

Water System Infrastructure

Report of the 2000-2001 San Francisco Civil Grand Jury

SUMMARY

The Civil Grand Jury (CGJ) reviewed the San Francisco Public Utilities Commission (PUC) water delivery system, from Hetch Hetchy through the South Bay and Peninsula to the City Distribution Division. All PUC staff we met with were professional, knowledgeable, and dedicated.

Over the course of our investigation, the CGJ noted that, while the system continues to function, there are significant infrastructure issues that require repair and upgrade. These issues include the need for increased infrastructure redundancy (to ensure continued water delivery in the event of significant damage), upgrade to current design standards, and increased attention to deferred maintenance.

The PUC has begun the task of identifying and prioritizing these infrastructure issues. Given the possibility of a significant earthquake, and given the amount of time it will take to resolve infrastructure needs, these plans need to be finalized, cost estimates prepared, and a formal proposal presented to all water system users clearly identifying options, recommended actions, and proposed funding mechanisms.

The CGJ recommends that:

- The PUC develop an water system infrastructure repair and upgrade plan, including estimated costs and proposed funding strategy.
- City reservoir dam face inundation maps be revised and distributed, and other actions taken as necessary, in accordance with California Government Code 8589.5.
- Emergency Operations Plan, Annex A, Page 17 be updated to include evacuation and control plans following receipt of reservoir inundation maps from the PUC, and that other actions be taken as specified in Government Code 8589.5.
- The PUC notify persons living near large City water tanks of the possibility of tank overturn and subsequent flooding in the event of an earthquake.
- Cessation of the use of the City reservoirs for recreational purposes due to the potential for contamination and other potential adverse effects. An alternate use for the reservoir roofs would be to install solar panels.
- The PUC review the Phase 2 Reliability Program Study to verify that earthquake fault systems have been properly evaluated.

BACKGROUND

The 1999-2000 CGJ issued a brief PUC water and power report, suggesting that the 2000-2001 CGJ consider a further review. The 2000-2001 CGJ followed up on this recommendation. The CGJ inspected the four major portions of the San Francisco water system infrastructure:

- Hetch Hetchy Water and Power
- Water Supply and Treatment - South Bay Division
- Water Supply and Treatment - Peninsula Division
- City Distribution Division

For each of these, we inspected the associated dams (see Attachment 1) and major components such as pump stations, treatment plants, water mains and watersheds. We reviewed general operations, emergency plans, and infrastructure conditions. We discussed major projects with the PUC staff, including chloramination, pipeline repairs, reservoir maintenance, treatment plant upgrades, and watershed management practices.

We reviewed several documents, including:

- PUC Facilities Vulnerability Study, Phase I: Facilities Assessment Final Report (January 1996).
- PUC Facilities Reliability Program, Phase II: Regional System Overview (January 2000).
- Ten-Year Capital Improvement Program and Long Range Financial Plan;
- Water Supply Master Plan.
- Agreement between San Francisco PUC and Santa Clara Valley Water District, "Long Term Operation and Maintenance of the Intertie," (November 1999).
- Draft Peninsula and Alameda Watershed Management Plans.

We also attended meetings of the PUC and the Public Utilities Infrastructure Task Force.

There currently are a number of legislative initiatives regarding a municipal utility district, power contracts, and water system privatization. Any rapid development in these areas could potentially invalidate months of review. We determined that we would not review the proposed municipal utility district, power contracts, or the recently formed San Francisco Water Alliance.

RESULTS

General System Conditions and Plans for Upgrade

It has been widely reported that, for many years, the City has made use of money from the Hetch Hetchy Water and Power system to help fund the General Fund, while increasing water and sewer service rates to finance capital improvements. Proposition H, passed in 1998, was in large part a response to this arrangement. Proposition H froze water and sewage rates, but allowed rate increases of up to 18 percent through 2006 in order to pay debt service for infrastructure programs.

To repair and/or upgrade all PUC facilities, current cost estimates range as high as \$8 billion. The PUC has begun to put in place the long-range plans for needed repairs. The Phase 1 and 2 studies, along with the 10-Year Capital Improvement Program, identify needed improvements and prioritize them.

It is not clear yet how the City or the PUC intends to fund all necessary work. For instance, the City Distribution System is responsible for the 13 reservoirs, 25 tanks, 18 pump stations, and approximately 1,240 miles of water mains. During our inspections of the various reservoirs and pump stations, we observed a substantial amount of needed maintenance, including:

- Degraded concrete and exposed rebar.
- Visible holes in reservoir roofs.
- Visible cracks in roofs, and visible light through expansion joints.

- Fences, roads, and drainage systems in poor repair.

In a presentation by PUC staff to the CGJ, the staff indicated that many reservoirs have substantial infrastructure degradation. They also informed us that 40% of the reservoirs are over 100 years old, with three built shortly after the Civil War. Capital improvements have been deferred over the years.

A major earthquake would jeopardize the City's emergency water supply. The PUC currently maintains four days of emergency storage. Staff postulated that, in a moderate earthquake (6 to 6.5 magnitude on the San Andreas Fault, or 6.5 to 7 on the Hayward fault) as many as six reservoir roof failures could occur. The proximity of the reservoirs to the San Andreas fault line dictate that the reliability of emergency capacity be increased. A portion of the emergency capacity might be supplied by the recent agreement between the PUC and the Santa Clara Valley Water District to establish a pipeline between the two water systems.

Recently, more of the Hetch Hetchy earnings have been returned to the PUC in order to fund needed repairs. We congratulate the City for the emphasis on infrastructure in the 2001-2002 budget. However, as is evidenced by the PUC studies, much more needs to be achieved in this area.

Dams

In October 1998, the Federal Emergency Management Agency issued the "Federal Guidelines for Dam Safety." The Guidelines were published to encourage thorough and consistent emergency action planning. The Guidelines recommended the formulation of an Emergency Action Plan (EAP) for each dam. In view of the ages of several of the City's dams, the CGJ proceeded to determine if the 1998 Federal Guidelines were being followed by the PUC.

The CGJ reviewed the current EAPs for the Hetch Hetchy and Water Supply and Treatment dams (Attachment 1). Our review indicated that all dams, with the exception of Stone Dam, have EAPs that appear to follow the Federal Guidelines. Several of the EAPs have been updated as recently as April 2000.

The PUC dams receive primary regulatory oversight by the California Division of Safety of Dams (DSOD). Moccasin is the only PUC dam with additional oversight from the Federal Energy Regulatory Commission.

During our inspections of the dams, maintenance appeared to be adequate. Vegetation control measures were in place and watershed plans were under active implementation. Staff appeared knowledgeable about the various aspects of their operations.

We obtained and reviewed correspondence between the PUC and DSOD. Regulatory oversight by DSOD of the PUC facilities appears to be proactive and conservative.

Our review of Phase 2 of the Reliability Study brought forth two issues. Regarding PUC infrastructure, it appeared that the Foothills faults had not been considered; these are low-activity faults, with recurrence approximately every 10,000 years. With respect to Sierra dams, the Sierra Nevada frontal fault system was not discussed; this fault would lie to the east of the dams.

City Reservoirs - Inundation Maps

There are 12 active reservoirs, one inactive reservoir (Francisco) and one unfinished reservoir (Balboa) within San Francisco city limits (see Attachment 1). Four reservoirs have above-ground sides that are considered to be dam faces: Sunset North and South, Sutro, University Mound North and South, and Stanford Heights Reservoirs. These reservoirs with dam faces are under the jurisdiction of the California DSOD. PUC staff note that Sutro Reservoir has dam seepage, and is uphill from a playground and fire station. University Mound Reservoir has a failed liner with basin leaks.

California Government Code, Section 8589.5 (see Attachment 2) requires that inundation maps be prepared for dams and submitted to the California Office of Emergency Services (OES) and the appropriate public safety agency of the county where the dams are located. Section 8589.5 further requires that the county public safety agency then adopt emergency procedures for the evacuation and control of populated areas below those dams.

Section 8589.5 also requires that a notice be posted at the offices of the county recorder, county assessor, and county planning agency identifying the location of the map, and of any information received by the county regarding changes to the map.

Once these maps are made public, then in accordance with Government Code Section 8589.3 and 8589.4, persons or agents transferring real property within inundation zones are required to notify purchasers that said property is within the zone.

Interviews with CDD staff indicate that inundation maps were prepared for the reservoir dam faces sometime in the 1970s. However, staff did not know the location of the previous analyses or the resulting maps, and were only able to produce the inundation maps as identified on the Association of Bay Area Government (ABAG) website (see Attachment 3). ABAG had obtained the maps from the California OES. City personnel agree that these maps may be outdated due to subsequent construction activities in the City that might change water flow patterns.

A review of the San Francisco offices of Recorder and Assessor found no posting regarding inundation maps for these four reservoirs. We checked with the Office of Emergency Services and the Department of Building Inspection, who had no copies of inundation maps available to the public.

We found no EAPs specific to the reservoir dam faces. A review of the "Emergency Operations Plan" maintained by the Mayor's Office of Emergency Services, Annex A, Page 17, "Reservoir Failure" (Attachment 4), discusses reservoir failure:

"Reservoir failures can result from a man-made or natural cause such as earthquake, structural flaw or terrorist action.

A reservoir failure has the potential to cause loss of life, property damage, and other ensuing hazards, as well as the displacement of persons residing or working in the inundation area. Damage to electric facilities (i.e., substations, transmission lines) and natural gas lines could also impact life support systems in areas outside the immediate hazard area.

Although there are ten large in-City reservoirs on the municipal water system, all are constructed of embankments thirty feet or less in height, conservatively designed and built, and concrete lined. Failure of such embankments is considered very unlikely."

The Emergency Operations Plan does not appear to conform to the requirements of state law, in that it does not provide information regarding the dam faces, nor does it acknowledge the inundation maps. It is unclear how the requirements of Section 8589.5 are complied with. Further, the Plan incorrectly states the number of active reservoirs. As noted in the EOP, failure of these dams is considered an unlikely event. Nevertheless, it is a state requirement that they be prepared and made available.

PUC staff stated that there are emergency procedures for draining reservoirs, which rely on gravity feeding to drain. In an emergency situation, reservoirs can be drained in two to three days. Water drained from the reservoirs goes into the water treatment (sewage) system for treatment and discharge.

Water System Tanks

During the PUC staff presentation, staff were asked if residents near tanks had been notified of any potential flooding issue. Until such time as they are repaired, several tanks are at risk of overturn during an earthquake, particularly the Forest Hill, La Grande and Potrero Hill tanks. The tanks do not hold as much water as the reservoirs, but still hold a significant amount of water and have a higher likelihood of failure with subsequent flooding. Staff were not aware of any notification that had been made, or of any state or local law that would require such notification.

Recreation on Reservoir Roofs

Three of San Francisco's reservoirs are used by the public for recreational purposes (Lombard, Merced Manor, and Sutro). These reservoirs were completed in 1860, 1936, and 1952, respectively. The roofs were designed to protect the contained water from contamination and exposure; none of these reservoirs were specifically designed for recreational use on their roofs.

Over the years, settlement, failed expansion joints, public vandalism, embankment movement, cracks etc. have caused the watertightness of the roofs to be compromised, permitting pollutants to enter, adversely affecting the water quality. The California Department of Health Services has recommended against recreational use on top of the reservoirs based on water quality concerns.

We acknowledge the need for recreational assets in the City. However, the mission of delivering approximately 80 million gallons of water to San Francisco daily and keeping an adequate water supply in reserve is of greater import.

In an agreement between the PUC and Recreation and Parks dated January 10, 1961, to allow recreation on Sutro Reservoir, Condition 1 states:

"Recreation agrees that the primary purpose of the reservoir and appurtenant facilities is to supply potable water to the water consumers in San Francisco and that they will do nothing or suffer or permit anything to be done that, in the opinion of [the PUC], is detrimental to the quality or use of the water in the reservoir."

As noted in a letter from the PUC to the CGJ (Attachment 5), some roof surface uses by the public do in fact cause deterioration of water quality, sometimes causing the stored water to require additional treatment prior to distribution. Several contamination problems have further required dumping of water rather than treatment.

In 1998, contamination required the dumping of three millions gallons of water. The identical amount was required to be dumped in 1999, but in 2000 six million gallons were dumped. Other reservoirs have also had to dump water. In addition to the danger to the public caused by pollution to the water system, the financially strapped PUC is forced to absorb the cost of transporting the dumped water to the City, treating that water when required, loss of the revenue that would have been obtained had the water been sold and the additional cost of treating the dumped water at the wastewater treatment plants.

The cost of strengthening roofs for recreation, when the original design was only to protect the water, can be as high as \$50 million (Attachment 5). Upgrade includes draining the reservoirs, installing new support columns and a new roof. It appears that accommodation of recreation can continue on the three reservoirs having roofs strong enough. However, recreation must be balanced against competing needs.

Recreation and Parks management told us they would prefer to continue and expand recreation on the reservoir roofs. When asked about funding for upgrades, the Department told us that they might be able to help research funding.

In subsequent discussions with PUC staff, we learned that the Recreation and Parks Department apparently would prefer that any funds for infrastructure upgrade allowing continued or additional recreation on reservoirs come from the general bonds expected to be put forth for upgrades to the water system.

We strongly recommend the immediate cessation of the use of the facilities for recreational purposes due to the potential for contamination and other potential adverse effects.

An alternate use for the reservoir roofs would be to install solar panels. When asked, PUC staff agreed this would make good use of the roofs.

FINDINGS AND RECOMMENDATIONS

1. Finding: While planning appears to be in place to adequately determine repair and upgrade priorities, it is not yet clear how the City or the PUC intends to fund all necessary work.

Recommendation:

The CGJ recommends that the PUC develop a financial strategy for funding necessary infrastructure repairs and upgrade.

Required Response:

Mayor - 60 Days

Board of Supervisors - 90 Days

Public Utilities Commission - 60 Days

2. Finding: Phase 2 of the Reliability Study appears to not consider the Foothills faults or the Sierra Nevada frontal fault system.

Recommendation:

The CGJ recommends that the PUC review the Phase 2 Study to verify that these fault systems have been properly evaluated.

Required Response:

Public Utilities Commission - 60 Days

3. Finding: Reservoir dam face inundation maps are not readily available and are very likely out-of-date.

Recommendation:

The CGJ recommends that reservoir inundation maps be reviewed, revised, and distributed, with other actions taken as necessary in accordance with California Government Code 8589.5.

Required Response:

Public Utilities Commission - 60 Days

4. Finding: The OES Emergency Operations Plan, Annex A, Page 17, needs updating with respect to reservoir inundation maps and other aspects of Government Code 8589.5.

Recommendation:

The CGJ recommends that Emergency Operations Plan, Annex A, Page 17 be updated with reservoir inundation maps information, once available from the PUC and that other actions be taken as specified in Government Code 8589.5.

Required Response:

Office of Emergency Services - 60 Days

5. Finding: Until such time as they are repaired, several City water tanks are at risk of overturn, with subsequent flooding, in the event of an earthquake.

Recommendation:

The CGJ recommends that the PUC notify persons living near the affected tanks of the possibility of overturn and subsequent flooding in the event of an earthquake.

Required Response:

Public Utilities Commission - 60 Days

6. Finding: Recreation on City reservoir roofs is problematic due to problems with contamination of water.

Recommendation:

The CGJ recommends the immediate cessation of the use of the City reservoirs for recreational purposes due to the potential for contamination and other potential adverse effects. An alternate use for the reservoir roofs would be to install solar panels.

Required Response

Mayor - 60 Days

Board of Supervisors - 90 Days

Public Utilities Commission - 60 Days

Recreation and Parks Department - 60 Days

**ATTACHMENT 1
DAMS, RESERVOIRS, AND SIGNIFICANT TANKS**

Division	County	Dam	Reservoir	Inundation Map	
Hetch Hetchy	Tuolumne	O'Shaughnessy Dam	Hetch Hetchy Reservoir	YES	
Hetch Hetchy		Upper Moccasin Creek Dam	Usually dry; prevents debris intrusion.	N/A	
Hetch Hetchy		Moccasin Lower Dam	Unknown - Afterbay?	YES	
Hetch Hetchy		Lake Eleanor Dam	Lake Eleanor Reservoir	YES	

Hetch Hetchy		Early Intake Dam	Early Intake Reservoir	YES	
Hetch Hetchy		Priest Dam	Priest Reservoir	YES	
Hetch Hetchy		Cherry Valley Dam	Lake Lloyd Reservoir (a.k.a. Cherry Lake)	YES	
Water Supply and Treatment (WS&T) - South Bay	Alameda	James H. Turner Dam	San Antonio Reservoir	YES	
WS&T - South Bay		Calaveras Dam	Calaveras Reservoir	YES	
WS&T - Peninsula	San Mateo	(Lower) Crystal Springs Dam	Crystal Springs Reservoir	YES	
WS&T - Peninsula		Pilarcitos Dam	Pilarcitos Reservoir	YES	
WS&T - Peninsula		San Andreas Dam	San Andreas Reservoir	YES	
WS&T - Peninsula		Stone Dam	Stone Dam Reservoir	N/A; dam mostly silted in	
City Distribution Division (CDD)	San Francisco		Balboa Reservoir	Unfinished - currently used for parking	
CDD			Sunset South Basin Reservoir	NO/but on ABAG website	
CDD			Sunset North Basin Reservoir	NO/but on ABAG website	

CDD			Sutro Reservoir	NO/but on ABAG website	Has recreation on roof
CDD			University Mound South Basin Reservoir	NO/but on ABAG website	
CDD			University Mound North Basin Reservoir	NO/but on ABAG website	
CDD			Stanford Heights Reservoir	NO/but on ABAG website	
CDD			College Hill Reservoir		
CDD			Francisco Reservoir	not in service	
CDD			Lombard Reservoir		Has recreation on roof
CDD			Potrero Heights Reservoir		
CDD			Hunters Point Reservoir		
CDD			Summit Reservoir		
CDD			Merced Manor Reservoir		Has recreation on roof
CDD	San Francisco Tanks		Forest Hill (100,000 and 300,000 gal)		

CDD			Forest Knolls		
CDD			La Grande		
CDD			Lincoln Park		
CDD			McLaren Park		
CDD			Mount Davidson		
CDD			Potrero Heights		

ATTACHMENT 2
CALIFORNIA GOVERNMENT CODE, SECTION 8589.3-
8589.5

8589.3. (a) A person who is acting as an agent for a transferor of real property that is located within a special flood hazard area (any type Zone "A" or "V") designated by the Federal Emergency Management Agency, or the transferor if he or she is acting without an agent, shall disclose to any prospective transferee the fact that the property is located within a special flood hazard area.

(b) Disclosure is required pursuant to this section only when one of the following conditions is met:

(1) The transferor, or the transferor's agent, has actual knowledge that the property is within a special flood hazard area.

(2) The local jurisdiction has compiled a list, by parcel, of properties that are within the special flood hazard area and a notice has been posted at the offices of the county recorder, county assessor, and county planning agency that identifies the location of the parcel list.

(c) In all transactions that are subject to Section 1103 of the Civil Code, the disclosure required by subdivision (a) of this section shall be provided by either of the following means:

(1) The Local Option Real Estate Disclosure Statement as provided in Section 1102.6a of the Civil Code.

(2) The Natural Hazard Disclosure Statement as provided in Section 1103.2 of the Civil Code.

(d) For purposes of the disclosure required by this section, the following persons shall not be deemed agents of the transferor:

(1) Persons specified in Section 1103.11 of the Civil Code.

(2) Persons acting under a power of sale regulated by Section 2924 of the Civil Code.

(e) Section 1103.13 of the Civil Code shall apply to this section.

(f) The specification of items for disclosure in this section does not limit or abridge any obligation for disclosure created by any other provision of law or that may exist in order to avoid fraud, misrepresentation, or deceit in the transfer transaction.

(g) A notice shall be posted at the offices of the county recorder, county assessor, and county planning agency that identifies the location of the special flood hazard area map, any relevant Letters of Map Revision from the Federal Emergency Management Agency, and any parcel list compiled by the local jurisdiction.

8589.4. (a) A person who is acting as an agent for a transferor of real property that is located within an area of potential flooding shown on an inundation map designated pursuant to Section 8589.5, or the transferor if he or she is acting without an agent, shall disclose to any prospective transferee the fact that the property is located within an area of potential flooding.

(b) Disclosure is required pursuant to this section only when one of the following conditions is met:

(1) The transferor, or the transferor's agent, has actual knowledge that the property is within an inundation area.

(2) The local jurisdiction has compiled a list, by parcel, of properties that are within the inundation area and a notice has been posted at the offices of the county recorder, county

assessor, and county planning agency that identifies the location of the parcel list.

(c) In all transactions that are subject to Section 1103 of the Civil Code, the disclosure required by subdivision (a) of this section shall be provided by either of the following means:

(1) The Local Option Real Estate Disclosure Statement as provided in Section 1102.6a of the Civil Code.

(2) The Natural Hazard Disclosure Statement as provided in Section 1103.2 of the Civil Code.

(d) For purposes of the disclosure required by this section, the following persons shall not be deemed agents of the transferor:

(1) Persons specified in Section 1103.11 of the Civil Code.

(2) Persons acting under a power of sale regulated by Section 2924 of the Civil Code.

(e) Section 1103.13 of the Civil Code shall apply to this section.

(f) The specification of items for disclosure in this section does not limit or abridge any obligation for disclosure created by any other provision of law or that may exist in order to avoid fraud, misrepresentation, or deceit in the transfer transaction.

8589.5. (a) Inundation maps showing the areas of potential flooding in the event of sudden or total failure of any dam, the partial or total failure of which the Office of Emergency Services determines, after consultation with the Department of Water Resources, would result in death or personal injury, shall be prepared and submitted as provided in this subdivision within six months after the effective date of this section, unless the time for submission of those maps is extended for reasonable cause by the Office of Emergency Services.

The local governmental organization, utility, or other owner of any dam so designated shall submit to the Office of Emergency Services one map that shall delineate potential flood zones that could result in the event of dam failure when the reservoir is at full capacity, or if the local governmental

organization, utility, or other owner of any dam shall determine it to be desirable, he or she shall submit three maps that shall delineate potential flood zones that could result in the event of dam failure when the reservoir is at full capacity, at median-storage level, and at normally low-storage level.

After submission of copies of the map or maps, the Office of Emergency Services shall review the map or maps, and shall return any map or maps that do not meet the requirements of this subdivision, together with recommendations relative to conforming to the requirements. Maps rejected by the Office of Emergency Services shall be revised to conform to those recommendations and resubmitted.

The Office of Emergency Services shall keep on file those maps that conform to the provisions of this subdivision. Maps approved pursuant to this subdivision shall also be kept on file with the Department of Water Resources. The owner of a dam shall submit final copies of those maps to the Office of Emergency Services that shall immediately submit identical copies to the appropriate public safety agency of any city, county, or city and county likely to be affected.

(b) Based upon a review of inundation maps submitted pursuant to subdivision (a) or based upon information gained by an onsite inspection and consultation with the affected local jurisdiction when the requirement for an inundation map is waived pursuant to subdivision (d), the Office of Emergency Services shall designate areas within which death or personal injury would, in its determination, result from the partial or total failure of a dam.

The appropriate public safety agencies of any city, county, or city and county, the territory of which includes any of those areas, shall adopt emergency procedures for the evacuation and control of populated areas below those dams. The Office of Emergency Services shall review the procedures to determine whether adequate public safety measures exist for the evacuation and control of populated areas below the dams, and shall make recommendations with regard to the adequacy of those procedures to the concerned public safety

agency. In conducting the review, the Office of Emergency Services shall consult with appropriate state and local agencies.

Emergency procedures specified in this subdivision shall conform to local needs, and may be required to include any of the following elements or any other appropriate element, in the discretion of the Office of Emergency Services: (1) delineation of the area to be evacuated; (2) routes to be used; (3) traffic control measures; (4) shelters to be activated for the care of the evacuees; (5) methods for the movement of people without their own transportation; (6) identification of particular areas or facilities in the flood zones that will not require evacuation because of their location on high ground or similar circumstances; (7) identification and development of special procedures for the evacuation and care of people from unique institutions; (8) procedures for the perimeter and interior security of the area, including such things as passes, identification requirements, and antilooting patrols; (9) procedures for the lifting of the evacuation and reentry of the area; and (10) details of which organizations are responsible for these functions and the material and personnel resources required. It is the intent of the Legislature to encourage each agency that prepares emergency procedures to establish a procedure for their review every two years.

(c) "Dam," as used in this section, has the same meaning as specified in Sections 6002, 6003, and 6004 of the Water Code.

(d) Under certain exceptional conditions as follows, the Office of Emergency Services may waive the requirement for an inundation map:

(1) Where the effects of potential inundation in terms of death or personal injury, as determined through onsite inspection by the Office of Emergency Services in consultation with the affected local jurisdictions, can be ascertained without an inundation map; and

(2) Where adequate evacuation procedures can be developed without benefit of an inundation map.

(e) If development should occur in any exempted area after a waiver has been granted, the local jurisdiction shall notify the Office of Emergency Services of that development. All waivers shall be reevaluated every two years by the Office of Emergency Services.

(f) A notice shall be posted at the offices of the county recorder, county assessor, and county planning agency that identifies the location of the map, and of any information received by the county subsequent to the receipt of the map regarding changes to inundation areas within the county.

ATTACHMENT 3

ASSOCIATION OF BAY AREA GOVERNMENTS WEBSITE INFORMATION

San Francisco Dam Failure Inundation Hazard Map

NOTE: If multiple reservoirs are listed in the legend under one color, this indicates that the area shown with that color will be inundated if ANY of those reservoirs fail. It does NOT indicate that all of the reservoirs must fail at the same time in order to inundate the area.

Directions to Access Inundation Maps in color on Internet:

- (1) Access the Association of Bay Area Governments website (www.abag.ca.gov).
- (2) Click on "Earthquakes" heading in left-hand column.
- (3) Click on "Dam Failure" heading in right-hand column.
- (4) Click on "View Dam Failure Inundation Hazard Maps".
- (5) Scroll to "San Francisco", then click "View Map".

ATTACHMENT 4

SAN FRANCISCO EMERGENCY OPERATIONS PLAN ANNEX A, PAGE 17, "RESERVOIR FAILURE"

ATTACHMENT 5

LETTER DATED DECEMBER 13, 2000
FROM JOHN MULLANE,
PUBLIC UTILITIES COMMISSION GENERAL MANAGER

TO
JOHN EVERETT, SAN FRANCISCO CIVIL GRAND JURY

