H. HYDROLOGY AND WATER QUALITY

This section describes the existing hydrological setting for the Measure DD Implementation Project, including runoff, drainage, and water quality, and identifies significant environmental impacts to hydrology and water quality that may result from project implementation. Mitigation measures for the identified significant impacts are provided, as appropriate.

The Measure DD Implementation Project includes components designed to improve the water quality of Lake Merritt, the Lake Merritt Channel, and by extension the Oakland Estuary and San Francisco Bay. The City-wide Creeks components of Measure DD propose stream protection and restoration projects intended to improve water quality and reduce flooding hazards for select creeks and watersheds within the City of Oakland.

1. Setting

This section describes the existing conditions at or near the component sites related to hydrology, water quality and storm drainage. This subsection discusses the methods used for analyzing the existing conditions for each of the four groups of project components. Additionally, the regulatory framework related to hydrology affecting the component sites is described. This section is based on material included with the component applications, review of published and unpublished regional and local area hydrologic reports and maps, environmental investigation reports, available site-specific technical reports, and a site reconnaissance.

a. Overview. This section provides an overview of climate, runoff and drainage, flooding, water quality, and ground wells.

(1) Climate. The climate of the Bay Area is characterized as dry-summer subtropical (often referred to as Mediterranean), with cool wet winters and relatively warm dry summers. The mean annual rainfall in the City of Oakland for the period between 1970 and 2006 is approximately 23.5 inches, with the vast majority of rainfall between October and May. Rainfall varies somewhat west to east across Oakland; the mean annual rainfall near the San Francisco Bay is approximately 18.0 inches and in the upper Oakland Hills it is approximately 25.0 inches.[1] Analysis of long-term precipitation records indicates that wetter and drier cycles lasting several years are common in the region. Severe, damaging rainstorms occur in the Bay Area at a frequency of about once every three years.[2]

(2) Runoff and Drainage. In an undeveloped setting, when rainfall intensities exceed the infiltration capacity of surface soils, runoff flows over the ground surfaces toward established natural drainage channels. Stormwater runoff is then conveyed away from the area in creeks and streams. In a developed setting, an increased portion of the natural soils is covered with impervious surfaces (i.e. roads, driveways, and roofs), increasing amounts and altering flow patterns of runoff. In developed portions of the City, storm drainage is conveyed in underground pipes, channels, and, to a lesser extent, swales. Specific drainage patterns at each component groups are discussed below.

[1] Western Regional Climate Center, 2007, *Historical Climate Information*, accessed 2-12-07 at www.wrcc.dri.edu.

[2] Brown, William M. III, 1988. *Historical Setting of the Storm: Perspectives on Population, Development, and Damaging Rainstorms in the San Francisco Bay Region*, in Landslides, Floods, and Marine Effects of the Storm of January 3-5, 1982, in the San Francisco Bay Region, California, Stephen D. Ellen and Gerald F. Wieczorek, Eds., U.S. Geological Survey Professional Paper 1434.

(3) Flooding. In 1968, Congress created the National Flood Insurance Program (NFIP) in response to the rising cost of taxpayer funded disaster relief for flood victims and the increasing amount of damage caused by floods. The NFIP makes federally backed flood insurance available for communities that agree to adopt and enforce floodplain management ordinances to reduce future flood damage. The Federal Emergency Management Agency (FEMA) manages the NFIP. FEMA is the agency responsible for conducting floodplain studies and publishing Flood Insurance Rate Maps (FIRMs) that delineate flood hazard areas. The City of Oakland is a participating community in the NFIP, and therefore all new development must comply with the minimum requirements of the NFIP.[3] Specific storm-related flooding hazards within each component group are discussed below.

Flooding can also occur as a result of catastrophic dam failure and the release of waters contained in upstream reservoirs. The component sites could be inundated if one or more of the several dams in the vicinity were to fail catastrophically. The dam and dam inundation areas that could affect each of the project groups are summarized in Table IV.H-1.

Some of the component sites are located on lowlands near San Francisco Bay, creating the potential for coastal flooding hazards, including tsunami, extreme high tides, and sea level rise. Tsunamis are long period water waves caused by underwater seismic events, volcanic eruptions, or undersea landslides. Tsunamis affecting the San Francisco Bay region would most likely originate west of the Bay, in the Pacific Ocean. Areas that are highly susceptible to tsunami inundation tend to be located in low-lying coastal areas such as tidal flats, marshlands, and former bay margins that have been artificially filled.

Extreme high tides in San Francisco Bay result from the combined effects of astronomical high tides (related to the lunar cycle) and other factors including winds, barometric pressure, ocean temperatures, and freshwater runoff. In California, the highest astronomical tides occur in the summer and winter, and therefore extreme high tides are most likely to occur during these times. Areas susceptible to extreme high tides tend to be located in low-lying coastal areas.

Over the last 100 years, the temperature of the earth's surface has risen approximately 0.6 degree Celsius (1.8 degree Fahrenheit).[4] Global warming causes thermal expansion of the upper layers of the ocean, which increases the volume of water, as well as melting of the earth's glaciers and polar ice fields. Tidal gauge measurements collected over the last 100 years indicate that sea level is rising relative to the land surface in many locations throughout the world. It is a near certainty that sea level will continue to rise in response to global warming. Such increases in sea level, if sustained over long periods of time, could create or exacerbate existing coastal flooding hazards. The group of sites most susceptible to the coastal flooding hazards is the Oakland Waterfront Trail sites.

(4) Water Quality. The quality of surface water and groundwater in the vicinity of the project sites are affected by past and current land uses at the individual sites and within the watershed, and the composition of geologic materials in the vicinity. Water quality in surface and groundwater bodies is regulated by the State Water Resources Control Board and Regional Water Quality Control

[3] City of Oakland, 2004. *General Plan, Chapter 6, Safety Element.* November.

[4] Intergovernmental Panel on Climate Change, 2001, Climate Change 2001: Synthesis Report, Summary for Policymakers.

Table IV.H-1: Dam and Reservoirs in the Vicinity of the Component Area

Affected site	Dam	Reservoir Name	Capacity (acre-feet)	Drainage (sq. miles)	Jurisdiction	Owner
East Oakland Aquatic, Sports and Recreation Complex	Chabot	Lake Chabot	10,281	41.4	State of California	EBMUD
	New Upper San Leandro	Upper San Leandro Reservoir	42,000	29.95	State of California	EBMUD
Lake Merritt and Lake Merritt Channel	Estates	Reservoir No. 1	56	0.01	State of California	EBMUD
	Piedmont	Reservoir No. 2	60	0.0 (Off-stream Reservoir)	State of California	EBMUD
Studio One	Lake Temescal	Lake Temescal	485	3.0	State of California	EBRPD
Waterfront Trails (Tidal Canal area)	Central	Central Reservoir	485	0.0 (Off-stream Reservoir)	State of California	EBMUD

Source: Governors Office of Emergency Services (OES), 2006, *GIS: Dam Inundation Maps*, State of California, 30 March.
EBMUD = East Bay Municipal Utilities District
EBRPD = East Bay Regional Park District

Boards. The component sites are under the jurisdiction of the San Francisco Bay Regional Water Quality Control Board (Water Board). Specific water quality issues at each of the component subareas are discussed below. The potential for the presence of contamination in the underlying groundwater associated with historic industrial activity at the Measure DD sites is discussed in the Hazards section of this DEIR.

(5) Groundwater Wells. Prior to establishment of modern infrastructure, the City of Oakland and vicinity historically relied on groundwater wells for most of the water supply. Many of these wells were properly abandoned (i.e. removed or sealed). However, many undocumented and non-maintained wells still exist in the East Bay area.[5] It is possible that undocumented wells are present at one or more of the project component sites. If damaged or not properly sealed, these remaining wells may act as a conduit for contaminant migration from the surface to the underlying aquifer.

b. Lake Merritt and Lake Merritt Channel (Group 1). Lake Merritt is a 140-acre tidal estuary formed in a drowned valley and joined to the Oakland Estuary and San Francisco Bay by the Lake Merritt Channel. The Lake has an average depth of seven to eight feet, 3.4 miles of shoreline, is classified as a Wildlife Refuge, and drains a watershed of approximately 4,650 acres.[6, 7]

(1) Runoff and Drainage. The topography of the project area adjacent Lake Merritt is flat to gently rolling, ranging in elevation from approximately sea level to 25 feet above mean sea level

[5] Figuers, S., 1998, *Groundwater Study and Water Supply History of the East Bay Plain, Alameda, and Contra Costa Counties*, June 15.

[6] California's Critical Coastal Area, 2006, *State of the CCAs Report, June 15*, accessed 2-13-07 at www.coastal.ca.gov.

[7] Carter, G., et al., 2005, *Water Quality Investigations at Lake Merritt in Oakland, California*, American Geophysical Union.

(msl) relative to the National Geodetic Vertical Datum (NGVD).[8, 9] Based on mapping of regional historic drainage conditions, some components, particularly those to the north and northeast of the Lake, are beyond the historical shorelines of Lake Merritt,[10] while other components are within the historical boundaries of the Lake and located on artificial fill over Bay Mud.[11] Currently around Lake Merritt, impervious surfaces such as roadways, parking areas, and paved walkways cover a significant portion of the site. Runoff from sidewalks, pathways, driveways and parking areas is directed by sheetflow towards lawns and landscaped areas. In other places, primarily roadways, street-side gutters and stormwater conveyance systems collect stormwater and direct it into Lake Merritt or the Lake Merritt Channel through approximately 60 stormdrain outfalls. Stormwater runoff in much of the 12th Street component area is directed toward a drainage system that consists of a network of drainage inlets, pipe culverts, and pump houses, and discharges into Lake Merritt or the Lake Merritt Channel.[12]

In the vicinity of the Lake, groundwater occurs at a depth of approximately five to ten feet below the ground surface (bgs).[13] Near Lake Merritt and the Channel, the groundwater level is influenced by the Lake and sea level and may fluctuate with the tides.

(2) Flooding. Based on FEMA mapping, the component sites adjacent the shorelines of Lake Merritt and the Lake Merritt Channel are located at least partially in the 100-year flood hazard zone,[14,15] and therefore could be affected by flooding. These component sites could be impacted if the Estates or Piedmont dams were to fail catastrophically. The location of the components on lowlands near San Francisco Bay creates a potential for coastal flooding hazards, including tsunami, extreme high tides, and sea level rise.

Preliminary site-specific studies for the 12th Street Bridge project have been completed to characterize the hydrology, tidal behavior, and potential wave run-up hazards associated with the 25- and 100-year storms for Lake Merritt and the Channel. The predicted Lake Merritt surface elevation under existing conditions with all pumps running to relieve high water conditions would be 7.9 feet above msl for a 25-year event, and 8.9 feet above msl for the 100-year storm event.[16]

[8] Note: City of Oakland Vertical Datum (COO) is equal to NGVD29 minus 3.0 feet, and NAVD88 minus 5.7 feet.

[9] United States Geological Survey (USGS), 1959 photo revised in 1980, Oakland West Topographic Quadrangle.

[10] Sowers, Janet M., 1993 (revised 1995 & 2000). *Creek and Watershed Map of Berkeley & Oakland,* Oakland Museum.

[11] USDA, Soil Conservation Service, 1981, *Soil Survey of Alameda County, California, Western Part,* March.

[12] Rajappan & Meyer Consulting Engineers, Inc., 2005, 12th Street Reconstruction Project: Draft Drainage Report, February.

[13] Geo/Resources Consultants, Inc., 2006, Geotechnical Investigation 12th Street Reconstruction Project, Oakland, California, April, Report No. 2046-100

[14] Federal Emergency Management Agency (FEMA), 1982, Flood Insurance Rate Map No. 065048 0015 B Oakland, City - Alameda County, 30 September.

[15] FEMA, 1982, Flood Insurance Rate Map No. 065048 0020 B Oakland, City - Alameda County, 30 September.

[16] Phillip Williams & Associates (PWA), 2004, Memorandum: Lake Merritt Design Flood Levels, 25 August, PWA#1726

(3) Water Quality. Stormwater from the Lake Merritt group of component sites discharges directly into Lake Merritt, a water body that is listed as impaired by the Water Board for organic enrichment/low dissolved oxygen as well as trash.[17] Approximately 60 stormdrain outfalls and several creeks flow into Lake Merritt. The ability of Lake Merritt and the Lake Merritt Channel to be flushed by natural tidal action has been limited by the encroachment of artificial fill and structures placed in the Lake Merritt Channel.[18]

c. Waterfront Trail (Group 2). The Oakland Waterfront Trail is part of the San Francisco Bay Trail. Projects within this group may include grading, demolition, refurbishment or replacement of structures as well as trail construction and restoration of disturbed coastal areas to tidal wetlands. The trail and park component sites are located along the eastern shore of the Oakland Estuary. Existing hydrologic conditions of the Waterfront Trail components are described below.

(1) Runoff and Drainage. The Oakland Waterfront Trail components are located adjacent to the Oakland Estuary in an area that is relatively flat, ranging in elevation from approximately sea level to eight feet above msl.[19] Based on mapping of regional historic drainage conditions, some components, particularly west of 29th Street along Brooklyn Basin, are in reclaimed areas consisting of artificial fill over Bay Mud, or former tidal wetlands.[20,21] Currently, the proposed trail route consists of existing trail segments, open land, and commercial properties. Impervious surfaces such as roadways, parking areas, and paved walkways, cover portions of various components; however, much of the proposed trail is pervious surface (i.e. unpaved). In some places current runoff is directed by sheetflow towards open lots or landscaped areas. In other places, storm water flows directly towards the estuary or into conveyance systems and then to the estuary. Because of the proximity of the estuary, groundwater levels may be influenced by sea level.

(2) Flooding. Based on FEMA mapping, most components sites adjacent to the shoreline of the Oakland Estuary are at least partially in the 100-year flood zone. [22,23] The components between 29th and High Streets could be impacted by inundation if the Central Dam were to fail catastrophically (Table IV.H-1). The location of the components, on lowlands near San Francisco Bay, creates a potential for the sites to be affected by coastal flooding hazards, including tsunami, extreme high tides, and sea level rise.

(3) Water Quality. Stormwater from the Oakland Waterfront Trail components discharges directly into the Oakland Inner Harbor Channel, a water body that is listed as impaired by the Water Board. The Water Board has designated the Oakland Inner Harbor Channel as water quality impaired

[17] Water Board, San Francisco Bay Region, 2003. 2002 CWA Section 303(d) List of Water Quality Limited Segment, Approved by USEPA, July 2003.

[18] California's Critical Coastal Area, 2006, op. cit.

[19] USGS, 1980, op. cit.

[20] Sowers, Janet M., 1993 (revised 1995 & 2000), op. cit.

[21] USDA, Soil Conservation Service, 1981, op. cit.

[22] FEMA, 1982, op. cit.

[23] FEMA, 1982, Firm # 065048 0025 B Oakland, City - Alameda County, 30 September.

for chlordane, DDT, diazinon, dieldrin, dioxin compounds, furan compounds, mercury, PCBs, selenium and exotic species.[24]

d. Recreational Facilities (Group 3). The two components within this group are the renovation of the historic Studio One Art Center, located in North Oakland and the construction of an East Oakland Aquatic, Sports and Recreation Complex. Existing hydrologic conditions of and around these facilities are described below.

(1) Studio One Art Center. The art center building is in the process of being refurbished, including seismic retrofitting with completion of improvements anticipated in 2007.

Runoff and Drainage. This component is located in an area with a gently rolling topography at an elevation of about 110 feet above msl.[25] No open creek or stream channels cross the project site; however, based on mapping of regional historic drainage conditions, a creek did cross the site, running north to south aligned approximately with the east end of the adjacent football field. Currently, impervious surfaces such as parking areas and paved walkways cover most of site. Runoff from sidewalks, play areas, driveways and parking areas in the form of sheetflow is directed towards landscaped areas or in curb-side gutters to storm water conveyance systems under 45th Street, and then to San Francisco Bay through the municipal stormwater system.[26]

Flooding. Based on FEMA mapping, Studio One is not located in a 100-year flood hazard zone.[27] The area could be impacted if Lake Temescal Dam were to fail catastrophically (Table IV.H-1). This component site; at an elevation of approximately 100 feet msl and more than a mile from San Francisco Bay, is not subject to coastal flooding hazards, including tsunami, extreme high tides, and sea level rise.

Water Quality. No open water bodies are present within the boundaries of this component site.

(2) East Oakland Sports Complex. This component is in the design phase, and would likely include an aquatic center, sports and recreation facilities. Schematic drawings prepared for this component indicate ground water elevations to be four to ten feet.[28,29,30]

Runoff and Drainage. This component site currently has gently rolling topography, rising from an elevation of about approximately 6 feet at the southwest corner to approximately 12 feet at the northeast corner.[31] No historical or current open creek or stream channels cross the project site. A

[24] Water Board, 2003, op. cit.

[25] USGS, 1959 revised 1980, op. cit.

[26] Sowers, Janet M., 1993 (revised 1995 & 2000). *Creek and Watershed Map of Berkeley & Oakland,* Oakland Museum of California.

[27] FEMA, 1982, Firm # 065048 0015 B Oakland, City - Alameda County, 30 September.

[28] Note: City of Oakland Vertical Datum (COO) is equal to NGVD29 minus 3.0 feet, and NGVD88 minus 5.7 feet.

[29] ELS Architecture and Urban Design; Murakami/Nelson, 2003, *Oakland Sports Center at Ira Jinkins Park, 100% Schematic Design*, prepared for: City of Oakland Public Works Agency, 31 January.

[30] Ground water elevations are reported based on City of Oakland datum.

[31] USGS, 1959 revised 1980, op. cit.

stormwater conveyance runs under Jones Street towards the southwest, merging with an engineered channel leading to San Leandro Bay.[32] Currently, impervious surfaces such as parking areas, paved play areas and paved walkways, cover a substantial portion of the site. Runoff from sidewalks, pathways and some drives and parking areas is directed by sheetflow towards landscaped areas.

Flooding. Based on FEMA mapping, this component site is not located in a 100-year flood zone.[33] This component site could be impacted if the Chabot or Upper San Leandro dams were to fail catastrophically (Table IV.H-1). This component site, with elevations of approximately 9 to 15 foot mean seal level is more than one-half mile from San Francisco Bay, is not subject to coastal flooding hazards, including tsunami, extreme high tides, and sea level rise.

Water Quality. No open water bodies are present within the boundaries of this component site.

e. City-wide Creeks (Group 4). The City of Oakland includes fifteen main creeks with over thirty tributaries that comprise over 40 to 50 miles of open creeks channels. The creek component sites are located throughout the City of Oakland.

(1) Runoff and Drainage. The topography of the City of Oakland ranges from the low elevations of the broad slopes of the near-Bay alluvial plains to the steeper upland terrain of the East Bay Hills. The low alluvial plains, starting at the San Francisco Bay and the Oakland Estuary range in elevation from sea level up to approximately 120 to 200 feet msl at the base of the foothills. Continuing east, the gently rolling uplands areas rise into foothills, and then, generally east of the Hayward Fault, into the steeper terrain of the East Bay Hills rising to elevations near the eastern border of the City of Oakland of approximately 1,440 feet msl.[34] The creek components act as drainageways for these hills, and improvement to streambeds, clearing of obstructions, maintenance of the riparian environment, and erosion protections measures comprise the activities proposed by the project for this group.

(2) Flooding. The channels of the component creeks have been mapped by FEMA. The lower reaches of the creeks are located within the 100-year flood hazard zone. Flooding can also occur as a result of catastrophic dam failure and the release of waters contained in upstream reservoirs. Some of the creek components could be impacted if one or more of the several dams in the vicinity were to fail catastrophically. The location of the component sites in the Oakland Hills eliminates the potential for coastal flooding hazards, including tsunami, extreme high tides, and sea level rise.

(3) Water Quality. The City-wide Creeks group includes one water body that is listed as impaired by the Water Board. The Water Board has designated Lower San Leandro Creek as water quality impaired for diazinon.[35]

f. Regulatory Framework. The following describes the regulatory framework for hydrology and water quality.

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[32] Sowers, Janet M., William Lettis & Associates, Inc., 1997, *Creek & Watershed Map of Hayward & San Leandro, Oakland* Museum of California.

[33] FEMA, 1982, Firm # 065048 0025 B Oakland, City - Alameda County, 30 September.

[34] USGS, 1959 revised 1980, op. cit.

[35] RWQCB, 2003, op. cit.

(1) State Water Resources Control Board and Regional Water Quality Control Board. The State Water Resources Control Board and Regional Water Quality Control Boards regulate water quality. The City of Oakland (and therefore all the Measure DD Implementation Project components) is under the jurisdiction of the Water Board, which is responsible for implementation of state and federal water quality protection policies in the Bay Area. The Water Board implements the Water Quality Control Plan (Basin Plan), a regulatory and policy document for managing water quality issues in the region. The Basin Plan establishes beneficial water uses for waterways and water bodies within the region.

The National Pollutant Discharge Elimination System (NPDES) program (established through the Clean Water Act) regulates runoff water quality. The NPDES program objective is to control and reduce pollutant discharges to water bodies. The Water Board administers the NPDES program. The Water Board has conveyed responsibility for implementation of stormwater regulations in the vicinity of the project site to the Alameda Countywide Clean Water Program (ACCWP). The ACCWP maintains compliance with the NPDES Permit and promotes stormwater pollution prevention (and is described further below).

Projects disturbing more than one acre of land during construction are required to file a Notice of Intent (NOI) with the Water Board for coverage under the State NPDES General Construction Permit for discharges of stormwater associated with construction activity. Sites less than one acre and not part of a larger project are not required to file the NOI under the General Construction Permit. However, projects less than an acre are still required to prevent erosion and sediment loss and other potential sources of water pollution resulting from construction by incorporating construction controls using Best Management Practices (BMPs).[36] The ACCWP Stormwater Quality Protection Plan requires that all new construction implement Construction Site Field Controls. The Plan also requires that BMPs be designed and implemented to reduce potential impacts to surface water quality during the construction of the project.[37]

(2) Alameda Countywide Clean Water Program. In 1987, 17 local agencies, including Oakland, formed the Alameda Countywide Clean Water Program (ACCWP) and obtained a joint NPDES permit. The NPDES program objective is to control and reduce pollutant discharges to water bodies from stormwater and point-source discharges.

Participating agencies (including the City of Oakland) must comply with the provisions of the countywide permit by ensuring that new development and redevelopment mitigate water quality impacts to stormwater runoff both during construction and operation periods of projects. Recent changes to the permit held by the ACCWP are detailed in Water Board Order R2-2003-0021 (NPDES Permit No. CAS0029831). All projects are required to apply the following stormwater requirements, as applicable: maximize pervious areas, use construction-period best management practices (BMPs), and post-construction stormwater treatment measures to the maximum extent practicable (MEP). Projects that propose to create (or in the process of redevelopment add or replace) more than 10,000 square feet of impervious surfaces are subject to these regulations plus additional requirements as detailed below.

[36] Alameda Countywide Clean Water Program, 2000 (revised 2002). *Developers, Contractors and Builders,* accessed at www.cleanwaterprogram.org on October 31, 2006.

[37] Alameda Countywide Clean Water Program 2003. *Stormwater Quality Management Plan 2001-2008*. February 19. Accessed at http://www.cleanwaterprogram.org on October 31, 2006.

Several of the proposed component projects would be create more than 10,000 square feet of new impervious surface, and therefore would be required to meet all the terms of the permit, including (but not limited to):

- ***Numeric Sizing Criteria for Post Construction Pollutant Removal Treatment Systems.*** Each project covered by the permit must include source controls, design measures, and treatment controls to minimize stormwater pollutant discharges. Treatment controls must be sized to treat a specific amount – about 85 percent – of average annual runoff (in the Bay Area this is equivalent to about the 1-inch storm).
- ***Operation and Maintenance of Treatment Measures.*** Treatment controls often do not work unless adequately maintained. The permit requires an operations and maintenance (O&M) program, which includes: 1) identifying the properties with treatment controls; 2) developing agreements with private entities to maintain the controls; and 3) periodic inspection, maintenance (as needed), and reporting.
- ***Limitation on Increase of Peak Stormwater Runoff Discharge Rates.*** Urbanization creates impervious surfaces that reduces landscape's natural ability to absorb water and release it slowly to creeks. These impervious surfaces increase peak flows in creeks and can cause erosion. This potential impact to creek systems is termed "hydrograph modification" or "hydromodification." Depending on location, some projects must evaluate the potential for this to occur and provide mitigation as necessary.

Hydromodification (Erosion Control). On March 14, 2007, the San Francisco Bay Regional Water Quality Control Board issued Order No. R2-2007-0025 (NPDES Permit No. CAS0029831), an amendment revising Order No. R2-2003-0021. This order adopts the revised hydrograph modification management provisions and includes by reference the ACCWP countywide Hydrograph Modification Management Plan (HMMP) of May 15, 2005.[38] The HMMP standard is intended to ensure that new projects in Alameda County, including within the City of Oakland, do not increase erosion. A new development or redevelopment project in which the combined amounts of impervious surface created and replaced totals one acre or more is required to comply with the Water Board Order's hydromodification standard and the ACCWP HMMP unless it falls into one of several exempt categories.

Examples of exempt projects include single family homes; transit village redevelopments; and sidewalks, bicycle lanes, trails, bridge accessories, guardrails, and landscape features associated with streets, roads, highways, or freeways. Exemptions are also provided for projects served by hardened stormwater conduits and projects in areas near the Bay that are tidally influenced or subject to sediment deposition. Proposed components of the Lake Merritt and Lake Merritt Channel group, the Waterfront Trail group and the Recreational Facilities group lie within areas served by hardened stormwater conduits or are located in exempt areas near the Bay. Many proposed components of the Citywide Creeks group would be constructed in non-exempt areas; however, they would not increase impervious surface area and, in fact, would in some cases remove existing impervious surface. Thus, the proposed project components are exempt from most requirements of the HMMP.

Nevertheless, exempt projects are required to incorporate site design/landscape characteristics, which maximize infiltration (where appropriate), provide retention or detention, slow runoff, and minimize impervious land coverage (i.e., use hydrologic source controls) to the maximum extent practicable.

[38] The Alameda County Public Works Agency, 2005. *Hydrograph Modification Management Plan.* ACCWP, 15 May.

For proposed components in the City-wide Creeks group (and other groups, if applicable), this would be ensured by compliance with the City's Creek Protection Ordinance, which is specifically recognized in the ACCWP HMMP. As a part of standard permit compliance, each proposed component would be evaluated for potential hydromodification impact (based on the project size, location and type of work proposed). If it is determined during the permitting process that hydromodification impacts could occur for one or more components, those components would be required to comply with HMMP provisions.

(3) Alameda County Flood Control & Water Conservation District. The Alameda County Public Works Agency is responsible for maintaining the infrastructure of Alameda County, including roads, bridges, flood channels and creeks. Flood Control Zone 12 comprises Oakland and Emeryville. Zone 12 includes Temescal, Glen Echo, Pleasant Valley, Trestle Glen, Sausal, Peralta, Courtland, Lion, Arroyo Viejo, Elmhurst, Stonehurst, and San Leandro creeks. Stormwater is conveyed in these waterways, as well as miles of underground pipes and culverts, which ultimately discharge to the Bay. In some cases pump stations are required to convey the water to the Bay for discharge.

Within the Public Works Agency, the Alameda County Flood Control and Water Conservation District plans, designs and inspects construction of flood control projects, maintains flood control infrastructure, and assists in planning new developments.

(4) City of Oakland Municipal Code. Some applicable chapters regarding Hydrology and Water Quality include:

- Chapter 13.16, Creek Protection Stormwater Discharge Control Ordinance. The Oakland Municipal Code prohibits activities that will result in the discharge of pollutants to Oakland's waterways or the damaging of creeks, creek functions, or habitat. The ordinance requires the use of standard Best Management Practices to prevent pollution or erosion to creeks and/or storm drains. Additionally, a creek protection permit is required for any construction work on creek side properties.
- Chapter 15.04, Oakland Amendments to the California Model Building Codes. This chapter of the Oakland Municipal Code shall be known as the "Oakland Amendments of the 2001 edition of the California Building Standards Code, Part 2 (California Building Code), Part 4 (California Mechanical Code), and Part 5 (California Plumbing Code), and the 2004 edition of the California Building Standards Code, Part 3 (California Electrical Code)".

The applicable amendments include, but are not limited to:

- 15.04.780 CBC Appendix Chapter 33 deleted and replaced. Delete CBC Appendix Chapter 33 and insert Ordinance 10446 C. M. S., Erosion and Sedimentation, with revisions as follows: SECTION 3304--GRADING, EXCAVATIONS AND FILLS.
- Chapter 15.04.780, Section 3304 - Grading, Excavation and Fills. The Grading Ordinance requires a permit for projects that exceed certain criteria. Subsection 3304.2 defines the terms under which a grading permit will be required.

(5) City of Oakland General Plan Objectives and Policies. The General Plan includes the following objectives and policies pertaining to hydrology and water quality:

- Policy FL-1: Enforce and update local ordinances, and comply with regional orders that would reduce the risk of storm-induced flooding.
- Policy FL-2: Continue or strengthen city programs that seek to minimize the storm-induced flooding hazard.

- Policy FL-3: Seek the cooperation and assistance of other government agencies in managing the risk of storm-induced flooding.

(6) City of Oakland Open Space, Conservation, and Recreation (OSCAR) Plan. The OSCAR includes the following Hydrology policy:

- Policy CO-5.1: Encourage groundwater recharge by protecting large open space areas, maintaining setbacks along creeks and other recharge features, limiting impervious surfaces where appropriate, and retaining natural drainage patterns within newly developing areas

(7) City of Oakland's Standard and Uniformly Applied Conditions of Approval. The City of Oakland's Standard and Uniformly Applied Conditions of Approval that would apply to the proposed project are listed below. Implementation of these Conditions of Approval would ensure that a project's potential hydrologic impacts would be reduced.

Condition 24: Erosion and Sedimentation Control (When no grading permit is required). *Ongoing throughout demolition, grading, and/or construction activities.* Pursuant to Chapter 13.16 of the Oakland Municipal Code, the project applicant shall implement Best Management Practices (BMPs) to reduce erosion, sedimentation, and water quality impacts during construction to the maximum extent practicable. At a minimum, the project applicant shall provide filter materials deemed acceptable to the City at nearby catch basins to prevent any debris and dirt from flowing into the City's storm drain system and creeks.

Condition 43: Erosion and Sedimentation Control Plan. *Prior to any grading activities*

a) The project applicant shall obtain a grading permit if required by the Oakland Grading Regulations pursuant to Section 15.04.780 of the Oakland Municipal Code. The grading permit application shall include an erosion and sedimentation control plan. The erosion and sedimentation control plan shall include all necessary measures to be taken to prevent excessive stormwater runoff or carrying by stormwater runoff of solid materials on to lands of adjacent property owners, public streets, or to creeks as a result of conditions created by grading operations. The plan shall include, but not be limited to, such measures as short-term erosion control planting, waterproof slope covering, check dams, interceptor ditches, benches, storm drains, dissipation structures, diversion dikes, retarding berms and barriers, devices to trap, store and filter out sediment, and stormwater retention basins. Off-site work by the project applicant may be necessary. The project applicant shall obtain permission or easements necessary for off-site work. There shall be a clear notation that the plan is subject to changes as changing conditions occur. Calculations of anticipated stormwater runoff and sediment volumes shall be included, if required by the Director of Development or designee. The plan shall specify that, after construction is complete, the project applicant shall ensure that the storm drain system shall be inspected and that the project applicant shall clear the system of any debris or sediment.

Ongoing throughout grading and construction activities

b) The project applicant shall implement the approved erosion and sedimentation plan. No grading shall occur during the wet weather season (October 15 through April 15) unless specifically authorized in writing by the Building Services Division.

Condition 62: Stormwater Pollution Prevention Plan. *Prior to and ongoing throughout demolition, grading, and/or construction activities.* The project applicant must obtain coverage under the General Construction Activity Storm Water Permit (General Construction Permit) issued by the State Water Resources Control Board (SWRCB). The project applicant must file a notice of intent (NOI) with the SWRCB. The project applicant will be required to prepare a stormwater pollution prevention plan (SWPPP). At a minimum, the SWPPP shall include a description of construction materials, practices, and equipment storage and maintenance; a list of pollutants likely to contact stormwater; site-specific erosion and sedimentation control practices; a list of provisions to eliminate or reduce discharge of materials to stormwater; Best Management Practices (BMPs), and an inspection and monitoring program. Prior to the issuance of any construction-related permits, the project applicant shall submit a copy of the SWPPP and evidence of approval of the SWPPP by the SWRCB to the Building Services Division. Implementation of the SWPPP shall start with the com-

mencement of construction and continue though the completion of the project. After construction is completed, the project applicant shall submit a notice of termination to the SWRCB.

Condition 63: Drainage Plan for Projects on Slopes Greater than 20%. *Prior to issuance of building permit (or other construction-related permit).* The project drawings submitted for a building permit (or other construction-related permit) shall contain a drainage plan to be reviewed and approved by the Building Services Division. The drainage plan shall include measures to reduce the post-construction volume and velocity of stormwater runoff to the maximum extent practicable. Stormwater runoff shall not be augmented to adjacent properties or creeks. The drainage plan shall include and identify the following:

- All proposed impervious surface on the site;
- Anticipated directional flows of on-site stormwater runoff;
- Site design measures to reduce the amount of impervious surface area and directly connected impervious surfaces;
- Source control measures to limit the potential for stormwater pollution; and
- Stormwater treatment measures to remove pollutants from stormwater runoff.

Condition 64: Site Design Measures for Post-Construction Stormwater Pollution Management. *Prior to issuance of building permit (or other construction-related permit)* The project drawings submitted for a building permit (or other construction-related permit) shall contain a final site plan to be reviewed and approved by Planning and Zoning. The final site plan shall incorporate appropriate site design measures to manage stormwater runoff and minimize impacts to water quality after the construction of the project. These measures may include, but are not limited to, the following:

- Minimize impervious surfaces, especially directly connected impervious surfaces;
- Utilize permeable paving in place of impervious paving where appropriate;
- Cluster buildings;
- Preserve quality open space; and
- Establish vegetated buffer areas.

Ongoing

The approved plan shall be implemented and the site design measures shown on the plan shall be permanently maintained.

Condition 65: Source Control Measures to Limit Stormwater Pollution. *Prior to issuance of building permit (or other construction-related permit)* The applicant shall implement and maintain all structural source control measures imposed by the Chief of Building Services to limit the generation, discharge, and runoff of stormwater pollution.
Ongoing
The applicant, or his or her successor, shall implement all operational Best Management Practices (BMPs) imposed by the Chief of Building Services to limit the generation, discharge, and runoff of stormwater pollution.

Condition 66: Post-Construction Stormwater Pollution Management Plan. *Prior to issuance of building permit (or other construction-related permit)* The applicant shall comply with the requirements of Provision C.3 of the National Pollutant Discharge Elimination System (NPDES) permit issued to the Alameda Countywide Clean Water Program. The applicant shall submit with the application for a building permit (or other construction-related permit) a completed Stormwater Supplemental Form for the Building Services Division. The project drawings submitted for the building permit (or other construction-related permit) shall contain a stormwater pollution management plan, for review and approval by the City, to limit the discharge of pollutants in stormwater after construction of the project to the maximum extent practicable.

a) The post-construction stormwater pollution management plan shall include and identify the following:
    - All proposed impervious surface on the site;
    - Anticipated directional flows of on-site stormwater runoff; and
    - Site design measures to reduce the amount of impervious surface area and directly connected impervious surfaces; and
    - Source control measures to limit the potential for stormwater pollution; and

- Stormwater treatment measures to remove pollutants from stormwater runoff.

b) The following additional information shall be submitted with the post-construction stormwater pollution management plan:
   - Detailed hydraulic sizing calculations for each stormwater treatment measure proposed; and
   - Pollutant removal information demonstrating that any proposed manufactured/mechanical (i.e., non-landscape-based) stormwater treatment measure, when not used in combination with a landscape-based treatment measure, is capable or removing the range of pollutants typically removed by landscape-based treatment measures.

All proposed stormwater treatment measures shall incorporate appropriate planting materials for stormwater treatment (for landscape-based treatment measures) and shall be designed with considerations for vector/mosquito control. Proposed planting materials for all proposed landscape-based stormwater treatment measures shall be included on the landscape and irrigation plan for the project. The applicant is not required to include on-site stormwater treatment measures in the post-construction stormwater pollution management plan if he or she secures approval from Planning and Zoning of a proposal that demonstrates compliance with the requirements of the City's Alternative Compliance Program.

Prior to final permit inspection
The applicant shall implement the approved stormwater pollution management plan.

Condition 67: Maintenance Agreement for Stormwater Treatment Measures. *Prior to final zoning inspection.* For projects incorporating stormwater treatment measures, the applicant shall enter into the "Standard City of Oakland Stormwater Treatment Measures Maintenance Agreement," in accordance with Provision C.3.e of the NPDES permit, which provides, in part, for the following:

- The applicant accepting responsibility for the adequate installation/construction, operation, maintenance, inspection, and reporting of any on-site stormwater treatment measures being incorporated into the project until the responsibility is legally transferred to another entity; and
- Legal access to the on-site stormwater treatment measures for representatives of the City, the local vector control district, and staff of the Regional Water Quality Control Board, San Francisco Region, for the purpose of verifying the implementation, operation, and maintenance of the on-site stormwater treatment measures and to take corrective action if necessary. The agreement shall be recorded at the County Recorder's Office at the applicant's expense.

Condition 68: Erosion, Sedimentation, and Debris Control Measures. *Prior to issuance of demolition, grading, or construction-related permit.* The project applicant shall submit an erosion and sedimentation control plan for review and approval by the City. All work shall incorporate all applicable "Best Management Practices (BMPs) for the construction industry, and as outlined in the Alameda Countywide Clean Water Program pamphlets, including BMP's for dust, erosion and sedimentation abatement per Chapter Section 15.04 of the Oakland Municipal Code. The measures shall include, but are not limited to, the following:

a) On sloped properties, the downhill end of the construction area must be protected with silt fencing (such as sandbags, filter fabric, silt curtains, etc.) and hay bales oriented parallel to the contours of the slope (at a constant elevation) to prevent erosion into the creek.

b) In accordance with an approved erosion control plan, the project applicant shall implement mechanical and vegetative measures to reduce erosion and sedimentation, including appropriate seasonal maintenance. One hundred (100) percent degradable erosion control fabric shall be installed on all graded slopes to protect and stabilize the slopes during construction and before permanent vegetation gets established. All graded areas shall be temporarily protected from erosion by seeding with fast growing annual species. All bare slopes must be covered with staked tarps when rain is occurring or is expected.

c) Minimize the removal of natural vegetation or ground cover from the site in order to minimize the potential for erosion and sedimentation problems. Maximize the replanting of the area with native vegetation as soon as possible.

d) All work in or near creek channels must be performed with hand tools and by a minimum number of people. Immediately upon completion of this work, soil must be repacked and native vegetation planted.

e) Install filter materials (such as sandbags, filter fabric, etc.) at the storm drain inlets nearest to the creek side of the project site prior to the start of the wet weather season (October 15); site dewatering activities; street washing activities; saw cutting asphalt or concrete; and in order to retain any debris flowing into the City storm drain system.

Filter materials shall be maintained and/or replaced as necessary to ensure effectiveness and prevent street flooding.

f) Ensure that concrete/granite supply trucks or concrete/plaster finishing operations do not discharge wash water into the creek, street gutters, or storm drains.

g) Direct and locate tool and equipment cleaning so that wash water does not discharge into the creek.

h) Create a contained and covered area on the site for storage of bags of cement, paints, flammables, oils, fertilizers, pesticides, or any other materials used on the project site that have the potential for being discharged to the storm drain system by the wind or in the event of a material spill. No hazardous waste material shall be stored on site.

i) Gather all construction debris on a regular basis and place them in a dumpster or other container which is emptied or removed on a weekly basis. When appropriate, use tarps on the ground to collect fallen debris or splatters that could contribute to stormwater pollution.

j) Remove all dirt, gravel, refuse, and green waste from the sidewalk, street pavement, and storm drain system adjoining the project site. During wet weather, avoid driving vehicles off paved areas and other outdoor work.

k) Broom sweep the street pavement adjoining the project site on a daily basis. Caked-on mud or dirt shall be scraped from these areas before sweeping. At the end of each workday, the entire site must be cleaned and secured against potential erosion, dumping, or discharge to the creek.

l) All erosion and sedimentation control measures implemented during construction activities, as well as construction site and materials management shall be in strict accordance with the control standards listed in the latest edition of the Erosion and Sediment Control Field Manual published by the Regional Water Quality Board (RWQB).

m) Temporary fencing is required for sites without existing fencing between the creek and the construction site and shall be placed along the side adjacent to construction (or both sides of the creek if applicable) at the maximum practical distance from the creek centerline. This area shall not be disturbed during construction without prior approval of Planning and Zoning.

n) All erosion and sedimentation control measures shall be monitored regularly by the project applicant. The City may require erosion and sedimentation control measures to be inspected by a qualified environmental consultant (paid for by the project applicant) during or after rain events. If measures are insufficient to control sedimentation and erosion then the project applicant shall develop and implement additional and more effective measures immediately.

Condition 69: Creek Protection Plan. (http://www.oaklandpw.com/creeks) *Prior to and ongoing throughout demolition, grading, and/or construction activities.*

a) The approved creek protection plan shall be included in the project drawings submitted for a building permit (or other construction-related permit). The project applicant shall implement the creek protection plan to minimize potential impacts to the creek during and after construction of the project. The plan shall fully describe in plan and written form all erosion, sediment, stormwater, and construction management measures to be implemented on-site.

b) If the plan includes a stormwater system, all stormwater outfalls shall include energy dissipation that slows the velocity of the water at the point of outflow to maximize infiltration and minimize erosion. The project shall not result in a substantial increase in stormwater runoff volume or velocity to the creek or storm drains.

Condition 74: Dewatering and Diversion for Creekside Properties. *Prior to the start of any in-water construction activities.* The project applicant shall develop and implement a detailed dewatering and diversion plan for review and approval by the Building Services Division. All proposed dewatering and diversion practices shall be consistent with the requirements of the Streambed Alteration Agreement issued by the California Department of Fish and Game.

a) If installing any dewatering or diversion device(s), ensure that construction and operation of the devices meet the standards in the latest edition of the Erosion and Sediment Control Field Manual published by the Regional Water Quality Control Board (RWQCB).

b) Construct coffer dams and water diversion system of a non-erodable material which will cause little or siltation. Maintain coffer dams and the water diversion system in place and functional throughout the construction period. If the coffer dams or water diversion system fail, repair immediately based on the recommendations of a qualified environmental consultant. Remove devices only after construction is complete and the site stabilized.

c) Pass pumped water through a sediment settling device before returning the water to the stream channel. Provide velocity dissipation measures at the outfall to prevent erosion.

Condition 75: Regulatory Permits and Authorization. *Prior to issuance of a demolition, grading, or building permit.* Prior to construction within the floodway or floodplain, the project applicant shall obtain all necessary regulatory permits and authorizations from the Alameda County Flood Control and Water Conservation District and shall comply with all conditions issued by that agency.

Condition 76: Structures within a Floodplain. *Prior to issuance of a demolition, grading, or building permit.*

a) The project applicant shall retain the civil engineer of record to ensure that the project's development plans and design contain finished site grades and floor elevations that are elevated above the Base Flood Elevation (BFE) if established of a 100-year flood event.

b) The project applicant shall submit final hydrological calculations that ensure that the structure will not interfere with the flow of water or increase flooding.

2. Impacts and Mitigation Measures

This section analyzes the impacts related to hydrology and water quality that could result from implementation of the project components. The section begins with criteria of significance, which establish the thresholds for determining whether a project impact is significant. The latter part of this section presents the potential hydrology and storm drainage impacts associated with the proposed project. Mitigation measures are provided, as appropriate.

a. Criteria of Significance. The project would have a significant impact on the environment if it would:

1) Violate any water quality standards or waste discharge requirements;

2) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or proposed uses for which permits have been granted);

3) Result in substantial erosion or siltation on- or off-site that would affect the quality of receiving waters;

4) Result in substantial flooding on- or off-site;

5) Create or contribute substantial runoff which would exceed the capacity of existing or planned stormwater drainage systems;

6) Create or contribute substantial runoff which would be an additional source of polluted runoff;

7) Otherwise substantially degrade water quality;

8) Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, that would impede or redirect flood flows;

9) Place within a 100-year flood hazard area structures which would impede or redirect flood flows;

10) Expose people or structures to a substantial risk of loss, injury or death involving flooding;

11) Result in inundation by seiche, tsunami, or mudflow;

12) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course, or increasing the rate or amount of flow, of a Creek, river or stream in a manner that would result in substantial erosion, siltation, or flooding, both on- or off-site; or

13) Fundamentally conflict with elements of the City of Oakland Creek Protection Stormwater and Discharge (OMC Chapter 13.16) ordinance intended to protect hydrologic resources. Although there are no specific, numeric/quantitative criteria to assess impacts, factors to be considered in determining significance include whether there is substantial degradation of water quality through: (a) discharging a substantial amount of pollutants into a creek; (b) significantly modifying the natural flow of the water or capacity; (c) depositing substantial amounts of new material into a creek or causing substantial bank erosion or instability; or (d) substantially endangering public or private property or threatening public health or safety.

Table IV.H-2: Summary of Potential Impacts – Hydrology and Water Quality

	Project Group[a]			
Would the Project:	**Group 1 Lake Merritt**	**Group 2 Waterfront Trail**	**Group 3 Recreational Facilities**	**Group 4 City-wide Creeks**
1. Violate water quality standards or discharge requirements?	O	O	O	O
2. Deplete groundwater supplies or interfere with groundwater recharge?	O	O	O	O
3. Result in erosion?	O	O	O	O
4. Result in flooding?	O	O	O	O
5. Result in substantial runoff that would exceed stormwater drainage systems?	O	O	O	O
6. Result in substantial polluted runoff?	O	O	O	O
7. Degrade water quality?	O HYD-1	O HYD-1	O HYD-1	O HYD-1
8. Place housing in a 100-year flood hazard area?	==	==	==	==
9. Place structures in a 100-year flood hazard that would redirect flood flows?	==	==	==	==
10. Expose people/structures to substantial loss involving flooding?	O	O	O	O
11. Result in inundation by seiche, tsunami, or mudflow?	O	O	O	O
12. Substantially alter existing drainage pattern of the site?	O	O	O	O
13. Conflict with elements of the Oakland Creek Protection Ordinance?	O	O	O	O

[a] The Lake Merritt and Waterfront Trail groups are analyzed at the project level. The Recreational Facilities and City-wide Creeks groups are analyzed at the program level. The level of impact and the proposed mitigation measure, if any, are identified as follows:

== No impact

O Less-than-Significant or Less-than-Significant with standard Conditions of Approval

- Reduced to Less-than-Significant after recommended mitigation
- Significant

NA Not Applicable

HYD-1, etc. identifies the mitigation measure, if any, that addresses the impact and reduces it to a level that is less than significant.

Source: LSA Associates, 2007

b. Impacts and Mitigation Measures Applicable to All Project Groups. Several impacts to hydrology and water quality that may result from the implementation of Measure DD would essentially be the same for each or most of the four project groups. These impacts are defined below for each criterion of significance listed above.

(1) Water Quality (Criteria 1, 3, and 6). Activities proposed by the project would include two phases that could result in impacts to water quality construction and operation.

Construction Period. Some of the proposed Measure DD Project components would require grading and excavation, such as for street realignment and bridge construction projects. Construction, grading, and excavation would require temporary disturbance of surface soils. During the construction period, grading and excavation activities would result in exposure of soil to runoff, and the discharge of groundwater from the excavation, potentially causing erosion and entrainment of sediment in the runoff. Soil stockpiles and excavated areas would be exposed to runoff and, if not managed properly, the runoff could cause erosion and increased sedimentation and pollutants in stormwater. The potential for chemical releases is present at most construction sites given the types of materials used, including fuels, oils, paints, and solvents. Once released, these substances could be transported to Lake Merritt and San Francisco Bay in stormwater runoff, dewatering effluent, wash water, and dust control water, potentially reducing water quality. Deposition resulting from the project could impact aquatic habitat and other beneficial uses of receiving waters.

Compliance with existing programs and ordinances, including the NPDES General Construction Activity permit administered by the State Water Resources Control Board and the City of Oakland Municipal Code section 13.16.100 (City Of Oakland Creek Protection, Storm Water Management and Discharge Control Ordinance) would be required. These programs and ordinances require that the City and/or its designated contractors mitigate potential construction-period water quality impacts for applicable projects. The City and/or its designated contractors would be required to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) for each component that includes disturbance of one more acre of land (NPDES requirements).

For example, a Storm Water Pollution Prevention Plan (SWPPP) has been prepared for the implementation of the Lake Merritt Master Plan Park and Street Design of El Embarcadero and Lakeshore Avenue. The SWPPP incorporates construction period Best Management Practices (BMPs) and Post-construction Storm Water Management methods including Site Planning Controls, Non-storm Water Management, and Maintenance, Inspection and Repair of structural controls in perpetuity.[39]

For those project components that would disturb less than one acre of land, the Oakland Municipal Code “prohibits activities that will result in the discharge of pollutants to Oakland's waterways or the

[39] Sandis, Humber, Jones, 2005, Storm Water Pollution Prevention Plan for Lake Merritt Master Plan Implementation, Park and Street Design of El Embarcadero and Lakeshore Avenue, Oakland CA., November.

damaging of creeks, creek functions, or habitat" and therefore water quality mitigation would still be required.

Operation Period. Under the proposed project, some components (such as the Sports Center, Lake Merritt Parks, and Bay Trail Trailhead facilities) would result in new facilities and parking lots. Sources of urban pollutants, including spills and leaks associated with automobiles, would accompany these new developments. These sources may contribute petroleum hydrocarbons, heavy metals, and sediment to the pollutant load in runoff discharged to receiving waters. Runoff from landscaped areas may contain residual pesticides and nutrients. Runoff from the components eventually enters Lake Merritt and San Francisco Bay, water bodies that are listed as impaired by the Water Board. The Water Board has designated Lake Merritt as impaired due to organic enrichment, low dissolved oxygen, and trash resulting from urban runoff and storm sewer effluent. San Francisco Bay and Oakland Inner Harbor are water quality impaired for several pesticides (chlordane, DDT, diazinon, and dieldrin), dioxin compounds, exotic species, furan compounds, mercury, PCBs, and selenium,[40] and the Water Board has determined that the assimilative capacity of the San Francisco Bay for these pollutants has already been exceeded.

Most contaminants that have been identified as causing the water quality impairment of the Bay and Inner Harbor are unlikely to be used at the Measure DD component sites. Each of the pesticides (chlordane, DDT, diazinon, and dieldrin) has been banned for non-agricultural use and is therefore not available for legal use at the component sites. The source of the dioxin and furan compounds has been identified as atmospheric deposition. The proposed project would not alter the rate of atmospheric deposition, and therefore not change the current loading rate of these compounds. The proposed Measure DD Implementation Project would not introduce exotic species to the Bay or increase the impact of existing exotic species. Mercury would not be used at the site and this project would not be expected to generate discharges of this contaminant. The selenium impairment has been caused by industrial point sources, natural sources, and exotic species; increases in selenium loading would not be expected based on the proposed land uses. The project component draining to Lake Merritt could contribute organic materials and nutrients to Lake discharge.

The existing NPDES program requires that any Measure DD components creating 10,000 square feet of new impervious surface or more, treat runoff prior to discharge using BMPs. The amount of runoff that is typically required to be treated is about 80 to 85 percent of the total average annual runoff from the site (depending on whether a volume-based or flow-based method is used). In general, passive, low-maintenance BMPs (e.g., grassy swales, porous pavements, and stormwater planters) are preferred. Under the existing program, the City would ensure that the project design includes features and operational BMPs to reduce potential impacts to surface water quality associated with operation of the project to the maximum extent practicable. Compliance with the terms of the standard Conditions of Approval associated with regulatory agency approved plans as detailed above would ensure that the impact would be less than significant.

Proposed components of the Lake Merritt and Lake Merritt Channel group, the Waterfront Trail group and the Recreational Facilities group lie within areas served by hardened stormwater conduits or are located in areas near the Bay that are relatively flat and have a low potential for erosion. These areas are exempt from the ACCWP erosion control requirements (hydromodification standards) but

[40] RWQCB, 2003, op. cit.

nevertheless would incorporate site design/landscape characteristics, which maximize infiltration (where appropriate), provide retention or detention, slow runoff, and minimize impervious land coverage (i.e., use hydrologic source controls) to the maximum extent practicable. Many proposed components of the City-wide Creeks group would be constructed in areas with steeper terrain. They would be constructed in accordance with the ACCWP HMMP and the City's Creek Protection Ordinance, which are intended to ensure, among other objectives, that projects do not increase erosion. As noted in Chapter III, Project Description, one of the objectives of the City-wide Creeks group is to control erosion and thus the proposed creek restoration activities would be designed to improve rainfall infiltration, stabilize stream banks and otherwise reduce erosion in the long term.

(2) Groundwater Supplies and Recharge (Criteria 2). Groundwater pumping is not proposed by any component of Measure DD. Groundwater recharge resulting from infiltration of precipitation depends on the type and amount of pervious surface within a watershed. Many components of Measure DD propose to move, replace or reconfigure impervious surfaces such as parking lots and roadways. However, as proposed, the components would result in approximately the same amount of impervious surfaces, and in some cases a reduction in impervious surface area relative to the existing conditions. New landscaping, park areas, and enhanced riparian habitats proposed by the project would likely improve infiltration and groundwater recharge. This potential impact would be less than significant.

(3) Flooding (Criteria 4, 5, 8, 9, 10, and 12). In general, the project components would be either outside the floodplain or designed to improve flood water conveyance and channel stability. For example:

- The project proposes to modify the Lake Merritt Channel shape to increase conveyance and flushing. Preliminary project design has been developed based on hydraulic analyses and mathematical modeling of the flow under the proposed 12th Street Bridge location.[41] Further studies have evaluated the conveyance capacity of the channel and drawdown rates for Lake Merritt based on the modeled configuration and concluded that conveyance capacity of the Channel will be approximately doubled if all channel improvement proposals are fully implemented. The ability of the channel to convey more water out of the Lake to the open water of the Estuary and Bay could alleviate flooding conditions.[42]
- Activities proposed by the City-wide Creeks group of projects are designed to improve the ability of the creeks to convey stormwater, increase streambed and bank stability, minimize erosion and improve water quality. Enhancement in the ability of the creeks to transport stormwater would reduce flooding and erosion hazards.

Substantial quantities of new impervious surfaces, which could increase runoff rates and velocities (and potentially flooding), would not be created by Measure DD project components. Construction of housing is not a proposed element of the project, and no new residential development would be subject to flooding. Therefore, no substantial impact related flood hazard or redirection of flood water would occur with the proposed Measure DD components.

[41] PWA, 2005, Report: City of Oakland, 12th Street Reconstruction Project, PWA Basis of Design Elements, 24 June, PWA#1726.00

[42] PWA, 2007, Memorandum: Lake Merritt Channel Conveyance Capacity, 17 January, PWA#1826/1827

Although a low probability event, structural dam failure can be caused by earthquake or overflow. All dams that could affect Measure DD components are under the jurisdiction of State of California, Division of Safety of Dams. Existing dams under state and federal jurisdiction are periodically inspected to ensure that they are adequately maintained and to direct the owner to correct any identified deficiencies. Regular inspections and required maintenance of the dams substantially reduce the potential for catastrophic failure.[43] In addition, the types of projects included in Measure DD (none include housing, schools, or critical facilities) are not particularly susceptible to impacts associated with dam failure inundation. This would be a less-than-significant impact.

(4) Degrade Water Quality (Criterion 7). One potentially significant impact related to water quality is described below.

Impact HYD-1 (Groups 1 – 4): Existing groundwater well(s), that may be encountered and/or damaged by proposed project activities, could act as conduits for migration of pollutants to the underlying groundwater aquifer. (S)

Hundreds of wells were formerly located in the East Bay Plain and used for general water supply. Many of these wells were not properly destroyed and may still be present at one or more of the project component sites. If the well was not fitted with an effective sanitary seal when constructed, or if the seal has been damaged since installation or were to be damaged during grading and construction associated with the project, surface water (potentially containing pollutants) could seep into the wells and the underlying aquifer, causing water quality degradation.

> Mitigation Measure HYD-1 (Groups 1 – 4)**:** Any existing wells discovered during the implementation of Measure DD shall be either: 1) properly abandoned in compliance with the California Department of Water Resources California Well Standards and Alameda County Environmental Health Department requirements prior to final approval of the grading plan; or 2) inspected by a qualified professional to determine whether each well is properly sealed at the surface to prevent infiltration of water-borne contaminants into the well casing or surrounding gravel pack. The California Well Standards require an annular surface seal of at least 20 feet. If the wells are found not to comply with this requirement, the City shall retain a qualified well driller to install the required seal. (LTS)

(5) Seiche, Tsunami, or Mudflow (Criterion 11). Those components with an elevation of approximately 10 feet NGVD or higher would be expected to be provided adequate protection from tsunamis, extreme high tides, and sea level rise, all of which tend to present hazards for sites at elevations lower than 10 feet NGVD. [44,45,46,47] Those components at elevations less than 10 feet NGVD are around the perimeter of Lake Merritt, along the Lake Merritt Channel and along the Oakland Estuary

[43] OES, 2006, op. cit.

[44] Houston, J.R., Garcia, A.W., 1975, Type 16 Flood Insurance Study: Tsunami Predictions for Monterey and San Francisco Bays and Puget Sound, Technical Report H-75-17, November.

[45] Ritter, J., Dupre, W., 1972. Maps Showing Areas of Potential Inundation of Tsunamis in the San Francisco Bay Region, California, Department of the Interior, U.S. Geological Survey, Misc. Field Studies, MF480.

[46] United States Army Corps of Engineers (USACE), 1984, San Francisco Bay Tidal Stage vs. Frequency Study, October.

[47] USEPA, 1995, The Probability of Sea Level Rise, EPA 230-R-95-008, October.

and consist of open structures such as the boathouse, bridges, pathways, signage and park land. These types of land uses are not particularly susceptible to impacts associated with sea level rise (as none include housing, schools, or critical facilities). As a result the impact would be less than significant.

Detailed tidal records for the Bay have been maintained for approximately 100 years, and during that time, a damaging seiche has not occurred.[48] A seiche of approximately four inches occurred during the M8.3 1906 earthquake. It is unlikely that the Bay region will experience a larger earthquake than the 1906 event, and therefore a seiche larger than four inches is considered unlikely to occur. Inundation from seiche would represent a less than significant impact.

(6) Creek Protection Ordinance (Criterion 13). Some project components within the Lake Merritt and Lake Merritt Channel, City-wide Creeks and Waterfront Trail groups are subject to the City's Creek Protection Ordinance, and Creek Protection Permits have already been obtained for the Lakeshore Avenue/El Embarcadero and East 18th Street Pier Overlook project components, for example. Conditions of approval for future Creek Protection Permits (Condition 69) will include requirements to minimize erosion and sedimentation in accordance with the Manual of Standards for Erosion and Sediment Control Measures.[49] In addition, Creek Protection Permits will require the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) pursuant to Water Board requirements. With the incorporation of these requirements into project approvals, projects funded by Measure DD will have a less-than-significant impact on City creeks or other areas subject to the Creek Protection Ordinance.

c. Impacts Unique to Specific Project Components. Specific impacts associated with hydrology and water quality for select components are described below.

Lake Merritt and Lake Merritt Channel (Group 1). The Lake Merritt and Lake Merritt Channel group consists of approximately 15 individual components of Measure DD. Of these, all are addressed adequately by the requirements described above in Impacts and Mitigation Measures Applicable to All Project Groups. Specifics of the three large components located in Lake Merritt Channel are detailed below:

- Replace 12th Street & Culverts with New Reconfigured 12th Street Bridge;
- Replace Existing 10th Street Bridge with New 10th Bridge; and
- Redesign of Channel at Lake Merritt Flood Control Station at 7th Street.

These three components are designed to improve tidal exchange between Lake Merritt and San Francisco Bay by clearing and broadening the channel to approximately 100 feet. New clear-span bridges would be constructed after removal of existing culverts under 12th and 10th streets and by reconfiguring the channel at 7th Street, resulting in approximately doubling the flow rate through the Lake Merritt Channel.[50,51] These components are also intended to improve pedestrian and bicycle circulation in

[48] A seiche is a standing wave in an enclosed or partly enclosed body of water. Earthquakes may induce seiche in lakes, bays, and rivers. More commonly, wind-driven currents or tides cause seiche.

[49] Association of Bay Area Governments. 1995. *Manual of Standards for Erosion and Sediment Control Measures.* Second edition. Association of Bay Area Governments, Oakland, California. 422 pp.

[50] Rajappan & Meyer Consulting Engineers, 2007, *Lake Merritt Channel Conveyance Capacity: 1826/1827 – Hydraulic Modeling,* prepared for the City of Oakland, 17 January.

the area of the Channel, and along with other components, enhance and improve the environment of Lake Merritt and surrounding parks. Topics of wildlife, aquatic life, vegetation, landscaping, creek restoration, U.S. Army Corps of Engineers Section 404 (filling and grading in wetlands) permitting, California Department of Fish and Game Section 1604 – Streambed Alteration Agreements, and San Francisco Bay Conservation and Development Commission (BCDC) requirements are addressed in the Biological Resources section of this DEIR.

The work at 10th and 7th Streets would use many of the same techniques during the construction phase to protect water quality as the 12th Street project. These techniques include performing shoreline and foundation works in a 'dry' environment by constructing cofferdams around the shoreline installations and filtering and removing the water from the work site. The City of Oakland would require that the contractor(s) acquire a Creek Protection Permit and, in accordance with the City's Standard Conditions of Approval develop and implement an Erosion Control Plan (ECP) and other measures protective of water quality for each component (Conditions 43, 69, and 74). During the dewatering process, removed water would be passed through a sediment-settling device before being returned to the channel. The contractor would use erosion control methods drawn from the Association of Bay Area Governments Standards for Erosion and Sediment Control and the San Francisco Regional Water Quality Control Board's Erosion and Sediment Control Field Manual.[52,53] Operation period water quality management practices proposed include the installation of bio-swales, detention basins and drainage inlets with filters to improve stormwater runoff water quality.[54] The operational period storm water runoff facilities would be required to treat at least 85 percent of the average annual runoff from the site. In addition, the channel banks would be stabilized and armored to reduce scouring and erosion along the channel, decreasing or eliminating erosion. The City of Oakland's Open Space Conservation and Recreation Element of the General Plan calls for the daylighting of creeks and removal of culverts within the city limits as a means of restoring natural creek ecosystems, and hence improving water quality. Compliance with the requirements as detailed above would ensure that the potential impacts to hydrology and water quality from the Channel projects are less than significant.

Waterfront Trail (Group 2). This component has no impacts beyond those described above in Impacts and Mitigation Measures Applicable to All Project Groups.

Recreational Facilities (Group 3).

Studio One Art Center. This component has no impacts beyond those described above in Impacts and Mitigation Measures Applicable to All Project Groups.

East Oakland Sports Complex. Schematic drawings prepared for this 14-acre component indicate ground water elevations to be four to ten feet COO (City of Oakland Datum) and a dewatering plan would be required. It is proposed to import approximately 12,500 cubic yards of fill and the site would be reshaped to generally slope from the center towards the site perimeter. The schematic site

[51] Rajappan & Meyer Consulting Engineers, 2005, *City of Oakland 12th Street Reconstruction Project: PWA Basis of Design Elements*, prepared for Philip Williams & Associates, Ltd., 24 June.

[52] City of Oakland Municipal Code, Section 3305 – Erosion and Sediment Control.

[53] City of Oakland, 2007, Environmental Services Division, *Oakland Sustainable Design Guide*, accessed at: www.oaklandpw.com/Page46.aspx, 20 April.

[54] Rajappan & Meyer Consulting Engineers, Inc., 2005, op. cit.

plans also propose extensive use of water-filtering bio-swales and a 5,000 square foot detention basin near Edes Avenue in the final configuration.[55] Compliance with existing programs and ordinances, the City of Oakland Standard Conditions of Approval, the NPDES General Construction Activity permit administered by the State Water Resources Control Board and the City of Oakland Municipal Code section 13.16.100 (City Of Oakland Creek Protection, Storm Water Management and Discharge Control Ordinance) would be required. These programs and ordinances require that the City and/or its designated contractors mitigate potential construction-period and operational water quality impacts for applicable projects. The City and/or its designated contractors would be required to prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) for any component that includes disturbance of one more acre of land (NPDES requirements). Compliance with the requirements as detailed above would ensure that the potential impacts to hydrology and water quality from the Channel projects is less than significant.

City-wide Creeks (Group 4). This component has no impacts beyond those described above in Impacts and Mitigation Measures Applicable to All Project Groups.

[55] ELS Architecture and Urban Design; Murakami/Nelson, 2003, *op. cit.*