Bay, constructed in the late '70's and early 80's. That neighborhood, in spite of being windward of the flooded Moonridge MidPen Housing complex, received no damage from the New Years storm of '23. This proves that it IS FEASIBLE to design and maintain a stormwater management system which handles Midcoast storms at their current levels. The implication of that

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[69] Section 1.3.1 page 9 of the SSMP cited above.

[70] And that observation is confirmed by the data on the NOAA site: https://hdsc.nws.noaa.gov/pfds/pfds_map_cont.html?bkmrk=ca

[71] MWSD FEMA application detailing recent storm sizes: https://www.coastsidebuzz.com/wp-content/uploads/2023/01/MWSD_FEMA_applic_2022_relocateWaterSewer.pdf

[72] Pg. 5-2 C.3 Regulated Projects Guide Chapter 5.1: General Technical Guidance for Treatment Measures

'infeasibility' excuse is to not require construction to deal with stormwater in a manner that prevents risks from accruing to the neighbors and roads affected by the runoff. Note that Ocean Colony found it 'feasible' to deal with Coastside stormwater.

Also, the feasibility of controlling stormwater runoff with Green Infrastructure is highly questionable, certainly on the Midcoast. An SSMP study performed by the County[73] documents the inability of Green Infrastructure (GI) approaches to stormwater management to handle storms such as those now annual on the Midcoast. It appears that the GI approach to stormwater management is proposed for this project. In that study, the Design Storm assumed was 5.03 inches for a 100-year storm. The modeling shows that for that level of storm only 3.3% of runoff would be captured. Further, that low capture rate was on the BAYSIDE, where the rainfall is lesser than the Coastside; our experience is likely to be even worse. That GI is clearly unacceptable control for the safety of the neighborhood, for Highway 1, and likely for the water quality in Midcoast creeks and the Fitzgerald Marine Reserve, where the water would be discharged, a region which is an ASBS, an ESHA, and a CCA.

Table 2-3. Runoff captured by GI in the bayside subwatersheds

| Climate Change | | 6-hour Runoff Depth (in.) by Return Period | | | | | |
|---|---|---|---|---|---|---|---|
| **Model** | **Implementation Scenario** | **2-yr** | **5-yr** | **10-yr** | **25-yr** | **50-yr** | **100-yr** |
| Runoff Depth Captured by GI | | 0.040 | | | | | |
| Historical | Runoff Depth | 0.97 | 1.30 | 1.56 | 1.90 | 2.17 | 2.44 |
| | % Capture | 4.1% | 3.0% | 2.5% | 2.1% | 1.8% | 1.6% |
| Median (RCP 8.5) | Runoff Depth | 1.10 | 1.53 | 1.94 | 2.56 | 3.07 | 3.62 |
| | % Capture | 3.6% | 2.6% | 2.0% | 1.5% | 1.3% | 1.1% |
| ***Runoff Increase*** | | ***0.133*** | ***0.225*** | ***0.375*** | ***0.657*** | ***0.895*** | ***1.19*** |
| ***GI offsets the impact of climate change by*** | | ***29.9%*** | ***17.6%*** | ***10.5%*** | ***6.0%*** | ***4.4%*** | ***3.3%*** |

This unmitigated runoff highlights how GI really isn't the solution to solve flooding issues. It's part of the solution, but it's not the solution alone, and the SSMP does not state that it is or should be. Larger stormwater conveyances, potentially combined with large-scale retention/detention systems, which probably need to be constructed a parks/schools/large parking areas (underground) are the clearer solution to flooding, in addition to creek/flood control channel management.

As empirical experience in the Midcoast shows that we have already experienced a number of 6" to 8" 24-hour storms in the last decade, a correct analysis for the Midcoast would use a storm of at least that size, and the stormwater capture ratio would be even lower, perhaps 1 or 2% of the rainstorms already extant.

[73] App. A - Climate Adaptation Risk Analysis for the San Mateo Countywide, Sustainable Streets Master Plan Technical Memorandum

Finally, the entire concept of the 'design storms' used by the County ignores the actual risks to residents. For example, the standards in the 2019 Drainage Manual considered a design storm as a "90% 10-year return storm" of about 4.03" in 24 hours in our area (table shown below). These were

| PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Duration | Average recurrence interval (years) | | | | | | | | | |
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 24-hr | 2.11 (1.91-2.38) | 2.66 (2.41-3.00) | 3.41 (3.07-3.86) | 4.03 (3.60-4.60) | 4.90 (4.23-5.79) | 5.59 (4.72-6.74) | 6.30 (5.20-7.80) | 7.05 (5.65-8.98) | 8.11 (6.23-10.8) | 8.95 (6.64-12.3) |

the standards in effect for much of the recent building on the Midcoast, now superseded by the 2023 update.

If you are protected from a 4" storm 90% of the time each year, then the compound probability of protection over a decade is only 34.9%, and that is only 'protection' from a 4" storm. Thus, over a decade you are NOT PROTECTED from that 4" storm 65.1% of the time. What is required on the Midcoast is protection from at least 6", and possibly 8", storms[74] using REAL Coastside recent data, so that we do not repeat the New Years' Eve Storm disaster where people were crushed and flooded out of their homes and Hwys 1, 92, and 84 were blocked by water and road damage.

The requirement that *"The post-development stormwater runoff peak flow and volume must be less than or equal to the undeveloped stormwater runoff peak flow and volume"* appears specious because how and when are those flows to be measured, by whom, and with what funding? It would take miraculous timing to measure those flows in identical storms before and after construction. In addition, what if those flows are ALREADY excessive for the safety of the neighborhood - then why is retaining that level of risk acceptable?

For many storms, there is a pattern of rainfall intensity lasting 4 to 6 hours, building up to a peak and then declining. The concept that a stormwater system only has to handle 1 hour of the design storms omits the cumulative risks and flows that result during a storms' duration. Note that the County's own Sustainable Streets Master Plan Technical Memorandum used a 6 hour storm, which we feel is more representative of the sustained risks posed Coastside.[75] Note further that when storms follow previous rainfall, with soils already saturated, the runoff increases.

An appropriate safety standard would be that a property, and its watershed neighbors, which as we noted previously are likely not insured for flooding, would suffer no flooding damage over a 50 or 100 year duration with a probability of 99% - that is, a **compound probability** over all those years, not the probability in any single year. Setting such a standard would require probability calculations based on local conditions using ACTUAL recent storm data, because NOAA and the longer term rainfall data have not caught up with our current climate reality.

Failure to treat or control all stormwater runoff from new construction passes the risks and costs onto existing properties in the area. Yet that is what current practices allow, as the County continues to

[74] MWSD FEMA application detailing recent storm sizes: https://www.coastsidebuzz.com/wp-content/uploads/2023/01/MWSD_FEMA_applic_2022_relocateWaterSewer.pdf

[75] App. A - Climate Adaptation Risk Analysis for the San Mateo Countywide, Sustainable Streets Master Plan Technical Memorandum

permit new construction in (and uphill of) the very areas already suffering flooding and uses methods which omit appropriate risk calculations.

## *C. Highway Design Implications for Residential Stormwater Management*

It is instructive to compare the stormwater regulations above with the practices of Caltrans and Cal Forestry, which have to preserve critical infrastructure. While Caltrans failed to respond to our multiple requests for information,[76] it is instructive to review their standards for culvert designs, because they are concerned primarily with preserving essential infrastructure from the damage from stormwater, as opposed to only water quality. In their Highway Design Manual, 820-1, July 1, 2020, Caltrans considers both 10-year and 100-year floods. They further state that *"A more frequent design flood than a 4% probability of exceedance (25-year) should not be used for the hydraulic design of culverts under freeways and other highways of major importance."*, a position which contrasts notably with the 10-year County standard design storm. To residents, their dwellings are as essential infrastructure as a highway, so we submit a higher design storm standard is appropriate for residences.

Another state agency, in the California Forestry Report No. 1 - Designing Watercourse Crossings for Passage of 100-year Flood Flows, Wood, and Sediment states that *"The estimated 100-year peak flows are then used to determine a culvert diameter large enough to handle the estimated peak flow ..."*.[77]

Here is the Forestry procedure for:

***Rainfall Intensity Determination***

*To determine the rainfall intensity for design purposes, one must:*

- *Determine the **time of concentration*** [emphasis added] *for the drainage basin upstream of the watercourse crossing.*
- *Choose a **100-year return-period rainfall*** [emphasis added] *duration (e.g., 15 minutes, 30 minutes) from depth-duration-frequency (DDF) rainfall data that is similar in duration to the time of concentration.*
- *Convert the 100-year return period DDF data to inches per hour for use as the rainfall intensity variable in discharge calculations"*[78]

We take the following implications from that procedure:

1. Forestry is using a 100 year storm, not 10 years, for their stormwater planning.

2. Forestry is using the "time of concentration"[79] – *"**Time of concentration** is a concept used in hydrology to measure the response of a watershed to a rain event. It is defined as the time needed for water to flow from the most remote point in a watershed to the watershed outlet."* What is important about this concept is that it includes THE ENTIRE WATERSHED in estimating stormwater

[76] Emails beginning Oct. 18, 2024 to prior Caltrans contacts and the Public Information Officer.
[77] Pg. ii of the manual
[78] Pg. 3 of the manual
[79] https://www.iowadnr.gov/Portals/idnr/uploads/water/stormwater/manual/iswmm_chapter03-03.pdf

effects at the point of vulnerability. We see no similar concept in the SMC Drainage manual, which appears to consider just the site under construction in isolation, rather than the entire watershed neighborhood at its most vulnerable point, to assess stormwater management requirements. In our discussion of Moss Beach and Cypress Point above, designing that site's stormwater systems based on the construction site plus 1 acre, when 11 acres uphill are feeding water to that site, is another illustration of inadequate design safety.

## *D. Insurance Implications for Stormwater Management Design*

Of note, *"for the past 30 years, California insurance regulations – specifically, Proposition 103 passed in 1988 – have required insurance companies to apply a catastrophe factor to insurance rates based on historical wildfire losses. In a dynamically changing risk environment, historical data alone is not sufficient for determining fair, accurate insurance premiums. According to Cal Fire, five of the largest wildfires in the state's history have occurred since 2017."*[80]

As a result of being denied the ability to price homeowner policies based on the real, and increasing, climate risks, insurers have suffered loss ratios above 100% of policy revenues. This has caused an exodus of insurers from the Calif. Insurance market.[81][82] Coastside residents have reported being cancelled or unable to obtain home insurance for wildfire. Of note, finally, the State is adapting to our new reality and going to adjust its regulations to allow risk estimation based on forward-looking climate models.[83] The measure also extends language related to improved climate modeling to "nature-based flood risk reduction". **The implication for stormwater design is that we should no longer rely on backward-looking rainfall data, but emulate the procedures to be used for wildfire insurance in the design specifications for our stormwater mitigation requirements.**

## *E. Recent Developments In Stormwater Science and Engineering*

Clearly, increased research attention is being given to rainfall and stormwater, as evidenced by the March, 2023 adoption of the new County Drainage Manual, by the November, 2023 update to the C.3 Regulated Projects Guide, by the recent email from OneShoreline announcing their initiatives to advance the science of climate science-informed stormwater design, and by the study OneShoreline forwarded which states in part:

*"…storm-total precipitation associated with the most common type of storm event may increase by 26–37% in 2100 relative to historical…"*[84]

And there are other recent regional efforts to develop new rainfall intensity, frequency, duration curves based on climate futures to modify design standards for conveyance and water quality infrastructure, such as this 2023 release from SFPUC:
sfpuc.gov/sites/default/files/documents/2023_CCSF_Extreme_Precipitation_Guidebook_Vol2_With_Forward_V.2_FINAL.pdf

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[80] https://insuranceindustryblog.iii.org/california-finalizes-updated-modeling-rules-clarifies-applicability-beyond-wildfire/
[81] https://jlkrosenberger.com/ssap/gloomy-california-insurance-market/
[82] https://www.eenews.net/articles/calif-scared-off-its-biggest-insurer-more-could-follow/
[83] https://insuranceindustryblog.iii.org/california-finalizes-updated-modeling-rules-clarifies-applicability-beyond-wildfire/
[84] Pg. 15 Future changes in extreme precipitation over the San Francisco Bay Area: Dependence on atmospheric river and extratropical cyclone events (Patricola, et al) *Weather and Climate Extremes*, 36 (2022)

Of note, that recent SPFUC study points out that the largest % increase in rainfall will come IN THE LARGEST STORMS. That is, the bigger storms will get even bigger faster than the small storms will increase. And that storm frequency will also increase:

*"The change in storms can also be viewed as a change in storm frequency…. Today's 100-year, 24-hour rainfall event could become a 40-year, 24 hour event by 2050, and a 20-year, 24-hour event by 2100."*[85]

However, the most concerning recent scientific finding is contained in the National Academies of Science 2024 document: Modernizing Probable Maximum Precipitation Estimation. That study was driven by concerns about the safety of dams and nuclear power plants in an era of Climate Change, but the lessons therein are relevant for SMC stormwater planning. As a lay summary, that document says:

1. We've been estimating extreme precipitation (Probable Maximum Precipitation - PMP) wrong.
2. We knew we were doing it wrong….
3. …But it didn't matter, until Climate Change.

And the recommendations are as follows:

1. Redefine PMP to include *"an extremely low annual probability of being exceeded"*[86], such probability having been ignored in prior concepts.
2. Consider the watershed in the calculations.
3. Fix the science behind the modeling.

However, remedying those deficiencies in the science is estimated to take 10 to 15 years, and we are at risk today.

Note that Cal Forestry and Caltrans procedures have already been addressing recommendations 1 and 2[87], because they consider probability and the "time of concentration" in a specific location. Time of concentration requires measurement of the effect of the watershed in gathering rainwater.

However, as we discussed previously, the County permitting procedures do not consider the compound probability of storm exceedance, nor the watershed effects surrounding a property in the event of larger storms.

A further advance in stormwater management can come from computer modeling of flood risk. Insurance companies are already doing it, and there are emerging solutions which could be employed by local governments and homeowners/buyers. One example is HighTide, which has already modeled Florida for SLR risks. The County could explore that or similar solutions to prioritize where and how much to invest in improved stormwater management.

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[85] Pg. 6: SF Bay Area Precipitation in a Warmer World: Volume 2

[86] Pg. 4: "The committee recommends revising the definition of PMP to become "the depth of precipitation for a particular duration, location and areal extent, such as a drainage basin, with an extremely low annual probability of being exceeded, for a specified climate period.""

[87] https://dot.ca.gov/-/media/dot-media/programs/design/documents/chp0820-a11y.pdf and https://dot.ca.gov/programs/design/manual-highway-design-manual-hdm

Another useful advance would be targets for stormwater volume management to address future large storm events. It does not appear the County currently has volume metrics/targets set at a watershed scale for our watersheds, and nor for the whole County.

## *F. Stormwater Funding*

Clearly, nothing can be done regarding stormwater on the Coastside without funding. It is not reasonable to expect the County DPW or Planning departments to take action on the stormwater hazards extant in the Midcoast without having the resources and funding to act. This section examines the current funding approaches and the potential need.

1. Current Funding Mechanisms

To date, we have identified three (3) current sources of stormwater funding for stormwater-related issues Coastside:

> *f) First, C\CAG collects a small storm fee for every parcel ($7.92/yr) to fund administration and renewal of the County's NPDES discharge permit. If you discharge pollutants from a point source to a water of the United States you need an NPDES permit.[88] The County and the 20 cities and towns in San Mateo County are all permittees under one regional urban stormwater NPDES permit, which also regulates municipalities in Contra Costa, Alameda, and Santa Clara Counties, as well as the cities of Fairfield, Suisun City, and Vallejo.[89]*
>
> *g) Secondly, SMC Planning charges fees for permits which are used to fund reviews and inspections by Planning and DPW, including the adequacy of stormwater-related aspects of projects. On an annual basis from 2021 through April, 2023, these fees were approximately $62,231 per year for Planning, and $19,200 for DPW, but clearly are allocated to the permitting process and do not fund infrastructure[90]*
>
> *h) Thirdly, DPW collects Roadway Improvement fees on permitted construction based on the square footage of impermeable surfaces. This derives from County Board Resolutions: "WHEREAS, countywide mitigation fees were adopted by Ordinance No. 3277 in November 1990, and amended by Ordinance No. 3458 in December 1992, Ordinance No. 3697 in January 1996, Ordinance No. 3819 in February 1998, Ordinance No. 3988 in August 2000, and Ordinance 4324 in August 2006".[91] Presumably some portion of these monies are available for stormwater drainage improvements. At the end of 2023, the Midcoast balance in this fund was $604,390.39[92]*



[88] The NPDES Program is a federal program which has been delegated to the State of California for implementation through the State Water Resources Control Board (State Water Board) and the nine Regional Water Quality Control Boards (Regional Water Boards), collectively Water Boards. In California, NPDES permits are also referred to as waste discharge requirements (WDRs) that regulate discharges to waters of the United States. See: https://www.waterboards.ca.gov/water_issues/programs/npdes/

[89] See Stormwater Pollution Prevention: https://ccag.ca.gov/programs/stormwater/

[90] DPW_Stormwater_Fees Paid by Account Code_2023.05.10.xlsx from SMC Planning

[91] Board of Supervisors agenda of March 26, 2024 - found here: Road Mitigation Fee.

[92] SMCagenda_20240326_att_Mitigation Fee Roads Attachment A.pdf from DPW

2. Estimates of Potential Funding Needs

The C\CAG presentation to the MCC on 4/26/23 framed the funding issues for the Coastside as well as for the County. Below are slides from that presentation, followed by a discussion:

## *Infrastructure Costs*

| | Storm Drain Master Plan Cost (total) | High Priority Projects | Med Priority Projects | Low Priority Projects | Dedicated Annual Revenue |
|---|---|---|---|---|---|
| Atherton | $45 | $18 | $24 | $3 | $0.000 |
| Belmont | $57 | $13 | $13 | $31 | $0.300 |
| Brisbane | $20 | $15 | $3 | $2 | $0.055 |
| East Palo Alto | $39 | $31 | $5 | $3 | $0.125 |
| Hillsborough | $58 | $26 | $14 | $18 | $0.030 |
| Menlo Park | $39 | $23 | $16 | | $0.335 |
| Millbrae | $42 | $3 | $30 | $9 | $0.240 |
| Pacifica | $11 | $9 | $2 | | $0.178 |
| San Bruno | $26 | $19 | | $7 | $0.575 |
| San Carlos | $56 | $43 | $13 | | $0.435 |
| San Mateo | $57 | $33 | $16 | $8 | $0.000 |
| South San Francisco | $54 | $23 | $27 | $4 | $0.425 |
| **Total** | **$504** | **$256** | **$163** | **$85** | **$3** |

Note: All costs in $ millions, for jurisdictions with storm drain master plans available to C/CAG

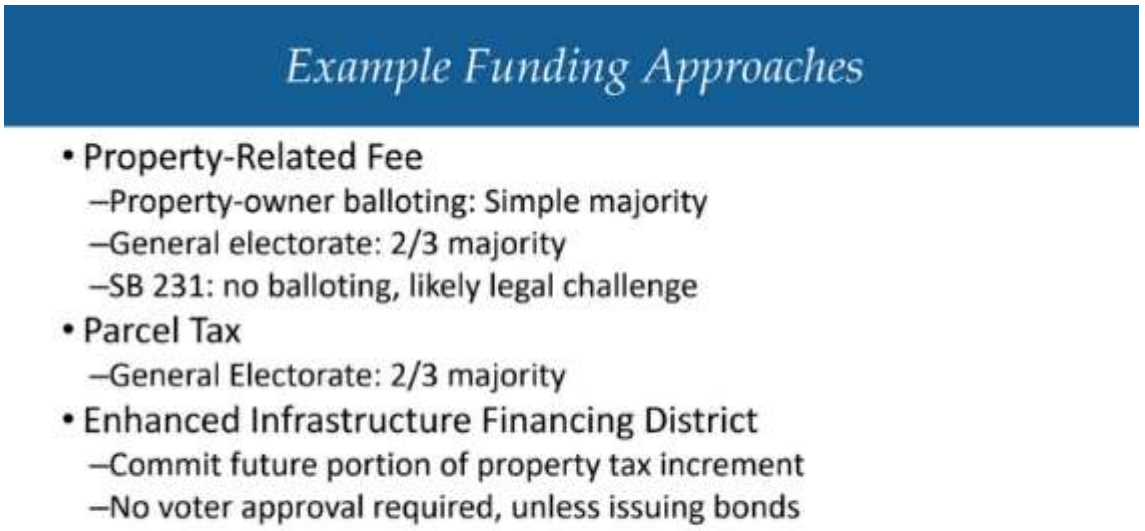
*Data are preliminary, not to be cited*

## *Water Quality Costs*

| Agency | Estimated Future Annual Costs | Estimated Annual Dedicated Revenue |
|---|---|---|
| C/CAG | $2,752,320 | $ 2,220,000 |
| Atherton | $298,267 | $ 80,000 |
| Belmont | $1,739,544 | $ 427,726 |
| Brisbane | $1,415,466 | $ 148,442 |
| Burlingame | $2,231,982 | $ 329,841 |
| Colma | $537,880 | $ 37,500 |
| Daly City | $2,265,544 | $ 837,507 |
| East Palo Alto | $1,597,787 | $ 218,967 |
| Foster City | $1,449,464 | $ 75,000 |
| Half Moon Bay | $282,257 | $ 37,500 |
| Hillsborough | $266,425 | $ 117,436 |
| Menlo Park | $3,021,189 | $ 401,649 |
| Millbrae | $1,568,084 | $ 330,932 |
| Pacifica | $879,653 | $ 322,515 |
| Portola Valley | $182,137 | $ 75,000 |
| Redwood City | $3,902,863 | $ 338,278 |
| San Bruno | $1,994,691 | $ 593,279 |
| San Carlos | $3,817,215 | $ 550,676 |
| San Mateo | $4,137,166 | $ 612,922 |
| SSF | $6,514,467 | $ 629,858 |
| Woodside | $320,576 | $ 75,000 |
| SM County | $31,501,569 | $ 612,166 |
| **TOTALS** | **$46,041,837** | **$ 9,072,194** |

*Note: data from C/CAG's 2014 funding needs analysis, likely not representative of current regulatory requirements*

The data in those slides are from 2014, but as of this writing no more recent data is available to us. Clearly, County-wide, stormwater has become a massive, and massively ignored, priority. We show the Water Quality costs because, although they are outside the immediate scope of this report, they are a related priority which will compete for funding. It is also likely that the flooding Coastside is harming water quality, so improvements in stormwater management (or the lack thereof) can help (or harm) water quality. The sample funding approaches slide leaves out two avenues of note:




A. Grants from federal or state sources, and,

B. Impact fees on new construction or remodeling.

Note that the storm drain Infrastructure Costs slide above OMITS unincorporated SMC, such as the Coastside. Here are some partial data points on potential stormwater management costs Coastside from which we can begin to estimate the funding required here:

1. Stormwater Master Plan: $1 million – *verbal estimate from partner at engineering firm*.
2. 2nd Street flooding fixes – 25 year Remediation: $2.7 million. [93]
3. Quarry Park flooding fixes: $1.5 million, *Burnett Silveria estimate*.
4. HMB stormwater capital plan: over $8 million unfunded in current projections[94]
5. C/CAG HMB retention basin concept: $3.2 million[95]

None of these designs is current and complete, but allow us to ballpark the cost of a functional stormwater management system (SMS) for the Coastside. From an order of magnitude viewpoint, an SMS must be somewhere between $20 and 100 million. Given the 2014 C/CAG cost estimates for the cities above, if Pacifica is a fair comparison, its 2014 cost estimate of $11 million would be $18 million today, but our incomplete project list already totals $16.4M, so $20M seems a likely minimum. At the higher end of the range, the Hillsborough cost was $58 million in 2014, which in 2024 would cost $96 million today.[96] We suspect that Pacifica in 2014 had far better stormwater infrastructure

[93] Drainage Improvement Study for the 2nd Street, Kanoff Street and East Avenue Areas of Unincorporated Montara County of San Mateo, California (2/7/2011), 25 year Remediation, Alternative 3, $1,564,250 inflated to 2024 dollars.
[94] Pg H-6 HMB FISCAL YEAR 2024-25 ADOPTED OPERATING BUDGET
[95] Pg. 28 – 5/31/22 estimate with annual operating costs of $173,000 per year; no estimate for annual asset replenishment reserves.
[96] Inflated using California Construction Cost Index, 6/2014 to 11/2024.

than the starting point for the Coastside today, and considering the larger Coastside land area and comparable though less dense population than Hillsborough, a reasonable estimate would be somewhere in the middle, perhaps $50 million.

Assuming there are 5,000 residences on the Midcoast, then the pro rata share of stormwater capital infrastructure would be approximately $10,000 per residence. Put another way, to fairly fund stormwater infrastructure, the "stormwater impact fee" for each new residence should be $10,000, in addition to the minimal amounts assessed by permit fees today.

In addition, there will be annual operation and maintenance costs, which we cannot reliably estimate. Note that the 2nd Street drainage study estimated annual maintenance and replacement reserve funding of $118K on then-project costs of $1.564K, thus 7.54% of capital costs per year. Using that percentage as a basis, the annual costs of a complete SMS for the Coastside would be $3.77 million – note that this is largely the necessary reserving for asset replenishment of a perpetual public works infrastructure. Per household, that would be $754 per year in ongoing annual charges.

Every residence we build or remodel that does NOT pay this level of impact fees is digging the stormwater hole deeper, both physically and financially, for everyone around them (especially downhill of them).

What is needed immediately is an estimate of stormwater management costs, and the related impact fees and annual infrastructure fees. Why the County has allowed construction for decades without charging impact fees sufficient to build a viable stormwater management system is unknown, but may relate to a bias for "development" fostered by real estate interests.

3. Prioritizing Stormwater Needs:

Clearly that amount of funding is not going to be available immediately, so we must focus on priorities. Supvr. Mueller was aware of some of the Coastside infrastructure needs before he took office, and in Dec. 2022 we coined the term CRISP for Coastal Resilient Infrastructure Strategic Plan. Supvr. Mueller obtained seed funding of $200k to study the Coastside infrastructure needs and begin the prioritization process in 2023. On July 24, 2024 the MCC formally responded to the CRISP Essential Elements Project Survey run by the SMC DEM with a letter and list of priority projects. Items 1, 2, 4, 8, 9, 12, 13, 22, 23, 35, 36, and 37 of our response overlap with stormwater concerns raised in previous chapters of this report. Note that several stormwater issues which threaten the SAM plant originate in HMB, and they will also require funding.

The most immediate risks appear to be on 2nd Street in Montara, and in El Granada, downstream of Quarry Park. Venues which affect the SAM plant, and the potential worsening of stormwater runoff in Moss Beach would appear to be larger in scope and potential damage than those two immediate priorities, but also involve other parties than the County (e.g. HMB, MidPen Housing, and the SAM JPA).

While these costs may seem high, stormwater management is required to protect the health and safety of the Coastside community, as well as the tax base of over $4.2 Billion in properties. For about the cost of a homeless hotel, the County can secure the stormwater safety of 12,500 residents and 5,000 homes. Note that the County spent $114 million on hotels converted to homeless housing

for 530 people, and that does not include the $33 million planned for the La Quinta hotel in Millbrae.[97] Further, the Coastside properties are tax-paying revenue sources, instead of losing Transit Occupancy and Property Taxes as with hotel acquisitions.



[97] PDF pg 21 – Grand Jury report: Hospitality with Hope: Transforming Hotels into Homes

# IV. *Conclusions and Recommendations*

## *A. Conclusions*

It is the opinion of the MCC and the residents of the Midcoast and portions of HMB, that stormwater is not being effectively managed to protect the health, safety, and property of the region.

Residents of the San Mateo County Coastside are being flooded out of their homes, and having them crushed by falling trees derived from unmanaged stormwater, and/or spending thousands of dollars to reduce or avoid damages to their homes and property. Standard homeowner insurance policies provide no insurance for external flooding, so these risks are born by the property/homeowners and cost tens to hundreds of thousands of dollars. The stormwater management and drainage policies the County is following derive from both outdated science and from an intentional bias in favor of new construction of impermeable surfaces. Those policies, along with Climate Change, are the drivers of the increased stormwater costs and risks borne by residents. There is no comprehensive Coastside Stormwater Management System[98] or Development Plan for such known to us – though piecemeal actions are underway in some of the neighborhoods covered in this report. There was a 2013 MidCoast Storm Drain Inventory and Assessment Project *(the "Drainage Report"),* which limited its findings to the now out of date 10-year storm standard, and which nevertheless reported:

*"282 drainage segments of the 1,323 drainage segments evaluated do not have adequate capacity to convey the peak flow rate during a 10-year storm event…. localized ponding areas were observed and appear to be as a result of where settlement has created depressed areas with no release point or where sediment deposition has created a barrier to flow"* and further reports presciently that: *"areas shown as adequate in this study may flood as a result of high creek water levels.*" As we now know, that historical 10-year standard was woefully inadequate for the current climate. However, that report appears to be the best inventory of stormwater infrastructure in the Midcoast. We are aware of no more recent assessment of Midcoast drainage capacity. Note further that that Drainage Report was limited in several key aspects as described in the report:

1. *"Site specific evaluation was not conducted as a part of these studies to follow the flow path of runoff in excess of the storm drain system flow capacity.*
2. *Specific recommendations for addressing deficiencies are not included as a part of this Report.*
3. *Deficiencies associated with inadequate inlet capacity were not addressed as part of this study*
4. Finally, *The products of the inventory and analyses should be used as a basis for designing stormwater improvements and measures for capturing trash, sediment, and filtering pollutants in order to protect the Fitzgerald ASBS and Princeton Harbor."*

As described above, current funding mechanisms are inadequate to create and maintain a stormwater management system which could handle the climate-change induced extreme rainfall now annually common Coastside.

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[98] Nute Engineering Email 6/7/23*: "By coincidence SAM crew were trying to update their sewer SSMP for locations they may need to implement protection the waters of the state (creeks and storm drains) in case of a sewer spill, and they found out that San Mateo County does not have a storm drain map for the coast-side available on the web. They asked me to search and I couldn't find it either. All I could find were maps of "blue lines" which presumably came from the USGS or other federal agencies. But nothing for inventory pipes and managed infrastructure we know is installed and in use in the field."*

At Moonridge, on unincorporated County lands, what had been routine annual flooding became disastrous and unmitigated in the New Year's Storm of 2023, flooding residents out of their homes. That development was permitted for construction in a flood plain. Drainage holes on medians and yards were totally inadequate. Yet, across Hwy1 from Moonridge, Ocean Colony experienced NO drainage problems in this same storm, having created AND MAINTAINED a drainage system since the late 70's. **Ocean Colony proves stormwater management can be done properly.** Moonridge proves the County and/or MidPen Housing do not (yet) know how to do it, or are unwilling to require or fund it. Several other neighborhoods suffer from a combination of increased rainfall, new impermeable surfaces permitted by the City and County, and a lack of stormwater management capabilities, and further the sewer system and highway linking the entire Coastside are at risk.

Two major advances are required to address stormwater hazards. First, construction design requirements must be immediately upgraded to respond to already-experienced climate change, and then adopt a coherent strategy to incorporate climate change into updated design storms analogous to the approach recommended by the National Academy of Sciences with respect to Probable Maximum Precipitation and to the risk assessments recently allowed for flooding by the State's change in insurance regulation (decades overdue). Secondly, funding must be secured to build and maintain an adequate stormwater management system Coastside – where that adequacy includes mitigating the existing risks identified in this report, others as subsequently documented, and the additional 'tipping point' risks created by recent and future construction.

In the Recommendations below, we detail a suite of actions required to secure the 12,500 lives and over $4.2 Billion of taxable properties on the Midcoast. Adding in HMB likely doubles those numbers. We hope to work with all the County agencies and departments required to solve this problem.

## *B. Recommendations*

The first Social Justice is Sustainability. If we cannot pass on to our descendants a sustainable world, we fail our primary purpose. Unmanaged stormwater threatens the health, safety, and affordability of (human) life on the Midcoast, and if the sewer plant fails, all civilization Coastside. The Coastside is uniquely vulnerable with:

- Farmworkers, mobile home parks, children, and senior citizens
- Tsunami, earthquakes, sea level rise, wildfire, and flooding risks
- One (1), tenuous, evacuation route and no established evacuation centers to address the former.

So, broadly speaking we initially propose a **New Tenant Protection Ordinance**:

- Let's keep the housing we already have…
- And prevent the next generation of homelessness.[99]

1. <u>Organizational Ownership and Accountability</u>

As we have discussed in this report at least six (6) County departments and agencies have potential roles in solving the flooding (and water quality) issues documented herein. **SMC Planning** has

[99] Note that one of the MCC council members was flooded out of her Moss Beach home and has yet to return.

established standards, administers permit review, and collects some fees. **C\CAG** is responsible for the NPDES permit, collects fees for that permit, and has led research on stormwater. **DPW** maintains the roads and culverts in the region, and had led construction of related assets (e.g. the Medio Creek Bridge). **RCD** has researched, designed and overseen implementation of stormwater and water quality issues, when requested and funded. **DEM**'s role is less clear to us, but has been conducting the CRISP Survey, and perhaps helping prioritize work based on the findings. **OneShoreline** has the statutory authority to manage flooding in the County, and we are recently advised, is also advancing research on stormwater standards. In addition, the **City of HMB** maintains its own DPW and deals with stormwater within its boundaries. **CCWD** provides water in HMB and up into the Harbor and in part of Miramar. **MWSD** maintains water supply and sewer in its service area, and **GCSD** maintains a sewer collection system in its service area.

What we request and recommend is that the County put one (1) agency in charge of researching, planning, and funding a Stormwater Management System (SMS) for the entire Coastside (e.g. down to and including Moonridge). We further request a Coastside Stormwater Manager be identified, whether that is a new position, or a new title given to an existing employee. That position would be accountable for communication, inter-agency coordination, and results regarding stormwater. An integrated approach is recommended because rainfall water will not follow administrative boundaries (i.e. *"What Happens in HMB doesn't Stay in HMB"*[100]). Other aspects of our Recommendations may fall to different agencies based on County organizational decisions – e.g. SMS implementation could be assigned to DPW.

Further to organizational changes, we recommend creation of a Citizen's Infrastructure Oversight Commission, to locally assess problems, monitor progress, set priorities, and coordinate infrastructure efforts so that we conserve funds by "Only Digging Once". Such a commission was established in Orinda, CA to coordinate gas, water, sewer, power, road and stormwater efforts, to save money and reduce disruption for all. After initial success in planning and coordination, the Orinda Commission was expanded and given expenditure control over certain tax revenues. Our County departments are largely focused on the Bayside, and local knowledge is essential in efficient and effective action. One alternative would be to empower the MCC to serve this function, with appropriate staffing and funding changes. Other alternatives would be to select one of the local agencies dealing with water and/or sewer to fill this role as Chair of the Commission.

Also, we recommend the County allow an MCC member to serve on the SMCWPPP Steering Committee. On that committee, there are representatives of 21 County agencies but as far as we can tell, no one with detailed Midcoast knowledge. An alternative would be to have the Director of SAM, or a board member of MWSD or GCSD serve on that committee.

2. Policy Solutions and Improvements

*a) Halt New Construction until viable Stormwater Design Standards are developed.*

We recognize the pressure from the State of California to construct new housing, and the financial interests of property owners and the real estate, finance and construction industries (and their campaign contributions). However, as the NAS has recently documented the science of estimating extreme precipitation is flawed, and it could take 10 to 15 years before more reliable, climate-

[100] And the same is true of Moonridge, whose flows will affect Canada Cove in HMB.

sensitive approaches exist. In the meantime, every new impermeable surface is increasing the risks, and damages, from rainstorms in our region. To borrow a phrase from Medical Science Ethics, "First, Do No Harm."[101] Once an effective SMS exists, and the Design Storms and Standards are updated, then construction can recommence, along with Impact Fees sufficient to fund the necessary mitigation. To fail to halt new construction is to expose current residents to increased, uninsured risks, to jeopardize the tax base, and to expose the County to liabilities. Continuing to build, without the changes recommended herein, will add to an existing infrastructure deficit, further undermine the insurability of current properties, jeopardize the County's tax base, and potentially expose areas to salt water intrusion and water table damage.

We need to start saving money by stopping adding to our future problems.

*b) Redefine & Improve Planning*

As discussed in Section IV.C above, the science of Climate Change is evolving, but lagging, our stormwater reality. The Coastside needs a focused planning effort to develop a Stormwater Management System, and then as mentioned below, the funding to implement it. We recommend the following steps:

1) Conduct a **Stormwater Forensic Assessment** to further document the concerns detailed in this report, in the CRISP Survey, and in the LHMP. Coastside flooding must be assessed more thoroughly than this informal report. We do not cover every stream and every neighborhood in this report, nor did the 2013 outdated assessment.

2) This initial forensic effort should be accompanied by an **ongoing stormwater incident repository**, so that both progress and problems can be recorded and priorities and actions adjusted based on new evidence. It may be possible to use sites such as https://www.iseechange.com/ for residents to report and accumulate flooding incidents; systems to record incidents such as requests for action are cheap with modern web technology.

3) **Define a realistic 'design storm' level.** We cannot wait 10-15 years for science to perfect its estimation technology. We need an immediate, approximate metric to define the design storms for which we must plan. It is suggested that the highest local storms in the last 100 years be used. Per the recent changes in Calif. insurance regulations, stormwater design should no longer rely on backward-looking rainfall data, but emulate the procedures to be used for wildfire insurance in the design storms and specifications for our stormwater mitigation requirements.[102]

4) Further, we must **define a protection level based on compound probability of flooding** from extreme rainfall over time, as the NAS recommends. One could ask *"What is the acceptable probability over a 10 or 20 year period for our uninsured residents to have their homes flooded or crushed by falling trees?"* But since many properties are uphill and largely immune from flooding – though contributing to it – better one should also ask *"What is the acceptable probability of damage for residents in the most vulnerable portions of our local watersheds which could be affected by these new impermeable surfaces?"* And that answer should be the basis for the type and level of stormwater retention required in any construction project. The current 10 year return method is of no help because: a) the compound probability of safety from a 10 year storm over a decade is only

[101] https://www.cms.gov/blog/first-do-no-harm
[102] https://insuranceindustryblog.iii.org/california-finalizes-updated-modeling-rules-clarifies-applicability-beyond-wildfire/

34.87% and b) the 10 year storm statistics are much lower than the actual 50 to 100 year rainfalls currently experienced, and much lower than current best practices in culvert design by Calif. agencies.

5) **Rewrite the SMC Drainage Manual** with guidelines that satisfy the probability of risk parameters described above. Use the NAS definition of PMP to define the new safety standard. The revised manual must also consider the impact of runoff on affected floodplains and watersheds in addition to the site-only standards currently in use.

6) **Create a Stormwater Master Plan (SWMP)** for the Coastside

At a minimum, such a Plan must contain:

a. An Assessment of storm handling requirements vs. existing capacity, based on recent rainfall.
b. An Hydraulic Model to analyze risk and ROI tradeoffs in deciding how much to invest, where.
c. A Robust Stormwater Management System Design to fix identified vulnerabilities, with Costs: both initial and perpetual.
d. Permitting/design requirements for new construction that fit within rated stormwater capacity.
e. A Stormwater Asset Inventory, perpetually maintained and re-priced for replenishment.
f. Policies to ensure stormwater drainage is perpetually funded, constructed, and maintained in accordance with SWMP guidelines - including planning & permitting, and an audit & adjustment process with: inspection, enforcement, and remediation/restitution mechanisms in event of failure.
g. A Management Organization & Process with integrated Regional Scope to include all entities creating or maintaining impermeable surfaces and/or watersheds here (e.g. Caltrans, DPW, HMB, SFPUC, MWSD, etc.).
h. A periodic procedure to prioritize and expedite correction of stormwater effects requiring immediate attention.
i. Note the LHMP Table 21-4[103]. Alternatives to Mitigate the Flood Hazard pp 21-5 has a list of many approaches to be considered in an SWMP. While all those strategies have merit, depending on cost/benefit analysis, here are some selected favorites which mirror ours:
    - Maintain the drainage system
    - Institute low-impact development techniques on property
    - Stormwater management regulations and master planning
    - Acquire vacant land or promote open space uses in developing watersheds to control increases in runoff
    - Adopt “no-adverse impact” floodplain management policies that strive to not increase the flood risk on downstream communities
    - Charge a hazard mitigation fee
    - Integrate floodplain management policies into other planning mechanisms within the planning area.

[103] https://www.smcgov.org/media/53471/download?inline= pp 21-5

- Consider the probable impacts of climate change on the risk associated with the flood hazard
- Consider the residual risk associated with structural flood control in future land use decisions
- Adopt land use policies that prohibit the placement of habitable structures in high-risk landslide areas.
- Adopt higher regulatory standards for new development within unstable slope areas.

7) **Upgrade the C.3 guide** and California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit, Because it contains an unacceptable acceptance of flooding risks. Note this comment in the guide: *"Water Board staff recognizes that the stormwater runoff pollutant and volume contribution from each one of these projects may be small relative to other types of development and redevelopment projects; however, the cumulative impacts are likely to be significant.* [emphasis added] *This Provision serves to address some of these cumulative impacts in a simple way that will not be too administratively burdensome on the Permittees."* The implication of that quote is to risk the homes and lives of everyone downhill in the effort to ease construction profits and benefits for "Permittees".

Also modify the following C.3 provisions to require any ALTERATION of properties to trigger requirement of stormwater mitigations sufficient to handle the new Design Storms and acceptable compound probability of risk. That is how we must 'catch up' by retrofitting adequate stormwater management to existing properties.

***Change this provision:*** "Required Site Design Measures for Small Projects and Detached Single-Family Homes Projects) contains requirements for detached single-family home projects that create, **ALTER PROPERTIES WITH,** and/or replace ≥ 2,500 ft2 to <10,000 ft2 of impervious surface and small development and redevelopment projects that create, **ALTER PROPERTIES WITH,** and/or replace ≥ 2,500 ft2 to <5,000 ft2 of impervious surface (collectively over the entire project)."

And ***remove this limitation*** "it would **be infeasible** to size stormwater treatment measures to treat runoff from large storms that occur every few years…" The implication of that 'free pass" is *"So, let's just pass the risk onto existing neighborhood property owners."* If it is infeasible to mitigate the stormwater, the project should not be permitted. Any permitting must consider the cost of failure elsewhere in the watershed in the project analysis.

*c) Focus on Priority Problem Areas Immediately*

From our review, and pending new findings, the immediate stormwater problems to mitigate are listed below. Stormwater flooding at these locations has frequently been severe and extremely dangerous - exposing Midcoast residents and their property to repeated health and safety risks – particularly, to adult and child pedestrians and their dogs, to vehicles, and to homes and roads needed for evacuation and first responders.

1. El Granada, especially downstream of Quarry Park
2. 2nd Street Montara, and the watershed above those properties contributing to flooding
3. Highway 1, in the areas cited in Section F
4. Moonridge
5. The Pullman and Roosevelt ditches in HMB

Of course, every neighborhood included in this report has claims on our attention. Specific recommendations for each area are contained in Section V-B.3.

*d) Create fiscally sustainable funding for stormwater management*

In order for the County to take action on the stormwater hazards extant in the Midcoast it must have the resources and funding to act. C/CAG has provided a summary of funding options in their GI study, Appendix D, including: Balloted Stormwater Fee; Special Financing Districts; Enhanced Infrastructure Financing Districts; In-lieu fees; Grants; Caltrans Mitigation Collaboration; Multi-Agency Partnerships, etc. We shall not duplicate their research here, but note some concepts we believe are relevant.

There is a concept of basing stormwater fees on the property surfaces: Jacksonville Takes AI Approach to Stormwater Fee Assessment. That article explains how one city uses AI to map and categorize terrain as a basis for levying fees.

**8) Create a Realistic Stormwater Impact Fee:** We note that the County has long permitted the construction of impermeable surfaces which contributes to our current flooding, and collected property taxes thereon. Its development of attendant stormwater management has not been as aggressively funded as the permitting of new construction. The Impact Fees to be created must ensure that future construction contributes a pro rata share of the region's required stormwater management capital AND Annual Fees to cover operating & maintenance costs of the required infrastructure. Funding must be inflation-proofed: impact fees must be indexed to the public works cost of construction, and annual management fees indexed to appropriate labor cost indexes, so that future Board votes and resolutions – with resultant lags – are not required to authorize fee increases. The County must build reserves proportional to the age (Life Cycle Ratio)[104] and current replacement cost of the planned or actual SMS, so that funds are available on demand for needs without borrowing and the waste of taxpayer funds in interest and borrowing fees (typically 70%).[105]

*e) Escalate concerns above County level for funding and enforcement*

State and Federal assistance should be pursued via our elected officials and relevant agencies. In particular funding for the SFPUC dams on Pilarcitos Creek and the SAM assets at risk from both SLR and flooding are regional health and safety issues – and because of the Fitzgerald Marine Reserve – issues of state and federal import. Further, the RWQCB has a role to play in ensuring that the SMS created Coastside is adequate, and properly managed.

3. Location-Specific Recommendations

This section builds upon the observations re neighborhoods discussed in Section III.

*a) Ocean Colony*

It would be nice if they would share maintenance cost and design details, so we could learn and assess what might be appropriate elsewhere in our region.

*b) Moonridge*

[104] A term introduced by the Fitch Rating Agency which depicts the % of its useful life an asset has aged.
[105] Although the recently withdrawn Regional Measure 4 would have wasted 141% of proceeds, and the Prop. 4 Climate Bond will waste 100% of proceeds, in interest and borrowing costs.

Build a diversion for uphill water to bypass the complex and/or retain the water safely for slow discharge to the ocean. Whatever is done must consider the downstream effects on Hwy 1 and Canada Cove, which certainly do not need accelerated delivery of stormwater.

*c) SAM*

1. Add more Wet Weather Storage in the Burnham strip.

2. Add Weather Storage on the pipes from HMB (this would be a HMB decision/action).

3. Ensure that SFPUC improves the safety and/or capacity of the dams upstream on Pilarcitos Creek. HMB has a emergency warning system installed and routinely. The problem is that it does not customize the warning in a way that allows those in harm's way to be alerted without many others being unnecessarily alarmed, which results in impassible evacuation routes and distrust of the warning system. A customized warning could address fire, tsunami, dam inundation, mud slide, etc. to alert relevant portions of HMB and SAM of potential flooding.

4. Create a stormwater retention facility south of the SAM plant. There is a C\CAG concept design, which is evidence of appropriate concern in the area, but that design seems inadequate to the volumes of water recently experienced, so more study and design is merited.[106]

*d) 2nd St. Montara*

1. Secure funding to update the assessment that was done by Creegan + D'Angelo Infrastructure Engineers in 2011

2. Proactively maintain 2nd St. current drainage to avoid spillover damage. Note that the recently paved part of East Avenue that the county required the new home builder to create, is adding to the 2nd street stream which already causes flooding.[107]

3. Evaluate re-contouring unpaved 2nd Street to drain towards the stream channel and installing water bars or rolling dips to help address road erosion.

4. Evaluate installing a pipe running down 3rd Street to capture runoff from the hillside starting at the intersection of Kanoff and LeConte and outletting downstream of Farallone to divert a significant amount of water from 2nd Street.

5. Continue the design and funding process begun by RCD. Consider the entire Montara watershed in design of solutions and then build a solution to handling the Montara watershed which drains into that creek. Include considerations of altenative for expanded wetlands as described in Exhibit 6.

6. Involve MWSD in the design and review process to ensure safety of public works assets.

7. Require design approvals by both Hydrologist and Geologist.

*e) El Granada*

1. In essence, the neighborhood requires a stormwater management system that works – including handling the increased Quarry Park runoff contemplated by the new Master Plan – and possibly

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[106] Advancing Regional Stormwater Management In San Mateo County Concept Design Report Half Moon Bay Sewer Authority Mid-Coastside Regional Project - https://drive.google.com/file/d/1Oxxbca52bKshnFgDWalgPXn7rlFpJHoz/view?usp=sharing

[107] Steve Saschneider email 12/4/24

recently stemming from the thinning of eucalyptus to reduce fire danger. Recommended steps are listed in Section III – E - 5.

In the immediate future, while awaiting a fuller plan:

2. Install permanent diversion at mouth of Quarry Park to divert flows south, away from Santa Maria and into the more developed (but incomplete) stormwater system.

3. Ensure the dam in Quarry Park is safe; recommend draining before rainy season, as long as items 1 and 2 above are in place.

*f) Highway 1*

1. Remove trees that can fall and block Hwy 1, whether due to storms or wildfire. Locations include: North of the Lantos Tunnel, Frenchman's Creek, Medio Creek, and southern Montara and Moss Beach west of Carlos St.

2. Work with Caltrans to ensure stormwater designs for Moss Beach, which flows already cause mudslides on Hwy 1 there, are sufficient to protect the highway with the addition of over 143,000 sq. ft. of impermeable surface in the Cypress Point project.

3. Expand and maintain culverts at the fields across from the HMB airport, which flood the highway during large storms. Concern is that the pressure from the pooled water could undermine the highway as occurred on Hwy 92.

4. Expand and maintain culverts across from Montara State Beach, which pool and overflow the highway during large storms. Concern is that the pressure from the pooled water could undermine the highway as occurred on Hwy 92.

5. Improve drainage at low spots on Hwy 1 immediately south of the Lantos tunnel and north of Grey Whale Cove, which pool on the road at its most curvy and narrow stretches.

6. Ensure that the The SR1 Multi-Asset Roadway Rehabilitation Project sizes drainage sufficient to meet storm rainfall recently experienced, rather than relying on outdated NOAA Atlas data. Note the problems cited in Moss Beach section of this report, and remedy them as part of this project.

*g) Moss Beach*

1. Improve and control drainage on Carlos St. and downhill thereof in Etheldore and California. Channel water away more rapidly to reduce I&I on MWSD and SAM assets there, including the SAM IPS.

2. More frequently maintain, or improve, the drainage "filters" installed in Moss Beach and at the south end of Birch Street which clog with debris and back up water.

3. Install stormwater controls on Sierra St. to protect residents of Kelmore St.

4. Install a culvert and pipe to control flows from Stetson at 2015 Carlos St. down to Carlos St. and NOT deposit runoff atop the MWSD manhole.

5. To prevent increased flooding from the over 140,000 new feet of impermeable surface created by the Cypress Point project, have both a hydrologist and a geologist certify the adequacy of that project's drainage plans (which are only signed by Geotechnical Engineers).

6. Sample the runoff from Montara and San Vicente Creeks for pollutants now, including lead and asbestos, before beginning excavation for the Cypress Point project. Then, sample the same streams during contruction and after completion to ensure no increases in pollutants – which would affect the Fitzgerald Marine Reserve. Note that the 2-hour, 10-year storm events used to size that Project's design have been superceded by the new NOAA Atlas and are already 10 years out of date.

*h) Roosevelt Beach*

1. Prohibit diversion of additional flows in the Pullman Watercourse. Note the comments in item 2 below.

2. Impose enforceable conditions on new development that require drainage not cause or contribute to flooding or erosion.

3. Assess the quality of water being released into the Roosevelt and Pullman watercourses. Provide a sampling and water quality testing agency for residents to call immediately upon observation of polluted runoff, so that it may be sampled with proper provenance, and the source confirmed.

4. Retain an independent geomorphologist to study the watershed and open the draft to independent peer review before publication or action. Prior designs in the area included upsizing the downstream culverts all the way to the beach, so that homes do not flood and the roads are not undermined. The 2010 Ashley report contained design of a 48" culvert that might be adequate for current flows, but was never constructed. However, we are concerned that accelerating transport in the ditch will lead to scouring and widening the ditch. Instead, increasing wetlands to retain water and allow water to percolate into the groundwater or run off slowly should be studied. There are lands south of this ditch appropriate for this purpose.

*i) Kehoe Watershed*

This is a complex watershed with several problems and risks. We observe that this area historically contained wetlands, and also east of Hwy 1. It appears we need to return to wetlands - a larger land surface to retain stormwater and release it more gradually seems appropriate. Note that water is entrained[108] between Grandview Blvd. and Terrace Ave. which flows into this watercourse. Water also enters this watercourse from lands north of Spindrift Way. Given the advent of Climate Change and Atmospheric Rivers, we need more wetlands than we have already destroyed. Fortunately, the fingers of undeveloped land between existing neighborhoods, much of which is in public ownership, provides an opportunity to improve stormwater management. We suggest that expanding the Caltrans mitigation wetland on Pilarcitos Creek adjacent to the SAM plant all the way back to Hwy 1. Where land is available, rock level spreaders should be used to dissipate entrained flows into sheet flow.

It appears HMB will have to lead the design of a solution, with SAM involved in the process because the plant is affected by the storm flows. The County has a role to play because this watershed includes unincorporated land east of Half Moon Bay's city limits, and county approvals were involved in some of watershed's development.

*j) Seal Cove*

[108] *Entrainment* - the process of making something part of a liquid or flow of something and carrying it along. In essence, gathering water into a more focused flow.

Again, this is a complex problem area, with unstable land conditions the major factor in damaging housing and public infrastructure. Improved stormwater management can provide some level of mitigation as described in section II-J. A change in policy to either halt new construction and/or surcharge it for the additional costs and risks attendant to the area, are proposed.

_____

4. Concluding Thought

Speaking only for the Midcoast, while acknowledging there are additional HMB priorities, we recommend the following four items as immediate priorities due to their potential severity and breadth of impact.

1. SAM, and the contributory risks thereto.
2. Downstream flooding from Quarry Park in El Granada.
3. 2nd Street Montara (and the watershed above that contributes to the flooding).
4. Areas identified on Highway 1 as subject to flooding and road constriction.

Whether our civilization can continue on the Coastside will depend upon the outcome of a race between the forces of climate change and the response of our fragmented governance. Let us hope that this report motivates the latter to come together to address the former via more realistic and effective stormwater management.

## V. Process Notes

Following the New Year's Eve storm of Jan. 2023, we were repeatedly contacted by residents concerned with flooding and related damages and risks (e.g. trees falling on homes). Our initial findings were reported in MCC meetings on Jan. 18,2023, and July 26, 2023. C/CAG also presented on Green Stormwater Infrastructure on April 26, 2023. Throughout and since that time, we have discussed stormwater issues with several engineering firms, geologists, an hydrologist, local agencies, and County staff. Rainstorms since that date, and previously in 2017 & 2021, continue to confirm the issues reported.

To document the problems and propose solutions we are preparing this report, which is expected to progress through drafts as follows:

Compilation Draft: Prepare a draft and confirm contents with content contributors for accurate on-the-ground reporting. Intent is to avoid factual and logical errors. (COMPLETED)

MCC Review Draft: (12/11/2024) Submit a revised draft to MCC for endorsement.

Agency Review Draft: (THIS DOCUMENT - 1/8/2024) Update as needed then submit a revised draft to the local agencies involved for comment (SAM, MWSD, GCSD, HMB, C/CAG, RWQCB, et al)

> *Added more evidence of flooding and more neighborhoods; added review comments from several professional contributors. Fixed some, but not all, formatting issues.*

Peer Review Draft: Update the report and submit it for Peer Review to a professional engineering firm. The MCC has agreed in concept to fund this review.

Submission: Update the report and submit it to the County and all involved as final report. Copy to RWQCB, C/CAG, and all local agencies.

Gather Momentum: Incorporate comments from report distribution; update; gather endorsements. Forward report & endorsements again requesting action. Escalate above SMC to State Electeds, CCC and RWQCB, and to Federal Electeds and Agencies to request funding and provide motivation to County.

Request for Action: Schedule meetings with the County to understand their reaction and schedule actions to resolve the stormwater-related issues raised in the report. Document those agreements and track to completion.

# VI. Acknowledgements

Lists of co-authors, contributors, and supporters – TBD

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Scott Powell – Roosevelt Beach

…plus others pending authorization

## *D. Supporters*

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Cid Young, Seal Cove

Henry Poon and Anny Mak- Montara

…plus others pending authorization

# VII. Glossary

CCA – Critical Coastal Area

C/CAG – City/county Association of Governments

CCWD - Coastside County Water District – provides water from Moonridge north into El Granada and the Harbor.

Coastside – the region of San Mateo County from Pacifica to Moonridge, including the City of Half Moon Bay

CRLF – California Red-Legged Frog – Imperiled species

DEM – San Mateo County Department of Emergency Management

Entrainment - the process of making something part of a liquid or flow of something and carrying it along. In essence, gathering water into a more focused flow.

FMR CCA – Fitzgerald Marine Reserve Critical Coastal Area

GCSD – Granada Community Services District

GIP – Green Infrastructure Plan

HMB – the City of Half Moon Bay

I&I – Infiltration and Inflow

LHMP – Local Hazard Mitigation Plan

Midcoast – the unincorporated region of San Mateo County south of Pacifica to Miramar, excluding portions in Half Moon Bay

MRP - Municipal Regional Stormwater Permit: issued by RWQCB

MWSD – Montara Water and Sanitary Districts

RCD – San Mateo County Resource Conservation District - provides comprehensive, integrated services addressing wildlife, water, climate, and agriculture.

RWQCB - San Francisco Bay Regional Water Quality Control Board

SAM – Sewer Authority Mid-Coastside

SFGS – San Francisco Garter Snake – endangered sub-species

SFPUC – San Francisco Public Utilities Commission

SMS – Stormwater Management System

SWMP - Stormwater Master Plan

## VIII. Exhibits

Exhibit 1 - Understanding Causes & Solutions for Montara 2nd Street Flooding

(slide show)

Exhibit 2- El Granada Drainage Photos for Section III-E

Exhibit 3 – Rocket Farms Drainage Estimates for Section III-H

Exhibit 4 – Hydrologist Report for Section III-H

Exhibit 5 – Midcoast Drainage Improvement Study for Section III-D

Exhibit 6 - 2nd Street and Kanoff Street Flooding Problems and Potential Solutions (Kobernus)

Exhibit 7 – Memo re Seal Cove from DPW to SMC Board of Supervisors Sept. 6, 2006

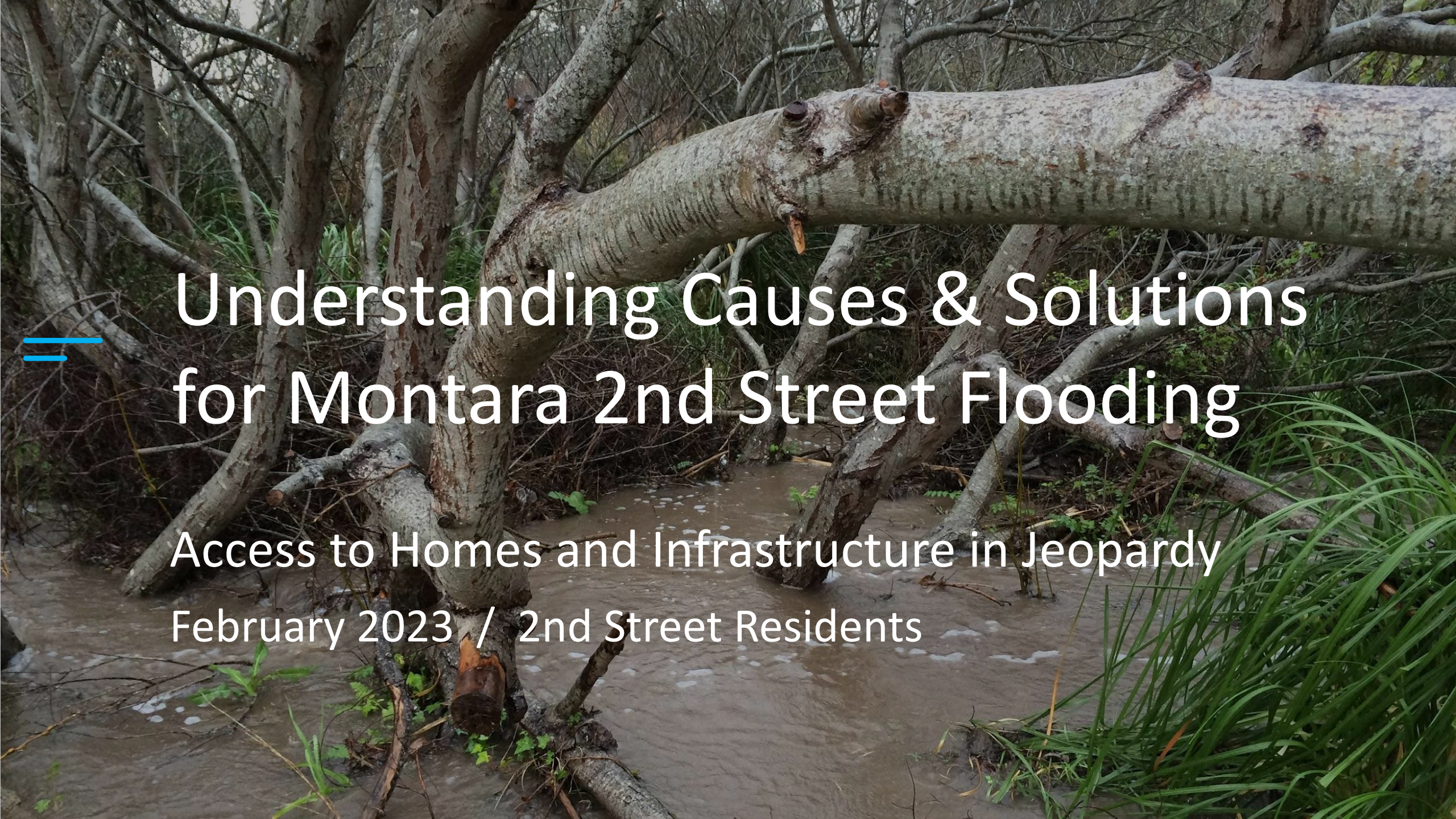
Exhibit 8 – Calif. Coastal Commission testimony re Deek Creek

*Note: Appended documents not indexed; page numbers their own.*

# Exhibit 1

## Understanding Causes & Solutions for Montara 2nd Street Flooding

(slide show)



# Understanding Causes & Solutions for Montara 2nd Street Flooding

Access to Homes and Infrastructure in Jeopardy

February 2023 / 2nd Street Residents

# A Growing Problem

**1990 - 2004**

In the late 1990's/early 2000's new development was approved. Runoff from those homes and sections of the Montara watershed were directed to open space along 2nd Street.

**2005**

In 2005 significant runoff from the county systems flooded homeowner's yards, road surface and creekside of 2nd Street

**2008 2015 2022**

Additional flooding episodes have occurred in 2008, 2014 2015, 2022

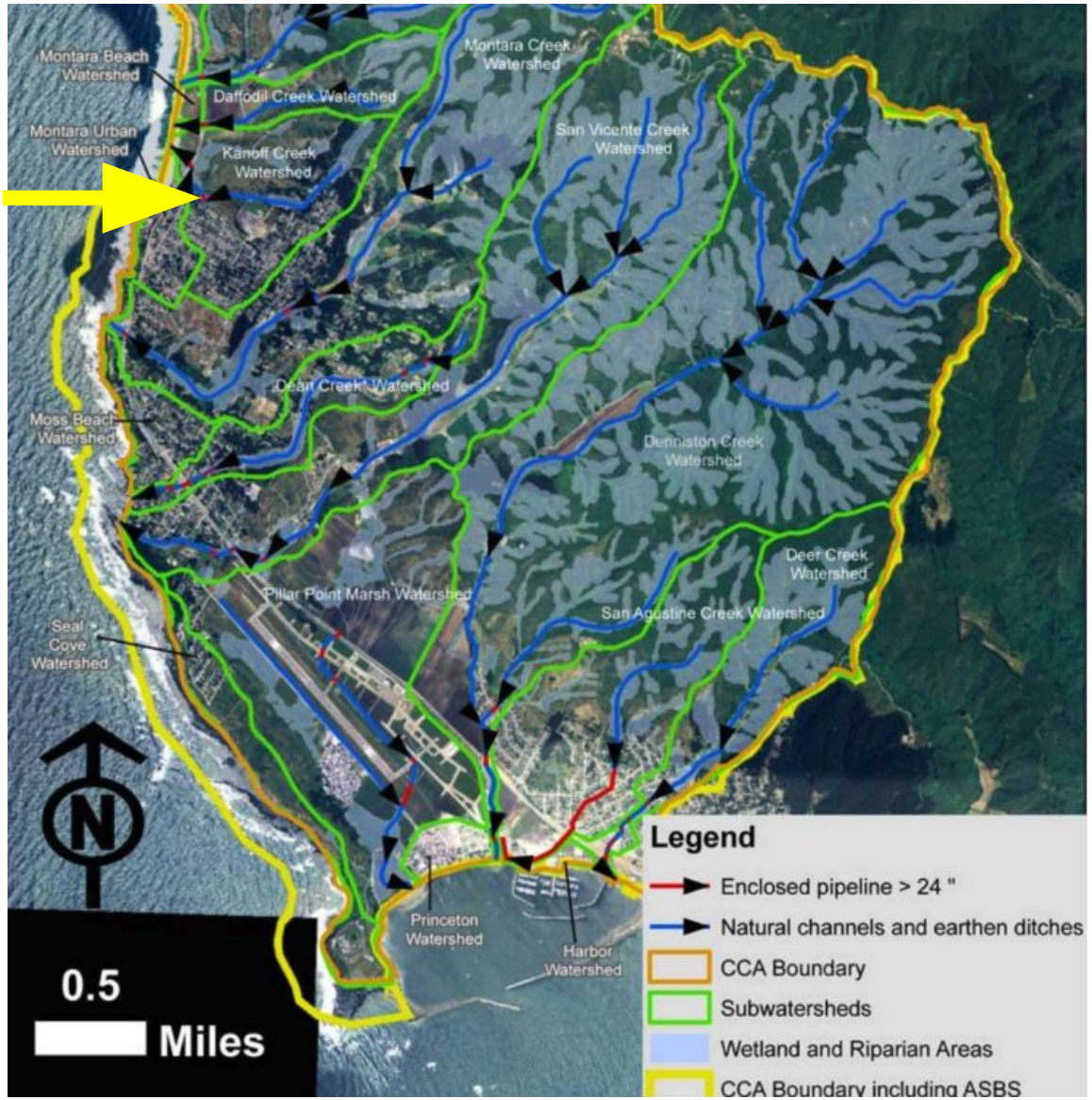
**2023/NOW**

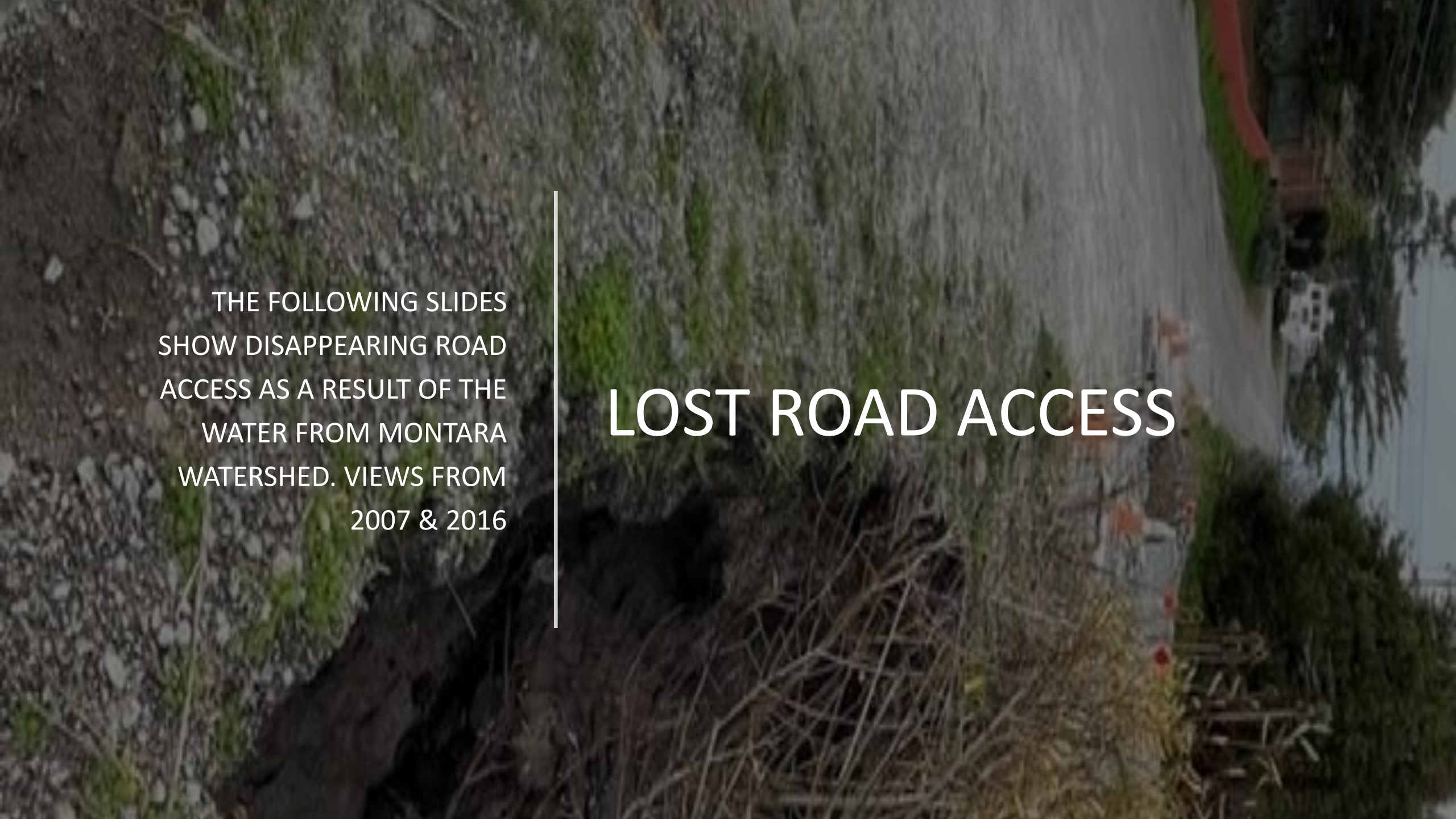
The roadside continues to erode and has become more unstable with decreasing road clearance.

# Increased Runoff Issues

Additional development behind homes on 3rd Street between LeConte and East, has increased the creek runoff causing:

- Significant untreated runoff is deposited into the Monterey Bay National Marine Sanctuary.
- Continued erosion of 2nd street and loss of roadway is a serious safety hazard and impacts access to home and property.
- Increased liability issues for homeowners and county.
- Increased risk to expose water and sewer lines due to roadway erosion.

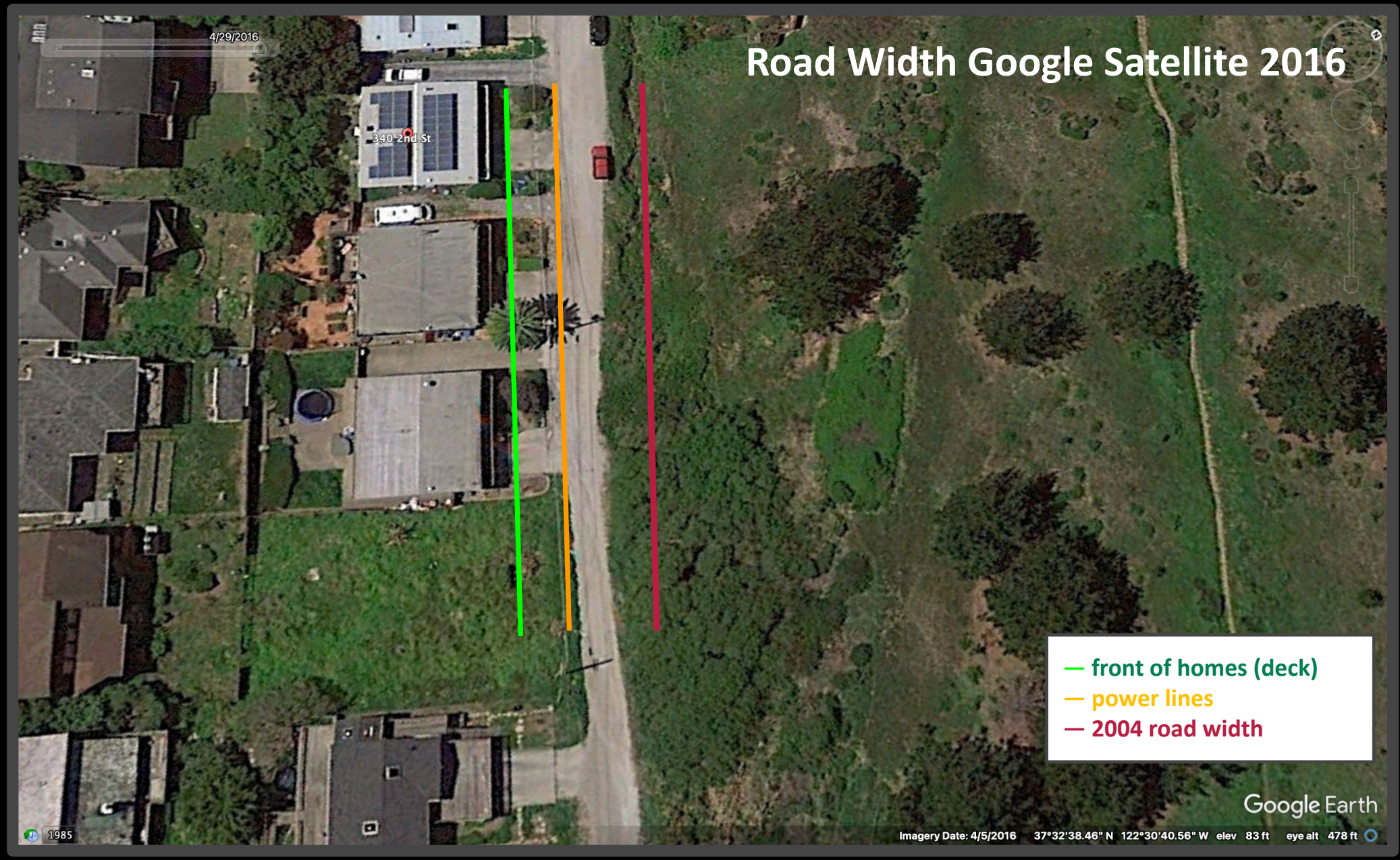


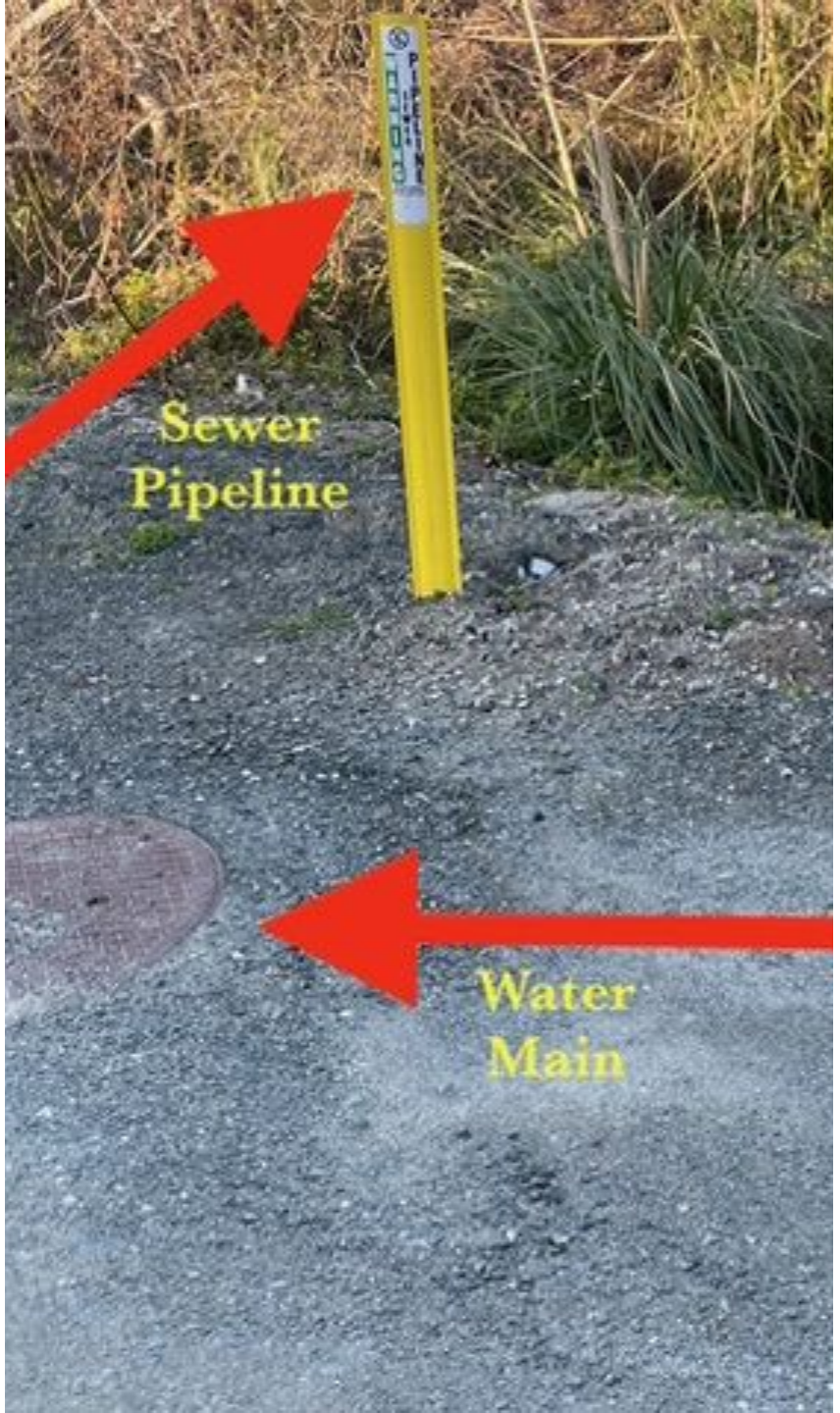


THE FOLLOWING SLIDES SHOW DISAPPEARING ROAD ACCESS AS A RESULT OF THE WATER FROM MONTARA WATERSHED. VIEWS FROM 2007 & 2016

# LOST ROAD ACCESS


Road Width Google Satellite 2007
6/29/2007
2006
2007
340 2nd St
— front of homes (deck)
— power lines
— 2004 road width
Google Earth
1985
Imagery Date: 5/31/2007 37°32'38.40" N 122°30'40.94" W elev 89 ft eye alt 478 ft


Road Width Google Satellite 2016
4/29/2016
340 2nd St
— front of homes (deck)
— power lines
— 2004 road width
1985
Imagery Date: 4/5/2016 37°32'38.46" N 122°30'40.56" W elev 83 ft eye alt 478 ft
Google Earth


Sewer
Pipeline
Water
Main

# 2nd Street Properties Flooded

Water from multiple locations is directed through homeowner’s front and backyards.

Flooding in 2005, 2008, 2014, 2015 and 2022.


Runoff from East and Third Streets
Creek overflow

# A Brief History of County Response to this Problem

In early 2000's residents of 2nd street alerted multiple county staff and representatives of the increased road erosion, streamflow and damage to property.

Residents attended multiple planning meetings with the MCCC and building/planning boards to express concerns regarding flooding and road erosion.

In 2009 The County contracted with Creegan + D'Angelo to complete a Drainage Improvement Study for the 2nd Street, Kanoff Street and East Avenue Areas. The study identified possible solutions for this problem.

Since 2010 when the report was completed, no support or funding has been assigned by the County to address this problem, and the situation has only become more dangerous and extensive.

# Organizations Contacted and Results

- **San Mateo Resource Conservation District (RCD)**
  Worked with residents of 2nd street to identify issues and create a plan to address the problem. Despite developing a comprehensive plan, no action was taken by the county.
- **Montarans United Against Flooding**
  Starting in 2006 Community members alerted and met with the Department of Public Works and County Supervisors regarding local flooding issues in Montara including 2nd street. No funding or support was offered by the county.
- **Oneshoreline**
  Shared documents and spoke with staff regarding this issue.

# County and Government Officials Contacted

Multiple meetings/discussions with the following local, state, federal and county representatives including:

- Midcoast Community Council
- County Building and Planning Department
- SMCO Board of Supervisors
- Supervisor Don Horsley
- Representative Jackie Speier
- FEMA


IMPLEMENT THE RECOMMENDATIONS OUTLINED BY CREEGAN + D'ANGELO OR DESIGN AND DELIVER AN ALTERNATE SOLUTION THAT PROTECTS THE ROADWAY EROSION AND PROPERTY.

# WHAT WE NEED

Creegan+D'Angelo
2420 Martin Road, Suite 380
Fairfield, CA 94534
Tel (707) 429-5300
Fax (707) 429-2086

STUDY AREA TOPOGRAPHY & IMPROVEMENT OPTION MAP
(10-YEAR STORM)
MONTARA DRAINAGE IMPROVEMENT STUDY

APPENDIX A
EXHIBIT 1

# Who To Contact: Second Street Residents

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# Exhibit 2

## El Granada Stormwater Management

## Photos & Maps of Example Locations

This Exhibit contains the photos referenced in Chapter II-E
regarding El Granada and Quarry Park Stormwater problems

## Santa Maria Ave. & Columbus St – stormwater runoff from Quarry Park


Photo 01 - Diverting lesser stormwater flow from Quarry Park at Park entrance (intersection of Santa Maria & Columbus)

Photo 02 - Diverted lesser stormwater flow from Quarry Park at Park entrance (intersection of Santa Maria & Columbus)

Photo 03 - Diverted lesser Park stormwater flow at Park entrance flooding down Columbus

Photo 04 - Diverted lesser Park stormwater flow flooding down Columbus (towards Santiago)

Photo 05 - Diverted lesser Park stormwater flow flooding down Columbus to Santiago

Photo 06 - Diverted lesser Park stormwater flow flooding into pseudo storm drain at intersection of Columbus & Santiago then under street to meadow belo

Photo 07 - Larger Park stormwater flow flooding down Santa Maria near Park entrance at intersection of Santa Maria & Columbus

Photo 08 - Larger Park stormwater flow flooding down Santa Maria at intersection of Santa Maria & Columbus

Photo 09 - Larger Park stormwater flow flooding down Santa Maria at x-street Francisco

Photo 10 - Larger Park stormwater flow flooding down Santa Maria at x-street Palma

Photo 11 - Larger Park stormwater flow flooding down Santa Maria just above pseudo storm drain

Photo 12 - Larger Park stormwater flow flooding into pseudo storm drain at end of Santa Maria at intersection with The Alameda

Photo 13 - Larger Park stormwater flow flooding from pseudo storm drain under the eastern side of The Alameda to open-air ditch in its median

Photo 14 - Larger Park stormwater flow flooding from ditch into catch basin as entry into an underground storm system at The Alameda & Ave. Cabrillo

Photo 15 - Underground storm system from catch basin entry to manhole cover in Ave. Cabrillo at intersection with The Alameda

Photo 16 - Underground storm system manhole cover in Ave. Cabrillo at intersection with The Alameda

Photo 17 - Underground storm system down Ave. Cabrillo to its storm drain at Ave. Alhambra - from manhole cover at intersection with The Alameda

## Reason for Diverging Lesser Flow from Quarry Park – January 1, 2023 Storm

Photo 18 - Two stormwater drainage & runoff flows over intersection of Santa Maria & Columbus at Park entrance

Photo 19 - Two stormwater drainage & runoff flows down Santa Maria

Photo 20 - Two stormwater drainage & runoff flows down Santa Maria over x-street Francisco

Photo 21 - Two stormwater drainage & runoff flows down Santa Maria over x-street Palma

Photo 22 - Two stormwater drainage & runoff flows down Santa Maria at Palma

Photo 23 - Two stormwater drainage & runoff flows at Santa Maria end towards The Alameda into the pseudo storm drain

Photo 24 - Two stormwater drainage & runoff flows from pseudo storm drain under the eastern side of The Alameda to open-air ditch in its median

Photo 25 - Two stormwater drainage & runoff flows into underground storm system catch basin at The Alameda & Ave. Cabrillo from the open-air ditch

**Update, April 15, 2023**

Photo 70 - Two stormwater drainage & runoff flows from Quarry Park entrance at Santa Maria & Columbus

Photo 71 - Two Park stormwater drainage & runoff flows down Santa Maria from Columbus to The Alameda

Photo 72 - Two Park stormwater drainage & runoff flows into pseudo storm drain at Santa Maria & The Alameda - then under The Alameda to an open-air ditch in its median

Photo 73 - Two Park stormwater drainage & runoff flows from the open-air ditch into a catch basin as entry into an underground storm system at The Alameda & Ave. Cabrillo

## Ave. Portola – stormwater runoff from the Highlands

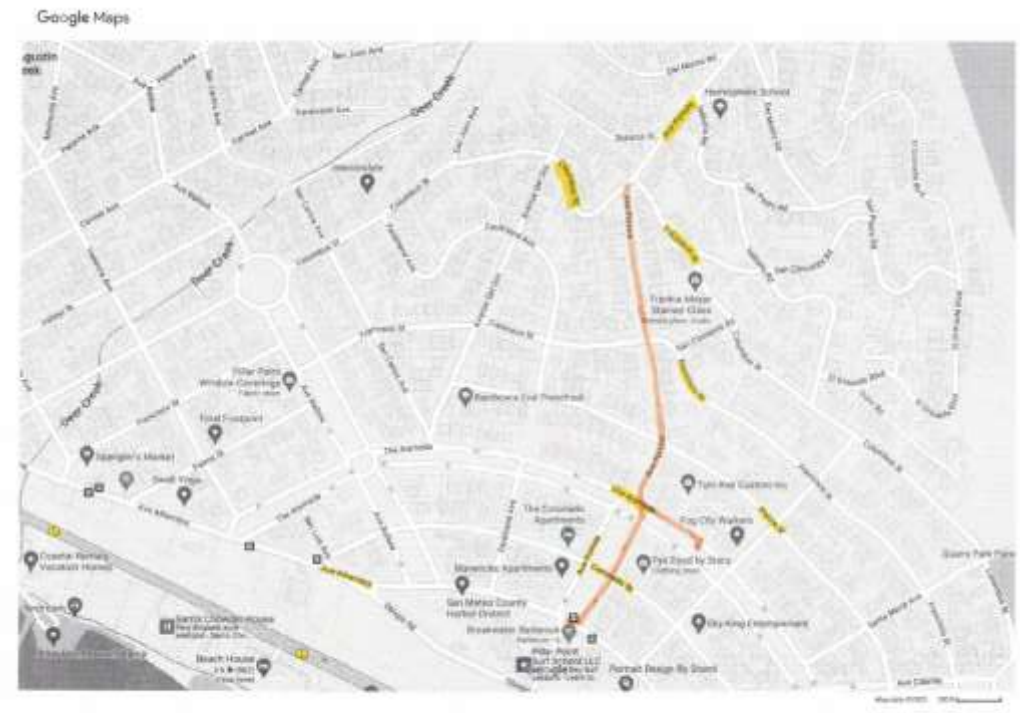




Photo 26 - Intersection of Ave. Portola & Columbus at Highlands


Photo 27 - Runoff from large pipe & culvert under Columbus at intersection with Ave. Portola


Photo 28 - Deep open-air ditch down Ave. Portola from Columbus


Photo 29 - Deep open-air ditches down Ave. Portola towards Francisco


Photo 30 - Flooding down open-air ditches and over x-street Francisco (looking up Ave. Portola)


Photo 31 - Flooding down open-air ditches and over x-street Palma (looking up Ave. Portola)

Photo 32 - Flooding down Ave. Portola to and over intersection with The Alameda

Photo 33 - Flooding from Ave. Portola down The Alameda towards Isabella

Photo 34 - Flooding continuing down The Alameda to a pipe under its eastern side

(Continued with next photo)

Photo 35 - Pipe under eastern side of The Alameda to culvert in median

Photo 36 - Culvert in The Alameda's median

Photo 37 - Additional flooding continuing down from Ave. Portola over the intersection with The Alameda

Photo 38 - Flooding continuing down Ave. Portola (over x-street Coronado in distance) to underground storm system storm grate at Ave. Alhambra

Photo 39 - Flooding down Ave. Portola to underground storm system storm drain at Ave. Alhambra

## Ferdinand Ave. – stormwater runoff from Ave. Del Oro & San Carlos Ave

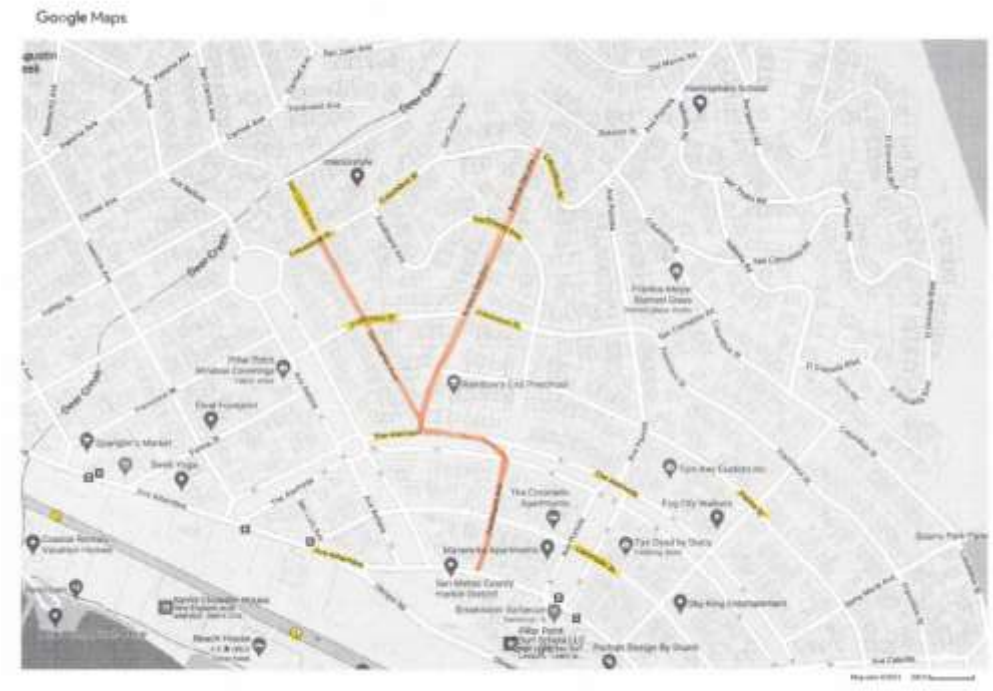



Photo 40 - Runoff from intersection of Ave. Del Oro & Columbus

Photo 41 - Runoff down open-air ditches & over x-street Ferdinand (looking up Ave. Del Oro)

Photo 42 - Runoff down open-air ditches & under x-street Francisco (looking up Ave. Del Oro)

Photo 43 - Runoff down open-air ditches & under x-street Palma (looking down Ave. Del Oro

Photo 44 - Runoff down Del Oro to convergence with runoff down San Carlos at The Alameda

(Continued with next photo)

Photo 45 - Intersection of San Carlos & Columbus

Photo 46 - Runoff down San Carlos to Francisco from Columbus

Photo 47 - Runoff down San Carlos and over x-street Francisco (looking up San Carlos)

Photo 48 - Continuing runoff looking up San Carlos towards Francisco

Photo 49 - Runoff down San Carlos to convergence with runoff down Ave. Del Oro at The Alameda

Photo 50 - Runoff down Ave. Del Oro & San Carlos converging to flood down to and across The Alameda

Photo 51 - Flooding down The Alameda from the convergence of Ave. Del Oro & San Carlos runoff

Photo 52 - Flooding over the eastern side of The Alameda to its median

Photo 53 - Diagonal open-air ditch in The Alameda's median

Photo 54 - Flooding over the western side of The Alameda to lower Ferdinand from the median ditch (towards Ave. Alhambra)

Photo 55 - Flooding down Ferdinand and over x-street Coronado (looking up Ferdinand)

Photo 56 - Flooding down Ferdinand to underground storm system storm drain at Ave. Alhambra

## Sonora Ave. – stormwater runoff from Ave. Granada & Solano Ave

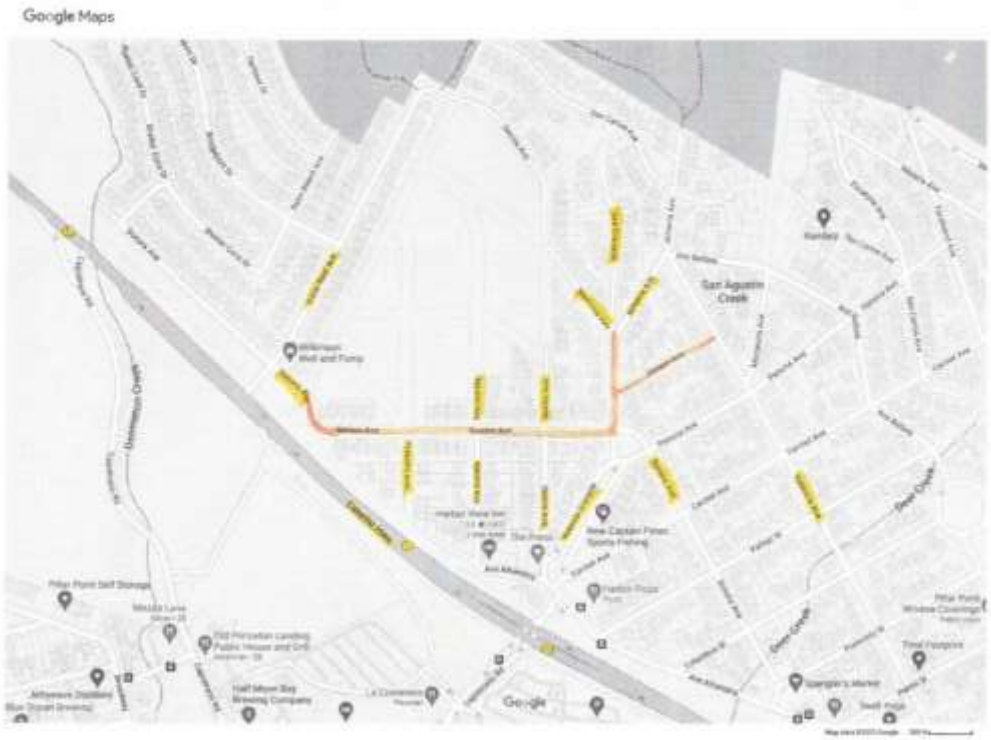



Photo 57 - Runoff from convergence of Ave. Granada, Madrona, & Almeria down Ave. Granada towards Sonora

Photo 58 - Runoff from convergence down Ave. Granada plus runoff from Solano at intersection of Sonora & Ave. Granada

Photo 59 - Combined runoff from Ave. Granada flooding down Sonora at intersection of Sonora & Ave. Granada

Photo 60 - Flooding down Sonora over x-street Sevilla (towards Ave. Granada)

Photo 61 - Flooding down Sonora over x-street Madrid (towards Ave. Granada)

Photo 62 - Flooding down Sonora over x-street Presidio (towards storm drain)

Photo 63 - Flooding down Sonora to the storm drain looking towards Presidio

Photo 64 - Flooding from both sides into underground storm system storm drain at the westerly end of Sonora before where it curves toward Coral Reef

Photo 65 - Flooding on Sonora from stormwater pooling at the curve back to the storm drain

Photo 66 - Pooling runoff flooding the entire roadway at the curved portion of Sonora (towards the storm drain)

Photo 67 - Large pooling of stormwater runoff behind homes flooding onto Sonora beyond its curved portion (Coral Reef is to the left)

Photo 68 - Wetlands behind homes at storm pooling site (4/15/2023)

Photo 69 - Wetlands behind homes towards storm pooling site (4/15/2023)

**Exhibit 3: Rocket Farms Data Gathered by MYRAINPLAN.com** March 2023

- The below sections (in this table) correspond to specific buildings in the included images (zip folder); they are not labeled in either the table or images
- I did not analyze every building related to Rocket Farms, but the ones that make the most sense for water harvesting
- This does not include any cost information. In most cases, multiple water harvesting devices (e.g. cisterns) would be required and there would likely need to be plumbing and/or conveyance work completed
- The below data is an estimate based on the following document
    - I would bear in mind that for state's such as California, rainfall totals vary a lot from year to year because of the climate. Actual capturable amounts will vary year over year

| | Est. Square Feet | Est. Gallons | Approx. Capturable Amount (1/3 rule) |
|---|---|---|---|
| **Rocket Farms Central** | 41,998 | 499,944.19 | 166,481.42 |
| | 135,234 | 1,609,825.54 | 536,071.90 |
| | 9,250 | 110,112.00 | 36,667.30 |
| | 17,538 | 208,772.35 | 69,521.19 |
| | 22,168 | 263,887.87 | 87,874.66 |
| | 11,481 | 136,669.82 | 45,511.05 |
| **Rocket Farms North** | 90,151 | 1,073,157.50 | 357,361.45 |
| | 69,511 | 827,458.94 | 275,543.83 |
| **Rocket Farms Northeast** | 12,813 | 152,525.95 | 50,791.14 |
| | 17,442 | 207,629.57 | 69,140.65 |
| | 34,931 | 415,818.62 | 138,467.60 |
| | 25,446 | 302,909.18 | 100,868.76 |
| | 20,930 | 249,150.72 | 82,967.19 |
| | 16,025 | 190,761.60 | 63,523.61 |
| **Rocket Farms South** | 268,300 | 3,193,843.20 | 1,063,549.79 |
| **Total(s)** | 793,218 | 9,442,467.07 | 3,144,341.53 |
| | | | |
| Half Moon Bay CA- Average Rainfall (in.) | 24 | | |
| Half Moon Bay CA- 80% Average Rainfall (in.) | 19.20 | | |
| 1” rainfall = 0.62 gals captured | 11.90 | | |

VFF Summary:
Exhibit 3: Rocket Farms Data Gathered by MYRAINPLAN.com March 2023

so Rocketfarms has an impermeable surface of approximately 800,000 sq ft with a one third rule capturable rainfall of 3 million gallons (from HMB rain estimates) over a year

From the rainfall captured on my 1000 sq ft property over the cyclone bomb and atmospheric river of the 10 days late March 23 of 600 gallons of rain, Rocketfarms would have experienced over 480,000 gallons (800x600) of rainfall that could have been captured to alleviate our flooding .... captured potentially by four 100,000 gallon cisterns (a practical size costing $70k per cistern). Note this is a high volume portion (16%) of the 3 million experienced over the year.

VFF:What are the means that could be used on the east side on Hghwy 1 to capture these high volumes of water? What would the cost be of the gutters and plumbing?

Response from MYRAINPLAN

- The impermeable surface amounts shared in the table above correspond to specific buildings located within Rocket Farms parcels. The total impermeable surface coverage is possibly higher. Also I would note these are based on high resolution imagery and may not be completely accurate
- For water catchment - it's probably more reasonable to break up the collection of stormwater into a lot of smaller sized cisterns versus doing a series of very large ones - because the catchment areas (roofs) are spread across many different buildings
- Capturing water along the side of a State Highway is extremely complex because of the multiple layers of government control. In my experience (in another life), it is more likely any infrastructure projects would include building in conveyance features to slow the flow of water and allow it to permeate versus capturing/storing it.
- Estimating drainage infrastructure at this scale is outside of the scope of what I am capable of doing (there are so many factors that would impact it). You would need an large scale contractor or someone with more experience in this field

# Exhibit 4

## Evaluate cause of flooding and standard of care

## Location of Incident:

## Rossi Residence

## Half Moon Bay, California

Engineering Design & Testing Corp.
**Oakland District Office**
2221 Commerce Ave., Suite A
Concord, CA 94520
P 925.674.8010
EDTEngineers.com

EDT
Forensic Engineering & Consulting

June 10, 2024

# Report

**Via Email Transmittal**
jrossi.91320@gmail.com


**SUBMITTED TO:** John Rossi
2804 Champs Elysee Blvd
Half Moon Bay, California 94019

**FROM:** Megan E. Abadie, P. E.

**REFERENCE:** Evaluate cause of flooding and standard of care – Rossi Residence
Location of Incident: Half Moon Bay, California
Date of Incident: Multiple dates, October 2021 through March 2023
Claim Number: N/A
EDT Case Number: OAK3676-77575

The following is a report of an investigation into the cause of flooding from a waterway adjacent to the residence, and into whether standard of care was exercised to prevent flooding impacts to the property. Figures 1 through 32 and four appendices are included to enhance the narrative of this report.

The conclusions and opinions stated herein are based on information available to the investigation as of this writing. It is conceivable that additional information may be forthcoming which bears on these conclusions and opinions. Therefore, the right is reserved to review and modify all conclusions and opinions at any future point in time should additional information become available. Any repair recommendations provided in this report are general in nature and the preparation of detailed plans and specifications is beyond the scope of this project and report. All repairs shall be completed in accordance with manufacturer's specifications and the applicable building code(s), including modifications by governing jurisdictions.

For ease of reading and convenience in presentation, this report has been divided into the following sections:

A. Background Information and Work of Investigation

B. Observations

C. Discussion

D. Conclusions

Figures 1-32

Appendix I: Aerial Photo of Rossi Residence from Google Earth, May 2022

Appendix II: Map of Pullman Creek Culverted Reaches

Appendix III: Preliminary Hydrology Report, Minor Subdivision APN 048-133-010, Michael D. Ashley, P.E., February 2010

Appendix IV: Table of Culvert Inlet Loss Coefficients from USACE

## A. Background Information and Work of Investigation

The Rossi residence, located at 2804 Champs Elysee Blvd, Half Moon Bay, CA (Appendix I and Figure 1), is a two-story wood-framed single-family residence on a concrete slab foundation. The residence was built between 2019 and 2021. Mr. John Rossi, the homeowner, purchased the residence in April 2021 and moved in in May 2021.

The residence faces northeast, and is bordered by Pullman Ditch (Ditch), a manmade waterway, on the Southeast (Figure 2). Faces of the residence are referred to by their abbreviated cardinal directions: NE (front), SE (left), SW (back), and NW (right). The Ditch begins an approximate two hundred feet east of Highway 1 and runs east from its origin to the NE edge of Highway 1, then southeast from Highway 1 to Roosevelt Beach on the Pacific Ocean. It is reported to have been hand-dug in the early twentieth century.

Mr. John Rossi, the homeowner, was present for both site visits. Mr. Rossi reported that his yard and residence had flooded during the following periods:

- October 2021
- December 2021
- December 2022
- January 2023
- February 2023
- March 28, 2023

The dates of the October 2021 through February 2023 floods were not recorded. During each of the flood events that Mr. Rossi witnessed, the peak flood level reached an estimated elevation of one foot above the ground level against the SE (ditch-facing) side of the house and an estimated two feet above the ground level against the SW (back) of the house, despite running two 300 gallon-per-minute (gpm) portable sump pumps. Sandbags were required to prevent flooding of the home's interior.

Several of Mr. Rossi's neighbors reported that homes fronting the Ditch had flooded for

years prior to the construction of Mr. Rossi's residence. One neighbor, Mr. Joe Farrell, emailed photographs of a January 16, 2020, flood of the 2804 Champs Elysee lot to the City of Half Moon Bay Planning Department at the time of that flood.

Mr. Rossi reported the following patterns and recurrent observations over the years that he has occupied the Residence:

- Water flowing over Highway 1 from the northeast and into the Ditch during heavy rain events
- Water level in the Ditch near his home rising about thirty minutes after the beginning of the rain
- Periods of sustained elevated flow in the Ditch during dry weather

In the summer of 2023, Mr. Rossi undertook modifications to the section of the Ditch fronting his property, including widening, straightening, and armoring of the channel.

City of Half Moon Bay planning staff provided EDT with several documents from the building application for 2804 Champs Elysee Blvd but stated that no hydraulic or hydrologic study or investigation was conducted as part of the building permit process.EDT was contacted on March 11, 2024 to evaluate cause of flooding and standard of care. EDT conducted a visual examination of the exterior of the property and the upstream and downstream reaches of the Ditch on March 22, 2024, and March 29, 2024 and took digital photos, which are presented in Figures 1 through 32. Rain was in progress during the March 29th inspection.

## B. Observations

EDT inspected the Ditch from the northeast side of Highway 1 to the outlet at Roosevelt Beach on the Pacific Ocean during dry weather and during a rain event. Culvert inlets and outlets were measured at Highway 1, Alameda Avenue, and Naples Avenue. Culvert measurements and materials are shown in Appendix II. Culvert inlets and outlets are shown in Figures 3 through 18. The two Highway 1 culverts terminated in a rectangular junction structure at the outlet. With the two culverts and the rectangular outlet flowing partially full, the flow viewed from the outlet appeared to change direction inside the junction structure. Other outlets were the same size, shape and material as the inlets.

Bridges crossed the Ditch northeast of the Highway 1 inlet, at Pullman Avenue, and at Champs Elysee Avenue (Figures 19 through 21). The majority of the open channel portions of the Ditch were vegetated earthen channels with irregular cross section (Figures 22 through 24), with a concrete barrier bordering the northeast bank at the end of Alameda Avenue (Figure 25), a concrete bank wall upstream of 2805 Naples Avenue (Figure 26), an irregular poured concrete outlet apron downstream of 2805 Naples Avenue (Figure 27), and a timber retaining wall on the northeast bank at the 2805 Naples Avenue outlet (Figures 13 and 28) . Downstream of the culvert crossing under 2805 Naples Avenue, soil loss was visible behind the timber retaining wall (Figure 29) and under the concrete apron (Figure 27). The section of the Ditch fronting the Rossi Residence had more uniform trapezoidal cross section than other open channel reaches of the Ditch, with rock armoring on one bank and jute netting on the other (Figure 30).

The final culverted reach of the Ditch terminated in two corrugated metal pipe outlets followed by a drop of at least five feet (Figure 31). The drainage path from the Coastal Trail culverts discharge to Roosevelt Beach was a vegetated gully with steep banks, some of which had negative slope due to undercutting (Figure 32).

Velocity between the Champs Elysee bridge and the Rossi Residence was measured during a March 29, 2024 moderate-intensity rain event at between 3.75 and 4.5 feet per second (fps).

## C. Discussion

### RAINFALL RECURRANCE INTERVALS FOR REPORTED FLOOD EVENTS

Precipitation records from the months and dates during which Mr. Rossi or other neighborhood residents documented flooding were analyzed to determine the recurrence interval (return period) of the rain event.

The nearest weather station that reports precipitation data to the National Oceanic and Atmospheric Association (NOAA) National Center for Environmental Information (NCEI) is Station ID WBAN:00228, located at the Half Moon Bay Airport (HMB Airport Station) 3.2 miles northwest of the Rossi residence (Appendix II). The available hourly precipitation records were downloaded from https://www.ncei.noaa.gov/maps/alltimes/. The recurrence interval of a location's precipitation can vary depending on the duration of time over which the rain accumulation is counted. For the purpose of estimating peak runoff at a location, which is one of the most important factors in flood occurrence, standard practice is to use the rain total during a duration equal to the Time Of Concentration (TOC) – the time water takes to travel from the most upstream location in the watershed to the location of interest. The maximum total precipitation that occurs during any duration of the TOC length during the rain event is then compared to the recurrence interval analysis of a statistical record of precipitation at the location of interest. The NOAA Atlas 14 Precipitation Frequency Data (Atlas 14 PFD) (https://hdsc.nws.noaa.gov/pfds/), is the national standard for rainfall recurrence intervals. Atlas 14 PFD tables are developed via statistical analysis of long term rainfall records for each weather station that submits adequate data to NCEI / NOAA. The Atlas 14 PFD for the HMB Airport station was used for this analysis so that the rain data is analyzed against the PFD for the same station.

Mr. Michael D. Ashley, P.E. estimated the TOC to be 24 minutes at a location 570 feet upstream of the Rossi residence in his 2010 Preliminary Hydrology Report on Minor Subdivision APN 048-133-010 (Appendix III, referred to as the Ashley Report). Based on measured and estimated wet weather velocities in the Ditch, the additional 570 feet adds an approximate 2 to 3 minutes of travel time, for an estimated TOC of 27 minutes at the Rossi residence (rounded to 30 minutes for recurrence interval estimation). This is consistent with Mr. Rossi's report that the Ditch level near his home tends to rise about half an hour after the rain starts, which validates the

TOC computed by Mr. Ahsley from topographic and land-use data.

Rain accumulation records are available from the HMB Airport Station at hourly intervals, not thirty minute intervals, but the maximum for thirty minute totals can be obtained by adding consecutive hourly totals; the rainfall distribution producing the maximum possible total within a thirty minute duration while still producing the reported hourly totals would occur if all the rain from one hour fell within the last 15 minutes, and all the rain from the subsequent hour fell within the first 15 minutes.

Using this methodology, the maximum possible thirty-minute precipitation total was calculated for each of the days and months during which flooding was reported. Linear interpolation between the recurrence intervals in the Atlas 14 PFD was used to determine the approximate recurrence interval for the maximum possible thirty-minute precipitation. It is probable that the actual maximum thirty minute precipitation totals (which would be evident with higher-resolution rainfall records), and therefore the actual recurrence intervals, are much lower. The thirty minute precipitation totals and corresponding recurrence intervals in Table 1 are upper limits on what is mathematically possible given the hourly totals and should not be construed as the actual values.

**TABLE 1**

| Month or Date | Date of Monthly Max.* | Max. Possible 30-Minute Precip., Inches | Corresponding 30-minute Recurrence Interval, Years |
|---|---|---|---|
| 1/16/2020 | N/A | 0.49 | 4.3 |
| October 2021 | 10/24/2021 | 0.67 | 22.2 |
| December 2021 | 12/23/2021 | 1.62 | >1000 |
| December 2022 | 12/27/2022 | 0.84 | 92.7 |
| January 2023 | 1/2/2023 | 0.39 | 1.5 |
| February 2023 | 2/3/2023 | 0.44 | 2.6 |
| 3/28/2023 | N/A | 0.57 | 8.9 |

***If date of observed flood was not specified**

All except one of the reported flood events occurred during months or days where the maximum 30-minute rainfall that was possible given recorded data was below the 100-year recurrence interval, yet caused the water level to rise above the ground floor of the residence. Although the recurrence interval of a flood is not necessarily the same as the recurrence interval

of the rain event that causes the flood (due to factors such as ground saturation, debris buildup, and temporary changes to surface conditions), there is a strong correlation. Therefore, the fact that the Rossi Residence has experienced flood levels above the ground floor level during storms with rain intensity at the TOC duration that is far below the rain recurrence interval indicates that its ground floor is below the 100-year flood elevation.

**DOWNSTREAM HYDRAULIC CONSTRICTIONS**

The Ditch is an open channel that passes under three bridges and through four culverted reaches prior to discharging to the Pacific Ocean (Appendix II). Locations, descriptions, cross sectional areas of the culverted reaches are shown in Table 2:

**TABLE 2**

| Location | Diameter, inches | | Material | | Total X-Sec Area, Sq. Ft. |
|---|---|---|---|---|---|
| | Culvert 1 | Culvert 2 | Culvert 1 | Culvert 2 | |
| Highway 1 | 25 | 25 | Concrete | | 6.82 |
| 2805 Alameda Ave. | 36 | | Corrugated Metal | | 7.07 |
| 2805 Naples Ave. | 29 | | Corrugated Metal | | 4.59 |
| Coastal Trail | 17 | 24 | Corrugated Metal | | 4.72 |

As indicated in Table 2, each successive culvert downstream from the Rossi Residence has a reduced total cross-sectional area. Cross-sectional area, wetted perimeter, material roughness, length, type of pipe entrance and exit, and slope determine the culvert's maximum flow capacity, with cross-sectional area having the largest effect.

A topographic survey of the Ditch was not available to EDT at the time of this report. However, the slope of the Ditch appears consistent throughout its extent and appears to approximate the average land slope of 0.01 feet per foot. Therefore cross-sectional area, perimeter, pipe material, entrance and exit type, and length will determine the differences in flow capacity among the Ditch culverts, with area having greatest effect.

Culvert flow is calculated using the Manning's equation when water is at or below the pipe crown (top of the pipe), and the Hazen-Williams equation when the pipe is full. Both equations feature cross-sectional area as the variable that is raised to the highest power compared to other

variables:

Manning's Equation:

$$Q = \frac{kA^{1.67}S^{0.5}}{nP^{0.67}}$$

Hazen-Williams Equation:

$$Q = \frac{kCA^{1.63}S^{0.54}}{P^{0.63}}$$

Where:

- Q is the flow rate (water volume per time)
- A is the cross-sectional area of the water inside the culvert occupied by water (when full, the cross-sectional area of the culvert)
- P is the wetted perimeter of the culvert (when full, the cross-sectional perimeter or circumference of the culvert)
- S is the hydraulic slope. For uniform flow and in Manning's equation, this is equal to the culvert slope; for pressurized or nonuniform flow and in the Hazen-Williams equation, it is the head lost to friction per length of pipe.
- k is a unit conversion factor
- n is a roughness factor that is gets larger the rougher the culvert material is
- C is a roughness factor that gets smaller the rougher the culvert material is

The effect of inlet and outlet configurations on flow rate are calculated separately using empirical factors such as those shown in Appendix IV (from the United States Army Corps of Engineers (USACE) at https://www.hec.usace.army.mil/) which represent the amount of slowing effect proportional to velocity.

Inlet losses can have a large effect on flow capacity, as rougher inlets require more energy for the water to enter the culvert. The downstream-most culvert reach (Coastal Trail) has the highest inlet loss coefficient because the protruding pipe ends and the rough, vegetated concrete

sandbag headwall make it inefficient for water to get into the culverts. The upstream-most culvert reach (Highway 1) has the lowest inlet loss coefficient because the culvert entrances are smooth and flush with an engineered headwall. The two intermediate culverts, at Alameda Avenue and Naples Avenue, have corrugated pipe with projections shorter than the Coastal Trail culverts and with concrete headwalls, and therefore have inlet loss coefficients in between those of the Highway 1 and Coastal Trail culverts. Thus, the culvert inlets become more constrictive to flow the further downstream they are located.

Based on culvert size, inlet type, and other characteristics, it is evident that the 2805 Naples Avenue culvert and the two parallel culverts under the Coastal Trail are the choke points of the Pullman Ditch. Since these two most downstream culverted reaches have similar total cross-sectional areas, iterative analysis based on survey data would be needed to determine which of them becomes the primary choke under various conditions, but their cross-sectional area relative to the two upstream culverted reaches ensures that the choke point, when one exists, always occurs downstream of the Rossi Residence. The observed scour and soil loss around the outlet of the 2805 Naples Avenue culvert corroborates that this culvert is a choke point: a culvert that cannot pass the flow coming into its upstream end develops high pressure driven by the buildup of depth at the upstream end due to water arriving at the upstream faster than it can enter, and this pressure causes high velocity at the downstream end which causes scour and soil erosion.

The existence of downstream choke points that have lower hydraulic capacity than the upstream conveyance ensures that water levels in open channel portions upstream of the choke point rise higher and higher as long as runoff entering the ditch exceeds the choke point's flow capacity. The presence of a choke causes water velocity to decrease and water depth to increase on the upstream side. Wave propagation velocity is proportional to the square root of water depth. Therefore the increase in depth and decrease in flow velocity causes wave velocity to become faster than the flow velocity. The elevated water level that builds up behind the choke point travels upstream due to the high wave velocity relative to flow velocity, and exits the channel wherever the local bank elevation is low relative to surrounding channel banks, causing flooding. The rise in water level can propagate upstream through other culverts that have sufficient hydraulic capacity.

Because the 36” culvert at 2805 Alameda Avenue has a similar cross-sectional area to the two 25” culverts under Highway 1, the Alameda Avenue culvert is unlikely to become a choke point if the only flow entering the Ditch is runoff from the NE side Highway 1 that passes through the Highway 1 culverts. However, if additional sources contribute to the Ditch storm flow, such as runoff from the residential neighborhood SW of Highway 1 or from runoff from the NE coming over the crest of Highway 1 (as reported by Mr. Rossi), this additional flow could cause the Alameda Avenue culvert to become a secondary choke point, with even closer proximity to the Rossi Residence.

Flow capacity of a drainage channel should either be consistent or increase as you move downstream, unless diversion or inline storage is provided, because flows increase downstream as more runoff joins the channel. Choke points in open drainage channels without storage or diversion upstream of the choke point can be expected to cause flooding unless the upstream system is oversized.

The undersized culverts at the Coastal Trail and at Naples Avenue (and at Alameda Avenue, during larger rain events where runoff from the neighborhood or flowing over the crest of Highway 1 enters the Ditch) caused flooding at the Rossi property to occur more frequently and in response to lower recurrence interval storms than would occur if the culverts were constructed in accordance with hydraulic engineering best practices. Since these culverts existed prior to the design and construction of the Rossi Residence, the Rossi Residence should have been designed according to the known and documented flood conditions created by existing watershed conditions including the presence of undersized culverts downstream.

## OTHER CONSIDERATIONS

Mr. Rossi documented elevated flows in Ditch during dry weather. All other properties fronting the Ditch are single-family residences and are unlikely to contribute to the elevated flows during dry weather. It is possible that Rocket Farms, a wholesale nursery located to the North of Highway 1 at the head end of Ditch, could be a contributing factor to the elevated flows during dry weather. More information on Rocket Farms’ operations and water management practice would be needed to determine whether it mitigates, exacerbates, or has no effect on the Ditch

flooding at the Rossi Residence. If Rocket Farms discharged water to the Ditch during rain events, then Rocket Farms was a contributing factor to the flooding at the Rossi Residence. If Rocket Farms discharged water to the Ditch only during dry weather, then it did not contribute to the flooding. If Rocket Farms detained stormwater runoff during rain events and then discharged some of that water during dry weather either directly or as irrigation runoff (a common flood control and water conservation practice), then Rocket Farms was a mitigating factor in the Rossi Residence flooding.

**STANDARD OF CARE AND NON-COMPLIANCE WITH LOCAL GUIDELINES**

The City of Half Moon Bay Local Coastal Land Use Plan (LCP) (https://www.half-moon-bay.ca.us/DocumentCenter/View/3762/Chapter-7-Environmental-Hazards) is referenced as a standard for proper development practices in coastal area where the Residence is located. Section 7-55 of the City of Half Moon Bay LCP states:

> 7-55. Flood Protection. Prohibit habitable space at elevations subject to flood risk. New development that must be located in areas subject to current or future flooding shall be sited and designed to be capable of withstanding such impacts in compliance with FEMA, NFIP, and Coastal Act requirements. This shall include elevating all finished floor elevations at least 2 feet above the 100-year flood event, taking into account future climate change and projected storm events. Allow retrofitting for existing development in areas subject to current or future flood, including through elevation of habitable areas, use of break-away walls, etc. Ensure that flood protection measures are consistent with the visual and other coastal resource protection policies of this LCP in the siting and design of raised development and other adaptation measures.

The Residence is in an area "subject to current or future flooding", a fact that was known to the local community and the City of Half Moon Bay for decades prior to the construction of the Rossi Residence. The fact that flooding has been observed during storms of much lower intensity than the 100-year recurrence rain event for the watershed's TOC indicates that the Residence is sited below the 100-year flood elevation based on current configuration of the Ditch and the watershed. Therefore to comply with the provisions of Section 7-55 of the LCP and

accepted development and engineering best practices, the Residence should have been built at a higher elevation, and/or made or requested changes to the Ditch, such as increased downstream flow capacity, to lower the 100-year flood elevation. Since the Residence was known to be located in an area that floods, a hydraulic study should have been undertaken prior to selecting the Residence's finished floor elevation. The evidence of frequent flooding was well-known prior to construction of the Residence, and the existence of undersized culverts downstream of the residence was evident and could be expected to pose a flooding risk. The construction of the Rossi Residence at location an elevation that could be expected to flood based on well-documented and publicized community concerns and evident flood risks constitutes a failure to exercise standard of care. The design and construction of the Rossi residence, which did not elevate the ground floor to the required level above the 100-year flood event as mandated by section 7-55 of the LCP, appears to be in violation of local flood protection guidelines.

## REMEDIAL ACTION RECOMMENDATIONS

Action should be taken before the next rainy season to protect the Residence from future flooding. This may include bringing the Residence into compliance with section 7-55 of the LCP by elevating the ground floor, and/or working with other parties and entities to improve the flow capacity of the Ditch or provide other flood control measures such as upstream detention or bypass / auxiliary conveyance. Any remedial action plan must be evaluated using hydrologic and hydraulic calculations or modeling, to ensure that it will prevent inundation of the Residence during flood events having a lower than 100-year recurrence interval. Such remediation is critical in order to prevent further damage, and to protect the property and its inhabitants from future flood risks.

## D. Conclusions

- The Rossi Residence is located in an area that floods during smaller storms than the 100-year recurrence interval rain event.
- The ground floor of the Rossi Residence is below the elevation that floods during smaller storms than the 100-year recurrence interval rain event.
- Undersized culverts on the Pullman Ditch downstream of the Rossi Residence cause flooding at the Rossi Residence at a lower recurrence interval than would occur if the culverts had been designed according to hydraulic engineering best practices
- Construction of the Rossi Residence with the existing ground floor elevation and without alternative flood protection measures violates the City of Half Moon Bay Local Coastal Land Use Plan and constitutes a failure to exercise standard of care.
- The undersized culverts and the inadequate ground floor elevation resulted in the Rossi residence experiencing flooding during smaller, more frequent storm events than the 100-year event which is the accepted level of flood risk. This significantly increases the risk to the property and its inhabitants. This heightened risk is a direct consequence of the failure to develop the property according to best practices and local guidelines.
- Action should be taken before the next rainy season to protect the Residence from future flooding. All remedial actions must be evaluated using hydrologic and hydraulic calculations or modeling.
- The effect of Rocket Farms Rocket Farms stormwater management and agricultural operations may either mitigate downstream flooding, exacerbate downstream flooding, or have negligible effect on downstream flooding.

# FIGURES

**Figure 1** Residence viewed from Northeast

**Figure 2** Residence viewed from Southwest


**Figure 3** Inlet to parallel 25” culverts under Highway 1

**Figure 4** Inlet to one of the parallel 25” culverts under Highway 1


**Figure 5** Outlet from the two parallel 25” culverts under Highway 1


**Figure 6** Outlet from the two parallel 25” culverts under Highway 1

**Figure 7** Inlet to 36” culvert under 2805 Alameda Ave

**Figure 8** Inlet to 36” culvert under 2805 Alameda Ave

**Figure 9** Outlet of 36” culvert under 2805 Alameda Ave

**Figure 10** Outlet of 36” culvert under 2805 Alameda Ave

**Figure 11** Inlet to 29” culvert under 2805 Naples Ave


**Figure 12** Inlet to 29” culvert under 2805 Naples Ave

**Figure 13** Outlet of 29” culvert under 2805 Naples Ave

**Figure 14** Interior of 29” culvert under 2805 Naples Ave, viewed from outlet

**Figure 15** Inlet to parallel 17” and 24” culverts under Coastal Trail

**Figure 16** Inlet to parallel 17” and 24” culverts under Coastal Trail

**Figure 17** Outlet from parallel 17” and 24” culverts under Coastal Trail

**Figure 18** Outlet from parallel 17” and 24” culverts under Coastal Trail


**Figure 19** Pedestrian bridge northeast of Highway 1

**Figure 20** Pedestrian bridge at Pullman Ave

**Figure 21** Pedestrian bridge at Champs Elysée Blvd

**Figure 22** Pullman ditch between Highway 1 and Pullman Ave, 3/29/24 rain

**Figure 23** Pullman ditch between Alameda and Naples Ave, dry weather

**Figure 24** Pullman ditch between Naples Ave and Coastal Trail, dry weather


**Figure 25** Concrete barrier at end of Alameda Ave

**Figure 26** Concrete bank wall upstream of 2805 Naples Ave

**Figure 27** Poured concrete apron at 2805 Naples Ave

**Figure 28** Timber retaining wall downstream of 2805 Naples Ave, downstream end

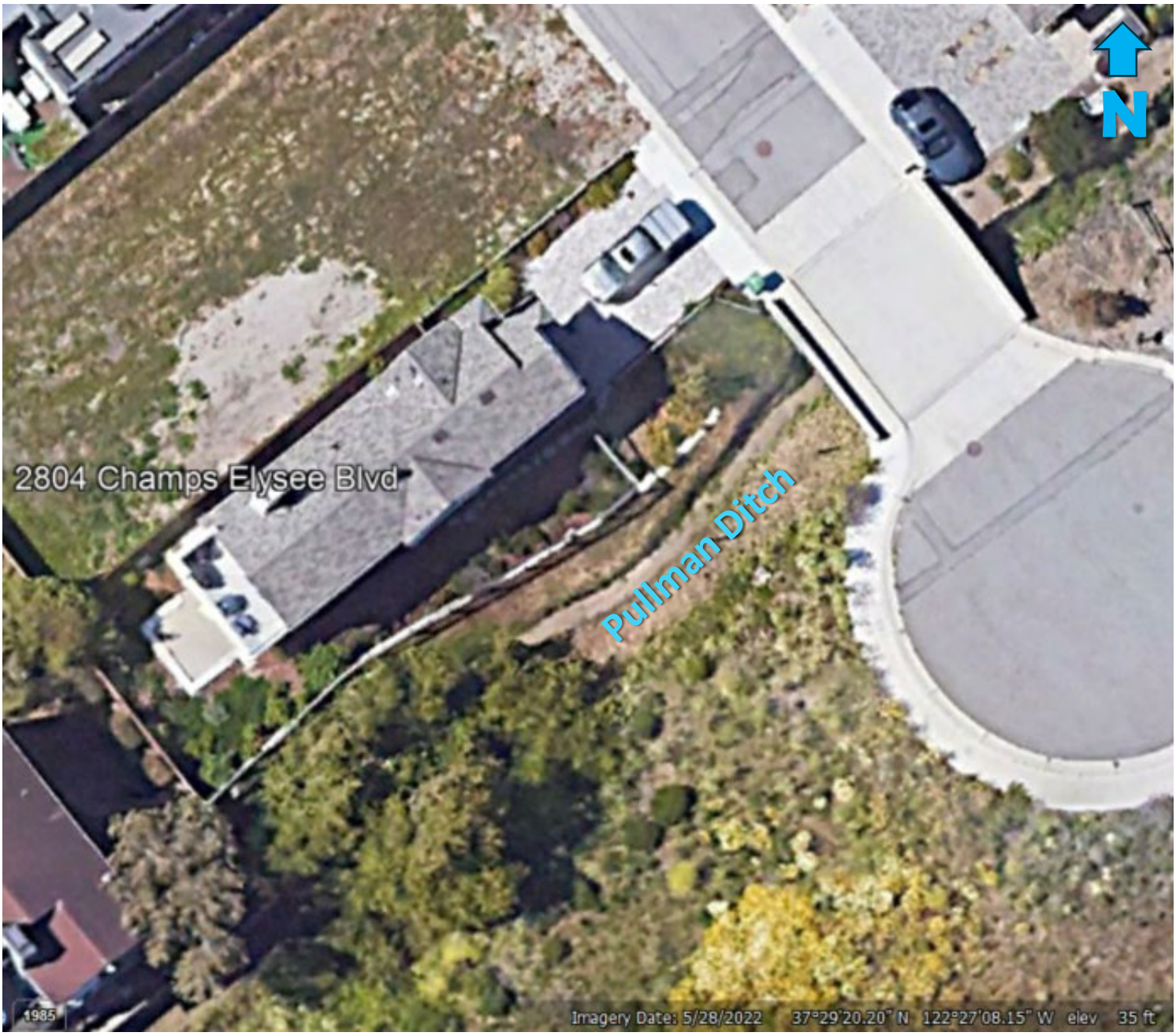
**Figure 29** Soil loss behind upstream end of timber retaining wall at 2805 Naples Ave

**Figure 30** Trapezoidal channel with riprap and jute netting at Rossi Residence

**Figure 31** Outlet of Coastal Trail culverts, zoomed out to show drop

**Figure 32** Example of undercut bank between Coastal Trail culvert outlets and Roosevelt Beach

# APPENDIX I
Aerial Photo From Google Earth
May 2022 (Prior to Ditch Straightening and Widening)
Labels Added by EDT



# APPENDIX II
# Pullman Ditch Culvert Locations

# APPENDIX III
Preliminary Hydrology Report
Michael D. Ashley, P.E., February 2010

ATTACHMENT 4

# PRELIMINARY HYDROLOGY REPORT

## Minor Subdivision: APN 048-133-010

Cabrillo Highway @ Knewing Avenue
Half Moon Bay, CA.

PDP-009-10

PLANNING DEPT.
FEB 16 2010
RECEIVED

Prepared for:

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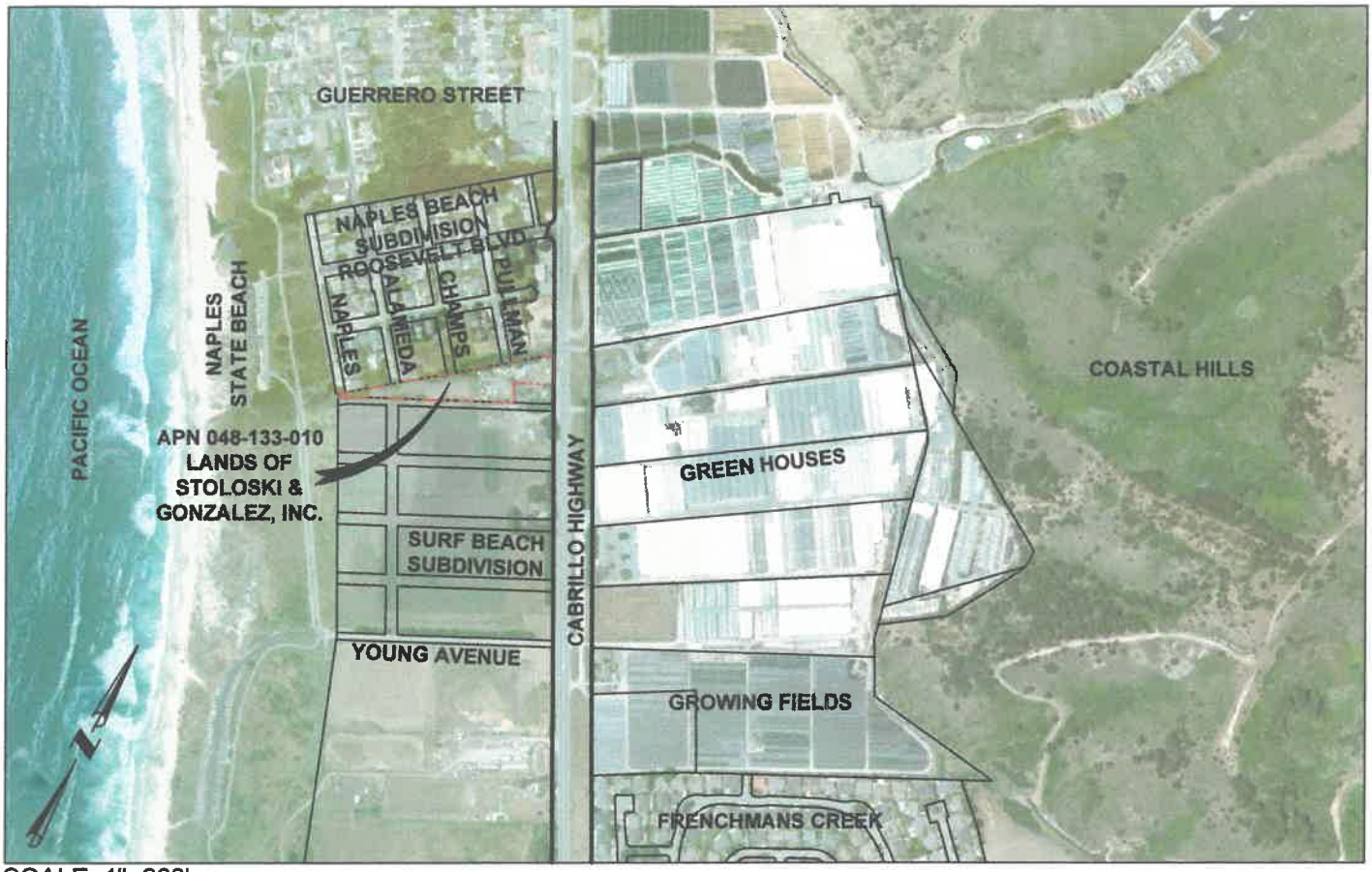
REGISTERED PROFESSIONAL ENGINEER
MICHAEL D. ASHLEY
C 19504
Exp. 9/30/11
CIVIL
STATE OF CALIFORNIA

FEBRUARY 2010

**INDEX:**



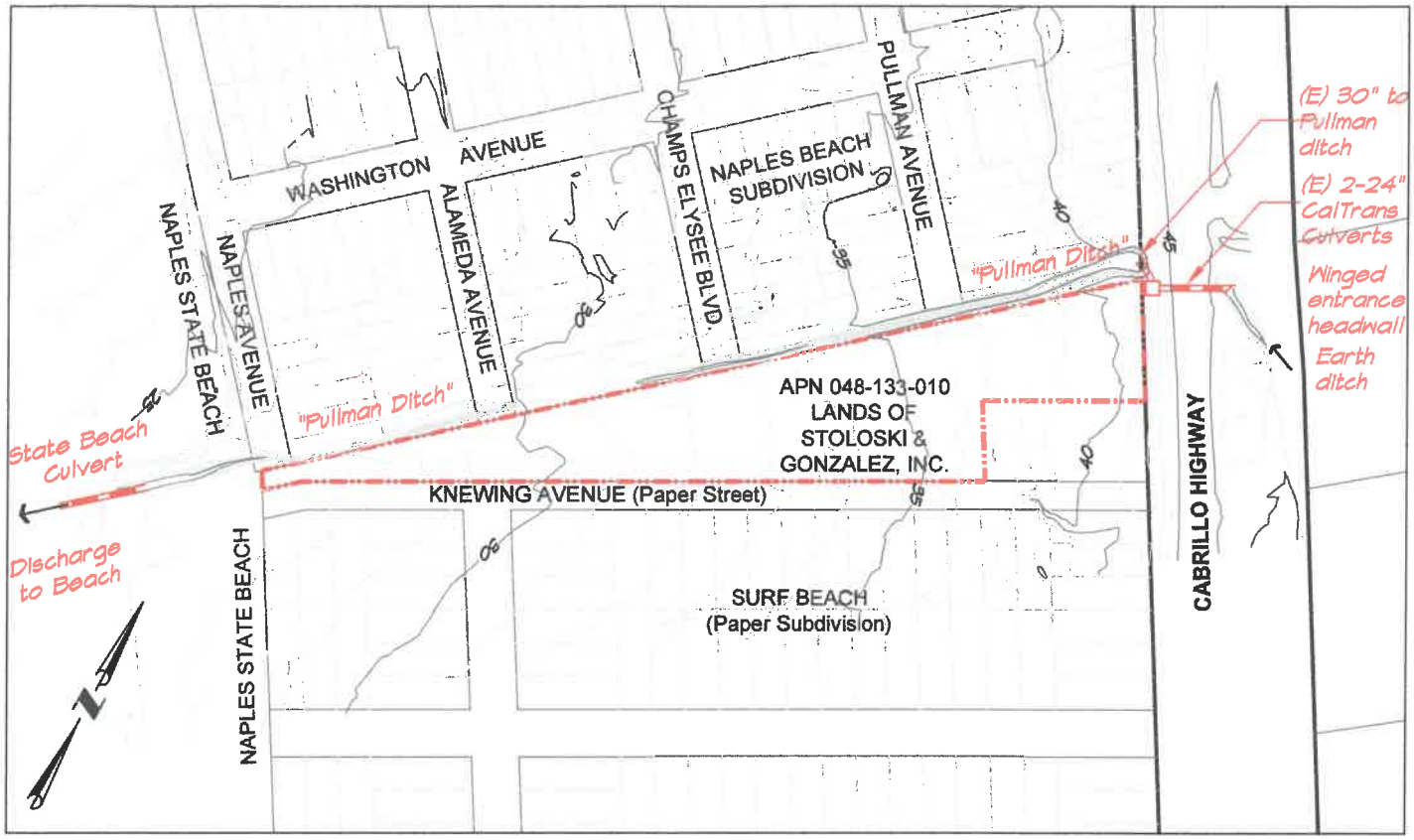

SCALE: 1"=800'

*The project site lies northerly of Frenchmans Creek at the northern end of the City of Half Moon Bay, westerly and adjacent to Cabrillo Highway (State Route 1). The project site is slightly over two acres in area, defined as APN 048-133-010. The site lies northerly of Surf Beach Tract an undeveloped subdivision from 1906, and southerly of Naples Beach Subdivision (City of Naples) from 1907.*

*The State Beach property bounds the project site on the west through a 20' wide strip of land.*

*The project site has highway frontage on the east, unimproved street frontage on Knewing Avenue (30' wide) to the south, and street frontage from Pullman Avenue, Champs Elysee Boulevard, Alameda Avenue & Naples Avenue to the north. Champs Elysee Boulevard is undeveloped from the project site northerly to Washington Boulevard.*

## VICINITY MAP




SCALE: 1"=200'

*Offsite contributing area to the project site is limited to surface flow from the westerly side of the Highway and right of way onto the project site, approximately 0.14 acres. The site gently slopes westerly at 1.5%. Surface flow from the project site enters the "Pullman ditch" west of the site near Naples Avenue.*

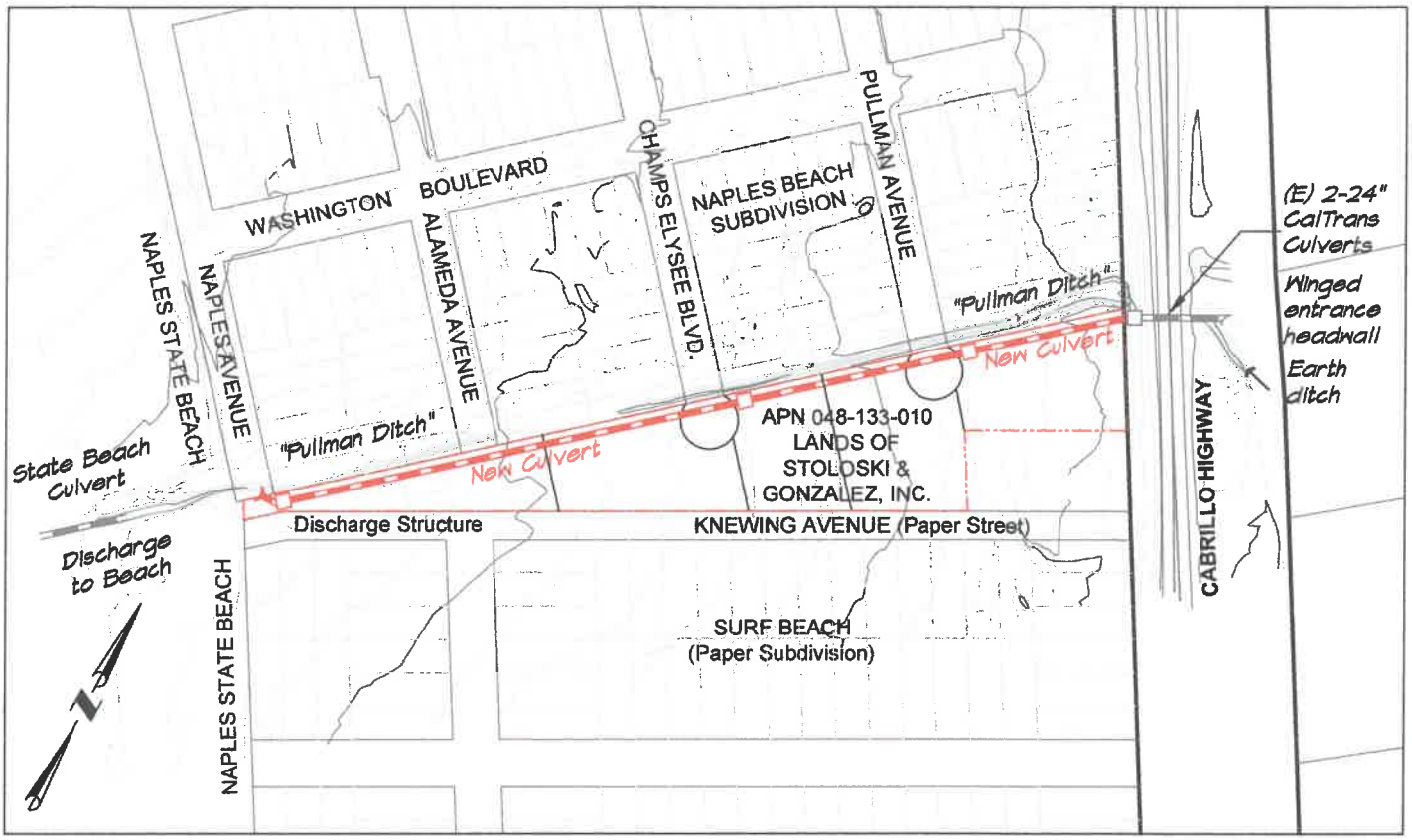
*The project site is protected from upstream surface flow by the "raised" Cabrillo Highway. Storm water runoff from the easterly side of the Highway is diverted to the two 24" CalTrans culverts, discharging into the unimproved "Pullman ditch". A description of this contributing area east of the Highway is described under "Contributing Area", Page 5 of this report.*

*Under current operating conditions storm water flow is significantly reduced to the two 24" CalTrans culverts. It is reported that "all" surface storm water at the greenhouse enterprise is used for irrigation, and excess flow is retained in onsite storage basins.*

*Without the onsite storage major storm flows would exceed the capacity of the two 24" CalTrans culverts and would pond at the inlet and within this Highway swale. The two 24" CalTrans culverts limit the flow to the "Pullman ditch".*

*This report considers two offsite conditions: first, current conditions with storm water retained in storage basins at the greenhouse enterprise; second, full release of storm water from the contributing watershed.*

## EXISTING DRAINAGE CONDITIONS




SCALE: 1"=200'

*The proposed project is a four lot minor subdivision with access from Pullman Avenue and Champs Elysee Blvd. to the north. The single family residential project to be developed as a "Planned Unit Development".*

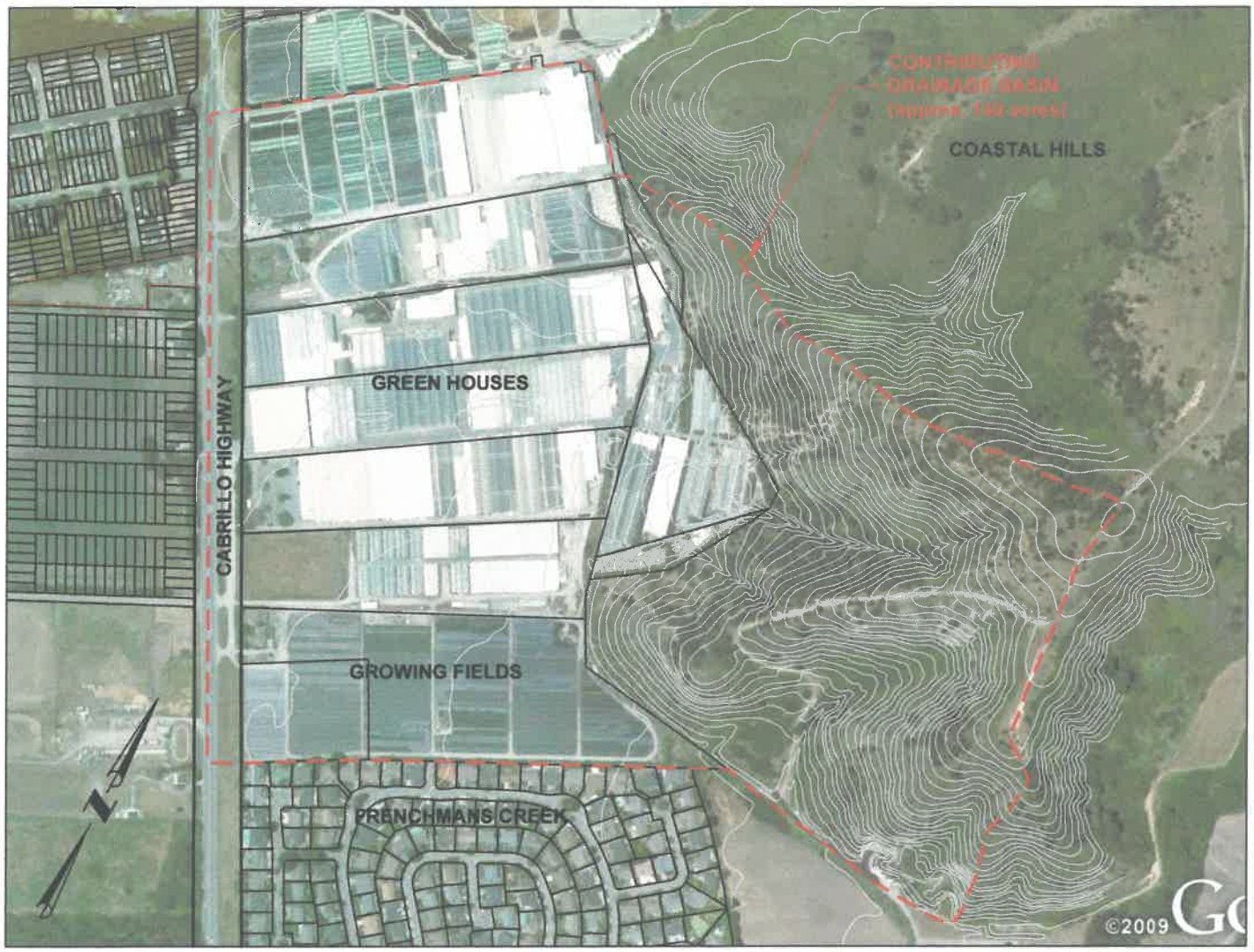
*Storm water design for the project site will be consistent with Best Management Practices. Site drainage for the four lots will include onsite percolation for increased flow consistent with current storm water discharge policies. This storm drainage work will be completed as part of the home building of the individual lots.*

*Stormwater runoff from 140 acres to the east of Cabrillo Highway is concentrated in a CalTrans culvert at the northeast corner of the site. This storm discharge flows from the CalTrans culvert into an undeveloped earth channel known as "The Pullman Ditch". The ditch lies northerly of the site and within the Naples Beach Subdivision without benefit of easement or maintenance.*

*Stoloski & Gonzalez, Inc. proposes to construct a culvert from the Cabrillo Highway CalTrans culvert to the vicinity of Naples Avenue, approximately 950 feet. The proposed culvert will be constructed within a 20 foot wide easement on the applicant's land and will be offered for dedication to the City of Half Moon Bay for maintenance.*

## PROJECT DESCRIPTION

**PRELIMINARY HYDROLOGY REPORT**
PREPARED FOR STOLOSKI & GONZALEZ, INC.
MINOR SUBDIVISION: APN 048-133-010
CABRILLO HIGHWAY @ KNEWING AVENUE
HALF MOON BAY, CA




SCALE: 1"=600'

*The drainage basin contributory to the CalTrans culvert comprises 140.2 acres and lies entirely easterly of Cabrillo Highway. The contributing area includes: a portion of the westerly slope of the coastal hills; agricultural greenhouses; agricultural growing fields; the swale within the CalTrans right of way; and, the paved Cabrillo Highway.*

*The CalTrans culvert discharges into the "Pullman ditch" westerly of the Highway. The banks of the ditch have been built up and the existing ground generally slopes away from the ditch. Thus very little surface drainage westerly of the Highway flows into "The Pullman Ditch".*

| ***Description*** | ***Area (Acres)*** |
|---|---|
| *Slopes* | *50.7* |
| *Greenhouses* | *62.9* |
| *Fields & Residence* | *20.5* |
| *Highway Paving* | *1.1* |
| *Highway R/W* | *5.2* |

## CONTRIBUTING AREA

**PRELIMINARY HYDROLOGY REPORT**

PREPARED FOR STOLOSKI & GONZALEZ, INC.
MINOR SUBDIVISION: APN 048-133-010
CABRILLO HIGHWAY @ KNEWING AVENUE
HALF MOON BAY, CA

## METHOD OF ANALYSIS

### SUMMARY:

*The Contributing Drainage Basin area was evaluated for the 10-year and 100-year storms.*

### DRAINAGE DESIGN CRITERIA:

*The tributary area of the watershed is less than 0.5 square miles; therefore flow rate of storm runoff is calculated by use of the Rational Method, given as:*

*Q = CIA, where:*
*Q = The peak runoff rate in cubic feet per second (cfs) at the point of analysis.*
*C = Dimensionless runoff coefficient*
*I = Rainfall intensity in inches per hour (in/hr) corresponding to the time of concentration in minutes (min).*
*A = The drainage basin area in acres (ac).*

### Runoff Coefficient:

*In accordance with the San Mateo County Department of Public Works the runoff coefficient is determined based on the percentage of impervious area onsite.*

*The following C values were used in our analysis:*

*Greenhouse Areas 0.85*
*Growing Field 0.3*
*Hillside Slopes 0.4*
*Highway Pavement 0.85*
*Highway Right of Way 0.4*

*A composite C value was computed as follows:*

| Description | Area (Acres) | "C" Value | C x A |
|---|---|---|---|
| Greenhouses | 62.9 | 0.85 | 53.46 |
| Fields & Residence | 20.5 | 0.30 | 6.15 |
| Hillside Slopes | 50.7 | 0.40 | 20.28 |
| Highway Paving | 1.1 | 0.85 | 0.94 |
| Highway R/W | 5.2 | 0.35 | 1.82 |
| | | | 82.65 |

*Composite "C" Value = 82.65 / 140.2 = 0.59*

### Maximum Flow due to existing two 24" culverts:

*The two 24" culverts limit the flow to the Pullman ditch to approximately 66 cubic feet per second.*

### Time of Concentration:

*Time of concentration was calculated for overland flow using the State of California formula and nomograph. For determining flow velocity in the CalTrans culvert a Manning "n" of 0.013 was used.*

$$Tc = \left(\frac{11.9\,L^3}{H}\right)^{0.385}$$

*Tc = time of concentration, hours*
*L = Length of travel, miles*
*H = fall, feet for length, L*

### Time of Concentration:

*REACH "A"*
*L = 1770'*
*ΔH = 410-90 = 320'*
*Overland flow, peak to toe at Frenchmans Creek*
*5 minutes*

*REACH "B"*
*L = 625'*
*ΔH = 90-75 = 15'*
*Earth channel at toe; slope = 2.4%*
*3.5 fps = 3 minutes*

*REACH "C"*
*L = 1250'*
*ΔH = 75-55 = 20'*
*Earth channel toe to highway swale; slope = 1.6%*
*2.5 fps = 8 minutes*

*REACH "D"*
*L = 1250'*
*ΔH = 55-38 = 17'*
*Highway swale to highway culvert; slope = 1.4%*
*2.5 fps = 8 minutes*

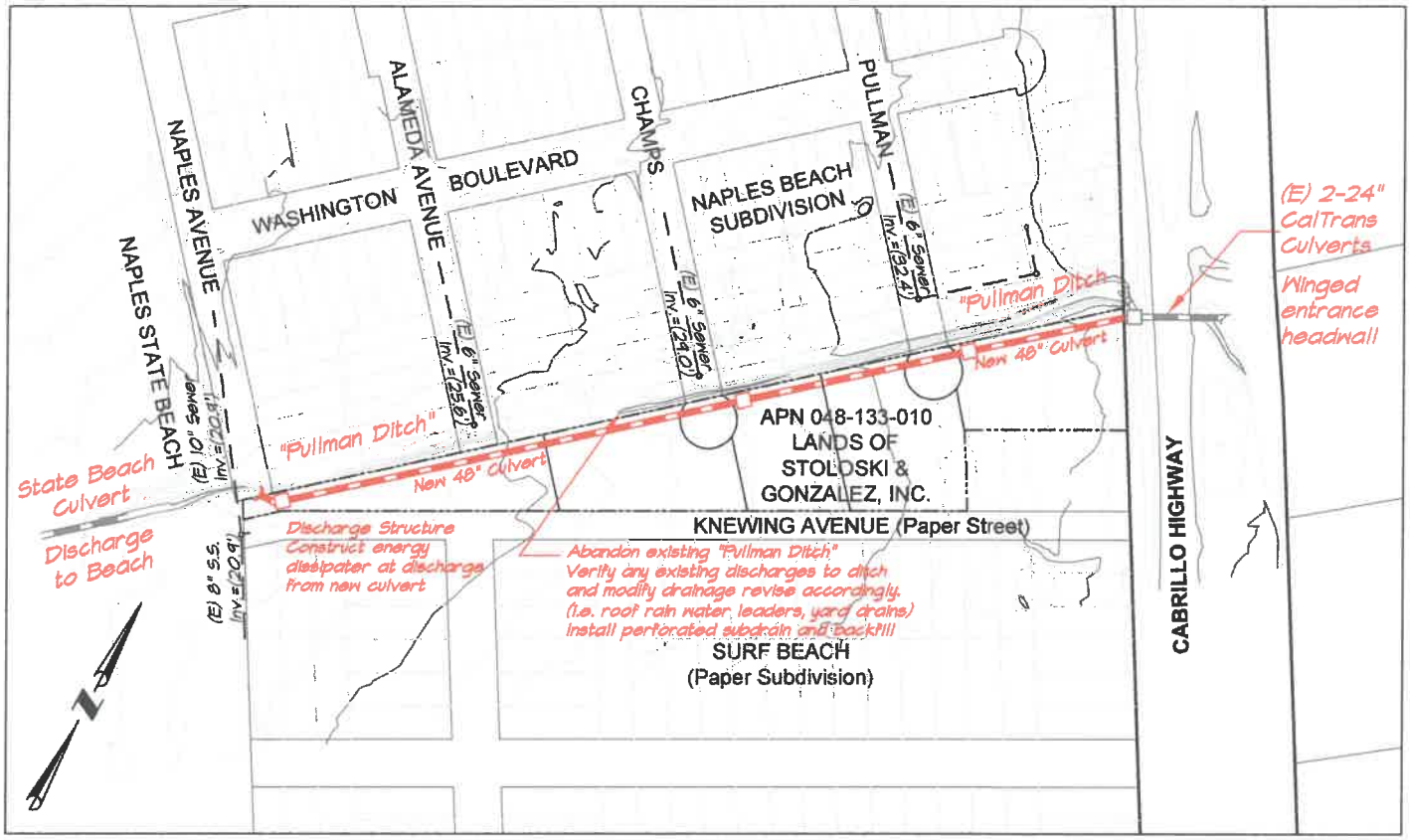
**Tc = 24± minutes**

### Rainfall Intensity:

*Rainfall intensity was determined for the 10-year and 100-year storm events using the CalTrans method. Results were compared to the County of San Mateo method for 10-year and 100-year. References for and determination of these rainfall intensities are included in the pages entitle "San Mateo County Method" and "CalTrans Method".*

*Storm water runoff (without retention) based on the "Rational Formula" is computed to be:*

| | |
|---|---|
| $I_{10}$ = 1.68 cfs | 139 cfs |
| $I_{100}$ = 2.62 cfs | 217 cfs |




SCALE: 1"=200'

*This report has identified a design flow to the entrance of the two 24" CalTrans culverts at 139 cfs (10 year return frequency). (See Sheet 6 - Method of Analysis). This project proposes to construct a 48" culvert from the existing CalTrans culvert westerly approximately 950 lineal feet to the west at Naples Avenue.*

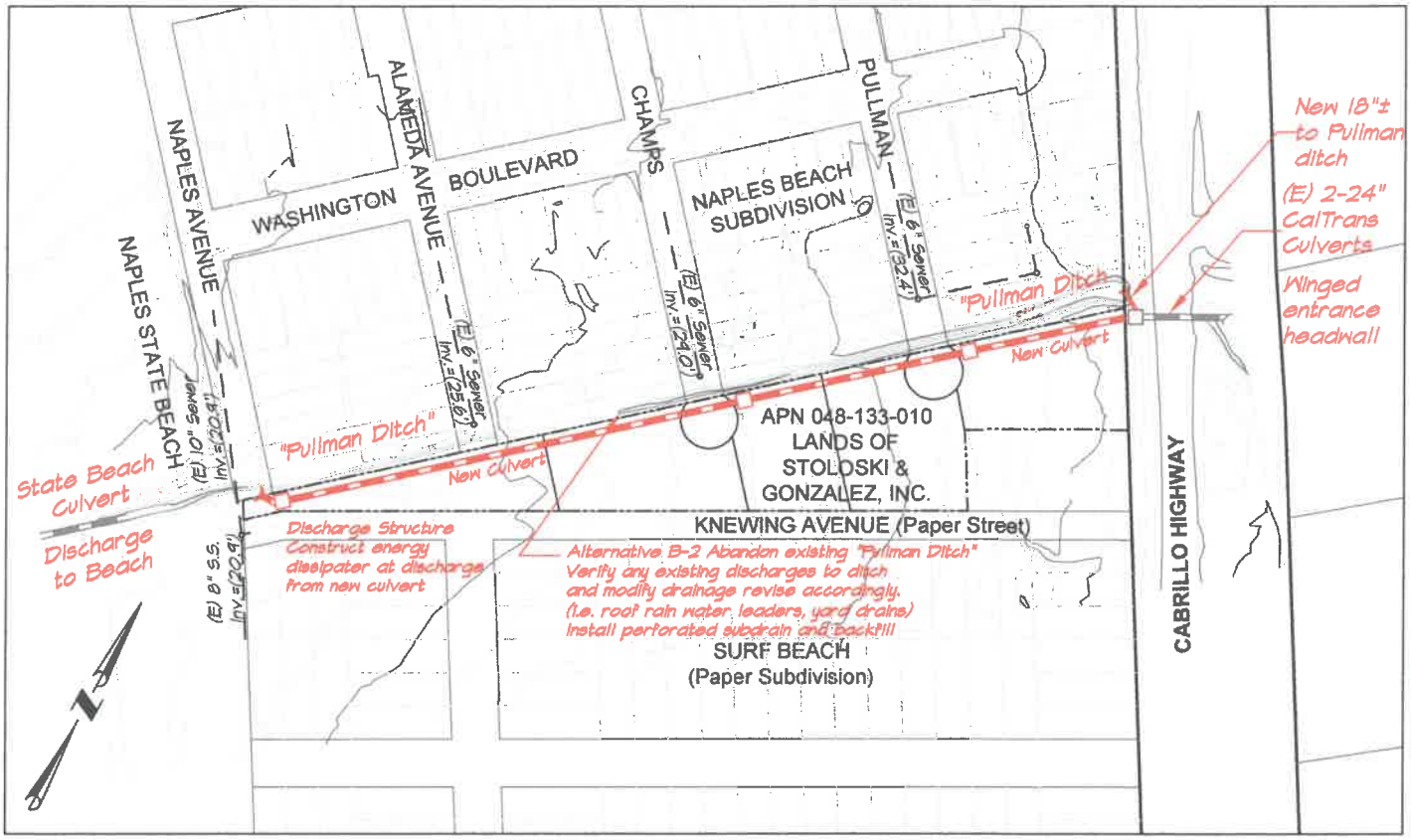
*The inlet construction and modifications of the proposed culvert may be within the CalTrans right of way and therefore an encroachment permit will be required. (Note that CalTrans is proposing to reconstruct the discharge into the Pullman ditch.)*

*The discharge of the storm drainage pipe will be above the existing Granada Sanitary Sewer District 10" diameter main to protect the facility. An energy dissipater will be required due to the exit velocity from the pipe.*

*The discharge of the proposed culvert will require an energy dissipater and connection to the existing ditch. This work may require construction outside the project (within Naples Avenue and perhaps the State Beach) to conform to the existing conditions. Encroachment permits will be required for this work from the appropriate agencies.*

## PRELIMINARY DESIGN

**PRELIMINARY HYDROLOGY REPORT**
PREPARED FOR STOLOSKI & GONZALEZ, INC.
MINOR SUBDIVISION: APN 048-133-010
CABRILLO HIGHWAY @ KNEWING AVENUE
HALF MOON BAY, CA




SCALE: 1"=200'

***ALTERNATIVES:*** *This page reserved for alternative storm solutions.*

*The Engineer has been advised that there may be concern with filling of the Pullman ditch due to environmental concerns. The following alternative is intended to provide an alternate plan to respond to that concern.*

*ALTERNATIVE B-1:*

*This Alternative B-1 proposes that the Pullman ditch remain and continues to carry minor storm flows with available capacity. Flow would be restricted through an 18"± discharge to the Pullman ditch. An overflow structure at Cabrillo Highway would direct flow exceeding the capacity of the Pullman ditch to a new 48" culvert.*

*ALTERNATIVE B-2:*

*This Alternative B-2 proposes to backfill the existing Pullman ditch; construct a 36" culvert to carry the capacity of the existing 36" CalTrans culvert. Currently major storms exceeding the capacity of the two 24" culverts pond at the culvert entrance.*

*Prior to filling the existing "Pullman Ditch", verify any existing discharges to ditch and modify drainage, revise accordingly (i.e. roof rain water leaders, yard drains). Install perforated subdrain and backfill.*

## DESIGN ALTERNATIVE "B"

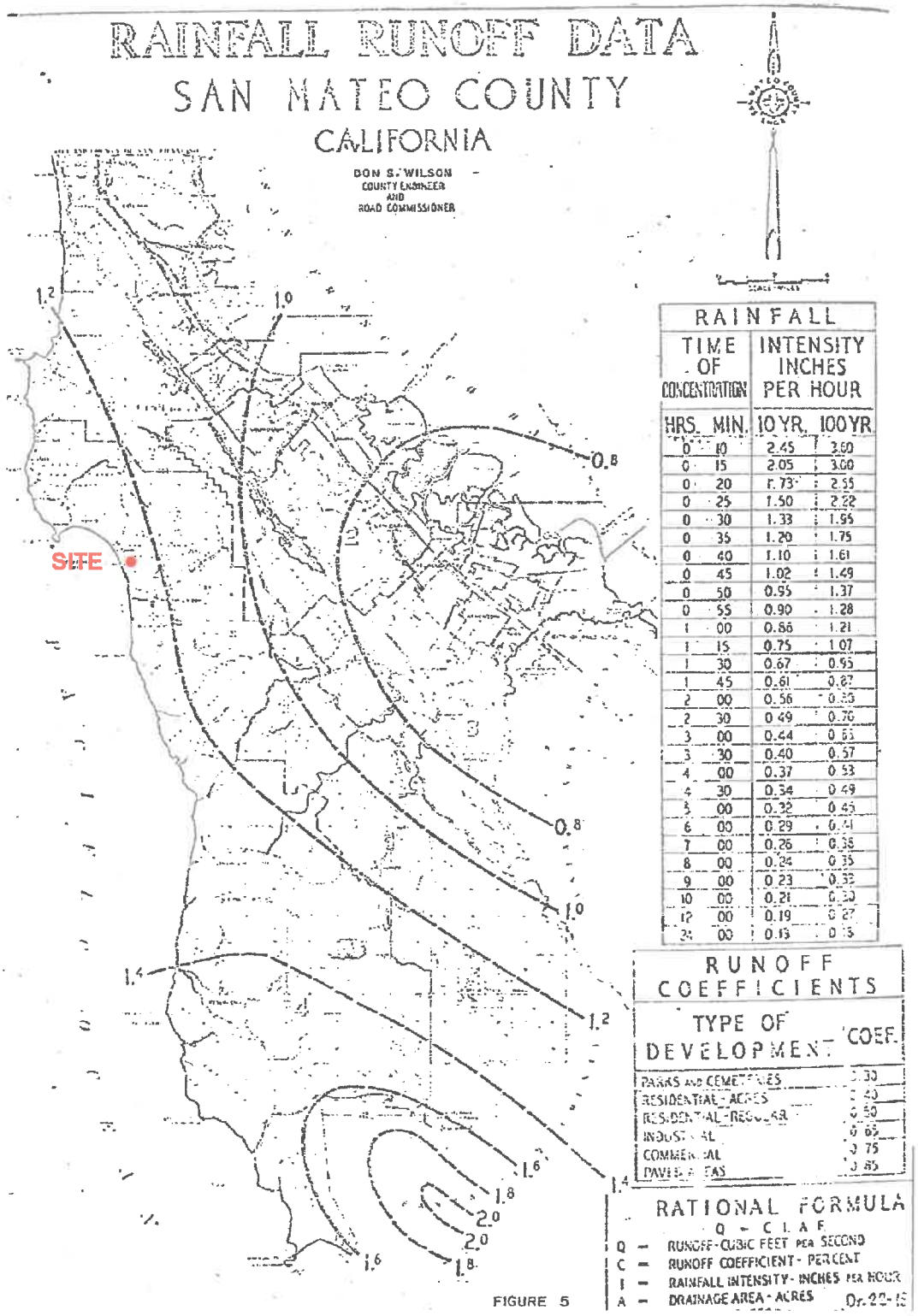



FIGURE 5

| RAINFALL | | |
|---|---|---|
| TIME OF CONCENTRATION | INTENSITY INCHES PER HOUR | |
| HRS. MIN. | 10 YR. | 100 YR. |
| 0 10 | 2.45 | 3.60 |
| 0 15 | 2.05 | 3.00 |
| 0 20 | 1.73 | 2.55 |
| 0 25 | 1.50 | 2.22 |
| 0 30 | 1.33 | 1.95 |
| 0 35 | 1.20 | 1.75 |
| 0 40 | 1.10 | 1.61 |
| 0 45 | 1.02 | 1.49 |
| 0 50 | 0.95 | 1.37 |
| 0 55 | 0.90 | 1.28 |
| 1 00 | 0.86 | 1.21 |
| 1 15 | 0.75 | 1.07 |
| 1 30 | 0.67 | 0.95 |
| 1 45 | 0.61 | 0.87 |
| 2 00 | 0.56 | 0.80 |
| 2 30 | 0.49 | 0.70 |
| 3 00 | 0.44 | 0.63 |
| 3 30 | 0.40 | 0.57 |
| 4 00 | 0.37 | 0.53 |
| 4 30 | 0.34 | 0.49 |
| 5 00 | 0.32 | 0.45 |
| 6 00 | 0.29 | 0.41 |
| 7 00 | 0.26 | 0.38 |
| 8 00 | 0.24 | 0.35 |
| 9 00 | 0.23 | 0.33 |
| 10 00 | 0.21 | 0.30 |
| 12 00 | 0.19 | 0.27 |
| 24 00 | 0.13 | 0.19 |

| RUNOFF COEFFICIENTS | |
|---|---|
| TYPE OF DEVELOPMENT | COEF. |
| PARKS AND CEMETERIES | 0.30 |
| RESIDENTIAL - ACRES | 0.40 |
| RESIDENTIAL - REGULAR | 0.50 |
| INDUSTRIAL | 0.65 |
| COMMERCIAL | 0.75 |
| PAVED AREAS | 0.85 |

**RATIONAL FORMULA**

Q = C I A

Q = RUNOFF - CUBIC FEET PER SECOND
C = RUNOFF COEFFICIENT - PERCENT
I = RAINFALL INTENSITY - INCHES PER HOUR
A = DRAINAGE AREA - ACRES

Dr. 22-15

*(County) (F=1.2)*

| Tc | I (10) | I (100) |
|---|---|---|
| 10 | 2.94 | 4.32 |
| 11 | 2.84 | 4.15 |
| 12 | 2.75 | 4.02 |
| 13 | 2.65 | 3.88 |
| 14 | 2.56 | 3.74 |
| 15 | 2.46 | 3.60 |
| 16 | 2.38 | 3.50 |
| 17 | 2.31 | 3.39 |
| 18 | 2.23 | 3.28 |
| 19 | 2.16 | 3.17 |
| 20 | 2.08 | 3.06 |
| 25 | 1.50 | 2.32 |
| 30 | 1.33 | 1.95 |

*San Mateo County Rainfall Runoff Data - Dr. 22-1856 F = 1.2*

## SAN MATEO COUNTY METHOD

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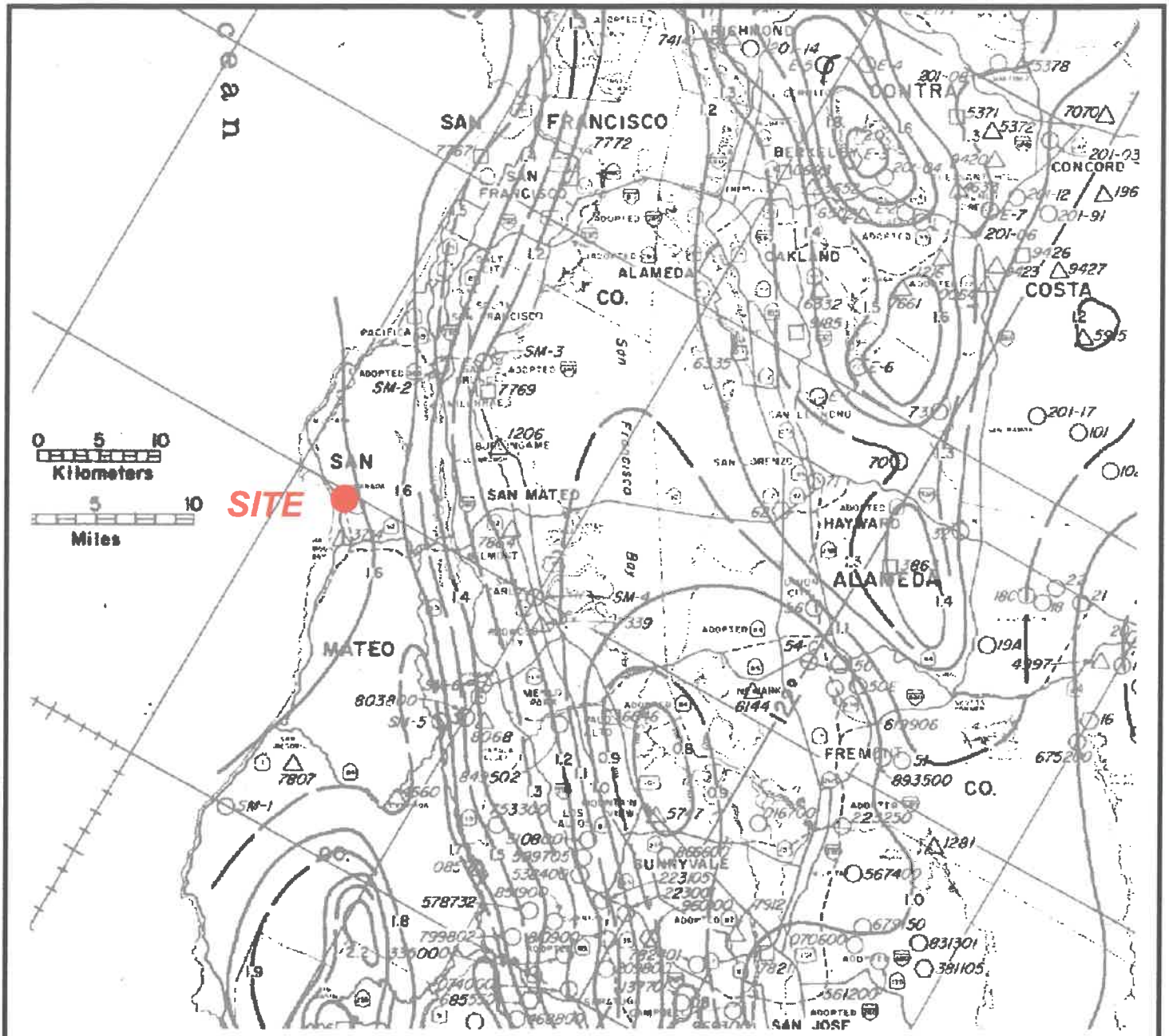
MINOR SUBDIVISION: APN 048-133-010
CABRILLO HIGHWAY @ KNEWING AVENUE
HALF MOON BAY, CA




STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
(CALTRANS) - DISTRICT 4

## DESIGN RAINFALL INTENSITIES - MAP "I"

1-HOUR, 1-IN-100-YEARS ISOHYETS ($I_{1,100}$)
("$P_{60}$ ISOPLETHS" AS USED WITH CHART "A")

From "1941-71 Rainfall Intensity - Duration - Frequency Analysis", based on up to 31 years of records (July 1940 - June 1971) from 79 recorder stations and 326 non-recorder stations.

LEGEND

- □ = National Weather Service - N.O.A.A. (formerly U.S.W.B.) Recorder Station
- △ = National Weather Service - N.O.A.A. (formerly U.S.W.B.) Non-Recorder Station
- ○ = Non-N.W.S./N.O.A.A./U.S.W.B. Recorder Station
- ○ = Non-N.W.S./N.O.A.A./U.S.W.B. Non-Recorder Station
- ——— EVEN TENTH
- - - - - ODD TENTH } ISOHYETS, INCH/HOUR

EK/ERR 9/76

## CALTRANS METHOD

**PRELIMINARY HYDROLOGY REPORT**
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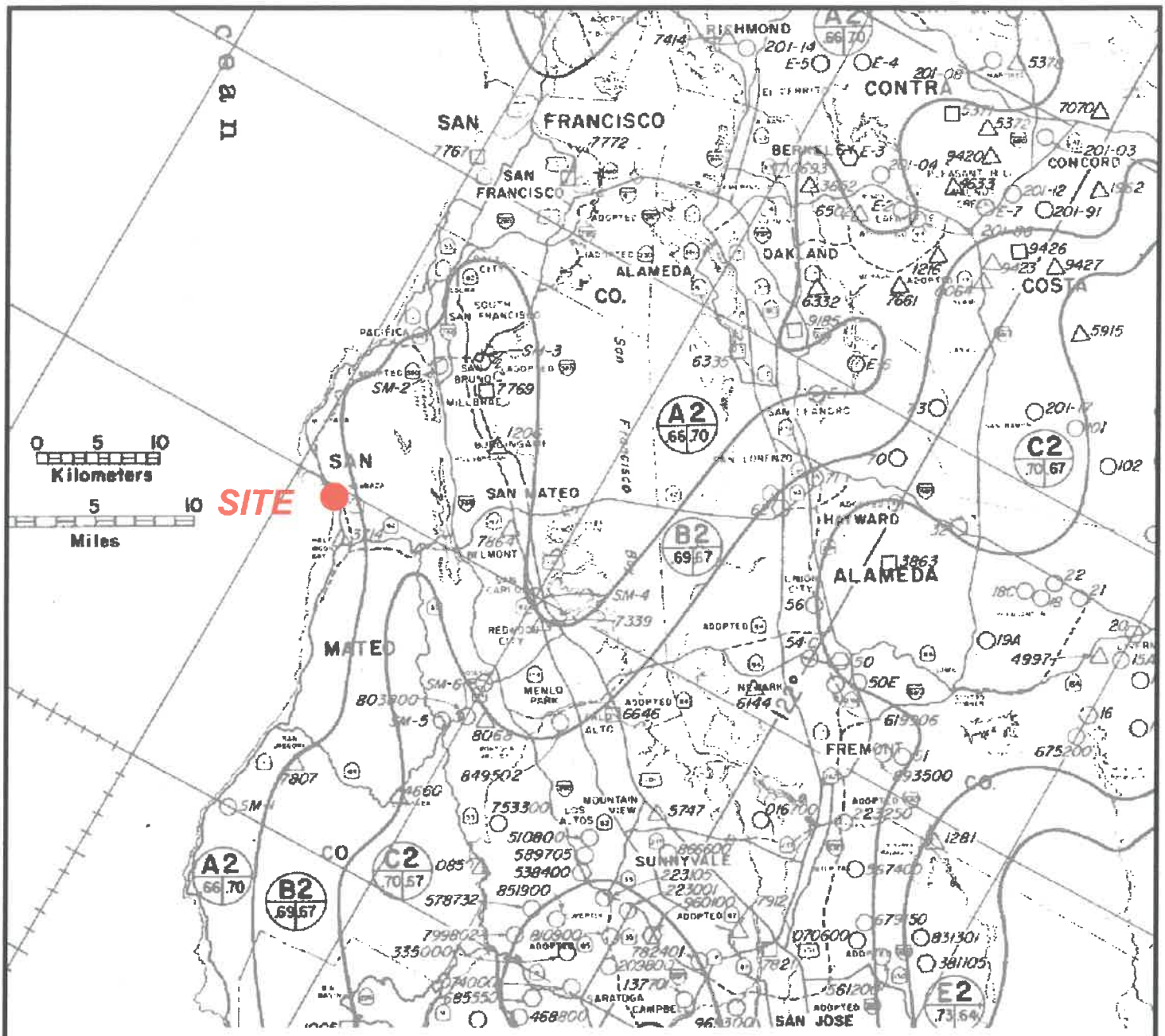
MINOR SUBDIVISION: APN 048-133-010
CABRILLO HIGHWAY @ KNEWING AVENUE
HALF MOON BAY, CA




STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
(CALTRANS) - DISTRICT 4

## DESIGN RAINFALL VARIATIONS - MAP "V"

### ZONES AND SUBZONES OF SIMILAR PATTERNS OF INTENSITY VARIATION, AS FUNCTIONS OF VARIATIONS OF DURATION AND FREQUENCY

From "1941-71 Rainfall Intensity - Duration - Frequency Analysis", based on up to 31 years of record (July 1940 - June 1971) from 78 recorder stations and 305 non-recorder stations.

LEGEND

- □ = National Weather Service - N.O.A.A. (formerly U.S.W.B.) Recorder Station
- △ = National Weather Service - N.O.A.A. (formerly U.S.W.B.) Non-Recorder Station
- ○ = Non-N.W.S./N.O.A.A./U.S.W.B. Recorder Station
- ○ = Non-N.W.S./N.O.A.A./U.S.W.B. Non-Recorder Station

SUBZONE
Zone 02 (70/64)
1-Hour 24-Hours

See Chart "K" for Intensity-Duration Curves and Intensity-Frequency Ratios

10-YR-100-YEARS INTENSITY RATIOS

EK/ERM 9/74

## CALTRANS METHOD

**PRELIMINARY HYDROLOGY REPORT**
PREPARED FOR STOLOSKI & GONZALEZ, INC.
MINOR SUBDIVISION: APN 048-133-010
CABRILLO HIGHWAY @ KNEWING AVENUE
HALF MOON BAY, CA

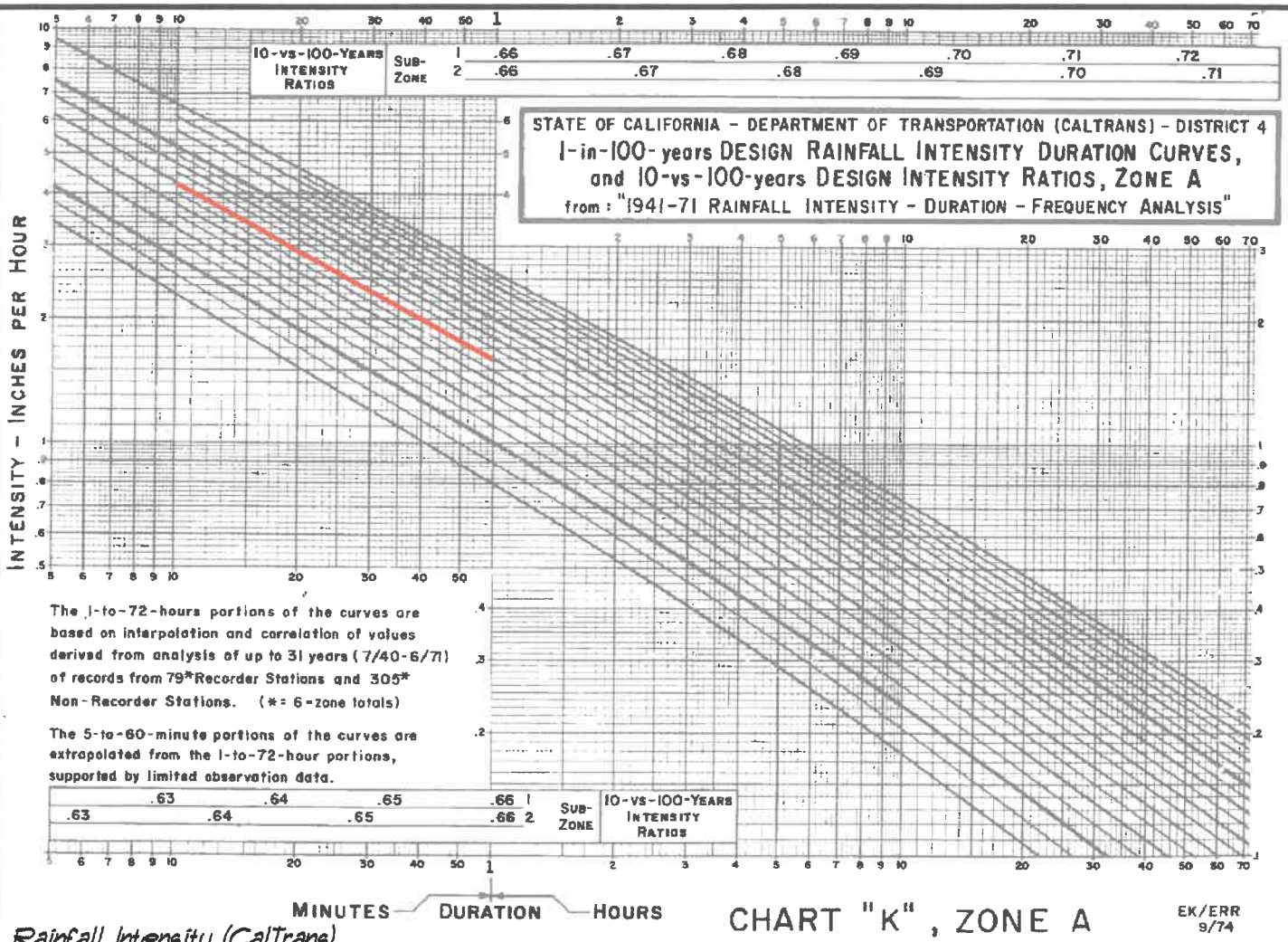



CHART "K", ZONE A

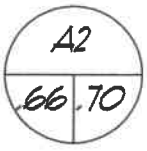
EK/ERR 9/74

*Rainfall Intensity (CalTrans)*

| Tc | I (100) | I (50) | I (25) | I (10) |
|---|---|---|---|---|
| 10 | 4.25 | 3.66 | 3.40 | 2.72 |
| 11 | 4.05 | 3.48 | 3.24 | 2.59 |
| 12 | 3.85 | 3.31 | 3.08 | 2.46 |
| 13 | 3.70 | 3.18 | 2.96 | 2.37 |
| 14 | 3.55 | 3.05 | 2.84 | 2.27 |
| 15 | 3.40 | 2.65 | 2.18 | 2.18 |
| 16 | 3.30 | 2.57 | 2.11 | 2.11 |
| 17 | 3.20 | 2.75 | 2.20 | 2.05 |
| 18 | 3.10 | 2.67 | 2.48 | 1.98 |
| 19 | 3.00 | 2.58 | 2.40 | 1.92 |
| 20 | 2.90 | 2.49 | 2.32 | 1.86 |
| 21 | 2.83 | 2.43 | 2.26 | 1.81 |
| 22 | 2.76 | 2.37 | 2.21 | 1.77 |
| 23 | 2.69 | 2.31 | 2.15 | 1.72 |
| 24 | 2.62 | 2.25 | 2.10 | 1.68 |
| 25 | 2.55 | 2.19 | 2.04 | 1.63 |
| 26 | 2.50 | 2.15 | 2.00 | 1.60 |
| 27 | 2.45 | 2.11 | 1.96 | 1.57 |
| 28 | 2.40 | 2.06 | 1.92 | 1.54 |
| 29 | 2.35 | 2.02 | 1.88 | 1.50 |
| 30 | 2.30 | 1.98 | 1.84 | 1.47 |

*Rainfall intensity was compared with the State of California-Department of Transportation (CalTrans) District 4 Rainfall Intensity Duration Curves, Chart "K", Zone A*

*1 hour - 100 year frequency*
*1 1 hr., 100 yr. = 1.6 inches per hour* Zone




## CALTRANS METHOD

**PRELIMINARY HYDROLOGY REPORT**
PREPARED FOR STOLOSKI & GONZALEZ, INC.
MINOR SUBDIVISION: APN 048-133-010
CABRILLO HIGHWAY @ KNEWING AVENUE
HALF MOON BAY, CA

# APPENDIX IV
# Table Of Culvert Inlet Loss Coefficients From USACE

https://www.hec.usace.army.mil/confluence/rasdocs/ras1dtechref/6.5/modeling-culverts/culvert-data-and-coefficients/

| Type of Structure and Design of Entrance | Coefficient, ken | Pullman Ditch Culvert Inlets |
|---|---|---|
| Concrete Pipe Projecting from Fill (no headwall): | | |
| Socket end of pipe | 0.2 | |
| Square cut end of pipe | 0.5 | |
| Concrete Pipe with Headwall or Headwall and Wingwalls: | | |
| Socket end of pipe (grooved end) | 0.2 | Highway 1 |
| Square cut end of pipe | 0.5 | |
| Rounded entrance, with rounding radius = 1/12 of diameter | 0.2 | |
| Concrete Pipe: | | |
| Mitered to conform to fill slope | 0.7 | |
| End section conformed to fill slope | 0.5 | |
| Beveled edges, 33.7 or 45 degree bevels | 0.2 | |
| Side slope tapered inlet | 0.2 | |
| Corrugated Metal Pipe or Pipe-Arch: | | |
| Projected from fill (no headwall) | 0.9 | Coastal Trail |
| Headwall or headwall and wingwalls square edge | 0.5 | |
| Mitered to conform to fill slope | 0.7 | |
| End section conformed to fill slope | 0.5 | |
| Beveled edges, 33.7 or 45 degree bevels | 0.2 | |
| Side slope tapered inlet | 0.2 | |

# Exhibit 5

# Drainage Improvement Study for the 2nd Street, Kanoff Street and East Avenue Areas of Unincorporated Montara County of San Mateo, California

# Drainage Improvement Study for the 2nd Street, Kanoff Street and East Avenue Areas of Unincorporated Montara County of San Mateo, California

## Prepared For:

County of San Mateo, California

## Prepared By:

Creegan + D'Angelo Infrastructure Engineers


February 7, 2011

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## FEASIBILITY STUDY



## APPENDIX

## A. Introduction

Since July 2007, the MidCoast Stormwater Drainage Committee (MSDC) has been meeting to discuss the stormwater drainage, flooding and pollution issues in the MidCoast area that is comprised of Miramar, El Granada, Moss Beach and Montara. The MSDC has developed a prioritized list of areas to be evaluated and the specific area of Montara (2nd Street, Kanoff Street and East Avenue) is the first set of streets identified as an area for comprehensive study to evaluate required drainage improvements. The site is surrounded by residential neighborhoods to the east, south and west and by a drainage swale to the north, beyond which lies open undeveloped land (Peninsula Open Space Trust) and the Farallone View Elementary School to the northeast. A portion of this undeveloped land is the site of a recent mitigation project conducted by Caltrans as a part of the Devil's Slide tunnel project.

The existing storm drain system consists mainly of unimproved ditches and undersized culverts under roads and driveways. In some cases, ditches have been encroached upon or supported by retaining walls installed by homeowners. At the downstream end of the study area, the ditches flow to an overgrown and relatively flat region vegetated with wetland species such as willows (*Salix spp.*). The ditches in this area do not have adequate capacity to convey the combined runoff for medium large storm events. Storm water frequently overtops the undersized earth channels, causing flooding to nearby properties. The general limits of the impacted study area can be seen in Exhibit 1 of Appendix A.


**Photo 1** Photo taken from corner of 2nd Street and East Avenue, looking west down 2nd Street. A good-sized gully exists at photo left, between the telephone pole and pink flowering escallonia (see also Photo 3). The riparian area is in the photo on the right, on the other side of 2nd Street and the dried Pampas grass. Note the large willow thicket in the middle of the photo.

This Drainage Improvement Study evaluates the existing drainage conditions and future issues that could arise as a result of future build-out in this portion of the community. Given the existing flooding problems and potential for compounded flooding in the future, four alternatives are presented and analyzed on a multi-disciplinary level. This report aims to provide as complete a picture as possible for selection and implementation of a solution best fit for the study area within the Montara community.

## B. Existing Conditions: Site Reconnaissance & Survey

In general, the existing condition of the 2nd Street, Kanoff Street and East Avenue area of Montara is mostly developed. Most lots have homes built, but some lots are not yet developed. In either case, current County code limits the impermeable surface on a lot to 50% of the total area. Most lots are not currently developed to this level. Some portions of the streets are paved and County-maintained, while some are within County right-of-way (ROW), but not paved or maintained by the County, known as "paper streets." Most roads in this area that are County-maintained do not have hydrologically designed

storm drain systems. The extents of County-maintained ROW and "paper streets" can be seen in Exhibit 1 of Appendix A.

Much of the residential area to the south and east of the study area is steeply sloped toward a convergence point just north of 1st Street, where the topography flattens out quickly before crossing north to the open space and the wetland mitigation area recently improved by Caltrans as a part of the Devil's Slide project. In addition to the ditches alongside most streets in this area, there is a drainage channel/small unnamed tributary along the north edge of this residential area, lying within the County's right-of-way for Kanoff and 2nd Streets (see Photo 1). A basic exhibit of the topography at the project site is included in this report as Exhibit 1 of Appendix A and a general outline of the area affected by flooding shown.

## C. Geotechnical Research & Exploration

A geotechnical Preliminary Site Assessment has been conducted by BSK for this site. The complete Assessment is included as Appendix B of this report. The Assessment included site reconnaissance and a literature review of any available existing geotechnical reports, investigations, or information of any sort. No existing reports and very little documented site data were found. However, with the available information for the area in general and observations from the site walk, some general assumptions were made. First, an infiltration system for stormwater management is not likely to be a feasible solution due to low permeability of the soils in this area. Second, there are no apparent unusual conditions that would cause complications for construction of any typical selected stormwater solution. Third, the groundwater level is expected to be highly variable, depending on the season.

As the title indicates, the Assessment is preliminary in nature. When a drainage improvement option is selected for design and installation, a more complete geotechnical investigation is recommended for use at that time. Any of the stormwater management solutions presented by this study are expected to be feasible from a geotechnical standpoint.

## D. Hydrology/Hydraulic Analysis

The hydraulic analysis for the project site has been based on a combination of the topographic information provided by the County and basic field survey conducted for this study. Analysis has been completed for 10-, 25-, 50- and 100-year frequency storm events, as well as for four potential improvement solutions. Improvements required for the 10-year storm for each alternative are illustrated in Exhibit 1 of Appendix A of this report. The complete hydraulic analysis and more detailed description of each alternative are attached to this report as Appendix C.

The four most viable improvement solutions which are detailed in this report and appendices include:

- Improving Existing Drainage Facilities
- Installation of an Underground Storm Drain System Parallel to the existing surface features
- Underground Storage of Excess Flow
- Hybrid solution of Storage and Conveyance

As the preliminary Geotechnical Assessment indicates, the soils in this area do not appear to favor an underground infiltration system solution. Additionally, we are not considering this as an option at this

time because of the presence of the wetland area north of the site. Since this wetland area is a recent improvement installed as Caltrans' mitigation measure for the Devil's Slide project, we are assuming that its design was based on the watershed hydrology in its present state and would therefore depend on the approximate present level of water being delivered to the site. If an infiltration system were installed as a solution to the flooding problems in the neighborhood, a significant amount of water would be diverted from the wetland and could compromise its health. Each of the alternatives studied here would maintain the same volume of flow to the wetland, but potentially modify the rate of delivery only.

Given right-of-way issues and the steep topography, surface storage is not considered particularly feasible, so this alternative was considered but deemed infeasible for this Drainage Improvement Study.

During the course of investigation for this report, it was discovered that there are plans with the County Roads Department for replacement of the two culverts crossing 3rd Street at Farallone and the culvert crossing Farallone at Kanoff. No specific details are available at the time of this report writing, and it appears that the replacements are a part of the standard maintenance of structures. No specific study or review has been conducted in association with the plans for replacement. If funds exist for the replacement of these pipes, it is the recommendation of this report that the plans for replacement be studied in accordance with the model set up for this Drainage Improvement Study before installation.

Brief descriptions of the four studied alternatives follow here.

## Alternative 1: Improving Existing Drainage Facilities

Since the existing storm drain facilities are currently undersized, as evidenced by the recurrent regional flooding, one alternative would be to upgrade the existing facilities as required to pass the peak flows for a given return period. Based on the desired level of improvement, the existing system could be upgraded to accommodate storm flow by increasing capacities of existing ditches and installing larger pipes under roadway crossings within the study area.

To install the most downstream portion of Alternative 1 as detailed in the hydrology report would require an easement, encroachment permit, or land acquisition from the Peninsula Open Space Trust in order to make the channel improvements recommended for the final segment of flow prior to entering the wetlands. This may not be an easy, inexpensive or even possible option. However, Alternative 1 could also be installed without the channel improvements downstream of Catchment Point 3 (CP3) and convey through the 10-year storm.

Alternatives 1 and 2 both rely on improvements between Catchment Points 1 and 2 that may be varied in their precise alignment. The existing drainage channel in the vicinity of CP1 begins uphill of CP1 along the Kanoff Street "paper street" right-of-way. It then turns northwest down 2nd Street for a short while before turning northeast through two private property parcels to again continue down the Kanoff Street "paper street" right-of-way. The portion of the channel running through the private parcels appears to be currently maintained in a nicely landscaped manner which, while aesthetically pleasing, does not afford adequate capacity for high flow volumes. For this portion of the channel, there is the second option of connecting and improving the existing segments of channel within the Kanoff Street right-of-way, by continuing along Kanoff Street to the east of the private property. Either improving the channel through its existing alignment or continuing it through the Kanoff Street alignment would involve work

and maintenance within "paper streets." However, maintaining the current alignment would also involve work and maintenance through private property, which is potentially an even less-desirable solution for both the County and the landowners. Connecting the channel along the Kanoff Street alignment would allow the majority of the water to flow in an unobstructed path in County right-of-way. Design could be accomplished to allow a smaller portion of the flow to continue on its current path through the private property, if so desired by the landowners and the County.

Since Alternative 1 would rely, in part, on installation of facilities, and then maintenance of those facilities, within a "paper street," an alternative source of funding would be required in order to finance these activities. The current legislation does not allow County funds to pay for installation or maintenance of facilities in "paper streets."

## Alternative 2: Installation of a Parallel Underground Storm Drain System

A second feasible alternative is to supplement the existing undersized storm drain system with a parallel system of sufficient capacity. New pipes would be installed within existing County right-of-way in maintained roadways and "paper streets" from the intersection of East Avenue/Kanoff Street/Second Street, to the west on Second Street, north on Farallone Avenue to Kanoff Street, and west on Kanoff Street to the final discharge point to the wetlands to the north. Improvements required for the 10-year storm are illustrated in Exhibit 1 of Appendix A of this report.

## Alternative 3: Underground Storage of Excess Flow

The third alternative evaluated by this report is the augmentation of the existing storm drain capacity with underground storm water storage. While specific points of the existing system cannot handle the peak flows, an underground storage system could be installed upstream of these points within public right-of-way. Storm water would be metered out through the existing system after the peak flows have passed and flooding would be avoided for storms up to the desired design level. Several different commercially available products are available that could provide this capacity. The required volume would depend on the desired level of protection, and detailed analysis for the 10, 25, 50 and 100-year storm events is provided in Appendix C. Improvements required for the 10-year storm are illustrated in Exhibit 1 of Appendix A of this report.

Alternative 3 is expected to be the most costly solution by far of any of the proposed options.

## Alternative 4: Combination of Storage and Conveyance of flow

A variation on Alternatives 1 through 3 was also evaluated by this report and is a combination of storm water storage and conveyance solutions. Since the most limiting feature at the downstream end of the study area is the culvert in front of the home at the north end of Kanoff, just prior to the wetland area, increasing the size of this culvert and the associated channel can allow storm water to be conveyed off the site at a much greater rate. One segment of 36" pipe could also be installed in 3rd Street to store some water until it is able to flow out the improved channel downstream.

This solution lends itself well to phasing, as the culvert and channel improvements could be made first, and the 36" storage pipe added at a later date. While in entirety, Alternative 4 is not the least expensive option. However, the option for phasing, as well as the lack of required right-of-way, the fact that the work would be entirely within currently maintained right-of-way, and the relatively minor expected environmental work, make this solution possibly the most desirable alternative for this storm water problem.

## E. Existing Biological Conditions

Photo 2. Looking east from the corner of 2nd Street and East Avenue. Note that the riparian area is on the other side of the street (outside of photo left), and also note the gullying in middle of photo.

A biological site reconnaissance was performed by TRA Environmental Sciences, Inc. on April 13, 2010, for this study. As stated above in "Section B. Existing Conditions," the 2nd Street, Kanoff Street and East Avenue area of Montara is "mostly developed" (urbanized), and does not contain undeveloped wildlife habitat. These urbanized areas support few native habitats and support wildlife species adapted to urban environments, such as raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), opossum (*Didelphis virginiana*), house sparrow (*Passer domesticus*), house finch (*Carpodacus mexicanus*), and brown towhee (*Pipilo crissalis*). Because Montara is surrounded by open space, several other wildlife species, such as black-tailed deer (*Odocoilus hermionus*) and bobcat (*Lynx rufus*), could occur there but are not likely to depend on the habitat for forage or breeding.

**Photo 3.** Photo taken just north of and across 2nd Street from Photo 2, showing the riparian area and open space/upland habitat beyond. Note that the area is severely gullying, and that the large dead grasses are nonnative Pampas grass.

The study area is in the northwestern portion of Montara, and is at the edge of one of the largest open space tracts of land on the San Francisco Peninsula. Immediately north and east of Montara are numerous designated open spaces and parks, including the 4,262-acre Rancho Corral de Tierra unit currently administered by the Peninsula Open Space Trust (POST), and Montara State Beach, which includes Montara Mountain (also called McNee Ranch). Montara Mountain is a northern spur of the Santa Cruz Mountains and features the only undisturbed coastal mountain habitat found over 100 miles of coastline (California State Parks 2010).

In addition to urban uses, the project area contains a small unnamed intermittent creek/drainage ditch and riparian area just north of the residential area on 2nd Street between Farallone/Kanoff Street and East Avenue (see Photos 1-3). Just north of this

riparian area is an upland area which forms a direct connection to the open space described in the paragraph above. That creek is within the County's road right-of-way and the historic channel was probably where 2nd Street currently exists. As shown in Photos 2 and 3, there are gullies on either side of the street at the top of 2nd Street at East Avenue. The riparian area on the northern side of 2nd Street has been disturbed in the past, probably as a result of the construction of 2nd Street and the houses that are located on the southern side of the street. One home is located on the northern side of the street, but the other lots are undeveloped. 2nd Street in this block is considered by San Mateo County to be an "unimproved paper street" and as such is not maintained by the County. It is surfaced with gravel and appears to have been chip sealed in the past. As shown in Photo 1, the topography in this area slopes northwest from East Avenue to Kanoff Street.

Much of the intermittent creek/drainage ditch is heavily vegetated with native Arroyo willow (*Salix lasiolepis*)(see Photos 2 and 3). It is likely that this willow stand was established after the construction of 2nd Street. The willow stands are fairly mature but do not have the trunk size associated with older trees. The understory includes native plants such as bee balm (*Scrophularia californica*), cinquefoil (*Potentilla gracilis*) and horsetail (*Equisetum telmateia ssp. Braunii*). However, the willow understory is dominated by nonnative forbs and grasses, including German ivy (*Senecio mikanioides*), poison hemlock (*Conium maculatum*) and woodland forget-me-not (*Myosotis sylvantica*). The portion of this drainage that is dominated by willows is wetland habitat.

**Photo 4.** Channelized drainage ditch at the corner of Kanoff and 2nd Street. This reach is dominated by nonnative plant species.

Where willows are lacking along 2nd Street, the vegetation is dominated by a combination of nonnative shrubs, forbs and grasses typical of areas mechanically disturbed in the past (ie, ruderal), including Pampas grass *(Cortaderia selloiana*), poison hemlock, radish (*Raphanus spp*.), carrot (*Daucus carota*) and iceplant *(Carpobrutus edulis*).

The upland habitat just north of the riparian area is dominated by naturalized (but nonnative) Monterey Pine trees (*Pinus radiata*), Pampas grass and other nonnative small grasses and forbs. The area was probably historically grassland, and native coyotebrush shrubs (*Baccharis pilularis*) and the pine trees are helping change the vegetation from grassland to coastal scrub. Also present are native plants such as Douglas iris (*Iris douglasiana*), California blackberry (*Rubus ursinus*), and western bracken fern (*Pteridium aquilinum*)(see Photo 3).

Bird species observed in the riparian habitat at the time of the site visit included American goldfinch (*Carduelis tristis*), golden-crowned sparrow (*Zonotrichia atricapilla*), and Anna's hummingbird (*Calypte anna*). No evidence of raptor nesting was found. Raptors typically nest in tall trees, and given the size of the willow thicket, there is a small potential for raptors to nest in these trees. However, raptors could nest in the Monterey pine trees in the adjacent grassland/scrubland. No special-status species were observed during the site survey, however, California red-legged frog (*Rana aurora draytonii*) and San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) occur in the region (California Natural Diversity Database search April 12, 2010), and the willow riparian could provide cover for these species. The willow riparian area and adjacent annual grassland/scrub habitat could support both nesting birds and the San Francisco dusky-footed woodrat (California Department of Fish and Game species of special concern). Surveys for these species will need to be performed as part of this Drainage Study process.

**Photo 5.** Looking at the southwest corner where Kanoff Street changes from north/south to east/west. Note the large willow thicket in the photo background that identifies this as a wetland.

At the corner of 2nd Street and Kanoff Street, the drainage ditch is channelized into a concrete "U" shaped ditch (see Photo 4). This reach is downstream of the area that contains the arroyo willow and ruderal vegetation. The vegetation in this reach is dominated by nonnative, invasive plants such as blackberry (*Rubus discolor*), German ivy, periwinkle (*Vinca minor),* and Algerian ivy (*Hedera helix*), has little habitat value, and there is no natural drainage channel.

The western end of the study area at Kanoff Street is the lowest point in elevation of the entire study area (see Photo 5). Just west of the residence at Kanoff Street is another wetland area, dominated by native willows, nonnative blackberries and German ivy (see Photo 5). This wetland area connects to the blue line creek shown on the USGS Montara Mountain quadrangle, and also connects to the newly created wetland mitigation pond created by Caltrans. It is also hydrologically connected to the large willow thicket in the natural area just east of the corner where Kanoff Street turns to Farallone Avenue (see Photo 6).

**Photo 6.** Looking at the northeast corner where Kanoff Street turns to Farallone Avenue to photo right. Note the large willow thicket in the photo background.

## F. Environmental Review

We have identified a list of permits that may be required by the potential solution options, the conditions which would trigger those permits, and the expected timeframe to process and gain each permit. See Table 1, below, for this listing. All permits may be processed simultaneously to reduce overall required time for permits to be received. The table also includes estimated costs for obtaining each permit. The estimated costs include the consulting and permit fees required, but not any potential mitigation fees. The required means and extent of mitigation are unknown at this stage.

Since the project area is located within the San Mateo County's coastal zone, a report answering the questions on the Biological Impact Form pursuant to Local Coastal Program (LCP) Policy 7.5 will be prepared for submission to the County's Planning and Building Division. The report will include an analysis of the proposed project's biological impacts. The report will partially fulfill the environmental review requirements of the San Mateo County Local Coastal Program and the California Environmental Quality Act (CEQA). In addition, a CEQA analysis will be completed on the selected preferred alternative. The CEQA analysis will take the form of a mitigated negative declaration or an environmental impact report, depending on the outcome of an Initial Study. As stated in San Mateo County's *Guidelines for the Preparation of Biological Impact Reports*, the definition of a Sensitive Habitat is an area in which plant or animal life or their habitats are either rare or especially valuable and those areas which meet one of the following criteria: (1) habitats containing or supporting "rare or endangered" species as defined by the State Fish and Game Commission, (2) all perennial and intermittent streams and their tributaries, (3) Coastal tidelands and marshes, (4) coastal and offshore areas containing breeding and/or nesting sites and coastal areas used by migratory and resident water-associated birds for resting and feeding, (5) areas used for scientific study and research concerning fish and wildlife, (6) lakes and ponds and adjacent shore habitat, (7) existing game and wildlife refuges and reserves, and (8) sand dunes. Such areas include riparian areas, wetlands, sand dunes, marine habitats, sea cliffs, and habitats supporting rare, endangered and unique species.

**Table 1**
**Permits That May Be Required**

| Type of Permit | Trigger | Estimated Timeframe | Estimated Cost | Alternatives that could Require Permit |
|---|---|---|---|---|
| USACE Nationwide Permit (s) | Construction activities within U.S. Army Corps of Engineers' jurisdiction (waters of the U.S. and/or wetlands) | With Endangered Species Section 7 consultation about 6-8 months; less if Section 7 is not required | $5,000-20,000 | 1, 3, 4 and possibly 2 |
| Biological Assessment for California red-legged frog (federal threatened) and San Francisco garter snake (federal endangered; state endangered; state fully-protected) | Project related activities that could result in take of federally or state listed species requires authorization from the U.S. Fish and Wildlife Service for federally listed species and the California Department of Game for state listed species. A Biological Assessment is part of the request for take authorization. | 6-8 weeks | $5,000 | 1-4 |
| Section 7 Consultation with the USFWS | Project removes federally-listed species or habitats, and requires a permit from another federal agency, such as the U.S. Army Corps of Engineers. Project activities in the willow riparian areas could trigger this. | 4-6 months to complete process | $5,000 | 1-4 |
| ESA Section 10 permit | If the project results in the take of federally listed species and no other federal authorization is required. | Several years (unknown) | >$25,000 | unknown |
| Coastal Development Permit from County Planning | This would be triggered if the project impacts riparian vegetation. LCP limit of riparian vegetation is listed as 30 feet for intermittent streams. Where no riparian vegetation exists along both sides of riparian corridors, the trigger would be construction within 30 feet from the predictable high water point to the midpoint of intermittent streams. | 6 months | $5,000-$7,500 | 1-4 |

| Type of Permit | Trigger | Estimated Timeframe | Estimated Cost | Alternatives that could Require Permit |
|---|---|---|---|---|
| Regional Water Quality Control Board water quality certification; Construction General Permit; stormwater discharge permits | 1. Water quality certification is required if a permit is issued by the U.S. Army Corps of Engineers. Construction activities subject to the Construction General Permit include clearing, grading and disturbances to the ground such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility.<br><br>2. Water quality certification is required for Small Linear Underground/ Overhead Projects that disturb at least 1 acre. For this certification, the project cannot be larger than 5 acres (including trenching and staging areas)<br><br>Projects less than 5 acres are covered by the Statewide General Permit for Storm Water Discharges Associated with Construction Activity from Small Linear Underground/Overhead Projects (Small LUP General Permit). The Small LUP General Permit has varying application and permitting requirements based on the type and complexity of the project. | 2-6 months<br><br>2-6 months | $5,000 | 1, 3, 4 and possibly 2 |
| California Department of Fish and Game, Streambed Alteration Notification | Project activities that affect the bed, bank or channel of any river, stream or lake. | 1-2 months | $3,000-$5,000 | 1-4 |
| California Department of Fish and Game, California Endangered Species Act, 2081 Permit. | Project activities that affect the San Francisco Garter Snake would trigger a permit under the California Endangered Species Act. However, because the garter snake is also state fully protected, take authorization cannot be granted. Therefore, project activities must avoid take. | 1-2 months | $3,000-$5,000 | 1-4 |

## G. Cost Estimate

At this stage in the study of options, a preliminary cost estimate is useful in gauging the approximate order of magnitude associated with different improvement choices. Using the items and quantities presented in the Draft Hydrology Technical Memorandum included in Appendix C of this report, the following costs represent the estimated installation costs associated with each improvement option for a level of protection to convey or contain up to either a 10-year or a 25-year storm. Installation will include items such as mobilization of workers and equipment, excavation, storage, and/or off-haul of soil, material costs, and repair of existing streets and utilities affected by the work. The following assumptions were also made:

- Preliminary maintenance cost estimates are based on the assumption that the County will provide maintenance through their existing maintenance program
- A 25% contingency/inflation factor is added into the installation costs
- The Replacement Reserve Funds allotment is based on an estimated lifespan for Reinforced Concrete Pipe (RCP) of 30 years
- Most proposed improvements will be made within County Right-of-Way, so no costs are associated with right-of-way acquisition; if Alternative 1 is selected and depending on the final design, there may be a need to purchase right-of-way or an easement through two private parcels between Kanoff Street and 2nd Street and in the Peninsula Open Space for swale construction and maintenance
- Potential costs of permitting associated with each alternative are not included here since it is not definitive at this point which permits would be required. Additionally, potential costs of any mitigation are not yet defined since mitigation requirements are not yet defined.
- Catchment Points (CP) are illustrated on Exhibit 1 of Appendix A and are discussed fully in Appendix C; Channel Sections A-A, B-B and C-C are as located on Exhibit 1 of Appendix A and are illustrated on Exhibit 2 of Appendix A.

**TABLE 2 – 10 Year Remediation Quantities & Estimates**

| **Alternative 1 - Improving Existing Drainage Facilities** | | | | | |
|---|---|---|---|---|---|
| **Reach** | **Item** | **Quantity** | **Units** | **Unit Cost** | **Item Cost** |
| ***CP1 to CP2*** | Channel Improvements – Section A-A | 720 | CY | $ 40 | $ 28,800 |
| | 5'x3' Reinforced Concrete Box Culvert | 1 | LS | $ 7,500 | $ 7,500 |
| ***Farallone to CP2*** | 21" RCP Replacement Culvert | 125 | LF | $ 150 | $ 18,750 |
| ***CP2 to CP3*** | 42" RCP Replacement Culvert | 40 | LF | $ 225 | $ 9,000 |
| ***CP3 to Wetland*** | Channel Improvements – Section B-B | 500 | CY | $ 40 | $ 20,000 |
| | **Design** | 1 | LS | $ 15,000 | $ 15,000 |
| | **Right-of-Way** | 1 | LS | | Unknown |
| | **Estimated Permits** | 1 | LS | $ 49,500 | $ 49,500 |
| | **Mobilization** | 1 | LS | $ 7,650 | $ 7,650 |
| | **Construction Management** | 1 | LS | $ 9,500 | $ 9,500 |
| | **Alternative 1 Installation Cost** | | | | **$ 165,700** |
| | **Expected Annual Maintenance** | | | $ 4,500 | **per year** |
| | **Annual Replacement Reserve Funds** | | | $ 8,800 | **per year** |
| **Alternative 2 - Constructing a Parallel Underground Conveyance System** | | | | | |
| **Reach** | **Item** | **Quantity** | **Units** | **Unit Cost** | **Total Cost** |
| ***CP1 to CP2*** | 36" RCP | 875 | LF | $ 200 | $ 175,000 |
| | Manhole | 3 | EA | $ 2,000 | $ 6,000 |
| ***CP2 to CP3*** | 36" RCP | 285 | LF | $ 200 | $ 57,000 |
| | **Design** | 1 | LS | $ 37,500 | $ 37,500 |
| | **Estimated Permits** | 1 | LS | $ 49,500 | $ 49,500 |
| | **Mobilization** | 1 | LS | $ 20,000 | $ 20,000 |
| | **Construction Management** | 1 | LS | $ 25,000 | $ 25,000 |
| | **Alternative 2 Installation Cost** | | | | **$ 370,000** |
| | **Expected Annual Maintenance** | | | $ 1,500 | **per year** |
| | **Annual Replacement Reserve Funds** | | | $ 24,500 | **per year** |
| **Alternative 3 - Storing Excess Water** | | | | | |
| **Reach** | **Item** | **Quantity** | **Units** | **Unit Cost** | **Total Cost** |
| ***3rd Street*** | 84" RCP | 2225 | LF | $ 325 | $ 723,125 |
| | Manhole | 3 | EA | $ 2,000 | $ 6,000 |
| ***3rd Street to Kanoff*** | 12" RCP | 445 | LF | $ 150 | $ 66,750 |
| | **Design** | 1 | LS | $ 148,100 | $ 148,100 |
| | **Estimated Permits** | 1 | LS | $ 49,500 | $ 49,500 |
| | **Mobilization** | 1 | LS | $ 78,990 | $ 78,990 |
| | **Construction Management** | 1 | LS | $ 98,735 | $ 98,735 |
| | **Alternative 3 Installation Cost** | | | | **$ 1,171,200** |
| | **Expected Annual Maintenance** | | | $ 2,000 | **per year** |
| | **Annual Replacement Reserve Funds** | | | $ 86,500 | **per year** |

| TABLE 2 – 10 Year Remediation Quantities & Estimates (Cont.) | | | | | |
|---|---|---|---|---|---|
| ***Alternative 4 - Combination of Storage & Limited Conveyance Improvements*** | | | | | |
| **Reach** | **Item** | **Quantity** | **Units** | **Unit Cost** | **Total Cost** |
| ***Kanoff St*** | 5'x3' Reinforced Concrete Box Culvert & upstream Channel Improvements – Section C-C | 1 | LS | $ 20,000 | $ 20,000 |
| ***3rd Street*** | 36" RCP | 1300 | LF | $ 200 | $ 260,000 |
| ***3rd Street*** | Catch Basin | 3 | EA | $ 2,000 | $ 6,000 |
| ***3rd Street to Kanoff*** | 12" RCP | 445 | LF | $ 150 | $ 66,750 |
| | **Design** | 1 | LS | $ 54,150 | $ 54,150 |
| | **Estimated Permits** | 1 | LS | $ 49,500 | $ 49,500 |
| | **Mobilization** | 1 | LS | $ 28,900 | $ 28,900 |
| | **Construction Management** | 1 | LS | $ 36,100 | $ 36,100 |
| | **Alternative 3B Installation Cost** | | | | **$ 521,400** |
| | **Expected Annual Maintenance** | | | $ 4,500 | **per year** |
| | **Annual Replacement Reserve Funds** | | | $ 36,300 | **per year** |
| | | | | | |

And for protection up to the 25-year event:

| TABLE 3 – 25 Year Remediation Quantities & Estimates | | | | | |
|---|---|---|---|---|---|
| **Alternative 1 - Improving Existing Drainage Facilities** | | | | | |
| **Reach** | **Item** | **Quantity** | **Units** | **Unit Cost** | **Item Cost** |
| ***CP1 to CP2*** | Channel Improvements - Section A-A | 720 | CY | $ 40 | $ 28,800 |
| | 5'x3' Reinforced Concrete Box Culvert | 1 | LS | $ 7,500 | $ 7,500 |
| ***Farallone to CP2*** | 24" RCP Replacement Culvert | 125 | LF | $ 175 | $ 21,875 |
| ***CP2 to CP3*** | 48" RCP Replacement Culvert | 40 | LF | $ 250 | $ 10,000 |
| ***CP3 to Wetland*** | Channel Improvements - Section B-B | 500 | CY | $ 40 | $ 20,000 |
| | **Design** | 1 | LS | $ 16,650 | $ 16,650 |
| | **Estimated Permits** | 1 | LS | $ 49,500 | $ 49,500 |
| | **Right-of-Way** | 1 | LS | | Unknown |
| | **Mobilization** | 1 | LS | $ 8,900 | $ 8,900 |
| | **Construction Management** | 1 | LS | $ 11,100 | $ 11,100 |
| | **Alternative 1 Installation Cost** | | | | **$ 174,325** |
| | **Expected Annual Maintenance** | | | $ 4,500 | **per year** |
| | **Annual Replacement Reserve Funds** | | | $ 9,300 | **per year** |

**TABLE 3 – 25 Year Remediation Quantities & Estimates (Cont.)**

| **Alternative 2 - Constructing a Parallel Underground Conveyance System** | | | | | |
|---|---|---|---|---|---|
| **Reach** | **Item** | **Quantity** | **Units** | **Unit Cost** | **Total Cost** |
| ***CP1 to CP2*** | 42" RCP | 875 | LF | $ 225 | $ 196,875 |
| | Manhole | 3 | EA | $ 2,000 | $ 6,000 |
| ***CP2 to CP3*** | 42" RCP | 285 | LF | $ 225 | $ 64,125 |
| | **Design** | 1 | LS | $ 46,500 | $ 46,500 |
| | **Estimated Permits** | 1 | LS | $ 49,500 | $ 49,500 |
| | **Mobilization** | 1 | LS | $ 24,800 | $ 24,800 |
| | **Construction Management** | 1 | LS | $ 31,000 | $ 31,000 |
| | **Alternative 2 Installation Cost** | | | | **$ 418,800** |
| | **Expected Annual Maintenance** | | | $ 1,500 | **per year** |
| | **Annual Replacement Reserve Funds** | | | $ 27,400 | **per year** |
| **Alternative 3 - Storing Excess Water** | | | | | |
| **Reach** | **Item** | **Quantity** | **Units** | **Unit Cost** | **Total Cost** |
| ***3rd Street*** | 144" RCP | 2450 | LF | $ 400 | $ 980,000 |
| | Manhole | 3 | EA | $ 2,000 | $ 6,000 |
| ***3rd Street to Kanoff*** | 12" RCP | 445 | LF | $ 150 | $ 66,750 |
| | **Design** | 1 | LS | $ 210,000 | $ 210,000 |
| | **Estimated Permits** | 1 | LS | $ 49,500 | $ 49,500 |
| | **Mobilization** | 1 | LS | $ 112,000 | $ 112,000 |
| | **Construction Management** | 1 | LS | $ 140,000 | $ 140,000 |
| | **Alternative 3 Installation Cost** | | | | **$ 1,564,250** |
| | **Expected Annual Maintenance** | | | $ 2,000 | **per year** |
| | **Annual Replacement Reserve Funds** | | | $ 116,000 | **per year** |
| ***Alternative 4 - Combination of Storage & Limited Conveyance Improvements*** | | | | | |
| **Reach** | **Item** | **Quantity** | **Units** | **Unit Cost** | **Total Cost** |
| ***Kanoff St*** | 5'x3' Reinforced Concrete Box Culvert & upstream Channel Improvements - Section C-C | 1 | LS | $ 20,000 | $ 20,000 |
| ***3rd Street*** | 36" RCP | 1300 | LF | $ 200 | $ 260,000 |
| ***3rd Street*** | Catch Basin | 3 | EA | $ 2,000 | $ 6,000 |
| ***3rd Street to Kanoff*** | 12" RCP | 445 | LF | $ 150 | $ 66,750 |
| | **Design** | 1 | LS | $ 54,150 | $ 54,150 |
| | **Estimated Permits** | 1 | LS | $ 49,500 | $ 49,500 |
| | **Mobilization** | 1 | LS | $ 28,900 | $ 28,900 |
| | **Construction Management** | 1 | LS | $ 36,100 | $ 36,100 |
| | **Alternative 3B Installation Cost** | | | | **$ 521,400** |
| | **Expected Annual Maintenance** | | | $ 4,500 | **per year** |
| | **Annual Replacement Reserve Funds** | | | $ 36,300 | **per year** |

## H. Opportunities and Constraints – Alternatives Analysis

Based on all aspects of analysis conducted by this Drainage Improvement Study, the impacts and implications of each of the three viable alternatives are summarized here.

**TABLE 4 – Opportunities and Constraints Alternatives Analysis Matrix**

| | Right-of-Way Requirements | Environmental Impact | Permitting |
|---|---|---|---|
| **Alternative 1** - Improve existing drainage facilities | Requires construction and maintenance of facilities on existing non-maintained County ROW (paper streets); May require ROW or easement for channel construction through private property and Open Space area | Moderate impact – clearing of brush in two existing ditches | Permitting likely required; Mitigation possibly required |
| **Alternative 2** - Install parallel storm drain conveyance system | Requires construction and maintenance of facilities on existing non-maintained County ROW (paper streets) | Some impact – clearing of brush in one existing ditch | Permitting likely required; Mitigation possibly required |
| **Alternative 3** - Underground storage of excess flow | Little to no impact | Little to no impact | Permitting likely required; Mitigation not likely required |
| **Alternative 4** - Combination of storage and limited conveyance improvements | Little to no impact | Little to no impact | Permitting likely required; Mitigation not likely required |

**TABLE 4 – Opportunities and Constraints Alternatives Analysis Matrix (Cont.)**

| | Life Cycle/Maintenance | Constructability/Phasing | Order of Magnitude Construction Cost |
|---|---|---|---|
| **Alternative 1** - Improve existing drainage facilities | Recurrent maintenance of channels to prevent establishment of woody vegetation | Moderate impact to traffic flow; reasonably constructible; could be phased as funding becomes available | $ |
| **Alternative 2** - Install parallel storm drain conveyance system | Recurrent maintenance of channels to prevent establishment of woody vegetation | Moderate impact to traffic flow; reasonably constructible; could be phased as funding becomes available | $$ |
| **Alternative 3** - Underground storage of excess flow | Maintenance of storage chambers and RCP as recommended by manufacturer | Moderate impact to traffic flow; reasonably constructible; could be phased as funding becomes available | $$$$$ |
| **Alternative 4** - Combination of storage and limited conveyance improvements | Maintenance of RCP as recommended by manufacturer | Moderate impact to traffic flow; reasonably constructible; could be phased as funding becomes available | $$$ |

## I. Recommendations on Preferred Solution

As mentioned above, Alternatives 1 and 2 both rely in part on installation of facilities and then maintenance of those facilities, within paper streets. Since the current legislation does not allow County funds to pay for installation or maintenance of facilities in paper streets, an alternative source of funding would be required in order to finance these activities. This is not a desirable situation. Additionally, a portion of improvements as recommended for Alternative 1 would require land acquisition of some sort from the Peninsula Open Space Trust, which may or may not be a possibility of achieving.

Alternative 3 does not have the right-of-way or land acquisition issues, or even many expected environmental issues, however, the cost of Alternative 3 makes it prohibitive.

As a hybrid of the other three alternatives, Alternative 4 seems to be the most desirable alternative for the storm water issues studied by this report. Alternative 4 is not the least expensive option; however, it may be phased as funds are available. Additionally, the lack of required right-of-way, the fact that the work would be entirely within currently maintained right-of-way, and the relatively minor expected environmental work, are all favorable features of this solution.

## J. Funding Strategies

Appendix D of this report consists of the complete Technical Memorandum on Funding Strategies, which includes:

- Analysis of existing agency resources with capacity or potential to contribute toward the estimated costs of the drainage improvement alternatives.
- Documentation of enhanced and/or new financing sources for the unfunded costs of the alternatives. Financing sources will include a compilation of external sources, but will focus most specifically on resources within the local control of the County (subject to constituent approval in some cases), which may include any number of exaction types: assessments, special taxes, property-related fees, and user fees or regulatory fees.

The memorandum gives a more complete picture of the funds required to install, maintain and, in the future, replace, each of the Alternatives described in this report. However, it does not show the specific breakdown of phasing installation. In the end, should the community elect to move forward with any of the improvement alternatives described in this report, the community will also need to decide which funding mechanisms are best for everybody involved.

# Appendix A:

Study Area Topography
and Improvement Options Map
(10-year Storm)

EXISTING STORM DRAIN CULVERT

CALTRANS CHARTHOUSE MITIGATION AREA

PENINSULA OPEN SPACE TRUST

ALTERNATIVE 1: REQUIRED 20' MAINTENANCE EASEMENT THROUGH OPEN SPACE

ALTERNATIVE 2: CP2 TO CP3 285'± 36" RCP

CP3

ALTERNATIVE 1: CP3 TO WETLANDS 305'± OF CHANNEL IMPROVEMENTS & MAINTENANCE **(SECTION B–B)**

CP2

1ST STREET

KANOFF ST

GENERAL POINT OF CONVERGENCE

ALTERNATIVE 1: REQUIRED 20' MAINTENANCE EASEMENT THROUGH PRIVATE PROPERTY

ALTERNATIVE 2: CP1 TO CP2 875'± 36" RCP & 3 MANHOLES

ALTERNATIVE 1: CP1 TO CP2 735'± OF CHANNEL IMPROVEMENTS & MAINTENANCE & 5'x3' BOX CULVERT UNDER DRIVEWAY **(SECTION A–A)**

EX COUNTY ROAD ROW (TYP)

FARALLONE VIEW ELEMENTARY SCHOOL

CP1

ALTERNATIVE 4: 5'x3' REPLACEMENT CONCRETE BOX CHANNEL & CROSSING **(SECTION C–C)**

2ND STREET

DRAINAGE CHANNEL

PACIFIC OCEAN

HIGHWAY 1 / CABRILLO WAY

ALTERNATIVE 1: CP2 TO CP3 40'± 42" RCP REPLACEMENT CULVERT

ALTERNATIVE 1: FARALLONE TO CP2 125'± 21" RCP REPLACEMENT CULVERT

ALTERNATIVE 3 & 4: 3RD STREET TO KANOFF AVE 445'± 12" RCP

FARALLONE AVE

EAST AVE

3RD STREET

ALTERNATIVE 3: 3RD STREET 2225'± 84" RCP & 3 MANHOLES

ALTERNATIVE 4: 3RD STREET 1300'± 36" RCP & 3 CATCH BASINS

APPROXIMATE AREA IMPACTED BY FLOODING

LE CONTE

0 75 150 300

( IN FEET )
1" = 150 ft.

## LEGEND

- APPROXIMATE IMPACTED FLOOD AREA
- ALTERNATIVE 1
- ALTERNATIVE 2
- ALTERNATIVE 3
- ALTERNATIVE 4
- COUNTY "PAPER STREETS" (NON–MAINTAINED ROADS)

CP = "CATCHMENT POINT"
EX = "EXISTING"
ROW = "RIGHT–OF–WAY"
RCP = "REINFORCED CONCRETE PIPE"

Creegan+D'Angelo
INFRASTRUCTURE ENGINEERS

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# STUDY AREA TOPOGRAPHY & IMPROVEMENT OPTIONS MAP

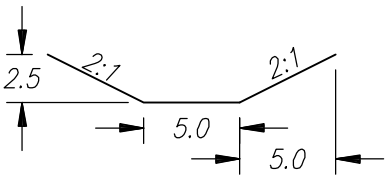
## (10-YEAR STORM)
## MONTARA DRAINAGE IMPROVEMENT STUDY

PROJECT #610002/134

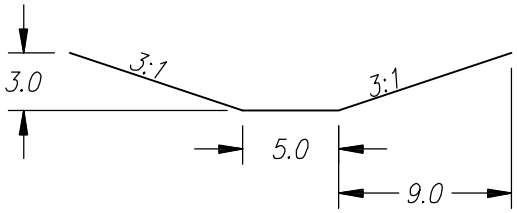
12/16/10

APPENDIX A
EXHIBIT 1

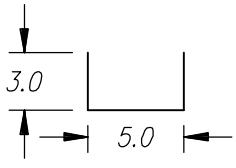
SHEET 1 OF 1




**SECTION A-A**




**SECTION B-B**




**SECTION C-C**

# SWALE SECTIONS

**EXHIBIT 2**

# Appendix B:

Geotechnical Preliminary Site Assessment

BSK Associates
Engineers & Laboratories

1181 Quarry Lane, Building 350
Pleasanton, CA 94566
(925) 462-4000
Fax (925) 462-6283

August 6, 2010

***BSK JOB NO. G10-055-11P***

Ms. Meghan Cronin
Creegan + D'Angelo
6800 Koll Center Parkway, Suite 150
Pleasanton, California 94566

**SUBJECT: Preliminary Site Assessment**
**Drainage Improvement Study**
**2nd Street, Kanoff Street and East Avenue**
**Montara, California**

Dear Ms. Cronin:

As requested and authorized, BSK has performed a preliminary site assessment for the Drainage Improvement Study in the area of 2nd Street, Kanoff Street and East Avenue in Montara, California. The approximate limits of the study area are shown on Figure 1, Site Plan. Our investigation was performed in accordance with our Proposal No. GP09-3770, dated October 14, 2009.

***Project Understanding and Scope of Work***

BSK understands that the town of Montara in San Mateo County has experienced repeated flooding issues particularly in the area of 2nd Street, Kanoff Street and East Avenue. The site is surrounded by residential neighborhoods to the east, south and west and by a drainage swale to the north beyond which lies open undeveloped land and Farallone View Elementary School to the northeast. It is our understanding that the initial phase of this Study is to evaluate existing and future drainage issues that could arise as a result of new developments and economic growth in this portion of the community. With the on-set of new developments and growth will be the need for improved drainage control and management. For the successful implementation of an effective drainage control system, a clear understanding of the geologic and geotechnical setting in which the site is located is essential. Our approach to develop this understanding has been to establish a baseline of general geologic and geotechnical information gathered from a literature search of available reports and maps of the project site and surrounding vicinity. To achieve this purpose, the following Scope of Service was performed.

- Review geotechnical and geologic reports prepared for the Farallone View Elementary School;
- Review pertinent geotechnical and geologic reports and maps on file with the County of San Mateo;

- Conduct a site surface reconnaissance to identify areas of significant ground erosion or instability that may have developed as a result of past periods of flooding; and
- Prepare a formal report documenting the results of our findings and conclusions with recommendations for future studies based on the results of our findings.

***Literature Search***

Our search of files at the offices of San Mateo County failed to turn up any reports on geotechnical or geologic investigations performed in the area of this study. Similarly, inquiries made to Cabrillo Unified School District (District) and to the California Division of State Architects (DSA) regarding the nearby Farallone View Elementary School failed to turn up reports or other documentation regarding geotechnical conditions underlying the site. Based on the response we received from both the District and DSA, no new construction has occurred at the school since it was built in the mid 1960's and the geotechnical reports initially prepared prior to construction of the school were not available for review.

***Site Reconnaissance***

Based on the results of our site reconnaissance, surface soils exposed in the open space to the north of the study area generally consist predominately of clayey and silty sand. The soil is moderately well compact and may not be as permeable as originally anticipated which may rule out the feasibility of below-grade stormwater disposal systems. During this site reconnaissance, no significant erosion feature was noted in the adjacent wetlands area. Erosion features and bank stability along drainage ditches and channels along Kanoff and 2nd Street were also assessed where accessible. However, dense overgrowth particularly in the drainage channel along Kanoff Street, severely limited the extent to which this visual assessment could be made. Those areas that could be observed did not reveal signs of excessive erosion or unstable slope conditions.

***Site Geology and Seismicity***

Geologic Setting - The Site is located in the Coastal Range geomorphic province. The Site area is situated near the contact of Pleistocene marine terrace deposits and Cretaceous Montara Mountain granitic rocks. The marine terrace deposits were formed from late Pleistocene (2.5 million years ago) to Holocene (10,000 years ago) uplift of the coastal plain and contain poorly to moderately consolidated deposits of marine, eolian, and alluvial sand, silt, gravel and clay.

Regional Tectonics and Seismicity - The Site is located in a seismically active area and there are a number of faults in the region which are geologically active and present the potential for high intensity ground motion at the site. The nearest active major faults are the San Gregorio fault zone and San Andreas fault zone, located 0.6 miles south and 6 miles east of the site, respectively.

***Groundwater***

Despite our extensive research, very little information could be obtained regarding the depth to the

groundwater table in the Study Area. The only information our research did uncover was provided by groundwater data available on the California Department of Water Resources web site at http://www.water.ca.gov/waterdatalibrary. This web site lists a well located near the Halfmoon Bay Airport, approximately 2.5 miles SSE of the Study Area. Groundwater levels in this well were monitored on a near annual basis from April 1953 to April 1991. During this time period, the depth from the ground surface to the water surface ranged from a low of just above 29 feet to a high of 0.1 feet below the ground surface. The ground surface at this well location is given as 35.0 feet above Mean Sea Level.

***Conclusions and Recommendations***

Based on the limited information available, in general it appears that infiltration of stormwater runoff into the subsurface soils maybe considered moderate at best. Therefore, the potential for the successful implementation of a below-grade stormwater disposal system, based on our preliminary findings, is considered to be low.

Based on the findings of our site reconnaissance and reports on the general geology of the site, it is anticipated that the consistency of the subsurface soils will range from stiff to medium dense allowing for the construction of improvements to the existing storm drain system from a geotechnical standpoint to be relatively straight forward. It is expected that excavation of trenches to install larger diameter replacement pipes to enhance the capacity of the existing storm drain system or to construct a new parallel system can be made with relative ease provided groundwater is not encountered.

Although limited reconnaissance of drainage ditches and channels in the Study Area was possible due to the heavy vegetation growth, reshaping and possibly deepening of these features are considered feasible from a geotechnical standpoint. Once the drainage ditches and channels are cleared of the overgrowth, the capacity of the system to handle and convey higher flows should be greatly enhanced. Use of geotextiles to help control erosion and proper use and installation of spun-bonded polypropylene fabrics will aid in weed abatement and should be taken into consideration during the final design.

***Future Geotechnical Investigations and Studies***

As evident by this preliminary site assessment, available information regarding the geotechnical conditions underlying the drainage improvement study area is minimal. During the final design phase of this project, a subsurface geotechnical investigation should be performed to assess local soil and groundwater conditions at the site. The scope of the geotechnical investigation should include, among possibly other tasks depending on the particular requirements of the final drainage design scheme, soil borings at or along key elements of the drainage system with a variety of laboratory tests to supplement the field data. The borings should extend to a depth of at least 5 feet below the bottom of the planned invert elevation of pipelines or bottom of pertinent structures. Based on the results of our preliminary site reconnaissance, it is our opinion that consideration should be given to incorporating the use of geo-synthetic fabrics to line drainage ditches and channels to help control erosion and retard the growth of weeds which currently clog many of the existing water ways.

* * * * *

This preliminary geotechnical assessment report is limited to providing a general site characterization and assessment of soil properties for purposes of developing alternative design schemes to alleviate flooding in the Drainage Improvement Study in the area of 2nd Street, Kanoff Street and East Avenue in Montara, California. The site assessment and recommendations submitted in this report are based upon the limited data available from published public sources.

This preliminary geotechnical assessment report is not applicable for the preparation of design and construction documents. A comprehensive geotechnical investigation, including borings and laboratory testing, should be performed following the completion of the design selection process.

We appreciate the opportunity to be of service to you on this project. Should you have questions or comments regarding the contents of this report, please contact us.

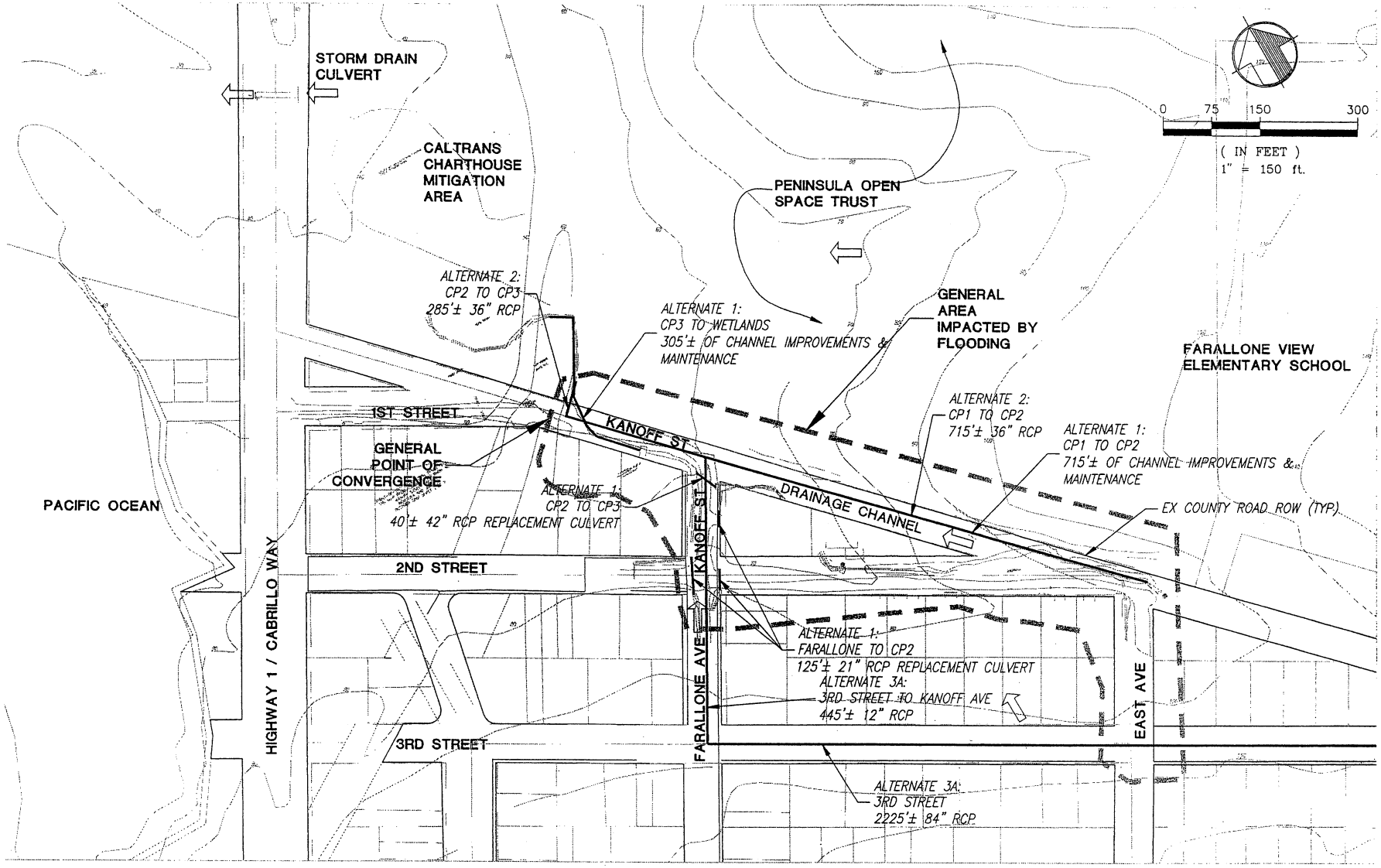
Sincerely,
***BSK ASSOCIATES***


Bob Yukinari, P.E., G.E.
Senior Geotechnical Engineer

***REVIEWED BY***

James K. Auser, P.E.
Senior Materials Engineer

Attachments:
Figure 1 – Site Plan
Figure 2 – Geologic Map
Figure 3 – Geologic Map Legend



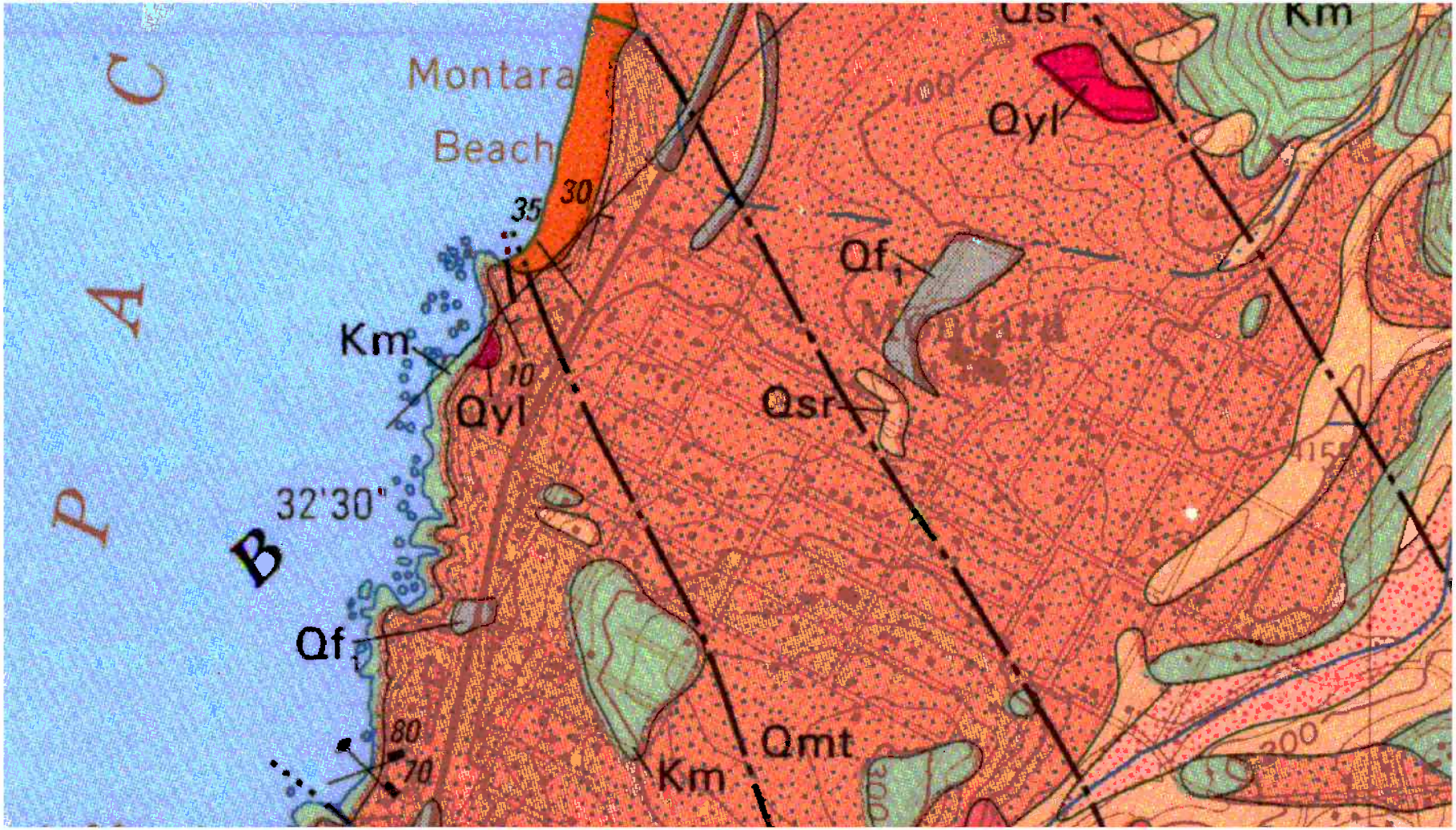

**Reference:**

Base taken from *Study Area & Improvement Option Map* prepared by Creegan + D'Angelo dated 07/28/10

**Preliminary Site Assessment**
**Drainage Improvement Study**
**2nd Street, Kanoff and East Avenue**
**Montara, California**

**Site Plan**
**Figure 1**
**BSK Job No. G10-055-11P**

BSK Associates Engineers & Laboratories




Source: Miscellaneous Investigation Series, Map I-2390
Montara Mountain, San Mateo County, California
United States Geological Survey
Photo-revised 1980

| | | |
|---|---|---|
| BSK Associates Engineers & Laboratories<br>0 0.75 1.5<br>Mile<br>N W E S | **Geotechnical Investigation**<br>**Montara Drainage Improvement Study**<br>**Montara, California** | **Geologic Map**<br>**Figure 2**<br>**BSK Project No. G10-055-11P** |

## LEGEND

Qf$_1$ — **Unit 1**—Poorly consolidated to well-consolidated gravel, sand, silt, and rock fragments in various combinations used in a variety of applications including riprap, highway-, railroad-, and airport runway-fills, earthfill dams, reservoir embankments, and building-site grades. Thickness and consolidation dependent upon type of application and site. Includes organic and man-made debris in sanitary landfills and spoil from tunneling operations. Many small fills not shown because of map-scale limitations

Qmt — **Marine terrace deposits (upper Pleistocene)**—Poorly to moderately consolidated deposits of marine, eolian, and alluvial sand, silt, gravel, and clay in various proportions and combinations, in indistinct to distinct lenses and beds. Locally includes thin lenses of lignite and asphaltic sand. Lower part of a single terrace unit commonly is marine, fine-grained, moderately well consolidated, and forms near-vertical cliffs along the exposed coast; upper part of a terrace unit commonly is sub-aerial, coarse-grained, poorly consolidated, and forms rounded or subdued topography. Deposits are as thick as 60 ft between El Granada and Princeton and 75 ft thick at Montara (Jack, 1969) and as thick as 90 ft near Laguna Salada (Smith, 1960). Unit locally may include some stream terrace deposits, alluvium, beach deposits, and younger eolian sands

Qsr — **Slope wash, ravine fill, and colluvium (Holocene)**—Unconsolidated to moderately consolidated deposits of sand, silt, clay, and rock fragments accumulated by slow downslope movement of weathered rock debris and soil. Composition dependent upon underlying rocks. Commonly unsorted and unbedded, but locally crudely layered by downslope movements. Mapped where thickness presumed to exceed 5 ft; as thick as 20 ft on north side of San Pedro Valley. Maximum accumulations commonly develop near bases of slopes underlain by sheared rock (fsr) of the Franciscan Complex. Deposits interfinger with alluvial deposits at bases of slopes. Locally includes alluvial deposits and older landslide deposits (Qol) too small to show at this scale. Numerous small shallow landslides (shown by small dots) occur in this unit on southwest flank of Montara Mountain

Km — **Granitic rock of Montara Mountain (Cretaceous)**—Pervasively fractured, punky, medium-crystalline to coarsely crystalline granitic rock, ranging from largely tonalite to granite and containing abundant hornblende and biotite. Includes aplite, pegmatite, and rhyolite dikes; also includes small masses of coarse-grained felsic rocks containing garnet but no hornblende or biotite. Foliation indicated by preferred orientation of mafic minerals and tabular dioritic inclusions and, in places, by orientation of dikes. Jointing is common and best seen in sea cliffs; epidote alteration occurs along some joint surfaces. Exposures of hard unfractured rock are rare, and commonly the rock is weathered to depths of 100 ft. Southwest flank of Montara Mountain is pockmarked by numerous small shallow landslides (shown by small dots) in weathered rock (grus) or in colluvium developed on weathered rock

# Appendix C:

Hydrology Technical Memorandum

Schaaf & Wheeler
CONSULTING CIVIL ENGINEERS

100 N. Winchester Blvd., Suite 200
Santa Clara, CA 95050
(408) 246-4848
FAX (408) 246-5624
canderson@swsv.com

# TECHNICAL MEMORANDUM

| | | | |
|---|---|---|---|
| PROJECT: | Montara Drainage Improvement Study | DATE: | June 21, 2010 |
| PREPARED: | Charles D. Anderson, PE | JOB #: | C&DO.02.10 |
| SUBJECT: | Evaluation of Hydrologic Conditions near Kanoff Street between East Avenue and Cabrillo Highway | | |

---

The County of San Mateo is in the process of evaluating local drainage conditions on the northern edge of unincorporated Montara in the vicinity of Second Street, Kanoff Street and East Avenue east of Cabrillo Highway (State Route 1), which is immediately adjacent to the bluff above Montara State Beach. The purpose of this memorandum is to document the estimation of peak runoff rates at several locations and compare these estimates to calculated capacities for existing drainage facilities.

Hydrologic calculations are based on methodologies and data from the 2007 Santa Clara County Drainage Manual (San Mateo County does not publish a drainage manual per se); 2005 orthophotography from the County of San Mateo; and April 2010 field surveys by Creegan + D'Angelo.

Information contained in this technical memorandum will be used to help establish drainage improvement alternatives for this area of Montara.

## Watershed Analysis

An HEC hydrograph procedure is used to estimate the 10-, 25-, 50-, and 100-year frequency storm flows for the local watershed following 2007 Santa Clara County methodology. Local watershed boundaries are based on 2005 San Mateo County topographic maps, supplemented by Creegan + D'Angelo field surveys. At County direction, stormwater runoff is modeled based on a worst case scenario of 50 percent impermeable surface conditions on residential lots. That is, with 50 percent of each lot covered by buildings, impermeable driveway, patios or other hard surface that prevents infiltration.

Three points of interest have been used to evaluate drainage catchments, which are shown in Figure 1:

1. The intersection of East Avenue with Second Street.
2. Kanoff Street one block north of Second Street.
3. The end of First Street, east of Cabrillo Highway.

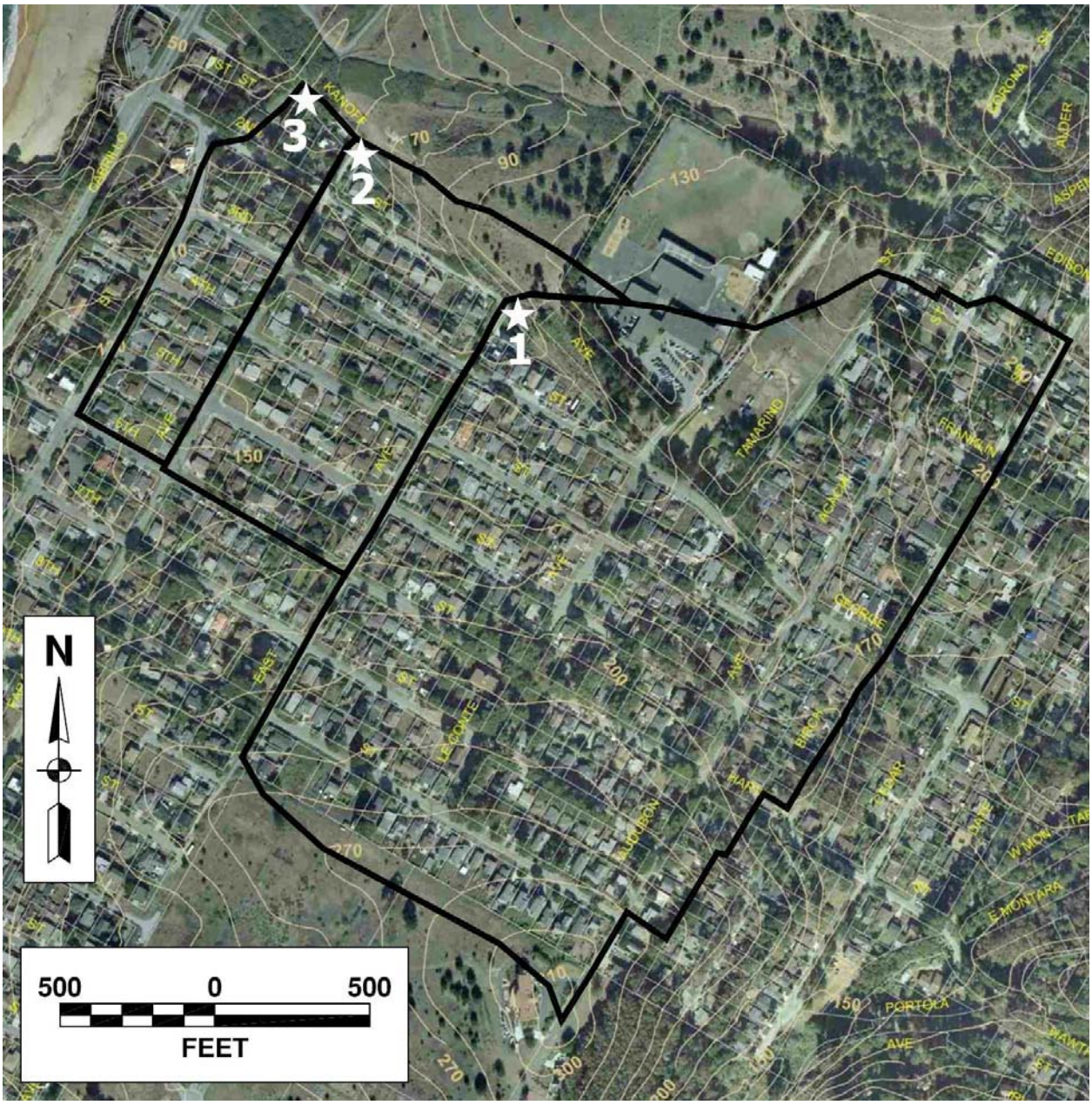



**Figure 1: Catchments Analyzed**

**Catchment Areas:**

1. **The intersection of East Avenue with Second Street.**
2. **Kanoff Street one block north of Second Street.**
3. **The end of First Street, east of Cabrillo Highway.**

## Hydrograph Method

The SCS unit hydrograph procedure as outlined in the Santa Clara County Drainage Manual accounts for hydrologic losses including evaporation, transpiration, infiltration, surface routing, storage within the watershed and varying antecedent moisture conditions. This method involves the development of flood hydrographs using a design storm, an appropriate soil loss function, and a synthetic unit hydrograph. This method is consistent with the HEC-1 and HEC-HMS programs developed by the Hydrologic Engineering Center of the U.S. Army Corps of Engineers.

### *Design Storms*

The standard storm duration for rainfall simulation is 24 hours. Figure 2 shows the adopted (normalized) 24-hour incremental rainfall distribution pattern, which is based upon the three-day December 1955 rainfall event that is still considered the storm of record for northern California. Note that the mean annual precipitation in the Montara watershed is 22.5 inches,[1] so the pattern for 20 inches of mean annual precipitation is used. This precipitation pattern has been adjusted to preserve local rainfall statistics in Santa Clara and San Mateo Counties as collected by the Santa Clara Valley Water District. Consequently, the incremental precipitation pattern shown in Figure 2 is balanced so that the 24-hour storm distribution may be used even where shorter duration storms are more critical. Table 1 provides values of precipitation as a percentage of the total 24-hour depth.

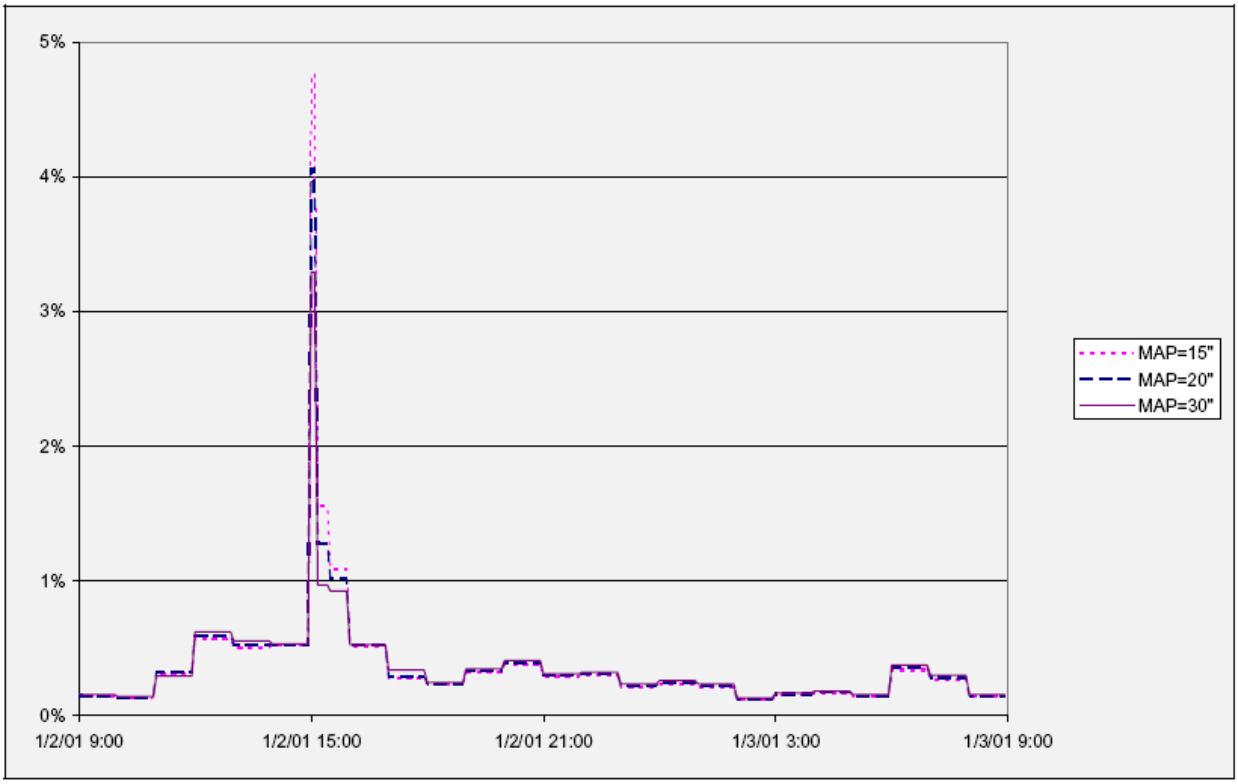



**Figure 2: 24-hour Precipitation Pattern (Santa Clara County Drainage Manual)**

[1] USDA Soil Conservation Service, "Soil Survey of San Mateo County, Eastern Part, and San Francisco County, California," May 1991.

**Table 1**
**Fractions of Total Rainfall for 24-Hour, 5-Minute Pattern**

| Time Starting | Fraction of Total Rainfall (%) | Time Starting | Fraction of Total Rainfall (%) |
|---|---|---|---|
| 0:00 | 0.1482 | 11:00 | 0.3933 |
| 1:00 | 0.1358 | 12:00 | 0.2979 |
| 2:00 | 0.3223 | 13:00 | 0.3099 |
| 3:00 | 0.5930 | 14:00 | 0.2223 |
| 4:00 | 0.5285 | 15:00 | 0.2470 |
| 5:00 | 0.5266 | 16:00 | 0.2223 |
| 6:00 | 4.0600 | 17:00 | 0.1235 |
| 6:10 | 1.2750 | 18:00 | 0.1605 |
| 6:30 | 1.0169 | 19:00 | 0.1729 |
| 7:00 | 0.5229 | 20:00 | 0.1482 |
| 8:00 | 0.2860 | 21:00 | 0.3581 |
| 9:00 | 0.2384 | 22:00 | 0.2840 |
| 10:00 | 0.3337 | 23:00 | 0.1482 |

Rainfall totals for the return periods of interest are calculated using the Santa Clara Valley Water District's Return Period-Duration-Specific (TDS) Regional Equation and summarized in Table 2 for each return period.

$$x_{T,D} = A_{T,D} + B_{T,D}\, MAP$$

where $x_{T,D}$ = precipitation depth (inches) for a specific return period and storm duration

T = return period (years)

D = storm duration (hours)

$A_{T,D}$; $B_{T,D}$ = dimensionless coefficients from Table B-1 of the Santa Clara County Manual

MAP = mean annual precipitation (22.5 inches)

**Table 2**
**Total 24-hour Rainfall Depths**

| Return Period | $A_{T,D}$ | $B_{T,D}$ | Total Rainfall (inches) |
|---|---|---|---|
| 10-year | 0.567017 | 0.162550 | 4.22 |
| 25-year | 0.675008 | 0.195496 | 5.07 |
| 50-year | 0.747121 | 0.219673 | 5.69 |
| 100-year | 0.814046 | 0.243391 | 6.29 |

***Soil Loss***

Direct runoff is estimated by subtracting soil infiltration and other losses from the rate of rainfall. The SCS Curve Number (CN) method is used to empirically reflect the potential loss for a given soil and cover complex. After satisfying an initial abstraction – rainfall that is absorbed by tree cover, depressions and soil at the beginning of a storm – the soil becomes saturated at a certain rate so that a higher percentage of the accumulated rainfall is converted to runoff.

Estimates of CN are made based on the soil types and cover within a drainage basin; varying from 0 to 100 and representing the relative runoff potential for a soil-cover complex under given antecedent moisture conditions. That is, how wet the watershed is prior to the precipitation event.

The soil-cover complex for the subject watersheds in Montara is called "Typic Argiustolls, loamy-Urban land association" by the SCS.[2] Native vegetation is mainly annual grasses, forbs, and scattered brush with urban land consisting of asphalt, concrete, buildings and other structures. Typic Argiustolls are loamy, deep and well drained soils formed in alluvium derived from coastal sediment with varying clay content. Permeability is moderately slow to slow. Since the SCS does not publish a specific Hydrologic Soil Group for Typic Argiustolls, Soil Group C (slow infiltration rate) has been selected for runoff estimation for clay loams, shallow sandy loam, soils low in organic content, and soils usually high in clay.[3] The cover type for open space/pervious areas is taken as "scrub" (native brush) or "grass-oak" – native oaks with an understory of forbs and annual grasses – in good hydrologic condition (at least 75% ground coverage) with a selected curve number (AMC II) of 60.[4]

The open space/pervious area Curve Number must be adjusted to reflect antecedent moisture conditions (AMC), which represent prior soil saturation, depression storage conditions and other hydrologic precursors.

[2] USDA, 1991.
[3] McCuen, A Guide to Hydrologic Analysis Using SCS Methods, Prentice-Hall, 1982.
[4] USDA, National Engineering Handbook, Table 9.4. Also SCC Drainage Manual Table F-1, "shrub land".

The Santa Clara County Drainage Manual establishes an AMC for each storm return period calibrated to individual flood frequency analyses of annual stream discharge data in Santa Clara County, for use with the specific rainfall distribution pattern shown in Figure 2. For the 10-year through 100-year return periods, the calibrated AMC is II½. A Curve Number of 60 for AMC II equates to a Curve Number of 69 for AMC II½.

Urban development is modeled using a percentage of impervious area, which prevents soil infiltration. At the County's direction, residential lots are assumed to be 50 percent impervious. Paved streets are assumed to be impervious and street areas are weighted into each watershed's net effective imperviousness. The portion of the Farallone View Elementary School within the first catchment is nearly 100 percent impervious.

***Basin Lag***

A modified version of the U.S. Army Corps of Engineers basin lag equation is used:

$$t_{lag} = (0.862)24\,N\left(\frac{L\,L_c}{\sqrt{S}}\right)^{0.38} - \frac{D}{2}$$

where $t_{lag}$ = SCS basin lag (hours)

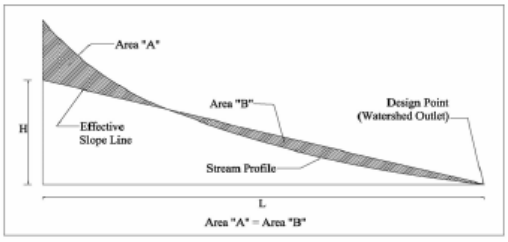
N = watershed roughness value (0.07 for ditches with few SD pipes)

L = longest flow path from catchment divide to outlet (miles)

$L_c$ = length along flow path from a point perpendicular with the basin centroid to its outlet (miles)

S = effective slope along main watercourse (feet/mile)

D = unit hydrograph duration (5 minutes or .083 hour)




**Effective Slope Diagram**

Unit hydrograph durations of 5 minutes have been selected to preserve the impacts of the most intense part of the rainfall pattern, particularly since the watersheds are relatively small and steep. Basin parameters are obtained from the San Mateo County 2005 orthophoto topography and summarized in Table 3. These parameters are input into HEC-1 to produce individual watershed hydrographs, which are combined and routed downstream to the natural outlet in the wetland area adjacent to Highway 1. Table 4 summarizes estimated peak flowrates for each return period at the previously identified catchment points.

**Table 3**
**Hydrologic Parameters**

| Catchment | Area (acres) | L (mile) | $L_c$ (mile) | S (feet/mile) | Basin Lag (hour) | Net Percent Impervious |
|---|---|---|---|---|---|---|
| 1 | 81.46 | 0.55 | 0.33 | 323 | 0.23 | 54 |
| 2 | 20.49 | 0.35 | 0.11 | 394 | 0.11 | 52 |
| 3 | 9.43 | 0.27 | 0.13 | 416 | 0.09 | 55 |

**Table 4**
**Estimated Peak Storm Runoff (cfs)**

| Catchment | 10-year | 25-year | 50-year | 100-year |
|---|---|---|---|---|
| 1. East Ave / 2nd Street | 58 | 74 | 86 | 99 |
| 2. Kanoff Ave from South | 17 | 22 | 26 | 29 |
| 2. Kanoff Ave to West | 68 | 88 | 102 | 116 |
| 3. 1st Street east of Hwy 1 | 72 | 92 | 108 | 123 |

## Existing Storm Conveyance Facilities

Based on field surveys conducted by Creegan + D'Angelo, storm water runoff is conveyed from the indicated catchment points to the wetland/detention area adjacent to Highway 1 in a series of corrugated metal pipe (CMP) culverts, ditches and open swales. Table 5 lists these drainage facilities in series, provides flow capacity estimates, and identifies the controlling capacity for each segment in bold.

From Catchment Point 1 (CP1) to CP2, a 3 feet deep earthen ditch conveys runoff into a "flat area with no distinguishable toe or bank" adjacent to Second Street. This area is heavily overgrown with vegetation as shown in the photograph (to the right of the road), so a Manning's channel roughness coefficient (n) of .08 is assumed; representing conditions of brush and trees in a floodplain. Higher ground to the north of the swale forces the natural release of floodwaters onto Second Street and adjacent low lying properties to the south. The driveway elevation at 360 Second Street is nearly one foot lower than the swale containment elevation.

Drainage from CP2 to CP3 is routed downstream in a 4 feet wide concrete box channel. The driveway crossing tends to choke flow since the headroom is only about 1.4 feet and inlet control governs. Excess flow would tend to flow to lower ground to the south and west. This channel continues into dense brush to the north and eventually discharges into the Caltrans wetland mitigation site. The safe release elevation for this storage area (39 feet at Highway 1) is more than ten feet lower than driveway elevations along First Street.

**Table 5**
**Storm Drain Facility Capacities**

| Reach | Facility | Slope (ft/ft) | Bottom Width (feet) | Bank Slope (h:v) | Flow Depth (feet) | "n" | Diameter (inches) | HW (feet) | Capacity (cfs) |
|---|---|---|---|---|---|---|---|---|---|
| CP1 to CP2 | Ditch at East Ave | 0.020 | 5 | 1:1 | 3.0 | .080 | | | 90 |
| | Swale N of 2nd | 0.040 | irregular | | 1.2 | .080 | | | **50** |
| | Ditch E of Farallone | 0.029 | 2 | 0.6:1 | 3.3 | 0.025 | | | 90 |
| Farallone from 2nd St to Kanoff (West Side) | CMP D/W Crossing | 0.107 | | | | 0.024 | 15 | 1.6 | **4** |
| | Ditch Choke | 0.151 | 0 | 4:1 | 0.2 | 0.015 | | | 75 |
| | CMP Crossing at 2nd | 0.128 | | | | 0.024 | 15 | 4.2 | 11 |
| | Ditch to Kanoff | 0.089 | 3 | 1.5:1 | 1.0 | 0.025 | | | 60 |
| Farallone from 2nd St to Kanoff (East Side) | Ditch to 2nd | 0.151 | 3 | 1.7:1 | 2.6 | 0.035 | | | 330 |
| | CMP Crossing at 2nd | | | | | 0.024 | 15 | 3.5 | **9** |
| | CMP D/W Crossing | 0.042 | | | | 0.024 | 18 | 3.1 | 11 |
| | Concrete Pan | 0.100 | 0 | 3:1 | 1.0 | 0.015 | | | 50 |
| CP2 to CP3 | CMP at Kanoff | 0.027 | | | | 0.024 | 30 | 5.6 | 40 |
| | Ditch S of Kanoff | 0.028 | 4 | 0:1 | 2.3 | 0.018 | | | 130 |
| | Box Crossing at D/W | 0.017 | 4 | 0:1 | 1.4 | 0.018 | | 2.0 | **25** |
| | Ditch to end of 1st | 0.014 | 2 | 1.5:1 | 1.8 | 0.035 | | | 40 |
| CP3 to wetland | Ditch from Kanoff | 0.011 | 2 | 1.5:1 | 3.0 | 0.045 | | | **90** |
| | Box Channel | 0.021 | 4 | 0:1 | 2.0 | 0.018 | | | 95 |

Controlling capacities are 50 cfs from Catchment Point 1 to Catchment Point 2; 13 cfs total on Farallone Avenue from Second Street to Kanoff Street; 25 cfs from Catchment Point 2 to Catchment Point 3; and 90 cfs from Catchment Point 3 to the wetland outlet.

## Storm Drain Remediation

Table 6 summarizes remediation required to provide sufficient drainage capacity for each of the return periods based on the capacity analysis described previously.

**Table 6**
**Storm Drain Remediation**

| Reach | Controlling Capacity (cfs) | Capacity Deficit (cfs) | | | |
|---|---|---|---|---|---|
| | | 10-year | 25-year | 50-year | 100-year |
| CP1 to CP2 | 50 | 8 | 24 | 36 | 49 |
| Farallone to CP2 | 13 | 4 | 9 | 13 | 16 |
| CP2 to CP3 | 25 | 43 | 63 | 77 | 91 |
| CP3 to wetland | 90 | 0 | 2 | 18 | 33 |

Three conceptual remediation alternatives are considered:

1. Improving the flow conveyance of existing drainage facilities.
2. Constructing a parallel underground conveyance system.
3. Storing excess water.

### *Alternative 1: Improving Existing Drainage Facilities*

CP1 to CP2: Existing drainage facilities could be enlarged as required to pass the peak flows for a given return period. By clearing a swath of vegetation north of Second Street and constructing a clean channel with appropriate erosion control, the 100-year peak discharge (100 cfs) could be passed without flooding adjacent properties. Assuming the improved channel can be maintained with some weeds and light brush on the banks (Manning's "n" of 0.045), a five- to ten-foot meandering channel bottom, and grade control structures limiting the longitudinal slope to about one percent (keeping flow velocities to less than five feet per second), the depth of channel required to carry the 100-year flow is about 2.5 feet. This option would require periodic maintenance to prevent the establishment of woody vegetation within the channel or banks.

Farallone to CP2: As evidenced by Table 5, the ditches running parallel to Farallone Avenue from Second Street to Kanoff Street have sufficient capacity; it is the undersized CMP crossings that choke the flow and cause storm runoff to spill onto private property. Kanoff Street is steep in this location (with a slope of 12 percent), so culvert hydraulics are inlet control; that is, the culvert capacity is controlled by the pipe diameter and inlet condition (headwall, projecting pipe, etc.).

Existing CMP crossings could be upsized, with a commensurate increase in depth to accommodate the larger pipe. Assuming a minimum two feet of cover (the approximate amount of cover at most existing crossings), the size of necessary replacement culverts (without building headwalls) are summarized in Table 7.

CP2 to CP3: The existing culvert crossing at Kanoff Street north of Second Street is a 30 feet long, 30-inch diameter CMP culvert with concrete headwalls. Its full flow capacity is approximately 40 cfs under surcharged conditions with the adjacent ditch bank full. This capacity is less than the estimated 10-year peak runoff. Excess flow will inundate the driveway crossing to the north (toward the Kanoff Street right-of-way) and Second Street.

This culvert could also be replaced with a larger CMP or RCP culvert. It is assumed that the new culvert slope will remain the same as the existing pipe (0.026 ft/ft) and that 2.5 feet of minimum cover must be provided as is the case now. The necessary replacement pipe sizes (assuming a headwall) are summarized in Table 7.

**Table 7**
**Replacement Culverts**

| Location | Required CMP Culvert Size (inches) | | | | Required RCP Culvert Size (inches) | | | |
|---|---|---|---|---|---|---|---|---|
| | 10-year | 25-year | 50-year | 100-year | 10-year | 25-year | 50-year | 100-year |
| Farallone Avenue from 2nd Street to CP2 | 21 | 24 | 27 | 27 | 21 | 24 | 24 | 27 |
| Kanoff Street north of 2nd Street (CP2) | 48 | 48 | 54 | 60 | 42 | 48 | 48 | 54 |

CP3 to Wetland: Increasing capacity to accommodate the estimated 100-year flow at three feet of depth on a one percent slope requires roughly a five foot bottom width with 3:1 side slopes and light brush maintenance.

### *Alternative 2: Parallel Underground Conveyance System*

For this alternative, storm drain pipe would be buried in the streets and paper streets from CP1 through to CP3, where the open ditch would still need to be improved to convey stormwater runoff to the wetland area and through the Highway 1 culvert to the ocean. The general route is from the intersection of East Avenue/Kanoff Street/Second Street, to the west on Second Street, north on Farallone Avenue to Kanoff Street, and west on Kanoff Avenue to the aforementioned discharge point (Figure 3).

Assuming pipe slopes that will maintain reasonable flow velocities (less than 10 feet per second), Table 8 summarizes a parallel RCP storm drain system that could accommodate the estimated peak flows, leaving the existing drainage facilities as a collection system.

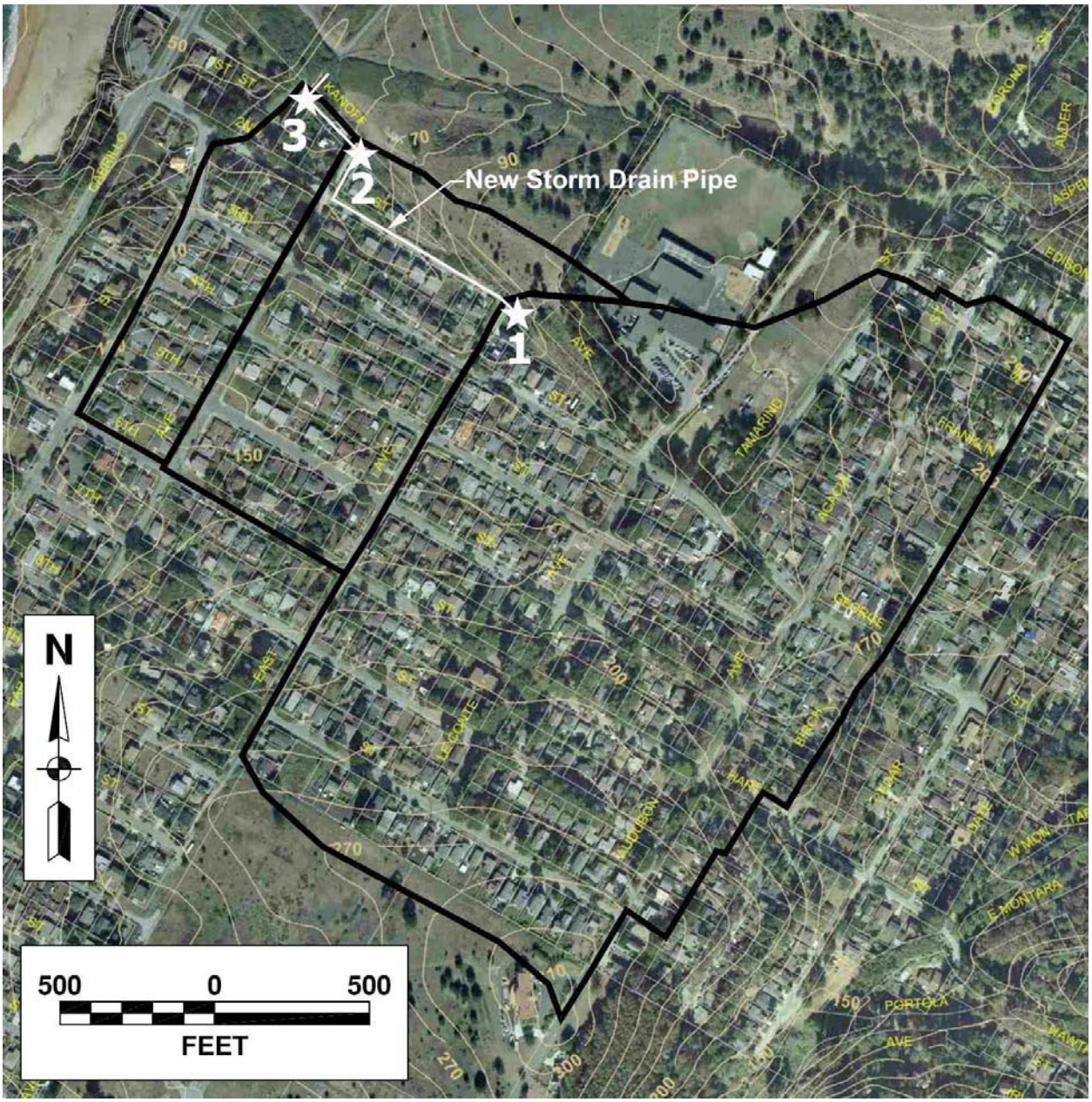



**Figure 3: Parallel Storm Drain System**

**Table 8**
**Parallel Storm Drain Alternative**

| Reach | Required RCP Size (inches) | | | |
|---|---|---|---|---|
| | 10-year | 25-year | 50-year | 100-year |
| 2nd St from East Ave to Kanoff St at Farallone Ave | 36 | 42 | 42 | 48 |
| Kanoff St from 2 nd Street to Discharge Point | 36 | 42 | 48 | 48 |

### *Alternative 3: Storage of Excess Flow*

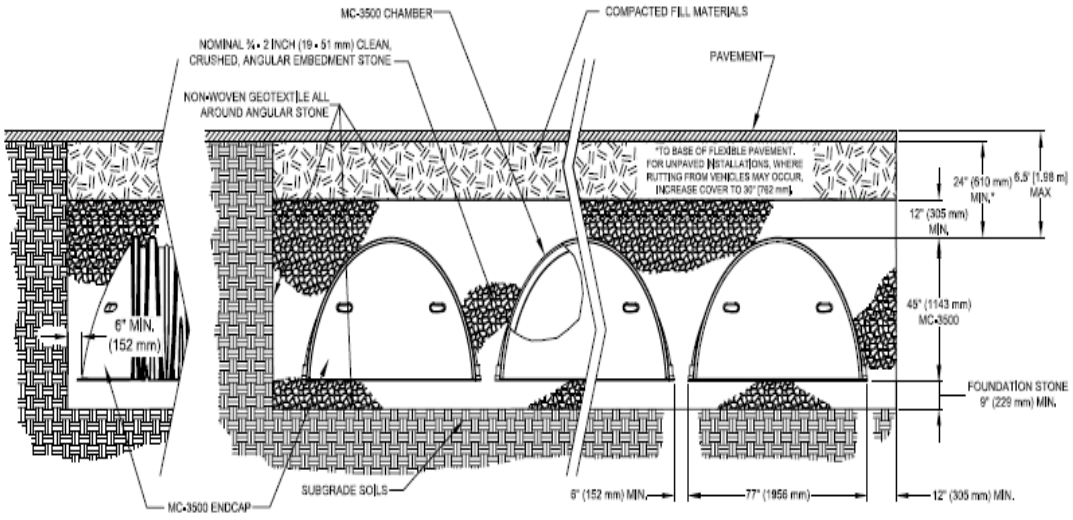
Given right-of-way issues and the steep topography, surface storage is not considered particularly feasible. The potential for underground storage, perhaps with a commercially available product, is investigated herein. The concept is to limit peak runoff so that it can be accommodated by the existing drainage system. To better follow the topography and avoid excessive excavation, 3rd Street provides the best alignment for a buried storage system. Furthermore, by extending the storage system to the intersection of 3rd Street and Le Conte Avenue, not only can more storage be provided, but the area tributary to CP1 and its undersized downstream drainage system can be reduced, thereby also reducing the risk of flooding on 2nd Street. Since the drainage system in Kanoff Street north of 2nd Street is under capacity, discharge from the buried storage basin would be piped from 3rd Street to the Kanoff Street system. Figure 4 shows this conceptual alternative, including the reduction in watershed area tributary to CP1. The underground storage system would essentially cut off the watershed at 3rd Street. Table 9 lists hydrologic parameters (using the USACE basin lag equation described on Page 6) with underground storage and additional inlets along 3rd Street from Farallone Avenue to Le Conte Avenue.

**Table 9**
**Hydrologic Parameters with Diversion at 3rd Street and Le Conte Avenue**

| Catchment | Area (acres) | L (mile) | $L_c$ (mile) | S (feet/mile) | Basin Lag (hour) | Net Percent Impervious |
|---|---|---|---|---|---|---|
| 1 | 17.80 | 0.38 | 0.21 | 312 | 0.14 | 52 |
| 2 | 8.35 | 0.17 | 0.06 | 237 | 0.05 | 52 |
| 3 | 9.43 | 0.27 | 0.13 | 416 | 0.09 | 55 |
| Storage | 75.80 | 0.67 | 0.32 | 236 | 0.24 | 54 |

Table 10 summarizes buried storage requirements to meet the 50 cfs capacity limitation between CP1 and CP2, the 25 cfs capacity limitation at the driveway crossing near the day care center on Kanoff Street between CP2 and CP3, and the 90 cfs capacity limitation downstream of CP3. Two sub-alternatives for storage are provided:

1. Dual circular pipe installed along 3rd Street (1,340 lineal feet available).
2. StormTech MC-3500 chambers as generally shown below (ref. StormTech, Inc.).



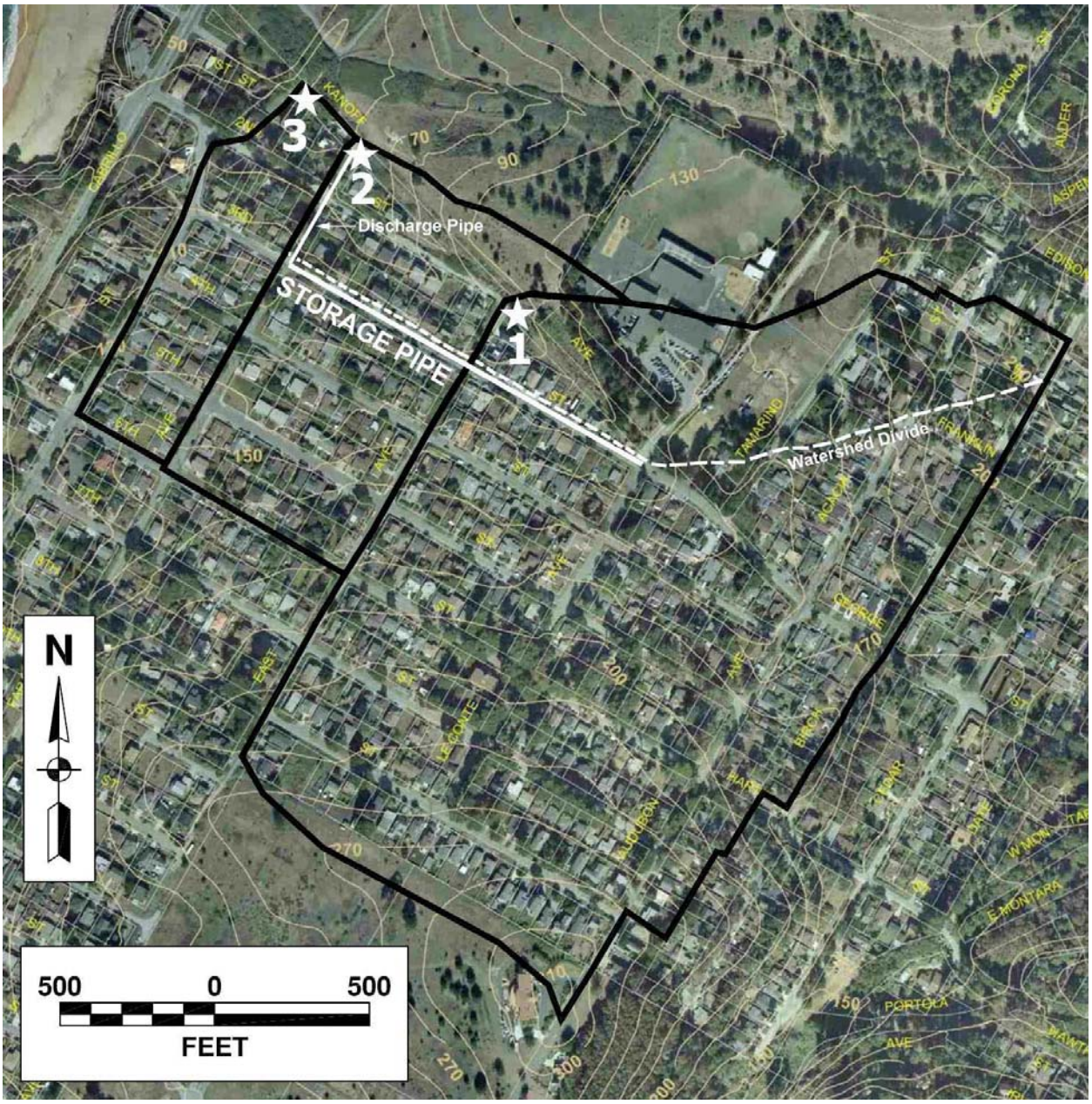



**Figure 4: Underground Storage**

Each StormTech MC-3500 chamber holds 113 cubic feet when installed as diagrammed above. The chambers will need to be installed level, and the chambers may change in elevation as needed to accommodate the minor longitudinal slope of 3rd Street (2 percent). A maximum of three rows of installed chambers appears to be feasible within the existing street pavement sections, depending upon any underground utility conflicts. From Farallone Avenue to Le Conte Avenue, about 525 chambers could be reasonably installed. This equates to a total available volume of 60,500 cubic feet or 1.4 acre-feet. As indicated in Table 10, the lack of available storage under 3rd Street makes it infeasible to use anything other than dual storage pipes; and then only for the ten-year return period.

**Table 10**
**Buried Storage Alternative**

| Return Period | Required Discharge Restriction (cfs) | Required Storage Volume (cubic feet) | Diameter of Dual Pipes in 3rd Street (inches) | Number of StormTech Chambers |
|---|---|---|---|---|
| 10-year | 15 | 85,500 | 84 | 757 |
| 25-year | 10 | 276,600 | 144 | 2,442 |
| 50-year | 10 | 390,300 | n/a | 3,454 |
| 100-year | 5 | 869,550 | n/a | 7,695 |

### *Combination of Storage and Limited Conveyance Improvements*

With the 25 cfs limitation at the day care driveway, upstream storage is not a feasible alternative. However, substandard drainage capacity at the day care driveway and the associated box channel could be improved without entering sensitive environmental habitats. By replacing the existing 4' x 1.4' rectangular channel crossing with a standard 5' x 3' RCB, and widening and deepening the box channel by one foot respectively, the capacity of this drainage feature could be increased to match the capacity of the ditches that discharge runoff to the wetland area. (The controlling capacity would be 90 cfs.) Table 10 is reprised as Table 11 with this improvement in downstream capacity.

**Table 11**
**Buried Storage and Kanoff St. Improvement Alternative**

| Return Period | Required Discharge Restriction (cfs) | Required Storage Volume (cubic feet) | Diameter of Pipe in 3rd Street (inches) | Number of StormTech Chambers |
|---|---|---|---|---|
| 10-year | none | none | 36" | 0 |
| 25-year | none | none | 36" | 0 |
| 50-year | none | none | 42" | 0 |
| 100-year | 70 | 12,600 | 42" | 112 |

Technically feasible alternatives from a hydraulic standpoint therefore include improving the drainage system in place, constructing a parallel storm drain system, and providing improvements on the south side of Kanoff Street in conjunction with buried pipe or storage facilities under 3rd Street.

## Limitations on Use

The information contained in this memorandum is for the sole use of Creegan + D'Angelo, specifically for the Montara Drainage Study. Analyses are based on available information and topography, which are not generally sufficient for design. More precise ground information and underground utility location information could affect recommended storm drain sizes, alignments and grade. The information contained herein is intended for feasibility level planning, not design.

# Appendix D:

Technical Memorandum on Funding Strategies

# TECHNICAL MEMORANDUM

**To:** Meghan L. Cronin, PE, LEED AP, Senior Civil Engineer
Creegan + D'Angelo Infrastructure Engineers

**From:** Jeanette Hahn, Director of Financial Consulting
NBS

**Date:** November 8, 2010

**Re:** Summary of Funding Strategies
County of San Mateo – Montara Drainage Improvement Study

## INTRODUCTION

The purpose of this memorandum is to summarize considerations and strategies in funding proposed local drainage improvements in unincorporated Montara in San Mateo County. Information provided includes:

- Net present value analysis of each improvement solution.
- Summary of locally-controlled revenue sources for initial capital improvement expenditures and ongoing maintenance and replacement reserve funding.

Four viable improvement solutions are presented in the Creegan + D'Angelo feasibility study:

- Alternative 1: Improving existing drainage facilities
- Alternative 2: Constructing a parallel underground conveyance system
- Alternative 3: Storing excess water
- Alternative 4: Combination of storage and limited conveyance improvements

The feasibility study has prepared cost estimates for each improvement solution under two conditions: 10- and 25-year storm remediation. Estimates include initial installation costs of design, permitting, mobilization, and construction management. Additionally, estimates have been prepared describing annual maintenance costs and annual reserve funding for future rehabilitation and replacement of improvements. Estimates do not include costs of right-of-way acquisition or possible environmental permitting fees.

# NET PRESENT VALUE ANALYSIS

Net present value (NPV) analysis is a method for comparing the economic feasibility of alternative solutions, taking into account the time value of money. To express the cost of each solution comparatively in present value, NPV analysis requires the selection of a key assumption in the discount rate applicable to future cash flows. In the municipal setting, the cost of capital is a commonly utilized assumption, with no further adjustment for risk or alternative investment (for profit) common in private sector analysis. Cost of capital is most readily linked to prevailing interest rates associated with municipal bonds. In this case, a rate of 5.0% has been used. A time period of 50 years has been selected for the comparative analysis, with each improvement solution set for whole replacement once every 30 years. Replacement has been presumed to be entirely cash-funded; therefore, the necessary recurrent replacement reserve funding to support that approach has been recalibrated in this analysis from the value assigned in the feasibility analysis. Additional assumptions include construction cost inflation at 4.0% annually, general cost inflation at 3.0% annually, and invested earnings at 2.0% annually.

Exhibits 1 through 4 summarize the simple cash flows for each of the four improvement solutions, inclusive of initial installation, annual maintenance, and annual reserve funding for capital replacement. Expressed in projected future values, these tables represent the total burden to County resources of the improvement solution in the year listed. These values may be directly compared in magnitude to existing, potential fund/departmental/divisional budgets within the County's financial/organizational structure that might be tapped as the one-time funding source for the initial capital outlay and/or the recurring, annual funding source for subsequent maintenance costs and replacement reserves.

***Exhibit 1. Simple Cash Flow, Improvement Solution Alternative 1***

| **10-YEAR REMEDIATION SOLUTION** | | | | | | |
|---|---|---|---|---|---|---|
| Year | 1 | 10 | 20 | 30 | 40 | 50 |
| Initial Capital Outlay | $ 107,001 | $ - | $ - | $ - | $ - | $ - |
| Annual Maintenance Cost | 4,500 | 5,871 | 7,891 | 10,605 | 14,252 | 19,153 |
| Annual Reserve Contribution | 8,226 | 8,226 | 8,226 | 8,226 | 26,679 | 26,679 |
| Total Cash Obligation | 119,727 | 14,097 | 16,116 | 18,830 | 40,931 | 45,832 |
| **25-YEAR REMEDIATION SOLUTION** | | | | | | |
| Year | 1 | 10 | 20 | 30 | 40 | 50 |
| Initial Capital Outlay | $ 116,505 | $ - | $ - | $ - | $ - | $ - |
| Annual Maintenance Cost | 4,500 | 5,871 | 7,891 | 10,605 | 14,252 | 19,153 |
| Annual Reserve Contribution | 8,956 | 8,956 | 8,956 | 8,956 | 29,049 | 29,049 |
| Total Cash Obligation | 129,961 | 14,828 | 16,847 | 19,561 | 43,300 | 48,202 |

### *Exhibit 2. Simple Cash Flow, Improvement Solution Alternative 2*

| **10-YEAR REMEDIATION SOLUTION** | | | | | | |
|---|---|---|---|---|---|---|
| Year | 1 | 10 | 20 | 30 | 40 | 50 |
| Initial Capital Outlay | $ 282,500 | $ - | $ - | $ - | $ - | $ - |
| Annual Maintenance Cost | 1,500 | 1,957 | 2,630 | 3,535 | 4,751 | 6,384 |
| Annual Reserve Contribution | 21,717 | 21,717 | 21,717 | 21,717 | 70,437 | 70,437 |
| Total Cash Obligation | 305,717 | 23,674 | 24,347 | 25,252 | 75,188 | 76,821 |
| **25-YEAR REMEDIATION SOLUTION** | | | | | | |
| Year | 1 | 10 | 20 | 30 | 40 | 50 |
| Initial Capital Outlay | $ 327,300 | $ - | $ - | $ - | $ - | $ - |
| Annual Maintenance Cost | 1,500 | 1,957 | 2,630 | 3,535 | 4,751 | 6,384 |
| Annual Reserve Contribution | 25,161 | 25,161 | 25,161 | 25,161 | 81,607 | 81,607 |
| Total Cash Obligation | 353,961 | 27,118 | 27,791 | 28,696 | 86,358 | 87,992 |

### *Exhibit 3. Simple Cash Flow, Improvement Solution Alternative 3*

| **10-YEAR REMEDIATION SOLUTION** | | | | | | |
|---|---|---|---|---|---|---|
| Year | 1 | 10 | 20 | 30 | 40 | 50 |
| Initial Capital Outlay | $ 1,115,701 | $ - | $ - | $ - | $ - | $ - |
| Annual Maintenance Cost | 2,000 | 2,610 | 3,507 | 4,713 | 6,334 | 8,512 |
| Annual Reserve Contribution | 85,769 | 85,769 | 85,769 | 85,769 | 278,183 | 278,183 |
| Total Cash Obligation | 1,203,470 | 88,379 | 89,276 | 90,482 | 284,517 | 286,695 |
| **25-YEAR REMEDIATION SOLUTION** | | | | | | |
| Year | 1 | 10 | 20 | 30 | 40 | 50 |
| Initial Capital Outlay | $ 1,508,750 | $ - | $ - | $ - | $ - | $ - |
| Annual Maintenance Cost | 2,000 | 2,610 | 3,507 | 4,713 | 6,334 | 8,512 |
| Annual Reserve Contribution | 115,984 | 115,984 | 115,984 | 115,984 | 376,184 | 376,184 |
| Total Cash Obligation | 1,626,734 | 118,594 | 119,491 | 120,698 | 382,518 | 384,696 |

### *Exhibit 4. Simple Cash Flow, Improvement Solution Alternative 4*

| **10-YEAR REMEDIATION SOLUTION** | | | | | | |
|---|---|---|---|---|---|---|
| Year | 1 | 10 | 20 | 30 | 40 | 50 |
| Initial Capital Outlay | $ 471,880 | $ - | $ - | $ - | $ - | $ - |
| Annual Maintenance Cost | 4,500 | 5,871 | 7,891 | 10,605 | 14,252 | 19,153 |
| Annual Reserve Contribution | 36,276 | 36,276 | 36,276 | 36,276 | 117,656 | 117,656 |
| Total Cash Obligation | 512,656 | 42,147 | 44,166 | 46,880 | 131,908 | 136,809 |
| **25-YEAR REMEDIATION SOLUTION** | | | | | | |
| Year | 1 | 10 | 20 | 30 | 40 | 50 |
| Initial Capital Outlay | $ 471,880 | $ - | $ - | $ - | $ - | $ - |
| Annual Maintenance Cost | 4,500 | 5,871 | 7,891 | 10,605 | 14,252 | 19,153 |
| Annual Reserve Contribution | 36,276 | 36,276 | 36,276 | 36,276 | 117,656 | 117,656 |
| Total Cash Obligation | 512,656 | 42,147 | 44,166 | 46,880 | 131,908 | 136,809 |

Exhibit 5 summarizes the net present value of each improvement solution. Based on the derived simple cash flows and the NPV assumptions described earlier, improvement solution 1 – improving existing drainage facilities under both the 10- and 25-year remediation assumptions – represents the least cost option to the County.

***Exhibit 5. Net Present Value of Improvement Solutions***

| Improvement Solution | | 50-Yr NPV |
|---|---|---|
| Alt. 1, | 10-Year Remediation | $ 444,267 |
| Alt. 1, | 25-Year Remediation | $ 471,382 |
| Alt. 2, | 10-Year Remediation | $ 852,323 |
| Alt. 2, | 25-Year Remediation | $ 980,141 |
| Alt. 4, | 10-Year Remediation | $ 1,485,296 |
| Alt. 4, | 25-Year Remediation | $ 1,485,296 |
| Alt. 3, | 10-Year Remediation | $ 3,244,956 |
| Alt. 3, | 25-Year Remediation | $ 4,366,356 |

It is important to note that comparative NPV outcomes for each solution are impacted materially by the timing and frequency of future capital replacement outlays. This analysis has presumed uniform timing/frequency of replacement between each project; however, if higher cost improvement solutions yield longer useful lives, the NPV of an apparently higher cost solution might actually be closer or lower than an apparently lower cost solution.

## LOCAL FUNDING MECHANISMS

To fund the cash obligations summarized in the preceding section (Exhibits 1 through 4), the County will need to acquire a one-time revenue source for the initial capital cost of installing its selected improvement solution, as well as a recurring, annual revenue source for maintenance and capital replacement reserve funding.

Upon internal evaluation of the simple cash flows listed in Exhibits 1 though 4, the County may determine that the costs of its chosen improvement solution can be scheduled and budgeted reasonably within the programmatic objectives and capabilities of an existing fund in its current financial/organizational structure. When compared to the magnitude of the County's existing capital improvement and maintenance budgets for select departments/funds where drainage improvements potentially could be programmed, the total outlays – particularly in the least cost options – are not out of line with currently scheduled projects and recurring obligations. While those funds may be wholly appropriated at present, it may be that internal County prioritization of projects would view the Montara drainage improvement of higher urgency than other projects, thus freeing an existing revenue stream.

If appropriation of existing revenues is not possible, the County must either acquire a wholly external funding source, such as a loan or grant from another agency, or seek approval for a new tax, assessment, or fee on property owners. The following sections

discuss potential land-secured or property-based mechanisms, all of which require some degree of voter- or property-owner approval and would generate ongoing administrative efforts and costs to maintain. These formation, approval thresholds, and ongoing efforts should be weighed against the ease (or lack thereof) of programming the County's selected drainage improvement solution within existing departmental/fund budgets, particularly in the least cost options. Pursuit of these funding sources not only requires rigorous analytical justification: it also requires upfront knowledge of political will and feasibility of garnering community support.

### *Community Facilities District*

A Community Facilities District (CFD) can be formed pursuant to the Mello-Roos Community Facilities Act of 1982. A CFD can pay for both capital projects as well as ongoing maintenance. Bonds would be issued to pay for capital costs secured by a special tax levy. (Depending on the selected drainage improvement solution, a small initial capital cost likely may make a bond issue non-viable, and another revenue would need to be acquired.) The same CFD can also fund ongoing maintenance cost through a special tax levy.

There is great flexibility in both the geographic area to be levied and the formula by which to levy when using a CFD. A CFD may include non-contiguous geographic areas. There is no requirement that the special tax be apportioned on the basis of benefit to any property. Property owned by a public entity is generally exempt from the CFD special tax, ensuring no lingering obligation of other County revenues.

Successful creation of a CFD requires approval of two-thirds of the registered voters voting in an election (or approval of the landowners if less than 12 persons are registered to vote within the CFD boundary). With a voter election, each voter has one vote, regardless of their weighted share of the proposed special tax levy. In a landowner election, the vote is one vote per acre or portion thereof.

### *1913/1915 Act Assessment District*

A 1913/1915 Act Assessment District can be formed pursuant to the Municipal Improvement Act of 1913, and bonds would be issued pursuant to the Improvement Bond Act of 1915. (Depending on the selected drainage improvement solution, a small initial capital cost likely may make a bond issue non-viable, and another revenue would need to be acquired.) This type of funding mechanism can only pay for capital outlays, not maintenance costs.

As an assessment district, there is a higher standard of benefit assignment, and the formula distributing costs must be detailed and substantiated with a report prepared by a Professional Engineer. The proportionate special benefit received by each parcel must be determined in relationship to the entirely of the capital cost of the public improvement. Parcels within the boundary that are owned by a public entity are not

exempt from assessment unless the County can show by "clear and convincing evidence" that the properties in fact receive no special benefit. For drainage projects impacted greatly by storm run-off from public roadways, this is virtually impossible; therefore, this funding mechanism would yield a remaining obligation to be met by other County revenues.

Notices and ballots are mailed to the affected property owners. When tabulating, the ballots are weighted according to the proportional financial obligation of the affected property. If the ballots submitted in opposition to the assessment do not exceed the ballots submitted in favor, the assessment district may be formed.

***Benefit Assessment District***

A Benefit Assessment District (BAD) can be formed pursuant to the Benefit Assessment Act of 1982. A BAD can fund ongoing maintenance costs but cannot fund capital costs.

As an assessment district, there is a higher standard of benefit assignment, and the formula distributing costs must be detailed and substantiated with a report prepared by a Professional Engineer. The proportionate special benefit received by each parcel must be determined in relationship to the entirely of the capital cost of the public improvement. Parcels within the boundary that are owned by a public entity are not exempt from assessment unless the County can show by "clear and convincing evidence" that the properties in fact receive no special benefit.

Notices and ballots are mailed to the affected property owners. When tabulating, the ballots are weighted according to the proportional financial obligation of the affected property. If the ballots submitted in opposition to the assessment do not exceed the ballots submitted in favor, the assessment district may be formed.

***Property-Related Fee***

A property-related fee is a fee for service attributable to the parcel being charged. A fee for storm drainage services levied upon the County tax roll is considered to be imposed as an incident of property ownership and as such, would be subject to the substantive and procedural requirements of California Constitution Article XIII D (known commonly by its enacting ballot measure: Proposition 218). The fee must be submitted and approved by a majority vote of the property owners or by a two-thirds vote of the electorate. The amount charged to each parcel must be proportional to the cost of service attributable to that parcel.

For a property owner election, each parcel generally receives one ballot, and each ballot has one vote regardless of the potential levy amount, although the County may also have the power to provide for weighted voting. In one-parcel-per-vote elections, a large commercial parcel with a calculated levy that is orders of magnitude greater than that of a vacant parcel would have the same, single vote as the vacant parcel.

The revenue stream from a property-related fee may be used for both capital and maintenance costs. The revenue stream could be pledged for a revenue bond issue to fund major capital improvements. (Again, the least cost improvement solution may have initial capital costs too low for a viable bond issuance; however, an interfund loan or other loan repayment could be supported by the resultant revenues.)

***Impact Fees***

Finally, while existing conditions in the Montara area demonstrate a drainage system undersized to prevent current flooding events, the feasibility study noted that such conditions will be exacerbated by and future issues could arise as a result of future development in the area. Furthermore, most currently developed lots are not yet developed to maximum impermeable surface allowed by County code, which means redevelopment will also contribute to burden on existing facilities and a need for future, upsized facilities. These described conditions provide an opportunity for the imposition of a development impact fee in the Montara area.

A development impact fee is a one-time fee imposed as a condition of development approval on new development that creates new, unmitigated impermeable surface and redevelopment that increases without mitigation impermeable surface. Development impact fees are authorized by Government Code 66000 et seq., created by the Mitigation Fee Act and referred to commonly as "AB 1600" fees.

A development impact fee may be established applicable to the Montara area based on that portion of the capital costs necessary to serve the burdens of new impermeable surface. (Based on the existing deficiencies, the fee cannot cover the entirety of the costs, leaving obligations that must be met through another revenue source.) If capital costs were funded by another revenue source prior to development and corresponding receipt of the impact fee, fee revenues may be used to replenish or pay back that prior revenue source. Impact fees may not recover any maintenance costs.

Impact fees may be implemented by consensus of the County Board of Supervisors alone. A nexus analysis and fee justification report must be prepared and made available to the public in advance of the public hearing.

## USE OF REPORTING

The preceding information has been issued to Creegan + D'Angelo as a part of its feasibility reporting for the referenced project. Outcomes presented may be impacted materially by refinement of the assumptions described. Furthermore, funding mechanisms are presented at a summary level and require methodical action plans to implement. Please contact NBS with any questions or further discussion.

# Exhibit 6

January 5, 2025

Gregg Dieguez
Vice Chair
Midcoast Community Council
Email: mccgreggd@gmail.com

Subject: *2nd Street and Kanoff Street Flooding Problems and Potential Solutions, Montara, CA*

Dear Mr. Dieguez:

Thank you for bringing awareness to the flooding issues we are having on 2nd Street and Kanoff Streets in Montara. I live at 370 2nd Street, and I am familiar with the flooding issues here, and have personally spent over $30,000 in the past year on fixing drainage issues on my property. I have experience working as a wetland consultant and wildlife biologist on several stream restoration projects in San Mateo County, and I recently walked the creek that runs along 2nd Street and Kanoff Streets with Matt Smeltzer, Geomorphologist and Engineer with Geomorph Design Group. Our hike was conducted during an intensive rainstorm on November 22, 2024 where Montara received 3 inches of rain in 24 hours. This letter provides information based on this walkthrough as well as my experience and research into the flooding issues in this neighborhood. I'm submitting this information as a supplement to the MCC report: "*Flooded With Problems: Stormwater Management on the SMC Coast Situation - Causes, Solutions and Recommendations*" (2024).

As the MCC report states, the flooding in our neighborhood has progressively gotten worse over the last 30 years and is now critical for many of the residents along 2nd Street and Kanoff Street. The ongoing flooding and bank erosion along the creek threatens to undermine the road and water and sewer line infrastructure on 2nd Street (Photo 1). During our walk-through on November 22, 2024, the creek overtopped its banks along Kanoff Street, and flooded the driveway, yard and garage at 280 Kanoff Street (Photos 2 and 3).

The cause of this flooding is from increased flow from: a) the rerouting of stormwater drainages to the swale (now a creek) along 2nd Street and Kanoff Street, and b) an increase in impermeable surfaces from development and paving of roadside ditches in Montara over the last 30 years. This has increased the volume of water coming down the steep streets on the north side of Montara, and has transformed a former swale along 2nd Street and Kanoff Street into a perennial creek. This transformation is shown in Figures 1 and 2 which show the change that occurred from 1993 to 2023. The USGS Montara quadrangle (2015) does not show a perennial or intermittent stream feature along 2nd Street or Kanoff Streets, while it does show intermittent streams in the surrounding area (Figure 3). This relatively newly formed perennial creek along 2nd and Kanoff Streets is the result of hydrological changes in the watershed, and is now larger than the existing intermittent streams in the surrounding watershed. The creek will likely continue to increase in size and erosive force, due to climate change bringing higher precipitation and runoff to the area.

In order to address this flooding problem, I concur with creating a secondary high flow channel, as part of a multi-approach solution (Figure 4: 2nd Street Concepts, prepared by the RCD). The secondary high flow channel would reroute the creek away from the road and the homes along 2nd Street and Kanoff Street. The creek could also be allowed to flood an existing wetland (under higher flows) to augment an existing wetland, which would also result in a reduction in stormwater pollutants entering the Fitzgerald Marine Reserve. The benefits of a comprehensive multi-approach solution include:

1) Protection of homes along 2nd Street and Kanoff Streets from flooding, and protection of 2nd Street from road collapse and damage to electrical and sewer systems. The current route of the creek which flows in-between homes at 331 2nd Street, and 700 Kanoff Streets has led to flooding and expensive flood control work paid for by individual homeowners.

2) Creation of approximately 500 – 700 feet of new creek channel and riparian corridor. This new corridor would provide new riparian habitat for wildlife such as native birds, bats, mammals and protected amphibians and reptiles such as the California red-legged frog and the San Francisco garter snake. This could provide an area for mitigation credit for the County and/or other agencies for riparian wetland impacts elsewhere.

3) Retainment of existing channel and riparian corridor. The old stream channel would still retain its riparian corridor and aquatic habitat due to water still flowing in from culverts along Farallone Avenue and from culverts along 2nd Street at 370 2nd Street and at 320 2nd Street. This creek section could also be modified to retain water longer, leading to better stormwater filtration, with no loss of existing riparian habitat.

4) Currently flow from the creek goes directly into the Fitzgerald Marine Reserve at Montara Beach. Higher flows could be diverted to augment the wetland area that includes Charthouse Pond (a California red-legged frog - CRF) breeding location on GGNRA lands (Figure 5). This pond has been gradually filling in with vegetation and sediment over the last 10-15 years, and has much less open water for CRF to deposit eggmasses. One potential idea to address these concerns would be to allow the creek to expand and flood this wetland area including charthouse pond, as it could improve CRF and San Francisco garter snake habitat, as well as habitat for several other aquatic and semi-aquatic species, and reduce stormwater pollutants entering the Fitzgerald Marine Reserve.

The proposed new high flow channel is one potential solution, and other potential solutions to the flooding problem outlined by the RCD such as installing a new stormwater pipe along 3rd Street (as shown in Figure 4) may also be a satisfactory solution to the flooding problem on 2nd Street and Kanoff Street, and would require less inter-agency coordination.

A more systematic solution is greatly needed and long overdue for the flooding problems in this area, and has been discussed at the County for several years at this point[1]. Thank you for your continued assistance in bringing awareness and developing potential solutions to the flooding problems in our area. Please keep me informed and let me know if I can be of any assistance.

Sincerely,

Homeowner at 370 2nd Street, Montara, CA
& Principal Biologist, Coast Ridge Ecology, LLC

[1] https://www.coastsidenews.com/news/county-moves-to-solve-montara-drainage-issues/article_801fc6f1-d84e-52c1-96a6-9c61b0ca9a3c.html)

Photo 1. Rilling and creekbank erosion on 2nd Street. Channel incision and bank erosion have eroded the roadway embankment on north side of road. Lack of proper engineering of roadway causing rilling of roadway. View is looking west (downstream).
Photo date: 11-22-2024.

Photo 2. Creek overflow flooding driveway, yard and garage at 280 Kanoff Street. View is looking west (downstream). Photo date: 11-22-2024.

Photo 3. Creek at bankfull, after overtopping at 280 Kanoff Street. View is looking east (upstream) towards intersection of Farallone Street and Kanoff Street. Photo date: 11-22-2024.


Figure 1. Aerial from 1993 showing that there was no creek or riparian corridor present along 2nd Street and Kanoff Street. Creek started forming in the 1990's. Source: Google Earth.

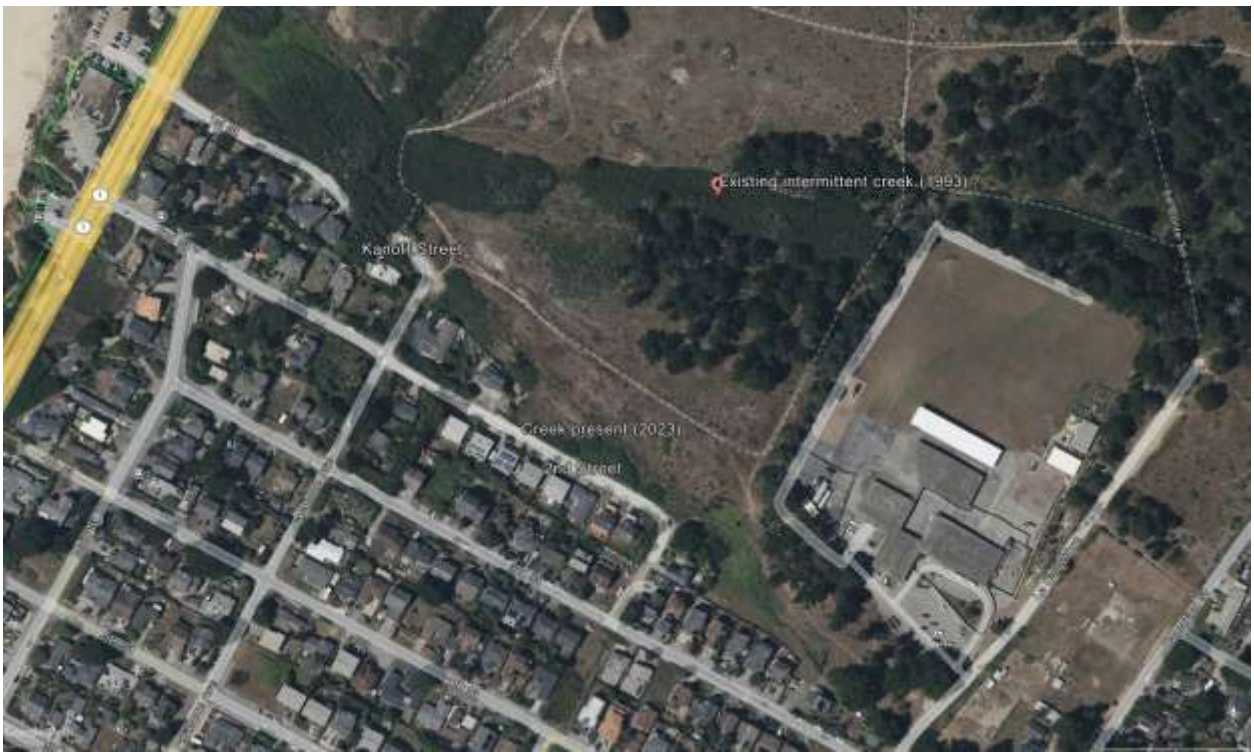



Figure 2. Aerial from 2023 showing establishment of creek and riparian corridor along 2nd Street and Kanoff Street. Source: Google Earth.

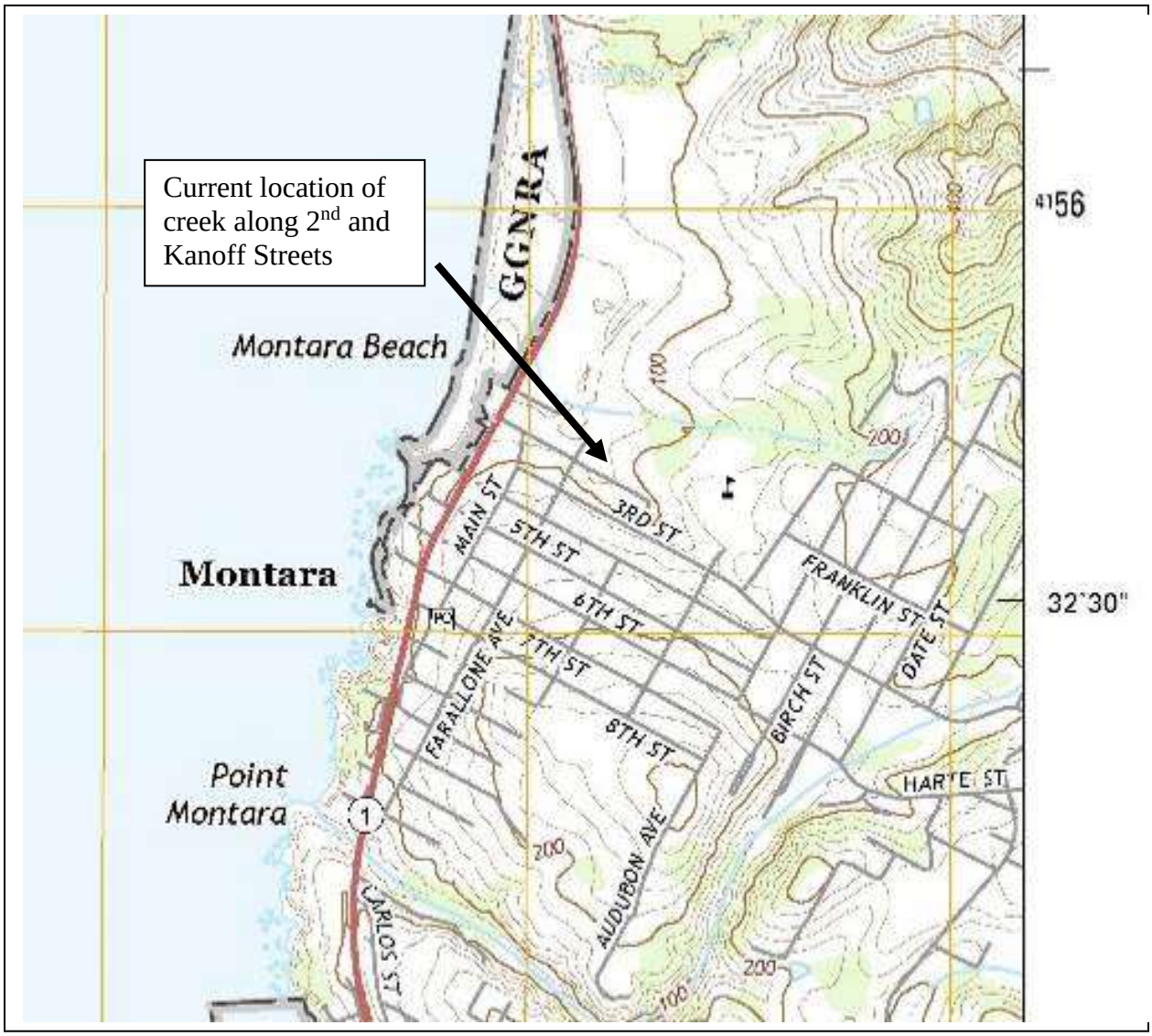



Figure 3. USGS Montara 7.5 minute quadrangle (2015). Perennial creek has formed in this location over the last 30 years.

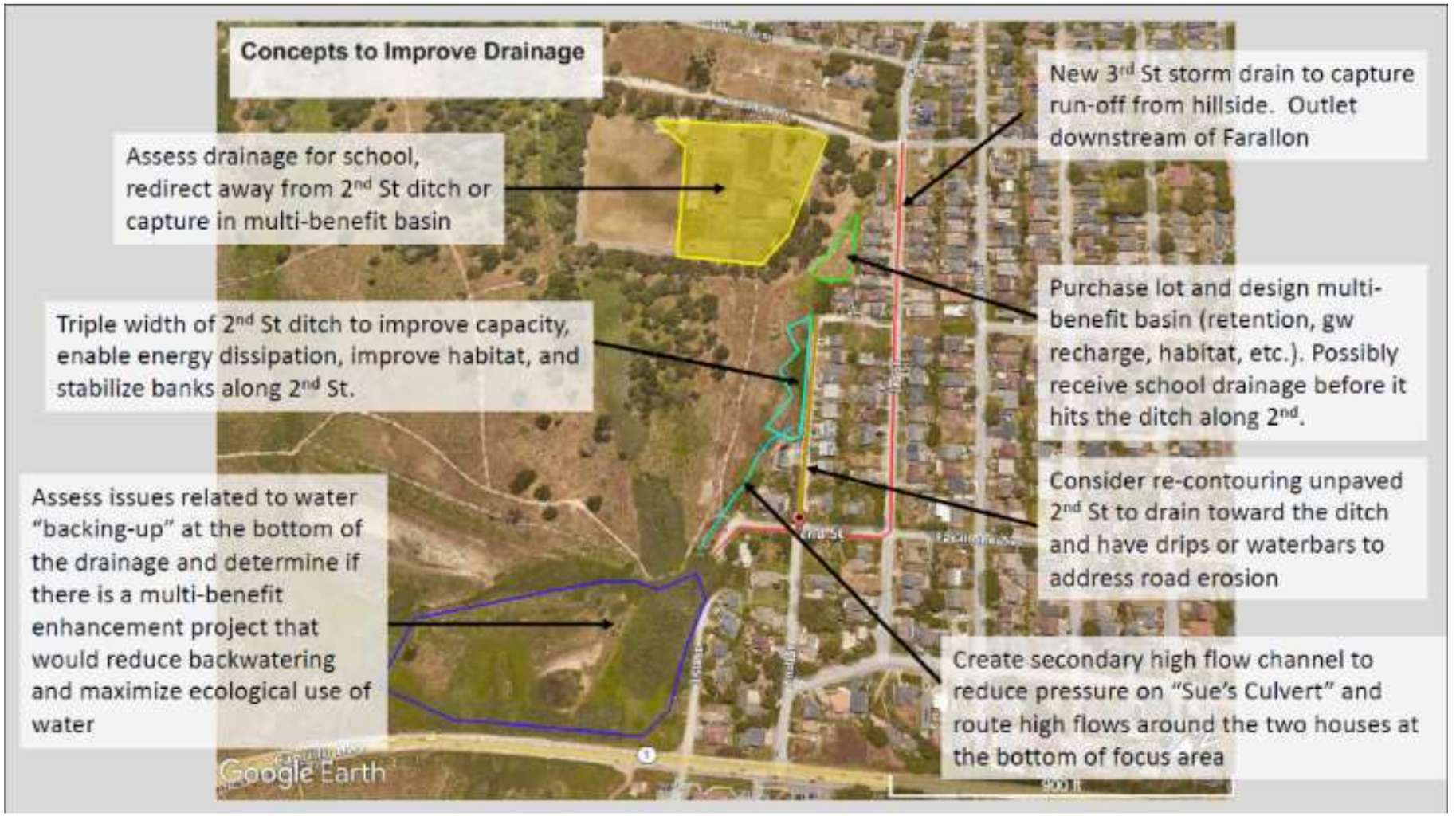


Figure 4. Outline of possible flood control solutions for 2nd Street and Kanoff Streets, Montara, CA. (2nd Street Concepts, prepared by San Mateo County Resource Conservation District).

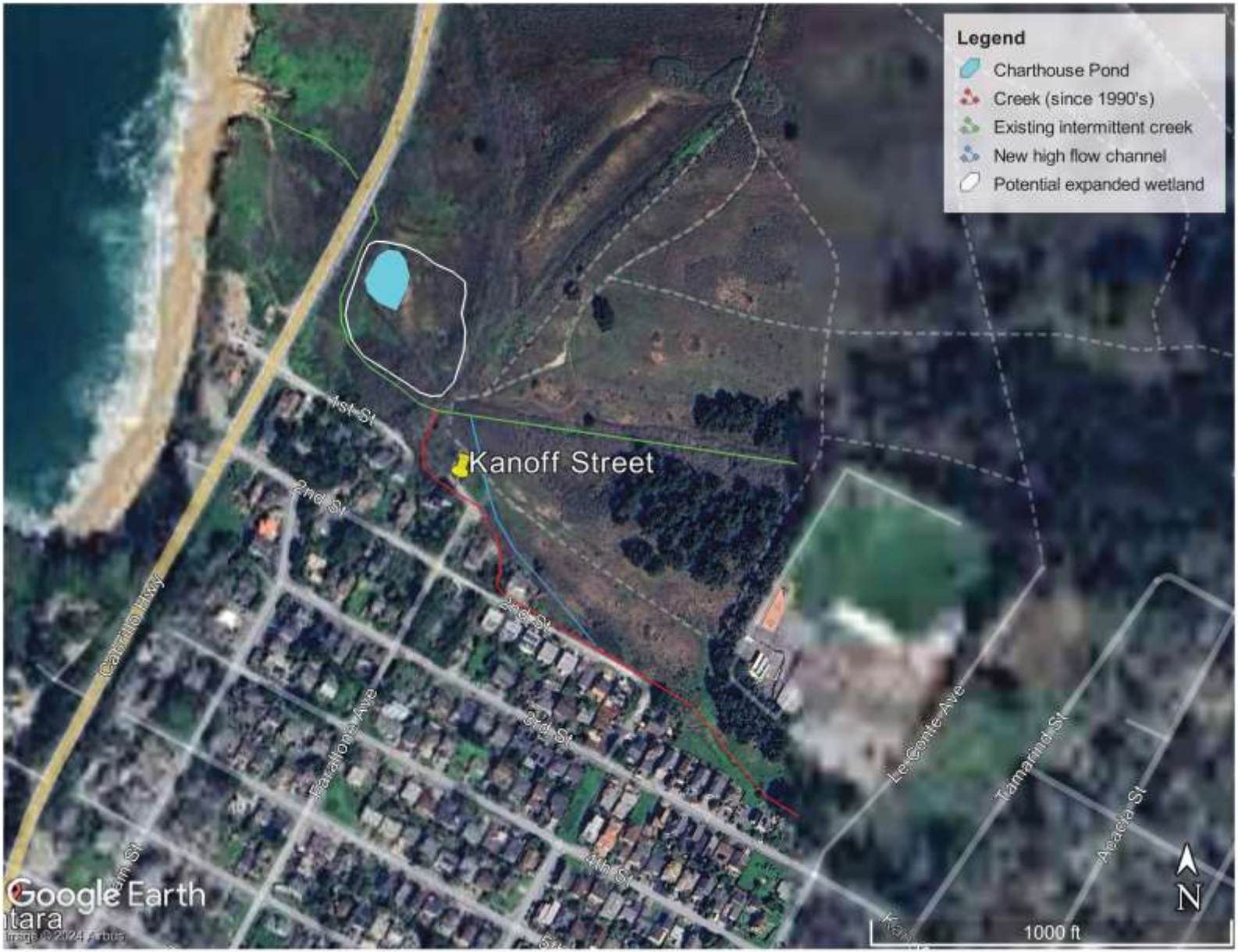



Figure 5. Creek along 2nd and Kanoff Streets (shown in red), and proposed new high flow channel (shown in blue). Google Earth imagery from 2024.

**Exhibit 7**

**County of San Mateo Memo**

**Sept. 6, 2006**

**Regarding Seal Cove, Moss Beach**

**With attached Geologic Summary**

# COUNTY OF SAN MATEO

**Inter-Departmental Correspondence**

**Date:** September 6, 2006

**TO:** Members, Board of Supervisors
via the County Manager

**FROM:** Neil R. Cullen, Director of Public Works

**SUBJECT:** Closure of Ocean Boulevard between Los Banos and San Lucas Avenue

Supervisor Gordon received the attached letter from Mr. George Lambert to the Seal Cove Neighborhood Association outlining the Association's concerns with the closure of Ocean Boulevard between Los Banos and San Lucas Avenues. The following is a brief history of Ocean Boulevard and the status of the request/concerns as expressed in Mr. Lambert's letter.

**History**

Your Board authorized the study of the Seal Cove area in 1971. The study concluded that the area was subject to geologic instability due to:

- Existing active landslide masses underlying the area
- Sea cliff erosion due to the effects of the wave and tidal action
- Shallow ground water, which adversely affects slope stability, seismic stability and surface drainage
- Seismic hazards due to close proximity of the Seal Cove Fault

A Geologic Hazard District was formed over the Seal Cove area in 1982, based on the identification of fault zones in the area and the conclusion that the area was highly susceptible to land sliding and cliff erosion.

A second entrance into the area was created in 1991, by the extension of Los Banos Avenue from Airport Street to Park Avenue. This was done as the previously mentioned geologic report concluded that the existing access via Beach Way could be closed due to future subsidence.

The Department closed Ocean Boulevard between Los Banos and San Lucas Avenues in 1995, after longitudinal cracks formed in the road and the westerly portion of a section of the road began to subside. We confirmed that the area was within a landslide originally mapped in 1971, and the consultant concluded, at that time, that the area will slowly slide onto the beach below, but that it would happen over a long period of time rather than catastrophically. The road was reopened at your Board's direction, and it has remained open for public use for the past 11 years until last winter.

We closed the road again in the same general location during the winter storms of 2005-2006, as there was additional ground movement that resulted in the road settling or heaving at generally four (4) locations. The road is currently impassable to standard vehicles and the fire service providers will not allow their equipment to use this section of the road.

The County Geologist visited the site in August 2006, and prepared a summary report that recommends that the damaged portions of Ocean Boulevard and Los Banos Avenue be permanently closed to all traffic (including bicycles and pedestrians), and that all paving be removed, the area regraded to a natural form and revegetated.

## Homeowners Concerns

The residents, in their letter to Supervisor Gordon, outlined four (4) concerns:

### Reopen the Road to Eliminate Traffic Diversions onto Other Streets in the Area

We do not believe that significant traffic is being diverted. We conducted traffic counts in the area in July 2006, to ascertain if traffic volumes have increased on other roads as a result of the current closure of Ocean Boulevard. These counts were compared to data that was collected in 1995, after Ocean Boulevard was reopened. The data indicates that the volumes of traffic using roads in the area have remained fairly constant with minor seasonal fluctuations that are not related to whether the subject portion of Ocean Boulevard is open or closed.

There are only two (2) entrances to the Seal Cove area and they are both on the north end of the subdivision. There is no impetus for through visitor traffic. However, I have directed the Roads Division to install "No Outlet" signs at the intersection of Los Banos and Park Avenues to discourage visitor or sight seeing traffic, and also on the streets that are currently "dead ended" by the closure of the Ocean Boulevard.

### Develop an Erosion Control Plan to Mitigate the Affects of the Winter Storms

The area is drained using surface ditches that flow towards the bluff along Ocean Boulevard. Surface ditches are the most effective drainage system for the area, as subsidence and heaving on or near Ocean Boulevard could divert water from underground drainage systems in the underlying faults or slip planes. We do not believe we can control the erosion in this area based on the conclusions reached in the original 1971 geotechnical report as described in the History section of the memo. We will continue to maintain the roadway ditches in the area.

### Develop a Long-Term Plan for an Additional Route (into the area)

The original access into the area is via Marine Avenue and Beach Way. As stated previously, your Board authorized a second access into the Seal Cove area in 1991, and Los Banos Avenue was extended to Airport Street.

### Control Speed Problems in the Area

Speed surveys were conducted on the maintained streets in the area as well as on the extension of Los Banos Avenue to Airport Street. The average speeds on the streets except Los Banos Avenue were within the 25-mile per hour speed limit.

However, Los Banos Avenue qualifies for speed humps under the Residential Speed Control Device Program ("Program") approved by your Board in April 2005, as the 85$^{th}$ percentile speed (the speed at or below which 85% of all traffic is traveling) on this section of Los Banos Avenue was 35 miles per hour. We will return to your Board with a recommendation concerning the installation of speed humps on Los Banos Avenue after the previously approved speed hump project on Santa Clara Avenue, and the projects currently under consideration by your Board, have been completed.

## Other Issues

A property owner also contacted us and inquired if another non-maintained street within the subdivision could be improved and accepted into the County maintained road system to provide an alternate route for the properties in the southern section of the subdivision.

There are other streets in the subdivision that could be improved in lieu of investing additional funds into maintaining Ocean Boulevard. However, the provisions of the current ordinance related to accepting roads into

the maintained system requires a petition signed by property owners representing over 50 percent (50%) of the frontage on a street, and the improvement of the street to at least a 16-foot wide paved travel way with shoulders and drainage swales. The improvement of the street would also be subject to a review to determine if a Coastal Development permit was required.

**Department Recommendation**

We believe that it is prudent to permanently close Ocean Boulevard between Los Banos and San Lucas Avenues based on the Geologist's findings. Your Board would need to consider our recommendation at a noticed public hearing and we would notify all the property owners in the immediate area and the MidCoast Council of the time and date of a hearing. In the interim, we will continue to maintain the barricades that preclude the motoring public from attempting to use this section of Ocean Boulevard.

Neil R. Cullen
Director of Public Works

NRC:
F:\USERS\ADMIN\ESD\membrsbs\2006\MembersMemoOceanBlvd0806NRC.doc
**F-36 (307)**

Enclosures: Letter from George Lambert
Aerial Photograph of the area

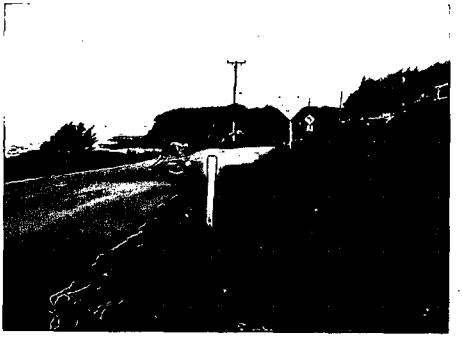
bcc: Deborah Penny Bennett, Deputy County Counsel
David J. Clarke, P.E., Deputy Director, Road Services Division
Brian C. Lee, P.E., Deputy Director, Engineering & Resource Protection Division

# GEOLOGIC SUMMARY OF CONDITIONS ALONG OCEAN BOULEVARD, MOSS BEACH

The County roads in the Seal Cove area have been affected in various ways over the years by the movement of the active coastal landslides in that area. The most recent movement has caused Ocean Boulevard, between Los Banos Avenue and Madrone Avenue, to become uneven and to tilt steeply toward the sea.

The movement under Ocean Boulevard appears to be a reactivation of a relatively small, older failure that is part of a much larger series of coalesced landslides that extend to the north and east of it.

The first of the two maps (map 1) that accompanies this report shows the most recent scarps and other landslide-related features in red. Older features, most of which still exist, are shown in black. The second map ( map 2) shows the general outline of the landslides in relation to the existing roads.



The southern end of the recent activity appears to be near the intersection of Ocean Blvd and San Lucas Avenue. This view is from that intersection, looking northward.

The graben extends into the field to the right, where there are several discontinuous parallel linear depressions in the head scarp area.

The depression shown here is the graben along the top of the rotating slide mass. The picture was taken facing southward, and the white barrier is at the intersection of Ocean and San Lucas.

The small red abandoned house is in the grove of trees on the right.

The landslide mass is apparently rotating outward as it moves downward. This has caused a graben, or closed depression, to form along the head scarp.

The backscarp formed along the western edge of the graben persists for some distance along Ocean Blvd, gradually leveling out and reversing itself into a normal west-facing scarp.

Downhill of the verge, the scarp is difficult to follow due to the dense vegetation. There is no well-defined landslide toe anywhere in this area.

The road steepens abruptly as it approaches its intersection with La Grande Avenue. The house in the upper right of the previous photo is at that intersection.

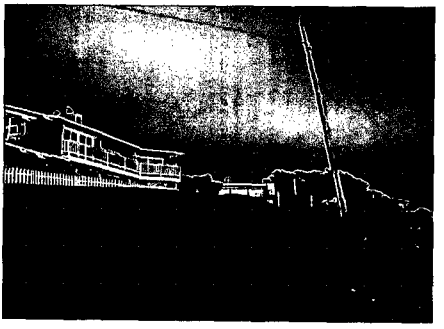
There is a fresh west-facing scarp that runs through this over-steepened portion of the road, and through the vacant lot, just below the light blue house. This scarp shows fresh soil, but its precise extent is impossible to determine due to dense vegetation.

There is water flowing through this vacant lot, close to this scarp. The source of this flow was not determined.

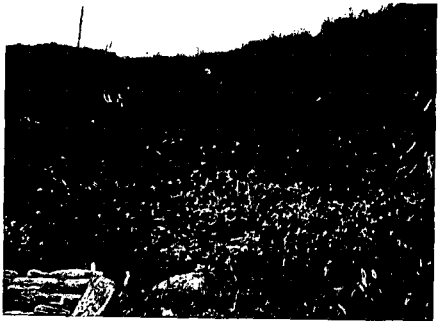
At the top of the hill, the intersection of Ocean and Le Grande appears to be underlain by resistant material. The boundaries of both landslides, to the north and south of it, curve away to the west (toward the sea) in this area.

This picture shows Ocean Blvd. from La Grande looking south to San Lucas (see barrier in distance). The road is offset along the cracks by as much as 6" vertically. The angle of dip on the road is from 2 to 20 degrees west.

To the north of the Ocean/La Grande intersection, the road drops off sharply again along a steep scarp that crosses the road just downhill of the junction.



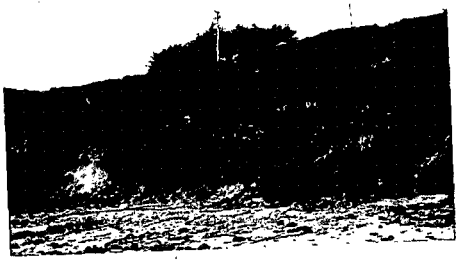
The scarp is visible as a dark wedge on the left of the photo, below the light blue house. The utility pole is one of about six that run along the west side of Ocean Blvd in this area. This is the pole that has been most affected by the movement of the slide. It is in the northern slide, near the scarp.



When this area is viewed from below, fresh scarps can be seen in several places, mostly directly below the road. This photo shows the swale immediately downhill of the worst of the recent movement. The leaning pole can be seen faintly in the upper left.

There is no evidence of fresh toe material anywhere in this vicinity on the beach. It appears that the active movement along Ocean Blvd. bottoms out on the natural bench that exists about half way down the slope.

Aerial photographs show that this area has moved many times in the past, mostly as small, local failures within the larger landslide mass that makes up much of the bluff area.



This is another photo showing the swale below the road, but looking slightly more northward than the previous one. The cement "steps" are in the middle at the base of the slope here, for reference. The benched form of the slope is evident, as is the lack of recent movement at the beach level.

There is a stream coming out at the base of the slope below the distressed portion of Ocean Blvd. On the east side of the road above, there is evidence of uncontrolled drainage coming through the vacant lot. This water may be a contributing factor in the recent movement.

There are several generations of riprap and cement cover in the two coves that lie below the area between Madrone Avenue and Cypress St to the north. There are the remains of cement "blankets" on the slope below both of the two remaining houses on the west side of Ocean Blvd. These are the little red house between San Lucas and Madrone (#3 on map 1), and the only occupied home, which is adjacent to the Distillery parking lot (#2 on map 1). The riprap is sparse in places and does not appear to provide much protection for the toe of the slope, particularly below the Distillery. The approximate extent of riprap is shown on map 1.

The left photo shows the small cove below the Distillery, which can be seen on the top of the bluff to the left. The picture on the right shows riprap on the beach near one of the houses that sits almost right on the beach. The exposed cliff on the right of the Distillery picture is visible in the distance on the right photo.

The picture on the left shows part of an old cement "blanket" that sits below the occupied house near the Distillery. It is broken, and the ocean has eroded the rock from behind it. The photo on the right shows the edge (just below the dark green bluff) of another partial blanket of cement that exists downhill of the Ocean Blvd. area that is failing.

There are other signs of continued and, in some places, accelerated landslide movement in the Seal Cove area. The slide that includes the Distillery restaurant, its parking lots, and several nearby homes, is very active and movement continues to cause cracking and deformation in pavement and structures. The head scarp for this slide crosses Beach Way at its intersection with Park Avenue, crosses diagonally through a house, a vacant lot, and across Los Banos Ave. It forms a steep scarp through the vacant lot and immediately downhill of the house on the northeast corner of La Grande and Ocean. This is the same scarp shown in a previous photo (with the leaning utility pole).

## CONCLUSIONS

Ocean Boulevard and an adjacent portion of Los Banos Avenue are currently impassable. These roads could be repaired by regrading and repaving. However, movement of the underlying landslides will probably continue, and will eventually destroy the roads again.

The current distress along the bluff road, from the Distillery south to Madrone Avenue, is caused by local movement within two separate landslides. The northern one is moving roughly northwest, with its head scarp curving out toward the sea at the intersection of Ocean Blvd. and La Grande Avenue. There appears to be a resistant mass of material beneath that intersection, which has deflected both of these slides. The southern failure, which is moving almost due west, extends from that intersection southward, with most of its movement concentrated in the area closest to its northern boundary, between La Grande and San Lucas Avenue. The southern limit of this landslide is not well-defined, although there are cracks and small bulges visible in the roads and other structures at least as far south as Madrone Avenue.

The most significant contributing factor to the current landslide movement is probably water, from surface drainage and rain during the very wet winter of 2005-2006. The uncontrolled drainage that exists through some properties along Ocean Boulevard, and landscape watering in this area will continue to be a problem, even if future rainy seasons are not as severe.

Landslide repair would probably involve the placement of buttress materials on the bench below the road and/or at the base of the coastal bluff slope. Even if this were accomplished below the two landslides identified here, further movement may occur in the surrounding, older landslide deposits. Because of the complex nature of the landslides in the Seal Cove area, any mitigation of small landslides in this area may later be affected by future movement within adjacent or inclusive failures. This is evidenced by the continued movement of the Distillery and its neighborhood, even though the base of the adjacent slope is protected by riprap.

## RECOMMENDATIONS

The following recommendations are based on field reconnaissance, aerial photograph interpretation, and review of the pertinent published and unpublished literature.

1. Abandon those sections of Ocean Boulevard and Los Banos Avenue that are currently impassable. Make the barriers permanent, and discourage any traffic through this area, including by bicycle or foot.

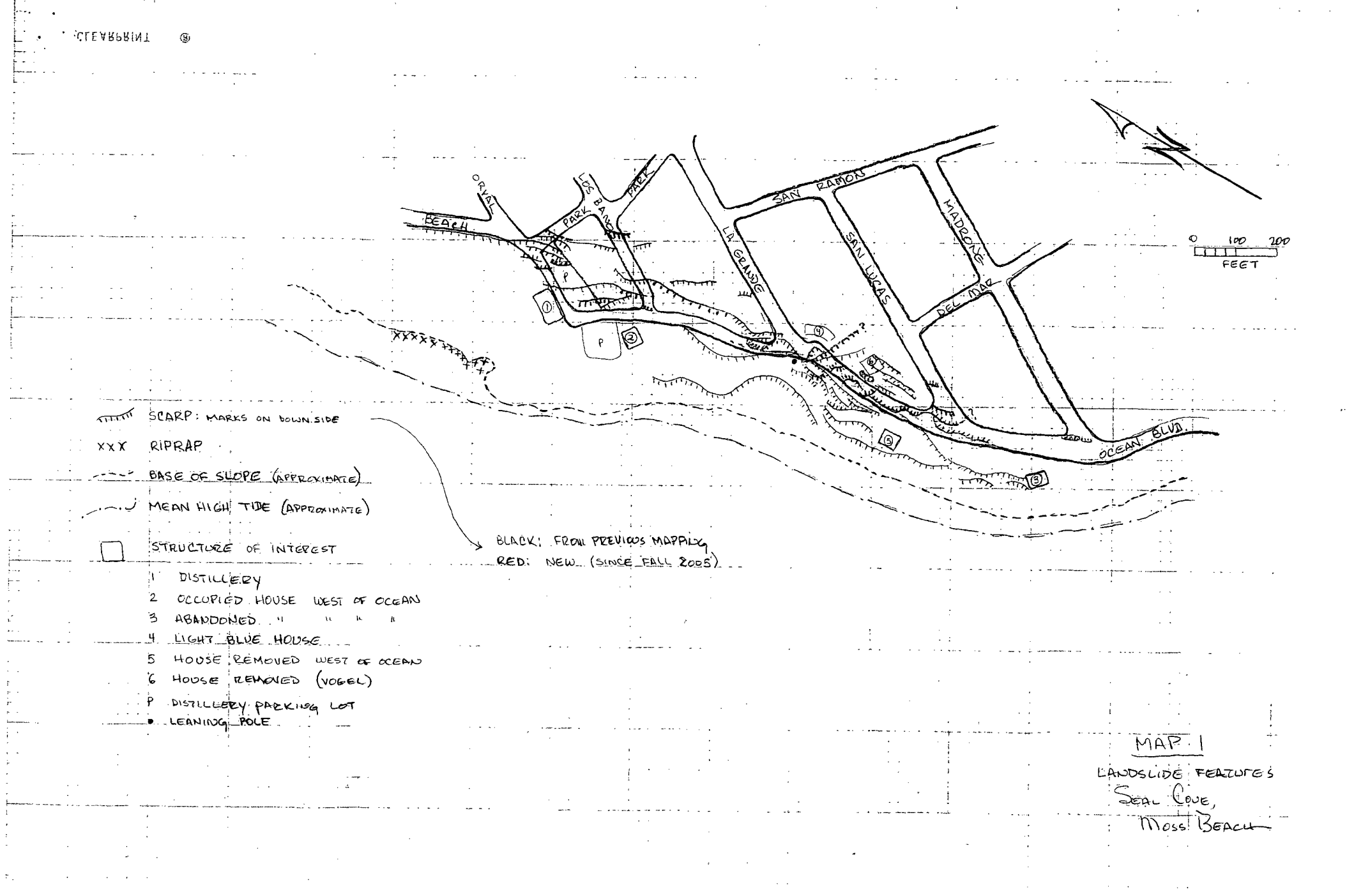
2. Remove paving and other structures, and regrade the slope into a natural form, with a positive grade toward the sea.

3. Revegetate the area with plants that are native to the area and that can survive with no care or additional water.

4. Require the utility companies responsible for the line of poles that are currently along the west side of Ocean Boulevard to relocate them to the east, outside the active landslide zone.

5. Provide control of drainage from the paved and developed portions of the Seal Cove area away from the two landslides. Failure to do this will probably result in continued movement in these areas, and possible headward migration of the scarps.

Respectfully submitted,
21 August 2006
Jean F. DeMouthe
Acting County Geologist

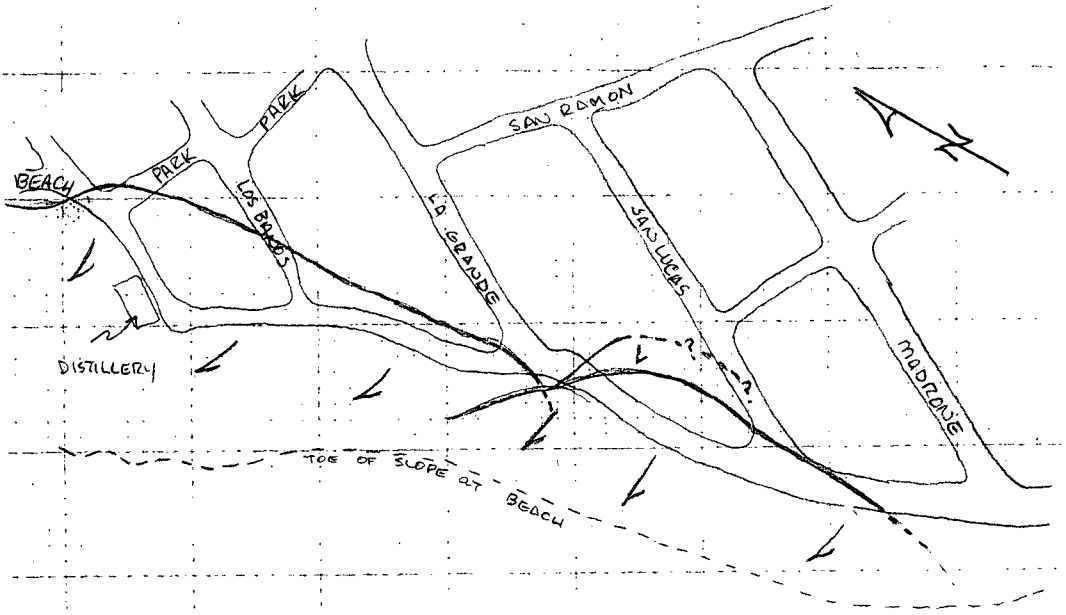



MAP 1

LANDSLIDE FEATURES

SEAL COVE,

MOSS BEACH

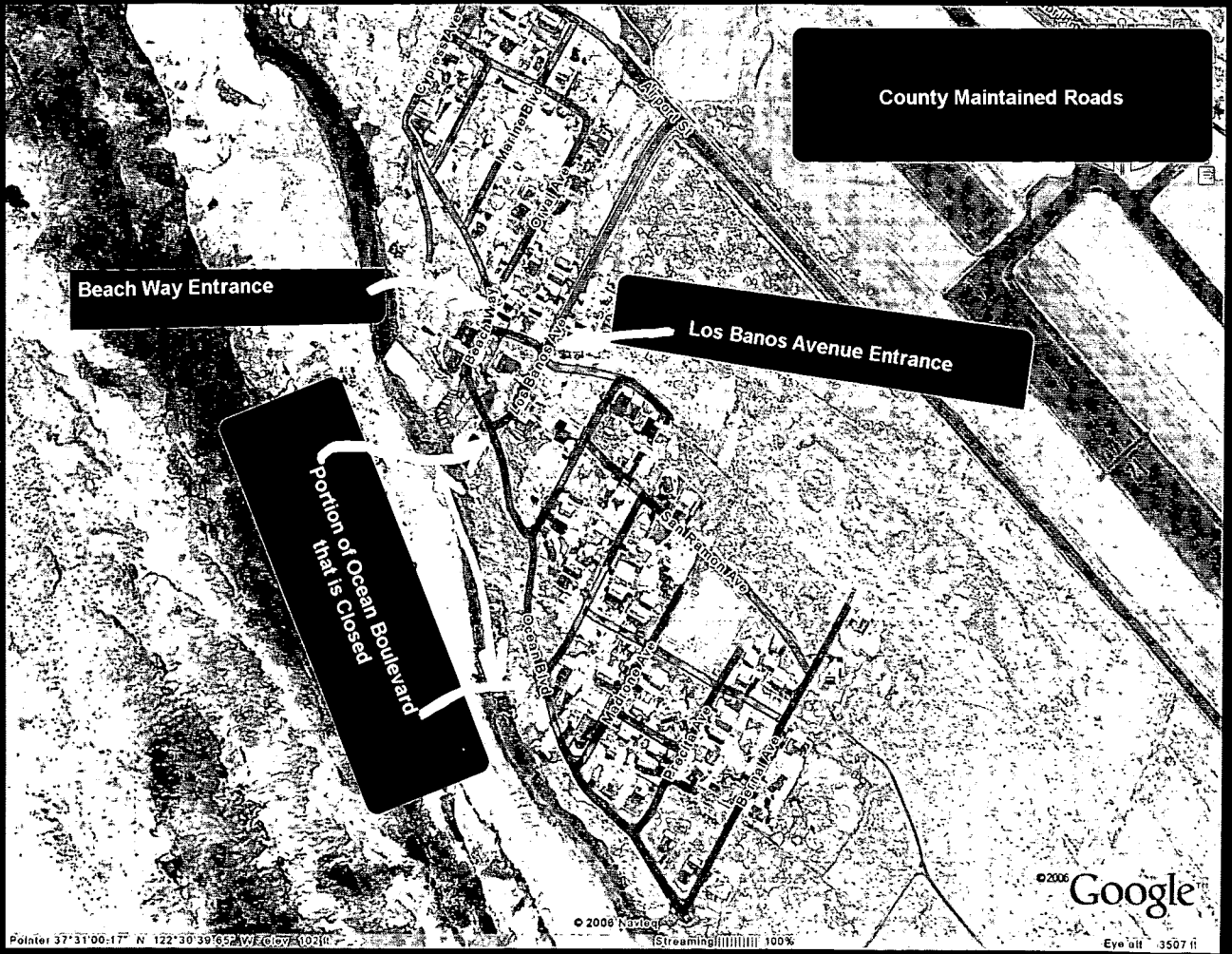



MAP 2

GENERAL LOCATION
OF
ACTIVE LANDSLIDES

| Terms for Members of the Colma Creek Citizens Advisory Committee* | | | |
|---|---|---|---|
| **Member Name and Agency** | **Initial Term Expiration (duration)** | **Subsequent Term Expiration (total appointment duration)** | **Subsequent Term Expiration (total appointment duration)** |
| Helen Fisicaro, Colma | March 31, 2004 (2 yr) | March 31, 2008 (6 yr) | |
| Emanuele Damonte, At Large | March 31, 2004 (2 yr) | March 31, 2008 (6 yr) | |
| David Carmany, Pacifica | March 31, 2004 (2 yr) | | |
| Robert Lorenzini, At Large | March 31, 2005 (3 yr) | March 31, 2009 (7 yr) | |
| Michael Kaiser, San Bruno | March 31, 2005 (3 yr) | March 31, 2009 (7 yr) | |
| Barry Nagel, South San Francisco | March 31, 2009 (4 yr) | | |
| Michael A. Wilson, South San Francisco | March 31, 2005 (3 yr) | | |
| Richard Battaglia, At Large | March 31, 2006 (4 yr) | March 31, 2010 (8 yr) | |
| Gail De Fries, At Large | March 31, 2006 (4 yr) | March 31, 2010 (8 yr) | |
| Carol Klatt, Daly City | March 31, 2006 (4 yr) | March 31, 2010 (8 yr) | |
| Julie Lancelle, Pacifica | March 31, 2008 (4 yr) | | |

*Twelve year term limit for Committee Members


County Maintained Roads
Beach Way Entrance
Los Banos Avenue Entrance
Portion of Ocean Boulevard that is Closed
Marine Blvd
Laurel St
Beach Way
Los Banos Ave
Ocean Blvd
San Francisco Ave
Maple Grove Way
Bernal Ave
©2006 Google
© 2006 Navteq
Streaming 100%
Eye alt 3507 ft

| Historical Data | | | |
|---|---|---|---|
| Street | Limits | Date | ADT |
| Park Avenue | La Grande - Los Banos | 9/19/1995 | 1316 |
| Park Avenue | La Grande - Los Banos | 9/20/1995 | 1229 |
| Los Banos Ave | Airport St- Park Ave | 2/21/1992 | 485 |
| Los Banos Ave | Airport St- Park Ave | 2/22/1992 | 515 |
| Los Banos Ave | Airport St- Park Ave | 2/23/1992 | 548 |
| Los Banos Ave | Airport St- Park Ave | 4/28/1992 | 580 |
| Los Banos Ave | Airport St- Park Ave | 4/29/1992 | 648 |
| Los Banos Ave | Airport St- Park Ave | 9/19/1995 | 783 |
| Los Banos Ave | Airport St- Park Ave | 9/20/1995 | 771 |
| Ocean Blvd | San Lucas-Madrone | 9/19/1995 | 325 |
| Ocean Blvd | San Lucas-Madrone | 9/20/1995 | 304 |
| San Lucas | Del Mar-San Ramon | 9/19/1995 | 1062 |
| San Lucas | Del Mar-San Ramon | 9/20/1995 | 949 |
| San Ramon Ave | La Grande-San Lucas | 9/19/1995 | 1200 |
| San Ramon Ave | La Grande-San Lucas | 9/20/1995 | 1081 |

| Street |
|---|
| Los Banos Ave |
| Ocean Ave |
| San Lucas Ave |
| San Ramon Ave |
| Precita Ave |

| AVERAGE ADT | |
|---|---|
| Los Banos Ave | 618.6 |
| Ocean Blvd | 314.5 |
| San Ramon Ave | 1140.5 |

| CURR |
|---|
| Los Banos |
| Ocean Blvd |
| San Ramon |

Notes*
Counts taken before any closure on Ocean. Cypress open to one way traffic and Orval opened to two way traffic.

Notes*
Ocean Blvd is closi
at San Lucas/Ocea

There is approxima
says that a dwelling
trips/day for this ar
Lucas-Madrone-Pr
Grande prior to the
been distributed an
avenues to access

| Current Data | | |
|---|---|---|
| Limits | Date | ADT |
| Airport-Park | 6/16/06-6/22/06 | 595 |
| San Lucas-Madrone | 6/22/06-6/29/06 | 300 |
| Ocean-Del Mar | 6/22/06-6/29/06 | 416 |
| La Grande-San Lucas | 6/22/06-6/29/06 | 483 |
| Alvarado-Ocean | 6/22/06-6/29/06 | 74 |

| ENT ADT | % Change |
|---|---|
| 595 | -3.8 |
| 300 | -4.6 |
| 483 | -57.7 |

ed at Los Banos/Ocean and La Grande/Ocean. Ocean is also closed
in for NB/SB thru traffic

itely 80 dwellings in this area. The trip generation manual (1988)
l can average 10 trips/day. This equals to approximately 800
ea. I get approximately 15 dwellings( southwest areas-Ocean-San
ecita area) that may have been accessed via Los Banos or La
closing, which equals 150 trips. These extra trips may have now
nong San Ramon and San Lucas, which is expected since other
the southwest area of this community is closed.

# Exhibit 8

Dear Coastal Commission and San Mateo County Supervisors,

I am writing you to provide some information regarding Deer Creek in the light of the San Mateo RCD having recently presented their Wildfire Scoping Project recommendations for El Granada. I have serious concerns that the project recommendations could result in the flooding of homes as well as increased wildfire danger. It identified Deer Creek as a top priority requiring treatment.

**Original Study Parameters**

It was my understanding that the Scoping Project Committee conducted the study taking into consideration ONLY wildfire factors within their modeling. It was explained at community meetings that other environmental factors would only be considered AFTER the recommendations were made and announced to the public. Any resulting projects would include both Environmental Impact Reports and funding availability. I was surprised that including the wider environmental impact would be made only after conclusions and recommendations were announced to the neighborhood.

**Does the Small Probability of Fire Require Stripping the Trees on the Creek?**

Much of the concerns in the El Granada neighborhood were exacerbated by some residents being concerned about Diablo Winds coming from the northeast down from the heavily forested Quarry Park toward the neighborhood. The likelihood of Diablo Winds was calculated by CalFire as occurring only .04 percent of the time. A wildfire would also require an initiating spark as well as an unusually dry environment, so the occurrence is even less likely. Destabilizing the structure of the soil on Deer Creek by stripping out trees seems like an extreme solution to an unlikely occurrence. In fact, the research organization First Street Foundation reported that homes in the flood zone along Deer Creek are at low risk for fire. I cannot imagine that communities across the state will strip their riparian creeks of trees with disregard for the benefits creeks bring to the environment.

**The Protected Riparian Corridor**

The results of the Wildfire Scoping Project study identified Deer Creek as a potential fire area, but the creek has been a protected riparian area by the Fish and Game Department. This also falls within the RCD's commitments to the Coastal Commission to protect waterways and soil as part of their resource conservation mission. For many years, builders and homeowners were told that removal of any vegetation would require a permit. This makes sense due to the creek being a vital wildlife corridor. Neighbors with nighttime cams have video recorded a wide variety of wildlife, including mountain lions and coyotes using the heavily vegetated creek as their hidden pathways. (Vallejo, San Carlos, Ave Balboa)

**Flooding of Homes on the Creek**

Another reason that neighbors look more closely at the consequences of removing trees and foliage is that there are homes in the projected flood zone. Many houses built in the late 80s were not required to have the standard 50-foot setback. Some of these homes— (1) have the edge of the house on top of the edge of the creek, (2) have driveways going over the creek, or (3) are built directly over the creek. In fact, in February 2017 several homes were flooded. It was the neighborhood's understanding that someone upstream had removed foliage that had caused this flooding. Trees and foliage keep the banks of the creek stable, by helping the understory stay moist. When the soils are stable they are able to hold more water, which prevents erosion and flash flooding downstream. Cutting too much vegetation would cause increased drying and crumbling of the banks and gradually fill the creek bed with sediment and debris, making the creek shallower and more blocked, so flooding of nearby homes a more likely occurrence.

**Poisons in the Creek**

When other areas in El Granada have discussed cutting eucalyptus trees, the San Mateo Parks Department and CalFire have explained at local community meetings that herbicides have to be used on stumps to prevent regrowth. Deer Creek flows directly into the sea, so herbicides would drain into the ocean, creating risks to those participating in recreational and fishing activities. Some have tried to diminish the value of the creek by referring to it as only a drainage ditch, which makes it seem like a man-made concrete-lined construction. It is a natural riparian corridor, rich in trees, foliage, consistent fresh running water, and wildlife.

**Preventing Fires**

The additional removal of vegetation from the creek could very well exacerbate the wildfire danger. Most discussions of "restoration" have been defined as only removing vegetation and then allowing whatever grows naturally to reappear. This includes poison oak and scotch broom. These would require additional herbicides. A dry grass fire in a now dried out creek could spread fire very quickly. Also, during the rainier winters, erosion would be likely, such as this past winter, which caused flash floods along the creek. The removal of larger, older trees also diminishes the carbon sequestration during a time of climate change. According to the local fire department, the strongest protector of wildfires on the Coastside is the moisture of the marine layer. Trees on the Coastside are known for dripping atmospheric moisture into the ground. Removing tree canopy diminishes the very moisture and wind blocks that protect us from fast moving fires.

**Property Ownership**

It is my understanding that the property along the upper creek is owned by the GGNRA. They have been in discussions with CalFire representatives on vegetation removal. I am not sure if the Coastal Commission is monitoring any erosion and flooding of homes that might result. The middle area of the creek is owned by private farms, and the lower areas are owned by the many neighbors whose houses border the creek. Some of the homes on Vallejo St. have private roads to their houses and retaining walls they must maintain. If vegetation is stripped from the creek, neighborhood homes could be flooded, foundations undermined, or erosion of embankments and roads could occur, leading to disputes and litigation.

**Alternative Solutions**

A less drastic approach would be to trim ladder fuel vegetation while leaving the trees. Also encouraging home hardening of nearby houses along the creek. This would both address fuel reduction while also preserving the vital root structures of live trees in the lower areas near the homes. These trees slow the flow of winter rains from the upper areas where the creek originates to prevent destructive flash floods. Also encouraging home hardening to property owners would increase safety, while still maintaining creek embankments.

**Summary**

The environmental impact and consequences of treatment on the creek should be considered with the Scoping Project recommendations. It is my hope that the creek can retain the very important trees that preserve the soil moisture and creek bed stability. The trees maintain the integrity of the creek in: preventing erosion and flooding; providing shade for understory health and moisture, offering a healthy wildlife corridor; providing a source of water for wildlife and a stable creek environment for a significant portion of El Granada homes. The California Coastal Commission and County Superintendents should be aware of the various ramifications of cutting trees and clearing foliage along Deer Creek in El Granada.

Thank you for your attention and support,
Jane Praysilver
El Granada
June 2022

**Addendum Photos and Recipients List:**

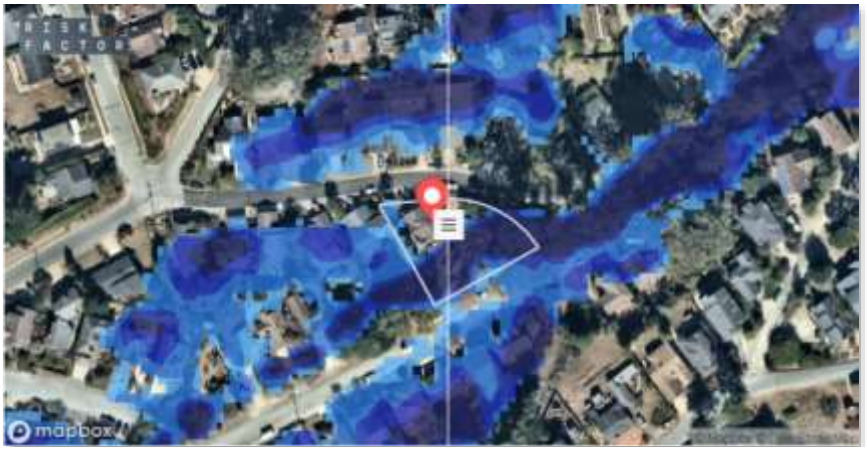
Images below of the El Granada neighborhood created by First Street Foundations National Modeling of flood risk (when an increased water level is reached along Deer Creek).
(https://firststreet.org/research-lab/published-research/flood-model-methodology_overview/)

It is worth noting that First Street Foundation's database shows these homes as having a low risk for fire.

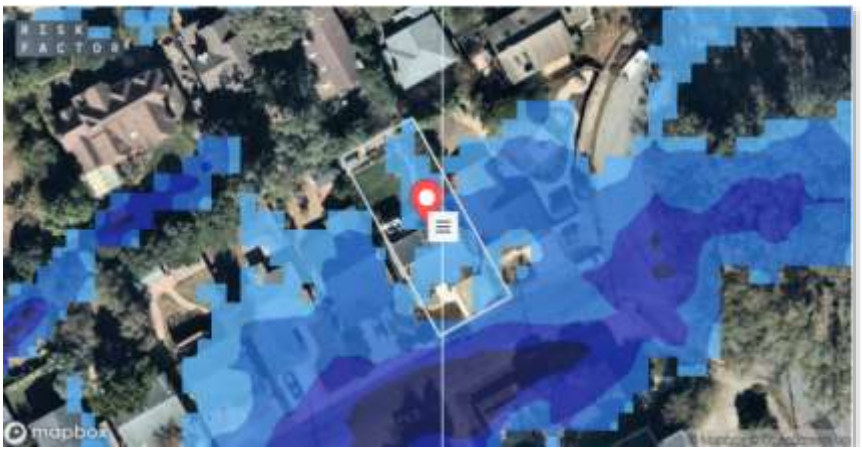
Vallejo, Columbus and San Carlos (From 339 Vallejo)

Upper Vallejo Street (from 606 Vallejo Street)

Columbus and Sonoma (from 315 Columbus street



Ferdinand Street (from 897 Ferdinand)



Columbus Street (from 355 Columbus Street)

**Houses Built Along the Edge with Driveways over the Creek**

**Homes with Deer Creek Running Through Yards**

**Intermixed with Housing In Lowest Elevations El Granada**


**Map Showing Homes with Deer Creek Running Under Homes and Driveways**

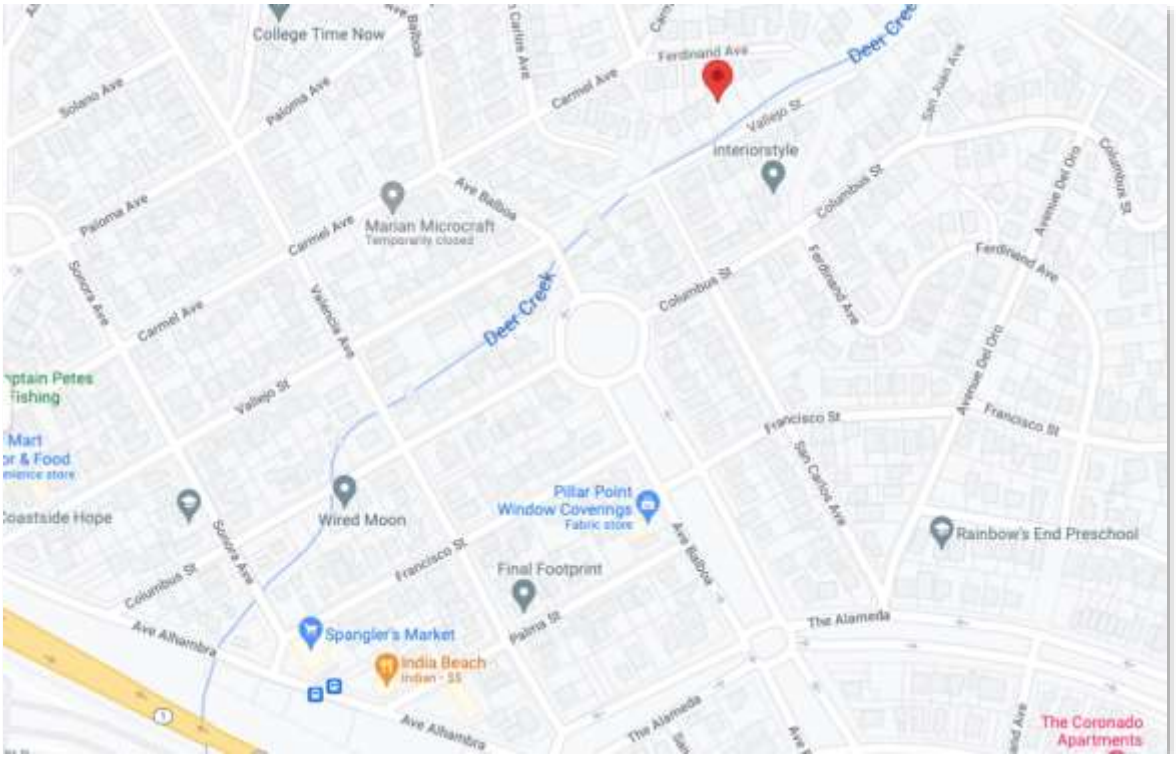


**Photo from <u>Half Moon Bay Review Feb. 23, 2017</u> of Deer Creek flooding onto Vallejo Street**
Neighbors believed someone had made changes to the creek upstream that exacerbated the flooding problem. Prior to the makeshift berm, water was diverted from one home, only to flow into another neighbor's home.

**Recipient's List:**
This letter is being sent to The California Coastal Commission and the San Mateo County Supervisors

Additional agencies are also involved with the input and final decisions on environmental changes to Deer Creek and the neighborhood. Representatives from those agencies are copied on this letter and include:

San Mateo Resource Conservation District (RCD)
Panorama Consulting Firm
Mid Coast Community Council
CalFire Representatives
GGNRA
The San Mateo County Fish and Game Department
San Mateo County Planning Department
GCSD