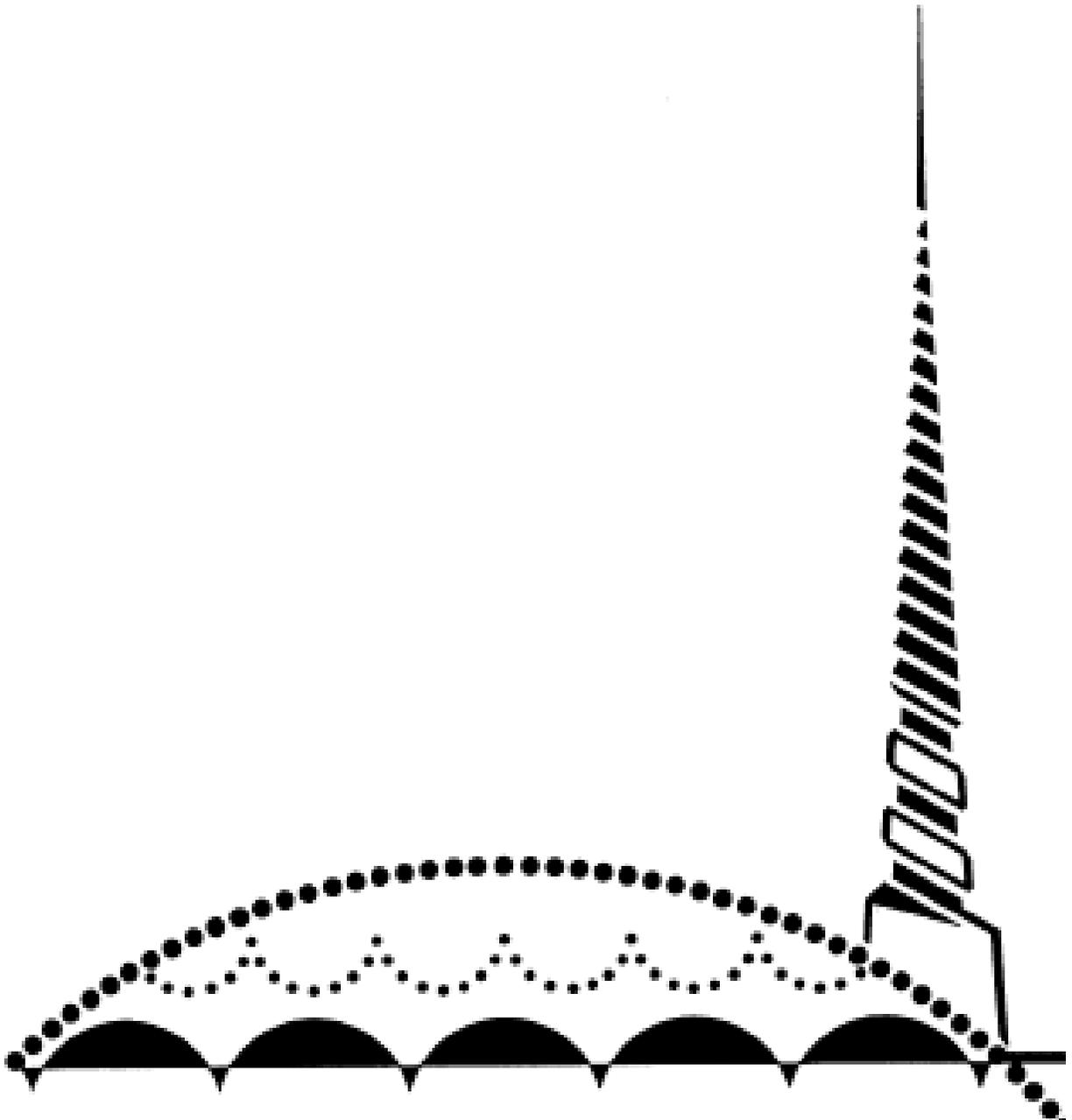


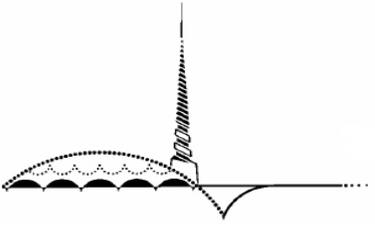
2008-2009 MARIN COUNTY CIVIL GRAND JURY

Southern Marin sewers: Cracks in the system

May 5, 2009



Marin County Civil Grand Jury



SUMMARY

Sewage spilling into San Francisco Bay is a news headline that grabs our attention. In January 2008, the Sewerage Agency of Southern Marin (SASM) released 2.4 million gallons of raw sewage on one day and another 962,000 gallons of partially treated sewage six days later. Since then, governmental orders have been issued, stiff fines imposed and operational failures corrected. But underlying problems persist beyond the headlines, and long-term solutions will require creativity, patience and cooperation.

SASM operates one of six large public sewage treatment facilities in Marin County. There are another eight smaller ones. Each of those plants is publicly owned and operated within its own watershed area. There are at least 10 additional special districts that collect and transport sewage to their treatment plants.

SASM is made up of six independent member districts. Each district owns and maintains a sanitary sewer collection system that transports untreated sanitary waste from homes and businesses to the SASM treatment plant. Five of the six SASM collection districts have their own five-member governing board. The sixth is governed by the City of Mill Valley. Each of the six districts has one seat on the SASM Board of Directors and has its own budget and staff. In addition, SASM itself has its own manager, staff and budget. All of this governance structure is combined to serve a grand total of about 28,000 residents in southern Marin County.

The focus of this report is two-fold:

- how SASM is structured, and what steps might be taken to improve the way it serves an area representing about one-tenth of Marin's population
- the important role home and business owners can play in maintaining sewer lines on their property and the impact they can have on the wet weather flows that played a significant part in the noxious spills of 2008

While this report is confined to SASM, many of the same problems and eventual lessons to be learned apply throughout the county. All property owners need to be more aware and more vigilant in maintaining the sewer lines that run beneath their property. This report might also be an organizational model for Marin's other special districts and treatment facilities to consider.

Most of the operational failures of 2008 have been corrected. However, the amount of rainwater in the sewage collection systems can be a serious problem that still needs to be

minimized. Aging infrastructure and lack of diligent maintenance allow increased amounts of rainwater to flow into our sewage systems. During winter storms, rainwater increases the flow into the SASM wastewater treatment plant by a factor of up to 10 times what it is during dry weather. Much of this increased wet-weather flow (influent) is directly attributable to faulty sewer lines, called private laterals, owned by property owners. The laterals are the responsibility of the property owner.

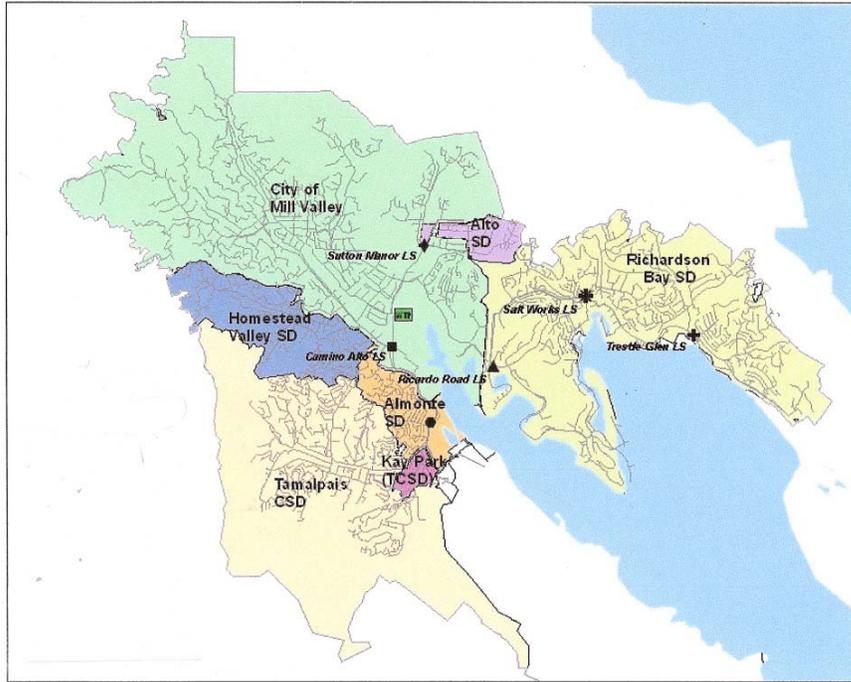
The flow of sewage from its source, through treatment, and finally to discharge into the Bay must be viewed as one seamless process. If the property owner, the collection district or the treatment facility does not effectively manage its portion of the process, then the efficiency and health and safety of the whole system may be compromised. The homeowners must maintain their private laterals and not discharge inappropriate materials. The collection district must help educate the homeowner and properly maintain the sewer mains and pump stations. The treatment facility must provide responsible treatment and coordinate wastewater strategic planning oversight for the region.

The Grand Jury strongly believes that consolidation of SASM and its member districts into one seamless agency is the best organizational structure for this small area with only 28,000 people. It will not be easy, it will take time, and it will require some changes in the long-standing political will. But eventually it should happen because the public expects an efficient system that serves the entire community responsibly at a reasonable cost.

The Grand Jury acknowledges that the politically and territorially entrenched labyrinth of districts that exists today will be difficult to deconstruct and reformat. Change can occur in stages, over time. Our recommendations realize this and focus on steps that can be taken to provide better and more seamless service leading to consolidation. The process may be complicated, arduous and time-consuming; but it should begin now, and in the end will be well worth the struggle for the districts, their employees and the people they serve.

BACKGROUND

The SASM service area is the portion of Marin encompassed by the City of Mill Valley, the unincorporated area on both sides of U.S. 101 surrounding Mill Valley north of Sausalito but south of Corte Madera, and a portion of the Tiburon Peninsula. (See **Figure 1** on the following page.)

Figure 1: SASM and Member District Service Areas

Source: Larry Walker Associates External Audit Report August 31, 2008

The member districts of SASM stem from the post-World War II era when the neighborhoods of southern Marin developed and it became clear that septic tanks were no longer an acceptable option. Neighborhoods that wanted sewer services but did not want to annex to a city or another district could gain these services by forming a separate sanitary sewer district.

In 1972 Congress passed the Clean Water Act mandating expensive secondary treatment of sewage, not just primary treatment as had been the accepted standard. However, it was not until the 1980s that federal money became sufficiently available to help finance the expensive sewage treatment plants that could comply with the new law. At that time it became economically imperative to have neighboring sewage collection districts form joint ventures to finance, build and operate shared wastewater treatment facilities. Thus SASM was formed in 1979 under a joint powers agreement by its six collection entity owners. Today, SASM has a staff of 12 people who are paid by the City of Mill Valley.

The board of SASM is comprised of a representative from each of the six collection agencies with equal representation as shown in **Figure 2**. In this service area, slightly more than half the people are in the City of Mill Valley where sewage collection is the responsibility of the city's Department of Public Works. The remainder of the SASM service area is managed by five other collection entities. As shown in **Figure 3**, the City of Mill Valley and the Richardson Bay Sanitary District together account for approximately 83 percent of the influent and operations of the SASM plant.

Figure 2: SASM Board Representation

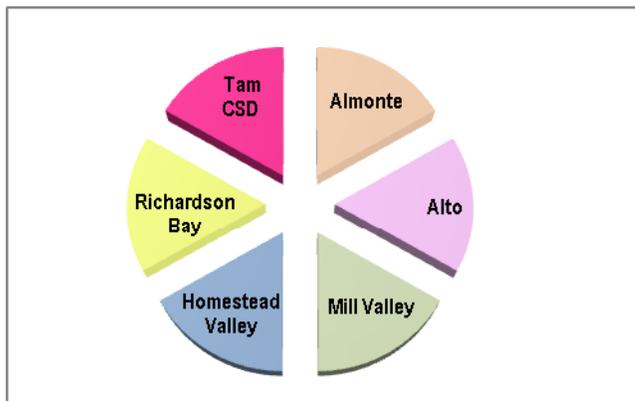
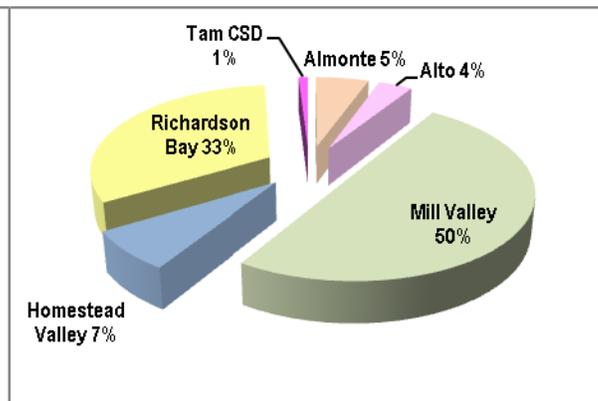


Figure 3: SASM Influent by District



In 2004, the Grand Jury issued a report, *Southern Marin Sewers—So Many Districts, So Few Users*, that identified concerns with SASM and its member districts.

Each California county has a seven-member Local Agency Formation Commission (LAFCO). Some of its duties include assistance to other governmental agencies in changing or consolidating local government organizations and boundaries. If the districts don't merge themselves, it could eventually be forced upon them. The Assembly is considering a bill by Marin's Jared Huffman that would allow LAFCO to consolidate small sewer agencies in the Bay Area, including Marin, under certain conditions.

Shortly after the 2004 Grand Jury report, the Marin LAFCO retained a consulting firm and financed a detailed study of the SASM agencies. The study by PB Consult Inc., dated July 29, 2005, is titled *Southern Marin County Sewer Service Alternatives Study Report* and is available on the Marin LAFCO website (<http://LAFCO.Marin.org>). This report identified short-term and long-term steps that could be taken to capture projected annual cost savings of between 8 percent and 12 percent which, at that time, would have amounted to well over \$1 million a year.

Few of the report recommendations have been enacted by the SASM agencies.

Spills of 2008 and penalties

This report was prompted in part by SASM's spills of more than 3 million gallons of sewage during six days in January 2008.

The spills were caused by operational errors precipitated by prolonged rain and significant extra volumes of rainwater coursing through the wastewater treatment system. The United States Environmental Protection Agency (EPA) and the California Regional Water Quality Control Board issued orders against SASM and its six member districts.

EPA orders required sewer cleaning, inspection of pipes, measurement of wet-weather flows, development of plans to manage excess flow and implementation of long-term sewer pipe repair and replacements. The final settlement resolution of \$1.6 million consisted of an \$800,000 fine payable to the state and \$800,000 allocated to two local environmental projects. These projects are the Richardson Bay Aramburu Island Project (habitat restoration and enhancement, \$200,000) and a private lateral pipeline replacement program (\$600,000) to be divided between grants and low-interest loans to assist homeowners in repairing their private lateral pipelines.

METHODOLOGY

The current Grand Jury was reminded of the SASM spill issues by a citizen complaint and began the inquiry with a review of the 2004 Grand Jury report. Over the course of several months we conducted interviews with local officials, board members, employees, and residents from within the service area. Documents including the joint powers agreement for SASM and financial statements were reviewed. Published reports and proceedings from the California Regional Water Quality Control Board and the EPA were studied. The 2005 consultant's report commissioned by the Marin LAFCO was examined.

Additional information on best practices was acquired from the North Bay Watershed Association and the Association of Bay Area Governments. Finally, jurors donned hard hats and visited the SASM wastewater treatment facility and a treatment facility operated by another district.

DISCUSSION

Many boards, few people, limited efficiencies

The six member districts of SASM each have an elected board of five members. These districts consist of Almonte Sanitary District, Alto Sanitary District, the City of Mill Valley, Homestead Valley Sanitary District, Richardson Bay Sanitary District and Tamalpais Community Services District (Kay Park service area only). The City of Mill Valley and the five separate districts, regardless of population, have equal representation on the SASM six-member board; each pays SASM costs proportional to the waste treatment services received by its residents. The Tamalpais Community Services District has only one small neighborhood, Kay Park, which contributes less than 1 percent of the SASM inflow. The balance of the Tamalpais Community Services District collected sewage is sent to the separate Sausalito-Marín Sanitary District.

Six organizations collecting sewage from only 28,000 people seems top-heavy. Thirty board members set policy that about 20 staff employees are expected to carry out. These board members, on the whole, are conscientious, public-minded citizens who serve their communities by developing and implementing wastewater policy. Their boards each meet at least monthly. A schedule of their meetings appears in **Appendix A**. Rarely do members of the public attend. Often, elections for these board positions are uncontested. In one case, three members of one board have each served for at least 30 years.

SASM AREA COLLECTION OPERATIONS AT A GLANCE

DISTRICT	POPULATION	SQUARE MILES SERVED	EQUIVALENT DOMICILE UNITS	EMPLOYEES	BOARD MEMBERS	MILES OF PIPE
ALMONTE	1,478	0.4	789	0.2	5	6
ALTO	939	0.3	508	0.2	5	6
MILL VALLEY	13,600	4.8	7140	2.5	5**	59
HOMESTEAD	2,354	0.7	1064	0.3	5	11
RICHARDSON BAY	9,494	3.1	4664	4	5	40
TAMALPAIS CSD	*	*	140	*	5	*

* Total service area not applicable to SASM

** City Council Members of Mill Valley

The Grand Jury in 2004 identified the peculiar situation in southern Marin of having an unreasonable number of very small political entities attempting to provide municipal sewer service to relatively few people. That report recommended steps to identify opportunities for integration, collaboration, and cooperation. Following the report there were a few meetings among the parties, but they have not resulted in substantial integration.

To their credit, the SASM boards have worked diligently to preserve and ensure the public health while keeping sewage rates low. Maintaining aging systems is a juggling act between oversight of operational and financial planning while simultaneously reacting to and quickly resolving day-to-day emergencies. Regulatory requirements and technological advances continue to evolve, placing more stress on the districts and their limited staffs while necessitating greater capital investment and maintenance of the infrastructure.

There is some sharing and cooperation. All of the districts use the same firm for maintenance and clearing pipe obstructions. Much of the long-term construction planning for all the districts involves advice from the same local engineering consulting firm. And most of the districts obtain insurance coverage in conjunction with SASM. However, there remains duplication of efforts and associated costs in a variety of areas including audits and routine filings with regulatory agencies.

In some instances, the boards have acted informally to increase efficiency by sharing information, services and, occasionally, personnel. Two districts share one part-time manager. All districts agreed to have SASM retain consultants to prepare joint responses to the Regional Water Quality Control Board and the EPA for the spills of 2008.

Consolidation into one agency could build on this type of partnering by merging services. A single agency would provide uniform levels of health and environmental protection with common reporting and system evaluation methods. There could be a single, 24-hour

emergency hotline and after-hours overflow regulatory reporting. Centralized contracts for engineering, construction, and emergency response can lead to important cost savings.

Combined services may make it more efficient and effective to staff some activities internally that are currently provided by outside contractors. For example, SASM's experts could overhaul and maintain pumps currently located in member districts. Eventually SASM could provide computerized maintenance tracking and geographical information system (GIS) linkage, which require sophisticated technology. A single, central agency would mean uniform standards, system-wide improvements of infrastructure and long-term financial and capital planning aimed at lower costs and greater efficiency.

A tour of the underground

The drainage conveyance world is divided into two separate and autonomous systems. The first system manages storm water runoff and leads that water, untreated, directly into the Bay. This system consists of culverts and storm drains often seen along the streets. Many times storm drains display a symbol of a fish with a warning that the contents flow directly into the Bay and people should refrain from adulterating the flow. The other drainage conveyance system is the sanitary sewer system. This system transports wastewater from residences and businesses to a wastewater treatment plant for treatment before discharge into the Bay.

Outside of Marin, sanitary sewer systems are often the responsibility and province of one entity, a department in a large city or special district, with tens of thousands or even hundreds of thousands of customers that may encompass a whole metropolitan area or most of a county. But in Marin, for historical and geographical reasons, we have a half dozen large wastewater treatment facilities, such as SASM, usually serving separate watershed areas. Each of these wastewater operations is physically separate from the others with few interconnections.

Wet weather inflow and infiltration

Ideally, storm water should be sent to the storm water drainage system and not to the sanitary sewage system. Inflow is the direct introduction of storm water into a sanitary sewer system from downspouts, outdoor drains, yards and parking lots. Another common problem is infiltration, which is the indirect flow of storm water into a sanitary sewer system through the soil at open joints and cracks. In the wet season the soil can become saturated and, just as hillsides may tend to give way from the pressure of the water moving within the soil, the same pressure is exerted against the sewer pipe. Cracks and openings within that pipe provide entrances for storm water to drain into the pipe. If there is a series of strong storms of long duration and only brief intervals between storms, then infiltration may become substantial. Typically, during heavy winter storms, the flow into the SASM wastewater treatment plant can be up to 10 times what it is during dry weather.

The noxious wastewater collected and conveyed from residences and businesses must consistently, reliably and cost effectively be transformed into benign substances which can be discharged safely into our environmentally sensitive coastal waters. (See **Appendix B** for wastewater collection and treatment overview.) Public health and water pollution control are of prime importance.

Homeowners' role for private lateral lines

Sewer laterals are the pipes that connect the plumbing system of a home or business to the sanitary sewer. Property owners are responsible for their maintenance, repair and replacement. Laterals should be cleaned and inspected regularly as a preventative measure. Many homeowners appear to be unaware of their responsibility to maintain their sewer pipes. Many erroneously believe that household responsibility stops once they flush or see the water go down the drain. In fact, property owners also have the responsibility of ensuring that only wastewater, and not storm water, flows through their lateral pipes. All too often storm water runoff enters the system on private property either from illegal storm water connections, such as drain spouts, or from leaks and cracks in the pipes caused by root growth or earth movement.

Most knowledgeable sources believe that the total length of pipelines on private property in a sewage collection system is equal to or greater than the total length of the public portion of sewer mains in the system. If property owners collectively improved their half of the overall system, the amount of wet-weather sewage entering the wastewater treatment plant would be significantly reduced and the threat of spills into the Bay would be minimized.

Inspection of these private lateral pipelines can be done using a smoke test that readily indicates areas in the system where leakage may be occurring. Another option for lateral evaluation is a video procedure that introduces small video devices into sewer pipes to give an inside view of the condition of the pipe. This video procedure is like a colonoscopy for sewer pipes and it serves an analogous purpose of addressing problems before they become emergencies. Small deficiencies can be remedied by replacement of a section of pipe or the insertion of a plastic sleeve that when inflated provides a new durable lining to an existing pipe.

Repair of home laterals can be expensive. Sausalito-Marín City Sanitation District, which is not a part of SASM, has attacked the expense issue with a grant policy to aid homeowners in repair of their lateral pipelines. That district is also considering a 45 percent rate increase for its customers to help pay for the repairs.

The settlement agreement of SASM with the Regional Water Quality Control Board, as an outgrowth of the 2008 spills, requires SASM to embark on a two-pronged program to assist with lateral improvements. Under the settlement, \$200,000 in grants would assist low-income homeowners and \$400,000 would be allocated for low-interest homeowner loans. Additionally, up to \$150 per lateral will be provided as a grant to provide incentive for video inspection of laterals. An integrated agency needs to consider some sort of

financial assistance in order to assist homeowners in properly maintaining the laterals. Such a program may require higher rates.

One self-help technique for homeowners is prevention and it costs nothing extra. The Association of Bay Area Governments at its specialized website (www.sewersmart.org) advises against:

- Pouring grease, fats and oils from cooking down the drain
- Using the sewer to dispose of food scraps
- Using the toilet as a wastebasket for garbage or chemicals
- Planting trees with shallow, spreading root systems near sewer lateral pipelines

Getting it together

An informed public will be better able to understand the role individual home and business owners can play in reducing the likelihood of accidental spills brought on, in part, by poorly maintained sewer lines on their property. This Grand Jury believes that a consolidated SASM will be better equipped to develop a comprehensive program to increase public awareness of wastewater responsibilities focusing on inspection, maintenance and repair of private laterals. The consolidation can occur gradually, but planning should begin now.

In a centralized agency, systems and programs that are now scattered throughout the six member districts can be standardized and improved to ensure that regulations dictated by state and federal laws are consistently met.

Integration of district staffs with SASM will provide better and more efficient service, and more career opportunities. This would include transferring the budget and staff currently employed by the City of Mill Valley to the independent agency. One Mill Valley official has told the Grand Jury that such a move would be a positive step.

FINDINGS

The Grand Jury finds that:

F1. The Sewerage Agency of Southern Marin (SASM) operates one of six large sewage treatment facilities in Marin County.

F2. The six member districts that comprise SASM serve about 28,000 people in southern Marin, have 30 board members and approximately eight employees. SASM itself has a staff of 12, paid by the City of Mill Valley.

F3. Changing the structure of SASM and its member districts will be difficult, but can be done over time.

F4. During one week in 2008, SASM accidentally spilled more than 3 million gallons of sewage into San Francisco Bay.

- F5.** Wastewater collection is a shared responsibility between homeowners, businesses and the sanitary sewage collection districts.
- F6.** The public is often unaware of its responsibility to maintain private lateral pipelines.
- F7.** Wet-weather flow to the SASM treatment facility is up to 10 times or more than dry-weather flow.
- F8.** Aging infrastructure and lack of diligent maintenance require greater capital investment and allow increased amounts of rainwater to flow into our sewage systems.
- F9.** The member districts have historically kept sewage rates low, even with aging infrastructure.
- F10.** The public expects an efficient system that serves the entire community responsibly at a reasonable cost. Under the current structure, there is unnecessary duplication of efforts and associated costs.
- F11.** The public rarely attends board meetings of these districts and elections for board positions are usually uncontested.

RECOMMENDATIONS

The Grand Jury recommends that:

- R1.** The Sewerage Agency of Southern Marin (SASM) and its six member districts consolidate into one central agency with a single budget and staff.
- R2.** SASM and its member districts begin the planning for consolidation now.
- R3.** In the process of consolidating, SASM provide shared services and staff to itself and its members and centralize contracts for engineering, construction bids and emergency response to increase efficiency and decrease costs.
- R4.** SASM and its member districts encourage active citizen participation in the decision making process.
- R5.** SASM and its member districts develop a program for educating the public on inspection, maintenance and repair of private lateral pipelines in order to help reduce wet-weather flows.

REQUEST FOR RESPONSES

Pursuant to Penal Code Section 933.05, the Grand Jury requests responses from the following governing bodies to all findings and recommendations:

- Sewerage Agency of Southern Marin
- Almonte Sanitary District
- Alto Sanitary District
- City of Mill Valley
- Homestead Valley Sanitary District
- Richardson Bay Sanitary District
- Tamalpais Community Services District

The governing bodies indicated above should be aware that the comment or response of the governing body must be conducted in accordance with Penal Code Section 933 (c) and subject to the notice, agenda and open meeting requirements of the Ralph M. Brown Act.

California Penal Code Section 933 (c) states that "...the governing body of the public agency shall comment to the presiding judge on the findings and recommendations pertaining to matters under the control of the governing body." Further, the Ralph M. Brown Act requires that any action of a public entity governing board occur only at a noticed and agendized public meeting.

The Grand Jury invites responses to all findings of fact and recommendations from:

- Marin Local Agency Formation Commission

BIBLIOGRAPHY

Association of Bay Area Governments, www.abag.ca.gov and www.sewersmart.org

California Regional Water Quality Control Board
www.waterboards.ca.gov/sanfranciscobay

California Regional Water Quality Control Board San Francisco Bay Region, Order NO. R9-2009-0026, Assessing Administrative Civil Liability for Violations of Order No. R2-2007-0056 (NPDES No. CA0037711) To SEWERAGE AGENCY OF SOUTHERN MARIN.

Clean Water Act (Water Pollution Control Amendments of 1972, P.L. 92—500, 33 U.S.C. sec 1251 *et seq.*).

Draft Sewage Spill Reduction Plan, on behalf of Almonte Sanitary District, Alto Sanitary District, City of Mill Valley, Homestead Valley Sanitary District, Richardson Bay Sanitary District, Sewerage Agency of Southern Marin, and Tamalpais Community Services District In Response to Docket No.: CWA-309(a)-08-030, (RMC Water and Environment, October 2008).

Environmental Protection Agency, www.epa.gov

IN THE MATTER OF SEWERAGE AGENCY OF SOUTHERN MARIN
WASTEWATER TREATMENT PLANT, COMPLAINT NO. R-2-2008-0070 FOR
ADMINISTRATIVE CIVIL LIABILITY, California Regional Water Quality Control
Board, San Francisco Bay Region, August 11, 2008.

IN THE MATTER OF: Sewerage Agency of Southern Marin, Almonte Sanitary District, Alto Sanitary District, City of Mill Valley, Homestead Valley Sanitary District, Richardson Bay Sanitary District, and Tamalpais Community Services District, United States Environmental Protection Agency, Region IX, Docket No. CWA-309(a)-08-30, FINDINGS OF VIOLATION AND AMENDED ORDER FOR COMPLIANCE, Proceeding under Sections 308(a) and 309(a) of the Clean Water Act, 33 U.S.C. secs. 1318 and 1319(a), September 2, 2008.

Marin Local Agency Formation Commission, <http://LAFCO.Marin.org>

North Bay Watershed Association, www.nbwatershed.org

PB Consult Inc., *Southern Marin County Sewer Service Alternatives Study Report*, (Marin Local Agency Formation Commission, July 29, 2005).

Sewerage Agency of Southern Marin External Audit Report, For Compliance with: Cleanup and Abatement Order No. R2-2008-0010 Issued by the San Francisco Bay Region, California Regional Water Quality Control Board, (Larry Walker Associates in association with Carollo Engineers, Larson Consulting, Stubban Systems Engineering, Shelli St. Clair, and Bartle Wells Associates, August 31, 2008).

Sewerage Agency of Southern Marin Restated Joint Exercise of Powers Agreement, Restated as of January 27, 2000.

Southern Marin Sewers—So Many Districts, So Few Users, 2003-2004 Marin County Civil Grand Jury, April 27, 2004.

Reports issued by the Civil Grand Jury do not identify individuals interviewed. Penal Code Section 929 requires that reports of the Grand Jury not contain the name of any person, or facts leading to the identity of any person who provides information to the Civil Grand Jury. The California State Legislature has stated that it intends the provisions of Penal Code Section 929 prohibiting disclosure of witness identities to encourage full candor in testimony in Civil Grand Jury investigations by protecting the privacy and confidentiality of those who participate in any Civil Grand Jury investigation.

APPENDIX A: SASM and district member contact information

DISTRICT	MANAGER	PHONE	BOARD MEETING	MEETING PLACE
SASM	Steve Danehy	388-2402	3 rd Thursday 7:00PM	450 Sycamore, Mill Valley
ALMONTE	Bonner Beuhler	388-8775	4 th Monday 7:30 PM	450 Sycamore, Mill Valley
ALTO	Tom Roberts	388-3696	4 th Wednesday 7:30 PM	450 Sycamore, Mill Valley
HOMESTEAD	Tom Roberts	388-4796	4 th Tuesday 7:30 PM	315 Montford, Mill Valley
MILL VALLEY	Wayne Bush**	388-4033	1st & 3 Mondays 7:00 PM*	26 Corte Madera, Mill Valley
RICHARDSON BAY	Johnny Tucker	388-1345	3 rd Tuesday 7:00 PM	500 Tiburon Blvd, Tiburon
TAMALPAIS CSD	Jon Elam	388-6393	2 nd Wednesday 7:00PM	203 Marin Ave, Mill Valley

* Mill Valley City Council Meetings

** Director of Public Works City of Mill Valley

APPENDIX B: Wastewater collection and treatment overview

I. Wastewater conveyance

Part 1: Gravity systems and force mains

Most sanitary sewer systems are largely gravity-fed, which means that everything runs downhill with each set of pipes buried deeper. In flat areas where wastewater is transported long distances or where it needs to go uphill, pumps may be necessary along the way with wastewater transported through force mains.

Part 2: Pipes: The basics

For decades, the standard for conveying wastewater was sections of clay pipes, commonly in five-foot segments and available in varying diameters. These segments could be fashioned into a pipeline because each segment had one flared end (bell) into which the plain end (spigot) of the succeeding segment could fit. The connection between segments placed together could be rendered more watertight by hammering into the crevices between the two pipe segments a material called oakum made of loose hemp

or jute fiber, sometimes treated with tar, creosote, or asphalt. The hammered oakum was then covered with a layer of mortar. The resulting pipes are relatively inexpensive, simple, available, rustproof, and, in theory at least, should last indefinitely. Clay or terra cotta pipes had their own limitations that are at the heart of much of the augmented volumes of wastewater delivered to wastewater treatment plants in wet weather. Clay pipes are heavy, inflexible and can crack or fracture. Over time, the connections between pipe segments shift because of the relative weight of the pipe as compared to the soil, or because of ground shift during earthquakes or soil movement during wet weather. Pipes also can shift from pressure of heavy vehicles on the roadway above or pressure from nearby roots. This movement of inflexible pipe segments may crack the mortar where the pipes are joined. These fissures are an open invitation for roots to grow in search of moisture and this root intrusion accelerates the decline of the integrity of the clay pipeline.

Modern sewer pipe construction uses 20-foot sections of flexible and lighter weight plastic pipes that can be securely joined using modern techniques to give a tighter, seemingly more permanent union between pieces of pipe.

A common modern technique for efficient replacement of old clay pipes without opening up a trench the entire length of the old pipeline is called “pipe bursting.” With this practice the old clay pipe is used as a pathway through which a device is pulled that expands in size and bursts the walls of the old pipe while dragging sections of new plastic pipe. For the most part, the only holes dug are at those points where private lateral lines from customers must be connected to the new replacement sewer main or periodically along the path of the old pipe to insert the bursting device and insert new lengths of new pipe.

II. Wastewater treatment

Part 1: Treatment plant process

Without delving unduly into the worlds of civil engineering, chemical engineering and biology, current wastewater treatment plant processes start with flow monitoring, bar screens and grit removal tank. The bar screens separate out large solids and debris while the grit tank separates out sand and stones. The screened materials are dewatered and then deposited in a sanitary landfill. The water is then pumped into a series of settling tanks (clarifiers) where solids settle to the bottom and oils and greases are skimmed from the top. The remaining suspended solids and the dissolved organics in the wastewater are then aerated in bio-towers where oxygen maintains the presence of bacteria. The bacteria incorporate these substances into their bacterial substrate and form new suspended solids. These suspended solids settle to the bottom of the tanks called secondary clarifiers. The suspended solids which migrate to the clarifier bottoms are removed and pumped to the anaerobic digesters, where the contents are heated and mixed with bacteria which then consume the organic matter and grow more bacteria. The sludge or bio-solids from these digesters are then dewatered and deposited in a sanitary landfill or used as nutrients on fields to grow non-food crops. The clarified wastewater is then disinfected

with sodium hypochlorite which kills pathogens. The sodium hypochlorite must be removed with a reducing agent like sodium bisulfite before the wastewater is discharged into the Bay. Wastewater treatment plants occasionally have reservoirs or ponds where partially treated wastewater can be diverted during rainfall, if flows through the plant exceed maximum treatment capacity. This diverted wastewater can then be redirected to the plant when treatment flow rates return to normal after the storm ceases.

Part 2: Required permits: the ticket of admission for entrance into the navigable waters of the United States

The Clean Water Act is the primary federal law governing water pollution (i.e., Federal Water Pollution Control Amendments of 1972, P.L. 92-500, 33 U.S.C. sec. 1251 *et seq.*). The Act introduced a permit system for regulating point sources of pollution, including municipal government facilities. It was violation of the terms of the permit held by SASM (i.e., Permit CA0037711) during the spills of January 2008 that prompted the California Regional Water Control Board and EPA to issue the proposed fine and orders for corrective action.

An EPA news release from its regional office on April 10, 2008 about SASM and its members stated:

The EPA orders require the sewer systems to employ a number of strategies to reduce sewage spills. In the short term, the systems are required to implement aggressive sewer cleaning programs aimed at the most problematic pipes. The systems are also required to inspect their sewer pipes and measure wet weather flows that are passed on to the sewage treatment plants. Finally, the systems must develop plans to manage excess flows and implement long term programs to repair and replace deteriorated sewer pipes.

The EPA encourages the cities and sewer districts to work together to finance, operate and renew their wastewater infrastructure.