SECTION 4.7

Hydrology and Water Quality

This section evaluates the potential effects of implementation of the proposed Campus Master Plan on hydrology and water quality on and adjacent the campus as well as the project's contribution to cumulative impacts on water quality in the region.

Public and agency comments related to hydrology and water quality that were received in response to the Notice of Preparation are summarized below.

- Commenters expressed concerns about the impact of the proposed project on water quality in the adjacent Lake Merced area.
- A commenter requested that the EIR provide an assessment of existing and planned hydrological features; identification of operating or abandoned groundwater wells or sumps; an estimate of additional impervious surfaces and additional storm water runoff that would be generated by the development under the proposed Campus Master Plan and any changes in groundwater recharge; likely contaminants in campus runoff and identification of all storm water management practices and features to control runoff water quality.

A description of the campus's existing storm water system is provided in Section 3, Project Description. All of the other issues listed above are addressed in the analysis below.

4.7.1 Environmental Setting

4.7.1.1 Study Area

The study area for direct impacts on hydrology and water quality includes the SFSU campus. The term "campus" refers to the campus planning area for the proposed Campus Master Plan that includes the 134-acre main campus and an additional 10 acres of adjacent property owned primarily by the SF State Foundation (see Figure 3-1, *Campus Master Plan Boundary*). See Chapter 3, *Project Description*, for further description of the 144-acre project area. Because portions of Lake Merced that are downgradient of the campus could be indirectly affected by the changes on the campus, Lake Merced is also included in the study area for hydrology and water quality impacts.

4.7.1.2 Regional Setting

Surface Water Features

The SF State campus is located in the Sunset region of the highly developed City and County of San Francisco. The Sunset region is composed primarily of high and low-density residential areas interspersed with retail locations. Most of the area is developed with urban uses and surface water features are generally not present in most of the area surrounding the campus. The one exception is Lake

Merced and its associated open spaces, which are located immediately west of the campus. Lake Merced and its watershed are described in more detail later in this section.

Groundwater

The Westside Basin underlies this portion of the City and is the largest groundwater basin in San Francisco with a total area of 40 square miles. It extends from Golden Gate Park to the north to the San Francisco International Airport to the south. To the east it is bound by San Bruno Mountains and on the west by the Pacific Ocean. Geologically, the groundwater basin consists of an impermeable bedrock overlain by unconsolidated materials that include dune sands, Colma formation, and Merced formation. These unconsolidated materials are water bearing. Although historically the basin has been used to supply potable water to users in San Francisco and Daly City, currently in San Francisco groundwater from this basin is drawn mainly for irrigation purposes. In many areas that use has also been discontinued in view of the falling groundwater levels. The San Francisco Public Utilities Commission (SFPUC) is working on numerous projects and programs to address the problems related to the depleted groundwater levels in this basin and the effects on water quality.

4.7.1.3 Campus Setting

The SF State campus consists mostly of a built environment (i.e., buildings, roads, and other improvements), as well as improved open spaces and outdoor recreational facilities. A description of the built environment is provided in Chapter 3, *Project Description*. No natural drainages or other surface water features are present on the campus. All campus runoff currently is directed into the City's combined sanitary sewer and storm water collection and conveyance system. No portion of the campus is located within a 100-year or a 500-year flood hazard zone as mapped by the Federal Emergency Management Agency (FEMA).

The central portion of the campus is occupied by a large east-west valley that extends from 19th Avenue to Lake Merced Boulevard. The valley is the remnant of a steep V-shaped canyon cut by a seasonal stream that flowed west into Lake Merced. Before the realignment of Lake Merced Boulevard, the northeastern arm of Lake Merced extended into the westernmost portion of this valley. With the realignment of Lake Merced Boulevard, the northeastern arm was severed from the lake. In the early 1940s, the canyon was filled to build terraces descending westward. The valley is now occupied by Cox Stadium, the campus main garage, the campus central plant, a number of playing fields, and temporary buildings.

4.7.1.4 Lake Merced Watershed

Lake Merced is part of the former western sand dunes of the San Francisco marine shore. At one time, streams in San Francisco flowed towards the Lake Merced area on their way to the ocean, and an estuary existed in this area that was open to the Pacific Ocean and subject to tidal action, until a sand bar formed a barrier between the lake and ocean. Over time, the lake evolved into a freshwater body as stream runoff diluted the salt water (EDAW and Talavera & Richardson, 2004a).

Lake Merced's original watershed covered an area of about 6,350 acres in San Francisco. However, now it is about 650 acres including the 300-acre lake, and is defined by the adjacent roadways that include

Lake Merced Boulevard, Skyline Boulevard, and John Muir Drive. The runoff from the rest of the former watershed is directed into the City's combined sanitary sewer and storm sewer system (EDAW and Talavera & Richardson, 2004a). The only land use within the 650-acre watershed is recreation.

Lake Merced consists of four interconnected freshwater lakes – North Lake, South Lake, East Lake, and Impound Lake – that are a surface expression of the shallow groundwater table in this portion of the City. The Westside Groundwater Basin that underlies the lake's watershed consists of a shallow unconfined aquifer with complete hydraulic connectivity to the lakes, and a deeper, confined aquifer that is used for municipal and other purposes and is not directly connected to the lakes due to the presence of a confining clay layer separating the two systems. Sources of lake water include groundwater seepage, precipitation directly on the lake surface, local runoff within the watershed, and infrequent planned discharges of dechlorinated water from SFPUC operations. Overflow from the Vista Grande Canal during storm events is also sometimes discharged into the lake. Lake levels fluctuate seasonally in response to changes in precipitation and groundwater levels (EDAW and Talavera & Richardson, 2004a).

Water quality varies within and between the four lakes at Lake Merced. Lake Merced is a eutrophic[1] water body, that is, the lakes in the system experience algal blooms and the water quality is poor. Studies suggest that various conditions exist at the lakes that contribute to this condition, including the presence of nutrients such as nitrogen in groundwater inflows (EDAW and Talavera & Richardson, 2004a).

Since the late 1980s, lake levels have been declining partially related to groundwater pumping and also as a result of the historic diversion of surface runoff and springs. Over the past 15 years, the SFPUC has conducted numerous studies to investigate and reverse the decline in lake levels, and in December 2004, the SFPUC adopted an Interim Lake Level Management Plan that is focused on raising and maintaining lake levels and improving water quality (EDAW and Talavera & Richardson, 2004b).

Historically (through 1932), Lake Merced served as a supply source for potable water used in the city. When other supply sources became available, Lake Merced became the emergency and irrigation water supply source for the city. The SFPUC continues to use the lake as an emergency supply source, and the lake and surrounding parklands are also important recreational resources,

4.7.2 Impacts and Mitigation Measures

4.7.2.1 Standards of Significance

The following standards of significance are based on Appendix G of the CEQA Guidelines. For purposes of this EIR, the project would have a significant impact with regard to hydrology and water quality if it would:

[1] Eutrophication is a process whereby water bodies, such as lakes, estuaries, or slow-moving streams receive excess nutrients that stimulate excessive plant growth (algae, periphyton attached algae, and nuisance plants weeds). This enhanced plant growth, often called an algal bloom, reduces dissolved oxygen in the water when dead plant material decomposes and can cause other organisms to die. Nutrients can come from many sources, such as fertilizers applied to agricultural fields, golf courses, and suburban lawns; deposition of nitrogen from the atmosphere; erosion of soil containing nutrients; and sewage treatment plant discharges.

- Violate any water quality standards or waste discharge requirements.
- 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.
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on site or off site.
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on site or off site.
- Create or contribute runoff water that would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff.
- Otherwise substantially degrade water quality.
- 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.
- Place within a 100-year flood hazard area structures that would impede or redirect flood flows.
- Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam.
- Inundation by seiche, tsunami, or mudflow.

4.7.2.2 Analytical Method

Because the campus contains no surface water body, the proposed Campus Master Plan does not have the potential to directly affect any surface water features in the study area. Two plan components that have the potential to indirectly affect surface and groundwater are the proposed new creek that would drain some of the campus runoff into Lake Merced and the introduction of some very minor addition impervious surfaces that could potentially reduce groundwater recharge.

Hydrology and water quality impacts of the creek project were evaluated by examining the proposed storm water drainage plan and the proposed creek for their ability to remove pollutants from campus storm water runoff prior to discharge into the lake. The effect of increased impervious surfaces on groundwater recharge was examined by evaluating the design features included in the proposed Campus Master Plan to infiltrate runoff.

4.7.2.3 Campus Master Plan Impacts and Mitigation Measures

Impact HYDRO-1:	Storm water runoff from the campus could potentially increase nutrients in Lake Merced, and thereby adversely affect water quality.
Significance:	Potentially significant
Mitigation HYDRO-1:	The campus shall conduct monitoring of storm water discharges to Lake Merced. If monitoring data indicate that the discharge of storm water from SF State to Lake Merced increases the level of nutrients in the lake, then depending on the source of the nutrient, additional measures (e.g., reduce the use of fertilizer on campus) to reduce nutrient loads shall be implemented.
Residual Significance:	Less than significant

Under existing conditions SF State does not discharge storm water to Lake Merced. Storm water runoff is discharged to the City's combined sewer system and is treated by the City's Oceanside Wastewater Treatment Plant and discharged to the ocean. The diversion of storm water runoff from not just the campus but all other areas in the lake's historic watershed into the combined sewer system, in conjunction with the local pumping of groundwater, has had the effect of lowering water levels in the lake. As discussed above, SFPUC has been evaluating various ways of increasing lake inflows so as to raise and maintain lake levels and improve water quality. The proposed Campus Master Plan includes a proposal to direct some of the runoff generated by new and replacement buildings and other impervious surfaces built under the proposed Campus Master Plan into a surface creek that would discharge excess runoff into East Lake. (See further description in Chapter 3, *Project Description*.) This element of the proposed Campus Master Plan would have a beneficial effect on Lake Merced as it would add new flows to the lake.

It should be noted that the campus contains typical urban land uses such as academic and residential buildings, roads, parking lots and structures, and landscaped areas, and does not include any industrial uses. Therefore runoff from campus surfaces is expected to contain pollutants that are typically found in runoff from urban areas. To avoid an impact on surface water quality, the proposed Campus Master Plan relies on Low Impact Development (LID) concepts of on-lot infiltration and control, and distributed retention to reduce the impact of increased storm water runoff to Lake Merced. The proposed Campus Master Plan calls for a three-tier approach to managing storm water runoff from redeveloped portions of the campus. Tier one is on-lot or local control of storm water. This consists of rain gardens and small infiltration devices located immediately adjacent to developed parcels. These are designed to maximize infiltration of runoff close to where it is generated. Excess water that does not infiltrate in these facilities would go to Tier 2 treatment devices consisting of small, distributed infiltration/conveyance areas and bioswales. These Tier 2 facilities would also infiltrate and treat runoff by utilizing biological processes. Lastly, discharges from Tier 2 facilities would flow into Tier 3 retention/detention facilities before discharging into a newly constructed creek to Lake Merced (see Figure 3-9, *Storm Water Management System*). The goal of the three-tier LID approach is to create an urban hydrologic system that mimics a natural hydrologic system.

Data on the effectiveness of the various treatment systems included in the proposed Campus Master Plan is variable and not definitive but the data available shows that the use of LID concepts lowers the levels of pollutants in urban runoff especially for heavy metals, with some studies showing large decreases in pollutant loads (EPA, 2000). Furthermore, the use of LID concepts in urban planning is considered state-of-the-practice and therefore for most urban runoff pollutants such as sediment, metals and oil/grease should result in a less-than-significant impact on Lake Merced water quality.

As discussed above, Lake Merced is a eutrophic lake with elevated levels of nutrients and a significant production of algae (EDAW and Talavera & Richardson, 2004a). The addition of water sources with high concentrations of nutrients and ammonia could potentially decrease the lake's dissolved oxygen concentrations and may cause eutrophication (EDAW and Talavera & Richardson, 2004a). Therefore, it is important that the addition of storm water runoff from the campus not increase the level of nutrients in the lake. Although the available data on the effectiveness of LID concepts on nutrients in storm water runoff is encouraging, some studies do indicate limited effectiveness (EPA, 2000). For this reason pursuant to Mitigation HYDRO-1, the campus shall conduct monitoring of the discharge of storm water from the campus to Lake Merced for nutrients. If the results indicate that the discharge of nutrients, especially limiting nutrients such as phosphorous, results in an increase in nutrient concentrations in the lake, at that time depending on the source of the nutrient, additional measures (e.g., reduction of fertilizer use) should be investigated and implemented. With the implementation of this mitigation measure, the impact would be reduced to a less-than-significant level.

Impact HYDRO-2:	Development of the campus under the proposed Campus Master Plan would not adversely affect the Westside Groundwater Basin.
Significance:	Less than significant
Mitigation HYDRO-2:	Mitigation not required
Residual Significance:	Less than significant

There are no operating or abandoned groundwater wells on the campus. The campus does not currently draw and would not in the future withdraw groundwater from the Westside Groundwater Basin. Therefore campus growth under the proposed Campus Master Plan would not affect the groundwater basin through withdrawal of groundwater.

Because redevelopment of existing building sites is a major component of the proposed Campus Master Plan, the plan would not result in a substantial increase in impervious surfaces on the campus. The increase in impervious surfaces would not substantially reduce the recharge of the groundwater basin. Furthermore, the proposed Campus Master Plan includes a storm water drainage system that incorporates LID concepts described above. These LID concepts would maximize the infiltration of new runoff into the campus lands, and most of the new runoff that is generated would infiltrate, evaporate or be discharged into Lake Merced. In some areas, the modified storm water drainage system would divert existing runoff from the storm drain system into infiltration areas and thereby add more water to the groundwater basin. In summary, the proposed project would not reduce recharge or adversely affect the groundwater basin. No mitigation is required.

Impact HYDRO-3:	Development of the campus under the proposed Campus Master Plan would not result in any other hydrology and water quality impacts.
Significance:	Less than significant
Mitigation HYDRO-3:	Mitigation not required
Residual Significance:	Less than significant

The uses anticipated under the proposed Campus Master Plan would not create effluent discharges from point sources and thus would not violate any waste discharge requirements. Wastewater from the campus would continue to discharge into the City's combined sanitary sewer and storm sewer system and would comply with the discharge requirements of the Oceanside Wastewater Treatment Plant. There would be no impact related to violation of water quality standard or waste discharge requirements.

As discussed in Impact HYDRO-1, the proposed project would alter the manner in which storm water from some portions of the campus is collected and discharged. The discharge of campus runoff into Lake Merced would not cause flooding or increased erosion in the Lake Merced area.

The proposed project will not place housing or other structures in areas that would be prone to flooding because no portion of the campus is within a 100-year flood zone or in an area that would be inundated in the event of a dam failure. The campus is also outside the city area that is projected to experience inundation during a tsunami event. No impacts are anticipated.

4.7.2.4 Cumulative Impacts and Mitigation Measures

Impact HYDRO-4:	Campus development under the proposed Campus Master Plan, in conjunction with other reasonably foreseeable development in the project vicinity, would not result in an adverse cumulative impact on Lake Merced water quality.
Significance:	Less than significant
Mitigation HYDRO-4:	Mitigation not required
Residual Significance:	Less than significant

Lands designated for development in the *San Francisco General Plan* and *Planning Code* in the vicinity of the campus are already mostly developed. Therefore, the majority of future development in the area is expected to consist of redevelopment of existing already developed properties, such as is currently proposed at 77 Cambon Drive, located south of the campus. Other redevelopment projects include the redevelopment and expansion of the YMCA on Eucalyptus and the redevelopment associated with the Balboa Park Station Area Plan located along Geneva, Ocean, and San Jose Avenues. A very limited amount of new development on undeveloped parcels may also occur in the vicinity of the campus, such as is proposed at 800 Brotherhood Way, also located south of the campus. None of these projects would result in impacts to Lake Merced water quality as these sites will discharge storm water runoff into the

combined sanitary sewer and storm sewer system and not into Lake Merced. Therefore, there would be no potential for a cumulative impact.

4.7.3 References

EDAW and Talavera & Richardson. 2004a. *Lake Merced Initiative to Raise and Maintain Lake Level and Improve Water Quality. Task 4 Technical Memorandum: Impacts to Water Quality, Vegetation, Wildlife and Beneficial Uses.* Prepared for the San Francisco Public Utilities Commission. March.

EDAW and Talavera & Richardson. 2004b. *Lake Merced Initiative to Raise and Maintain Lake Level and Improve Water Quality. Interim Lake Level Management Plan*. Prepared for the San Francisco Public Utilities Commission. December.

EPA. 2000. Low Impact Development. A Literature Review. EPA-841-B-00-005. Office of Water. October.