APPENDICES

APPENDIX A
Steelhead Habitat Enhancement Project
Project Description

Stanford University - Utilities Division

Steelhead Habitat Enhancement Project

Project Description

(Prepared January 5, 2007)

Summary:

The Steelhead Habitat Enhancement Project (Project) implements structural, mechanical, electrical, and site work improvements to the Los Trancos Creek Diversion Facility, San Francisquito Creek Pump Station and Felt Reservoir diversion facilities owned and operated by Stanford University. Stanford's diversion facilities are diagrammatically shown on the accompanying figure titled "Lake Water Sources." The Project also institutes operational measures agreed to by Stanford, the California Department of Fish and Game (DFG) and the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) to enhance creek conditions for steelhead while preserving Stanford's ability to meet its important water supply needs and obligations.

The primary components of the Project include:

- Reconfiguring of the Los Trancos Creek Fish Ladder and Diversion Facility with mechanized flow-regulating gates for the flume and ladder instead of manually operated flashboards, replacement of the facility's Alaskan Steeppass fish ladder with a continuously operating step-pool and weir facility that will accommodate passage for juvenile as well as adult steelhead over a broader range of flow, and replacement/modernization of the fish screen, along with appurtenant structural, mechanical and electrical modifications;
- Increasing the minimum bypass flow rate in Los Trancos Creek during the winter diversion period after attraction flow from 1 cubic feet per second (cfs) to 5 cfs, when available, and providing 8 cfs minimum bypass flow, when available, for adult up-migration passage in Los Trancos Creek, from December 1 through April 30;
- Adding a surface intake screen and additional pump to the San Francisquito Creek Pump Station, along with appurtenant structural, mechanical and electrical modifications, and restoring the creek's natural flow path by removal of an accumulated sediment deposit and installation of rock spurs;
- Increasing the minimum bypass flow rate in San Francisquito Creek during the winter diversion period following attraction flow from approximately 2 cfs to 5 cfs, when available, along with other restrictions in diversions at other creek flow rates, as described in the above-referenced Operations document;
- Excavating in Felt Reservoir to restore its original capacity.

Background and Overview:

Stanford University exercises appropriative and riparian water rights to divert water from Los Trancos Creek and from San Francisquito Creek, and has exercised these water rights for more than a century. Diverted water is used primarily for irrigation of the campus golf course, athletic fields, and campus landscaping, as well as for environmental, recreational, aesthetic and groundwater recharge purposes on campus. In an emergency, Stanford's water rights could be exercised to supply domestic and municipal water to the campus and surrounding communities.

To protect and enhance steelhead habitat in San Francisquito Creek and Los Trancos Creek, Stanford and the DFG installed a fish ladder at the Lagunita Diversion Dam in 1954, and Stanford installed a fish screen and fish ladder and increased bypass flows at the Los Trancos Creek Diversion Facility in 1995. These fish ladders and increased bypass flow have ensured a healthy steelhead population in both creeks above and below the diversion structures. As a result of the listing of steelhead as a threatened species in 1997, Stanford has been working with the DFG and NOAA Fisheries to develop additional structural and operational modifications to these facilities to further enhance habitat conditions for steelhead in the creeks.

The proposed Project would implement additional structural and operational measures agreed to by Stanford, DFG and NOAA Fisheries to further enhance creek conditions for steelhead while preserving Stanford's ability to meet its important water supply needs and obligations. The two equal objectives of the Project are: (1) to improve the design of the existing fish passage facilities to further enhance passage conditions at the facilities, and (2) to improve the efficiency and operational capabilities of Stanford's diversion facilities to accommodate increased bypass flows in Los Trancos and San Francisquito Creeks while minimizing adverse effects to Stanford's water supply.

The primary enhancements to steelhead resulting from the Project are:

- increasing the minimum bypass flow rate in Los Trancos Creek during the winter diversion period after attraction flow, from 1 cubic feet per second (cfs) to 5 cfs;
- providing an improved fish ladder at Los Trancos Creek, which will accommodate passage for juvenile as well as adult steelhead over a broader range of flow;
- providing 8 cfs for adult up-migration passage in Los Trancos Creek from December 1 through April 30 (when available) following initial attraction flow;
- providing 5 cfs for out-migration of juveniles and adults in Los Trancos Creek (when available);
- increasing the minimum bypass flow rate in San Francisquito Creek during the winter diversion period following attraction flow, from approximately 2 cfs to 5 cfs.

This Project meets the resource agencies' instream flow requests to enhance steelhead passage in Los Trancos and San Francisquito creeks, and will ensure sufficient flows in the creeks to protect and conserve steelhead and steelhead habitat. The Project also includes measures to minimize and mitigate impacts to Stanford's water supply and water rights, and provides more certainty as to future operations of Stanford's diversion facilities. These modifications will cost hundreds of thousands of dollars at each facility, and the cost of pumping at the San Francisquito Creek Pump Station (as compared to gravity delivery at the Los Trancos Creek diversion) will add tens of thousands of dollars to Stanford's annual operations expenses.

These diversion facility modifications and increases in bypass flows for steelhead passage and habitat enhancement are the result of a long process of discussions between the agencies and Stanford staff, for years with DFG and intensively with both agencies since 2005. Because all parties desired long-term resolution of bypass flows, the agencies and Stanford have taken a conservative approach to the quantification of bypass flows at both facilities.

Any dewatering at the two creek facilities necessary for construction will be accomplished using coffer dams and bypasses, implemented with carefully planned fish removal provisions directed by fisheries biologists. Disturbed areas at the diversion facilities will be revegetated in accordance with the revegetation and riparian restoration plans and drawings associated with the SHEP work.

Proposed Modifications at Los Trancos Diversion/Ladder Facility:

The Los Trancos diversion dam and flume to Felt Reservoir were initially constructed in the early 1900s. Stanford's appropriative water rights authorize diversion of Los Trancos Creek flow up to the flume's 40-cfs capacity. Prior to 1995, the excess flows from heavy storms would spill over the diversion dam and its flashboards, or would be passed through the radial gate at the diversion structure, which would open automatically after storms when the creek's flow escalates drastically.

In 1995, Stanford constructed a fish screen structure, Alaskan Steeppass fish ladder, and a bypass channel at the diversion, based on design specifications from DFG. Since that time, flows to the diversion flume, ladder, and bypass have been controlled by the placement of flashboards in various configurations, depending on the creek's flow level. The fish ladder only operates effectively at a flow rate above 3 cubic feet per second (cfs), limiting fish passage to those periods. The installation of these fish passage and diversion system components complicates and reduces the efficiency of Stanford's diversion operations, and Stanford's water systems technicians have experienced many problems with the screen and brush mechanisms at the mouth of the diversion flume. The configuration of the bypass channel, diversion flume, fish screen, and the ladder results in inefficient diversion during medium and high creek flows because the water does not back up properly against the screen and flume entrance. Frequent clogging of the screen further exacerbates loss of diversion flow to the flume. These design and operational problems have greatly reduced Stanford's ability to divert during higher flow periods. Reductions in diversion during high flow events has necessitated that Stanford maximize diversions during the low-flow periods of the diversion season.

The Project involves modifications to the design of the fish ladder and fish screen, such that Stanford can more efficiently divert water during high flow periods. By increasing diversions during high flow periods, Stanford will have greater flexibility to increase bypass flows during low-flow periods with comparatively smaller impacts to total yield at the Los Trancos Diversion/Ladder Facility. The Project also improves the efficiency and performance of the fish passage components, by consolidating the bypass function with the fish ladder in one fishway.

The proposed Los Trancos Creek Fish Ladder Facility modifications include:

- removing from service the existing fish screen cleaning system and fish ladder;
- grout-filling and abandoning in place the existing bypass channel;
- installing a new pool-and-weir fishway that will operate continuously (except during short maintenance periods in the summer);
- installing a new diversion control structure;
- modifying the fish screen; and
- installing a local control station.

The reconfiguration of the facility and added components, including the control structure, will back the water up higher against the screens, which will improve the efficiency of the diversion and reduce debris clogging of the screens. The existing dam, radial gate, flume and access structure will be preserved in place. Flow measurement devices will be incorporated in the diversion facility to facilitate controls and operation. The physical and operational modifications to the Los Trancos Creek facility will rely on the use of modern electro-mechanical equipment and automated control mechanisms to regulate diversions and bypass flows according to an operating strategy as described in the operations section below.

The new fishway has been designed to comply with current DFG and NOAA Fisheries criteria for anadromous fish passage, and will be installed into the existing berm between the creek and flume. The fish screen modifications and proposed screen clearing mechanism will also conform to current DFG and NOAA Fisheries criteria. The new diversion control structure, fishway slide gate, and automated control mechanisms will be installed and configured such that the diverted flow and bypass flow can be controlled as a function of total creek flow. Creek flow will be routed either through the new fishway, through the existing radial gate spillway structure, over the existing dam, or diverted through the modified fish screen structure and into Stanford's conveyance system to Felt Reservoir. The proposed modifications will facilitate and improve operations and enhance fish passage conditions during periods of low and high creek flows.

Fisheries biologists will be involved prior to and during any work to ensure that steelhead are not present in the work area and will not be adversely affected during construction activities, and other best management practices will be implemented to minimize construction impacts. The work area will be isolated and dewatered using a coffer dam and bypass pipe, and fish removed by the biologist using seines, or the biologist will electro-fish the construction area if/as necessary. Detailed design drawings and specifications will be submitted for review by the agencies as part of the permitting process.

Proposed Modifications at San Francisquito Creek Pump Station

Operational modifications and increased bypass flows at the Los Trancos facility necessitate improvements to the San Francisquito Creek Pump Station facility downstream of the Los Trancos Diversion/Ladder Facility, in order to capture a portion of the water bypassed at the Los Trancos facility. The current San Francisquito Creek Pump Station is located in San Francisquito Creek, just over one mile below the confluence of Los Trancos and San Francisquito creeks, and was constructed in 1998. It replaced a pump station that had been used exclusively to divert water to Lagunita. The new pump station was constructed with two pairs of pumps: one pair for the Lagunita diversion, and a second pair ("Felt pumps") to exercise Stanford's San Francisquito Creek water rights and to divert Los Trancos Creek water bypassed as a result of installation of the Los Trancos Creek fish ladder in 1995. The Lagunita pumps lift water from the creek to the Lagunita flume near the top of bank, which extends across Junipero Serra Boulevard through the golf course and across Campus Drive West, to Lagunita. The Lagunita pumps are physically and hydraulically not able to pump to Felt Reservoir. The Felt pumps divert creek water to a pipeline that connects Felt Reservoir to the lake water distribution system. The Felt pumps are not connected directly to the Lagunita flume; however, water from Felt Reservoir and its pipeline to the lake water system can be conveyed to Lagunita. Each pair of pumps in the current station has a capacity of 4 cfs. The pumps have been operated one pair at a time, but not simultaneously, because of limitations of the intake system and the usually low creek flow rate in the spring when the Lagunita diversions are generally needed. The pump station's infiltration gallery did not function properly until 2004, as a result of sediment deposits along the inside of the bend in the creek atop the infiltration gallery.

The San Francisquito Creek Pump Station will be modified to facilitate capture of the increased bypass flows at the modified Los Trancos Creek diversion facility. The capacity of the Felt pumps within this pump station will be increased from their current 4 cfs capacity to 8 cfs. This flow rate is the maximum rate that can be accommodated in the existing pipeline between the station and Felt Reservoir. The Lagunita pumps will not be changed. The necessary modifications include:

- addition of a new 4-cfs Felt pump/motor in a new vault immediately upstream of the existing pump vault (the existing two 2-cfs Felt pumps will remain as they are);
- upsizing of the entire electrical service and system to serve the new larger pump/motor;
- addition of a 12-cfs capacity surface intake system, properly screened, in order to provide

additional and more reliable intake capacity to the pumps;

- installation of rock spurs upstream of the pump station, to guide and stabilize creek flow to the intake gallery and fish screens, where it was prior to the construction of the current pump station;
- raising of the pump vault lids above the low flow water level (for maintenance access); and
- a creek flow measuring device, so that diversions can be regulated with respect to flow.

The construction of these improvements will involve redirecting the creek's low summer flow around the work area. All creek construction work will take place during low flow summer months when fish are less likely to be present, and will be performed under the direction of qualified engineers and biologists to avoid adverse effects to fish and wildlife resources in the work area. As with the Los Trancos work, fisheries biologists will be involved prior to and during any work to ensure that steelhead are not present in the work area and will not be adversely affected during construction activities. The work area will be isolated and dewatered using a coffer dam and bypass pipe, and fish removed by the biologist using seines, or the biologist will electro-fish the construction area if/as necessary. Detailed design drawings and specifications will be submitted for review by the agencies as part of the permitting process.

Proposed Maintenance Excavation Work at Felt Reservoir

Increased bypass flows at the Los Trancos Creek and San Francisquito Creek diversion facilities will reduce the quantity of water previously diverted during periods of low creek flow. This reduction in low flow diversions will limit Stanford's ability to meet its water supply needs. As a means to partially offset reductions in yield, the Project will require improvements to Stanford's diversion efficiency during the winter months' higher creek flow periods to maximize diversions during that period. Increased diversions during the high flow periods are currently limited by available capacity to store water at Felt Reservoir during the winter months, as immediate water demands tend to be lower during the winter and less water is drafted from or through Felt Reservoir for beneficial use.

The Project will include restoration of the original storage capacity at Felt Reservoir to accommodate increased wintertime diversion water. Deposition of sediment in Felt Reservoir has reduced its storage capacity by nearly 100 acre-feet as compared to the original storage volume. Even without the proposed Project, Felt Reservoir would require occasional maintenance to retain its capacity; with the Project's modifications to the timing of diversions, however, the need for capacity restoration is even more necessary. The Felt Reservoir will be drained, and then excavated laterally below its high water level, using a clean scoop and lift approach, depositing the excavated material in the upland borrow pits (used originally to build Felt Reservoir's dam) and adjacent areas, above the area covered by water at its high water (spillway) level. The Felt Reservoir capacity restoration effort will necessitate draining the Reservoir during the summer, after its stored volume has been substantially depleted to satisfy summer irrigation demand. The draining effort will be closely monitored by fisheries biologists to respond appropriately, in the unlikely event that any sensitive native species are encountered.

Although this component of the Project is considered a maintenance effort, it is included in the Project description to ensure that it is permitted appropriately as an integral and necessary component of the overall Project. Because the clean scoop and lift process will be used to excavate deposited sediments, the Project will not cause a discharge of fill material; therefore, a Section 404 Permit from the Corps is not required. However, the work does require a permit from the Regional Water Quality Control Board (RWQCB), and a Streambed Alteration Agreement will be requested from DFG.

Proposed Operation of Modified Los Trancos Fish Ladder Diversion Facility:

Stanford has contracted with qualified fisheries biologists to conduct numerous studies and surveys of steelhead habitat conditions in Los Trancos Creek for the past several years. Based on the results from these studies, the following conditions were determined by Stanford's biologists to be appropriate to provide steelhead passage during all adult and juvenile life stages in Los Trancos Creek:

Adult steelhead migration upstream from S.F. Bay:		
	Time of year	Primarily January through February; December also, if heavy early rains, and March also, if heavy rains occur late
	Migration trigger	Sustained significant flow all the way to S.F. Bay, defined as 2 consecutive days of at least 8 cfs mean flow in Los Trancos Creek at the diversion facility
	Minimum flow rate	8 cfs, and at least 1 cfs (when available) to sustain creek pools
	Enhancing flow rate after trigger	8 cfs, with 3 cfs sustained flows (when available) in between to provide cover, water surface turbulence, and other habitat values
Adults and juveniles/smolts downstream to Bay:		
	Time of year	March and April, possibly May also if creek flow is sustained by continuing storms
	Migration trigger	Sustained flow in creek
	Minimum flow rate	1 cfs for smolts, 3 cfs for adults
	Enhancing flow rate	3 cfs for smolts and adults

The operation proposed for Los Trancos Creek Fish Ladder/Diversion Facility is described in the accompanying "Operations and Bypass Procedure" and tabulated in the accompanying "Diversion Facilities Operations Criteria and Plan Summary".

These proposed bypass flows exceed the flows recommended by Stanford's fisheries biologist for protection of steelhead habitat in Los Trancos Creek and are consistent with the bypass flows that NOAA Fisheries recommended. These bypass flows are a significant increase over the 1.0 cfs bypass flow rate being provided currently, and provide enhanced habitat and creek flow conditions for steelhead. The proposed modifications to the Los Trancos diversion facility will help reduce the impacts of these increased bypass flows to Stanford's water supply in normal and wet years, but during below average rainfall years Stanford's yield will be significantly reduced compared to current operations. This yield reduction will be mitigated by increasing the diversion capacity at the San Francisquito Creek pump station and by restoring original storage capacity at Felt Reservoir to allow optimal diversions to storage during high flow events.

Proposed Operation of Modified San Francisquito Creek Pump Station Diversion Facility:

Stanford's consulting biologist and NOAA Fisheries staff conducted a field investigation of San Francisquito Creek passage conditions at various creek flow rates. Allowable diversions as a function of creek flow rate were derived by NOAA Fisheries staff. Based on that information, Stanford proposes to operate the modified San Francisquito Creek Pump Station as described in the accompanying documents previously cited. Stanford will monitor conditions and improvements at the two locations mentioned in the table's footnote, and modify its diversions accordingly when these changes occur, advising the agencies of the changes.

In addition to typical water demands, diversion is often needed for Lagunita to sustain water levels for the benefit of California tiger salamanders (CTS), also a federally protected species and state species of concern. During the wet winter months, the CTS migrate to Lagunita and lay their eggs, which then rely on sustained water level in Lagunita for survival. Because Lagunita percolates its water quickly, water levels must be replenished, either by storm runoff or artificially from creek diversions. Stanford will operate the pump station through June 30 to make available water supply for Lagunita, in accordance with the bypass

flows stipulated in the accompanying documents. If creek flows are inadequate to meet water demands at Lagunita for CTS, Stanford will rely on water from other sources to meet this need.

This proposed operation represents an increase of 3 cfs (from around 2 cfs now to 5 cfs) in minimum bypass flow, and also improves flow conditions for upstream migration by reducing diversions at identified key flow ranges, 12 to 20 cfs and 34 to 47 cfs. At these flow ranges, increased bypass flows will facilitate passage through downstream segments of the creek that have difficult passage conditions. The resulting diversion yield reduction will be mitigated by the increase in diversion rate from 4 cfs to 8 cfs during the higher creek flow rates, as indicated in the table. This substantial increase in bypass flow at both low creek flows and higher creek flows in San Francisquito Creek provides enhanced habitat and creek flow conditions for steelhead passage and habitat.

Maintenance of Modified Facilities

Each of the modified diversion facilities will require routine maintenance for ongoing operation. Permits for the SHEP will cover the routine maintenance efforts for each facility described below. Ongoing maintenance activities will not require subsequent permitting unless substantial construction of additional or new facilities or major components is contemplated. For routine maintenance of these modified facilities, fisheries biologists will be involved for any activities that may significantly affect creek waters and steelhead (personnel walking in the creek near the facilities will not constitute such an activity), such as creek dewatering or diversion of creek flow. Except as necessary for continued diversion operation, all such maintenance work will be performed in the summer low flow periods.

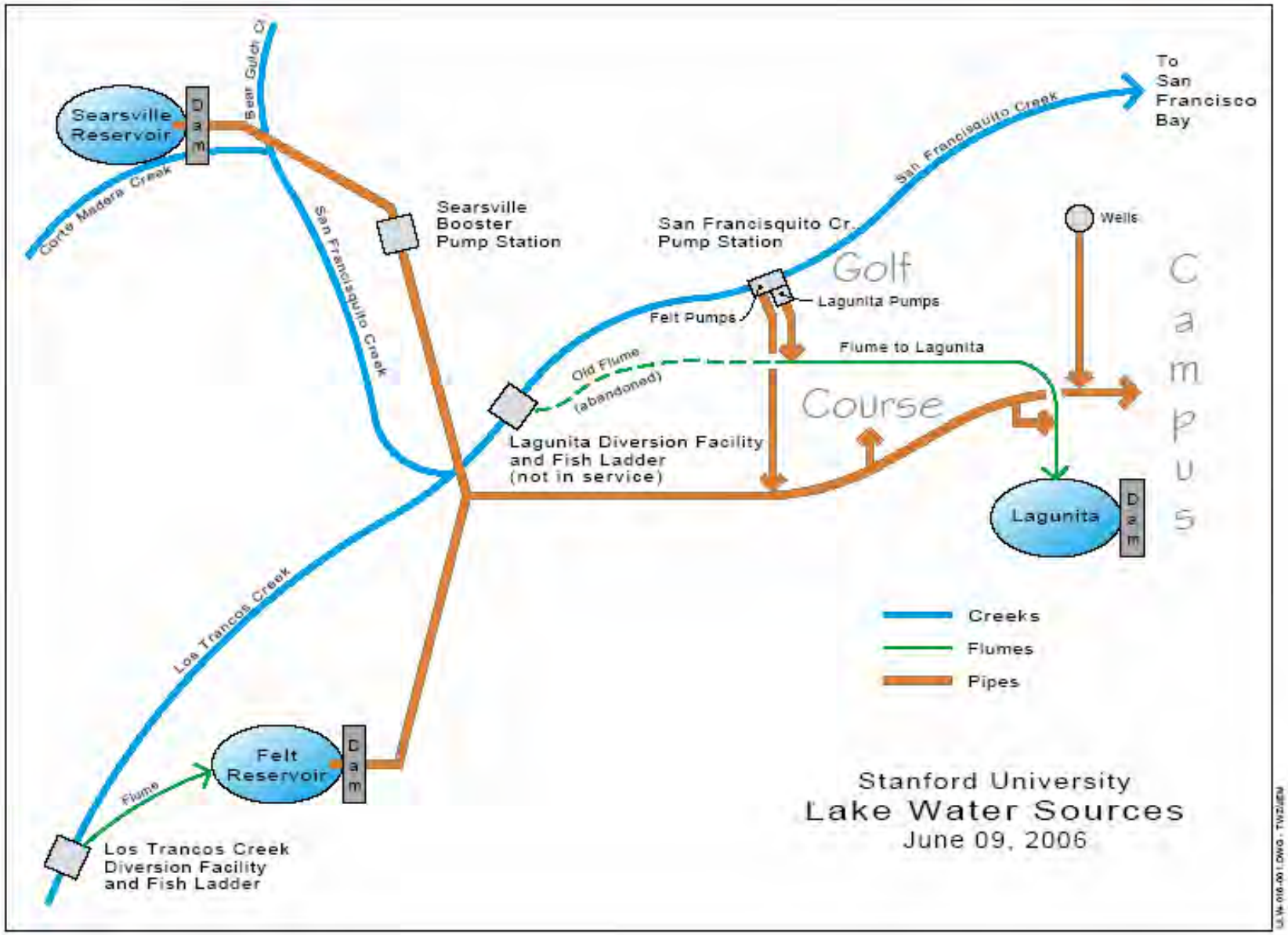
For the Los Trancos Fish Ladder Diversion Facility, maintenance efforts will include periodic gravel removal from the ladder, inspections and maintenance of the gates and brush mechanisms and screens, and repairs of the concrete structures. Prior to any work in the creek flow path, if fish are observed a qualified fisheries biologist will remove any fish using small seines or dip nets, and the fish taken and released downstream of the bypass. Typically, ladder access for sediment removal or repairs will be accomplished by the redirection of flow through the radial gate, and removal of the cover grates and opening of clean-out ports in the bottom of the baffles, or hand clearing of accumulated sediment and other materials. Following large storms, accumulated gravel in the flume/ladder entry area will be removed as necessary by opening the radial gate and shoveling the material over the dam, for washout by the next storm. Any necessary concrete repairs will be made in a manner ensuring that fish are not exposed to uncured concrete.

For the San Francisquito Creek Pump Station Diversion Facility, maintenance efforts will include periodic inspection, repair and replacement of the pumps, screens, flow measurement devices, and concrete structures, gravel removal from the vaults, and possible adjustment of the bendway weirs. The raising of the pump vault covers above the low creek water level, being accomplished as part of the Project, will facilitate access to the pumps and vaults without creek entry. Also, slots and boards inside the screens will enable them to be accessed without creek water entering the vaults. However, should access to the screens from the creek be necessary, and prior to any work being done, if fish are observed a qualified fisheries biologist will remove any fish using small seines or dip nets, and the fish taken and released downstream of the bypass.

For Felt Reservoir, maintenance efforts will include periodic sediment deposition removal utilizing clean scoop and lift methods, minor dam repairs and rodent control, and reshaping work at the flume entry and spillway areas. These efforts will be conducted after water level has receded. Disturbed areas will be revegetated in accordance with the revegetation plan associated with the SHEP work.

Attachments:

- "Stanford University Lake Water Sources" diagram, dated June 6, 2006
- Stanford SHEP "Operations and Bypass Procedure", dated January 5, 2007
- Stanford SHEP "Comparison of Existing and Proposed Modified Facilities and Operations", dated January 5, 2007
- Stanford SHEP "Diversion Facilities Operations Criteria and Plan Summary", dated January 5, 2007


Searsville Reservoir
Dam
Bear Gulch Cr
Corte Madera Creek
San Francisquito Creek
Searsville Booster Pump Station
San Francisquito Cr. Pump Station
San Francisquito Creek
To San Francisco Bay
Wells
Golf
Course
Campus
Felt Pumps
Lagunita Pumps
Flume to Lagunita
Old Flume (abandoned)
Lagunita Diversion Facility and Fish Ladder (not in service)
Lagunita
Dam
Creeks
Flumes
Pipes
Los Trancos Creek
Felt Reservoir
Dam
Flume
Los Trancos Creek Diversion Facility and Fish Ladder
Stanford University
Lake Water Sources
June 09, 2006

Stanford Steelhead Habitat Enhancement Project
Operations and Bypass Procedure[1]

1) Los Trancos Creek Diversion

a) Stanford will not divert from Los Trancos Creek, under any basis of right, between May 1 and November 30.

b) Diversions at the Los Trancos Creek diversion facility will be limited to the period between December 1 and April 30, as follows:

i) The maximum instantaneous diversion rate will be limited to 40 cfs, less the simultaneous rate of flow diverted at the San Francisquito Creek facility.

ii) Beginning December 1, the instantaneous bypass will not be less than 2 cfs (or natural flow, if less than 2 cfs).

iii) Beginning January 1, or earlier if the "trigger" event described in paragraph 1.c occurs prior to January 1, the instantaneous bypass flows will not be less than 5 cfs (or natural flow, if less than 5 cfs) when Creek flow upstream of the facility is less than 8 cfs, and will be 8 cfs when Creek flow upstream of the facility is equal to or greater than 8 cfs for two hours.

c) The "trigger" event for flows described in paragraph 1.b.iii occurs when the mean daily (i.e., calendar day) Creek flow above the Los Trancos creek diversion facility is 8 cfs or more at any time after October 1.

2) San Francisquito Creek Diversion

a) Stanford will not divert from the San Francisquito Creek pump station, under any basis of right, from July 1 through November 30.

b) Consistent with paragraph 2.c, the maximum instantaneous rate of diversion at the San Francisquito Creek pump station (whether to the Felt Lake/campus distribution system, to Lagunita, or to both systems simultaneously) will not exceed 8 cfs.

i) The maximum instantaneous rate of diversion to Lagunita will not exceed 4 cfs.

ii) From December 1 through April 30, Stanford may divert up to 8 cfs at the San Francisquito Creek pump station, even if the instantaneous diversion amount is greater than the flows simultaneously bypassed at the Los Trancos Creek diversion facility, provided that the combined instantaneous diversions at the San Francisquito Creek pump station and the Los Trancos Creek diversion facility do not exceed 40 cfs.

c) From December 1 through June 30, the instantaneous bypass flows and the maximum instantaneous rate of diversion at the San Francisquito Creek pump station will be as described in the NOAA Fisheries Operational Plan (See Attachment 1).[2]

3) Felt Lake Capacity Restoration

a) Stanford will remove silt from the Felt Reservoir to restore the capacity of the Reservoir to 1050 acre feet, the capacity at the time Felt Reservoir was inspected and licensed by the SWRCB in 1937.

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[1] Stanford will not increase diversions above the specified diversion rates, decrease bypass flows below the specified bypass rates, or initiate new diversions in San Francisquito Creek or Los Trancos Creek without obtaining all necessary permits and/or approvals from DFG, NOAA Fisheries, and the State Water Resources Control Board (SWRCB). The bypass and operational commitments set forth herein do not reflect a waiver, abandonment or forfeiture of water rights, but are a compromise and accommodation to protect and enhance steelhead in Los Trancos and San Francisquito Creeks.

[2] Stanford, DFG and NOAA Fisheries recognize and agree that upper bypass flows may be reduced at the San Francisquito Creek Pump Station when downstream passage barriers are removed or modified (as described in the NOAA Fisheries Operational Plan).

ATTACHMENT 1 -- NOAA FISHERIES OPERATIONAL PLAN

(Excerpted from Table 5 of NOAA Fisheries' report titled "An Assessment of Bypass Flows to Protect Steelhead below Stanford University's Water Diversion facilities on Los Trancos Creek and San Francisquito Creek" dated February 15, 2006)

Q_{SF} cfs	Diversion cfs		Q_{SF} Cfs	Diversion cfs		Q_{SF} cfs	Diversion cfs
0 - 5	0		12-16	0		23	7
6	1		17	1		24-33	8
7	2		18	2		34-40	0 [a]
8	3		19	3		41-46	4 [a]
9	4		20	4		47+	8
10	5		21	5			
11	6		22	6			

[a] Max diversion rate could be increased to 8 cfs over this range of flow if the riffle at Transect 3 is modified and able to successfully pass adult steelhead between flows of 16 and 40 cfs and the Bonde Weir is modified to successfully and efficiently pass adult steelhead at flows of 16 to 100 cfs. (Modification at these sites is not included in the Project.)

Stanford's Steelhead Habitat Enhancement Project

Comparison of Existing and Proposed Modified Facilities and Operations

Facility, item	Existing	Proposed	Effects of Project (vs. Existing Operations/Facilities)
Los Trancos:			
• fish ladder type	Alaskan Steeppass	Pool & weir	Improves juvenile and adult passage.
• minimum bypass flow:			
- prior to attraction flow	0.5 cfs	2 cfs [a]	Provides deeper and broader pools & riffles.
- after attraction flow	1.0 cfs	5 cfs [a]	Provides deeper and broader pools & riffles.
• fish ladder operational limits	3 to 8 cfs	0.1 to 8 cfs	Provides passage over greater creek flow range.
• flow control mechanism	flashboards	flow-limiting gate	Backs water up, reducing screen velocities.
• type of operation	manual	automatic	Adjusts as creek flow changes without personnel.
• time to change operations	hours	minutes	Adjusts more quickly to changing conditions.
San Francisquito Cr Pump Station:			
• pumping capacity, Felt div'n	4 cfs	8 cfs	Mitigates water supply impacts resulting from upstream bypass at the Los Trancos Diversion.
• pumping capacity, Lagunita div'n	4 cfs	4 cfs	No change - retains ability to divert to Lagunita for CTS.
• number/size of pumps, Felt div'n	2 @ 2 cfs ea [b]	2 @ 2-cfs, 1 @ 4 cfs [b]	Ability to regulate diversion rate from 1 cfs to 8 cfs.
• minimum bypass flow	2 cfs [c]	5 cfs	Provides deeper and broader pools & riffles.
Felt Reservoir:			
• capacity restoration	937 acre-feet	1,050 acre-feet	Maintenance effort to restore to original capacity [e]. Temporary impacts to wetlands will be mitigated through natural revegetation.

[a] exceeds enhanced steelhead habitat/migration bypass flow rate recommended by Carmen (2005).
[b] pumps are electrically configured to function with variable frequency drives.
[c] practical limit, not regulatory.
[e] 1929 capacity was approximately 1,050 acre-feet.

Stanford's Steelhead Habitat Enhancement Project

Diversion Facilities Operations Criteria and Plan Summary

	Los Trancos Cr Fish Ladder Diversion Facility	San Francisquito Cr Pump Station Diversion Facility
Season of diversion [a]	Dec 1 through April 30	Typically Dec 1 through June 30 [b]
Attraction flow trigger [c]	1 calendar day of mean creek flow ≥ 8 cfs, or January 1, whichever first occurs	Not applicable
Measured at	Either upstream of diversion facility, or sum of flows at ladder, flume and radial gate	Not applicable
Maximum diversion rate:		
Before attraction	40 cfs minus simultaneous diversion rate at SF Cr Pump Station	Per accompanying table [d], to a maximum of 40 cfs minus Los Trancos flume flow rate
After attraction	40 cfs minus simultaneous diversion rate at SF Cr Pump Station	Per accompanying table [d], to a maximum of 40 cfs minus Los Trancos flume flow rate
Measured at	Diversion flume at facility	Discharge pipeline flow meters at creek top of bank
Minimum bypass flow [e]:		
Before attraction	2 cfs	5 cfs minimum, and per accompanying table [d]
After attraction	5 cfs, 8 cfs when creek flow ≥ 8 cfs	5 cfs minimum, and per accompanying table [d]
Measured at	Ladder flow plus flow past radial gate	Either upstream of pump station [f] minus pipeline meters, or downstream of pump station

[a] within July 1 thru June 30 water year

[b] though not limited to this period by water rights

[c] any such occurrence after October 1

[d] Table 5 from NOAA Fisheries' report "An Assessment of Bypass Flows to Protect Steelhead below Stanford University's Water Diversion Facilities on Los Trancos Creek and San Francisquito Creek", dated February 15, 2006, with diversion restrictions to be lifted as described in table 5 footnote

[e] flow rates given mean actual creek flow rate or rate given, whichever is less

[f] new device at bendway weir immediately upstream of pump station

APPENDIX B
Recommended Best Management Practices for Management of Animal Waste, Compost and Sediment on Creeks

Recommended Best Management Practices For Management of Animal Waste, Compost and Sediment On Creeks

For
Stanford Management Company
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July 30, 1999

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Introduction

Maintaining water quality in the creeks of Santa Clara and San Mateo Counties is a high environmental priority. Since rainwater run-off naturally drains into the creeks, land management practices on the lands adjoining the creeks are particularly important to the water quality of the creeks. Irrigation water and wastewater from domestic and recreational activities, if drained into the creeks, are also of concern.

This report is a practical guide to prevent discharges of pollutants into local creeks. This report recommends Best Management Practices (BMP) for the handling of animal waste and other materials generated or stockpiled near watercourses and for the maintenance of unpaved roads adjacent to creeks.

The report was prepared for agricultural tenants on lands owned by Stanford University. Tenants are responsible for ensuring that activities on their leaseholds do not cause polluting discharges to local watercourses. Because each leasehold property is different, it is important that each tenant tailor these recommended practices in a way that is appropriate for his or her individual operations and leasehold characteristics.

Effect of Animal Waste and Compost on Water Quality

As noted by the Council of Bay Area Resource Conservation Districts publication, *Horse Owners Guide to Water Quality Protection*, animal wastes (manure, urine and any material that comes in contact with manure and urine, such as bedding) have biological and chemical properties that can be toxic to fish and other aquatic life if those wastes get into local watercourses. Moreover, any water that comes in contact with compost or animal waste can acquire high levels of dissolved nutrients.

Organic matter and dissolved nutrients are a food source for microorganisms in the water, such as algae and bacteria, stimulating their activity and reproduction. With this extra food, their populations increase rapidly, using dissolved oxygen in the water that would normally be available for other aquatic life. Since all aquatic life depends on the limited amount of dissolved oxygen found in water, the habitat is altered and degraded as dissolved oxygen is less available; fewer species thrive.

Animal waste and compost can also be a source of ammonia, which is toxic to fish in even low concentrations. Salts naturally found in animal waste and compost are also water soluble, mobile, and can increase the salt load of watercourses to levels intolerable to many local species.

Effect of Sediment on Water Quality

Sediment from eroded areas, mud puddles in roads, and dust on roads often can be washed into watercourses during rainstorms. Sediment is detrimental to aquatic life because it can fill pools, smother fish spawning beds, cover food

supplies, increase water temperature, block light for aquatic plants, and clog fish gills. It can also bring additional nutrients into the water, as well as toxic substances--hydrocarbons, heavy metals, and pesticides.

Cumulative Effect

Because each of these substances—organic matter, ammonia, salt, and sediments—cause different problems, their cumulative impact can be significant. Discharges of water containing large quantities of these substances can alter the ecology of a watercourse.

What is a Watercourse?

As used in this report, a watercourse refers to all creeks, intermittent streams, and drains, whether natural or man-made.

RECOMMENDED BEST MANAGEMENT PRACTICES

The following recommendations are guidelines for best management practices in the following operations and uses:

- Animal washing
- Horse boarding, pasturing, and training
- Stockpiling animal waste, compost, or nursery-container materials
- Disposing of animal waste
- Land application of manure and compost
- Maintaining unpaved roads adjacent to creeks
- Other sediment producing activities adjacent to creeks

Not all of the suggested practices may apply or be appropriate in all locations. Each tenant should use these guidelines to develop a management plan that is appropriate for their site.

These recommendations are based on numerous sources, listed in the Reference section of this report, as well as our own extensive experience in agricultural management. For easy reference, these recommendations are summarized in Table 1, "Recommended Best Management Practices," of this report. Supplemental equine management literature from the Bay Area Resource Conservation District is also included in Appendix B.

Tenants located in the Town of Portola Valley and the Town of Woodside must also comply with their respective stable ordinances, which are included in Appendix A of this report.

The United States Department of Agriculture Natural Resource Conservation Service (NRCS) is an excellent source of additional literature and recommended practices that meet federal and state soil and water conservation guidelines. The University of California Cooperative Extension also has many publications dealing with animal waste management.

Each county in California has a NRCS office with technical advice available for the actual implementation of these recommendations. Each tenant should contact NRCS and the Regional Water Quality Control Board (RWQCB) to obtain advice. The phone numbers for each office is as follows:

- Santa Clara County NRCS (925) 672-4577
- San Mateo County NRCS (650) 726-4660
- RWQCB (510) 622-2300

Santa Clara County has a special ordinance regulating activities near watercourses. Beginning on July 26, 1983, the Santa Clara Valley Water District (SCVWD) required a permit to (1) construct a structure or perform grading within

50 feet of the banks of a watercourse and (2) to excavate or deposit material on the bank of a watercourse. San Mateo County has similar recommendations, although no formal regulations. Copies of the applicable regulations and recommendations are included in Appendix A of this report.

It is best to schedule major BMP construction projects during the dry season. In addition, tenants should avoid driving heavy equipment within 300 feet of creeks when the soil is saturated with water.

The agricultural leaseholds may have habitat for threatened or endangered species and may contain archaeological resources. Each tenant should contact and obtain approval from Stanford Management Company before performing any of the following activities:

- Locating or relocating stockpiles of any materials, including but not limited to manure, compost, debris, shavings, dirt, or sand
- Grading, trenching, excavating, or other activities that disturb native soil
- Introducing fill soils, base rock, sand, or other foreign materials in or onto the ground
- Moving nursery container boxes within 50 feet of a watercourse

Stanford Management Company will evaluate the proposed activity to avoid impacts on archaeological and/or biological resources. Monitoring may be required.

Animal Washing

Wastewater from animal washing can contain soap, surfactants, pesticides, and other chemicals, as well as urine and organic matter. Tenants should not drain animal wash water directly into watercourses. If animal wash water is commingled with clean run-off water, tenants should not drain any of the water directly into watercourses.

The preferred method to dispose of animal wash water is to drain it into a septic system or dry well. If this method is not possible, the wash water can be directed across a 100-foot vegetated buffer. The buffer should be wide and flat to slow the velocity of the water and permit infiltration into the soil of the buffer. The edges of this buffer should be raised to prevent the wastewater from draining into watercourses. Refer to the section titled "Buffers as Filter Strips", below. If no septic system or dry well exists for animal washing areas, tenants should avoid washing animals during rainstorms.

Arenas and Riding Rings

Arenas and riding rings are fenced or unfenced broad, flat areas for exercising and training horses. Typically they are not vegetated and their surface is sand or mulched soil that is periodically raked or tilled to keep smooth and soft.

Arenas and riding rings do not need to be cleaned of manure provided the manure is periodically incorporated into the soil and at no time could wash into a

watercourse. Arenas and riding rings should be located at least 50 feet from any watercourse. This minimum distance is a buffer to protect the water quality of the watercourses. Refer to the section titled "Buffers as Filter Strips", below.

As a BMP, any existing arenas or riding rings should be relocated more than 50 feet from watercourse, or their use should be discontinued unless it is infeasible to do so. If it is not feasible to relocate or discontinue use, then tenants should take steps to prevent run-off.

If less than the recommended buffer width exists, tenants should avoid using uncovered arenas and riding rings during rainstorms and remove all unincorporated manure from them before the rainstorm.

Stalls, Paddocks and Turnouts

As used in this report, a *stall* is the small enclosure in which horses are boarded typically located in a barn. A *paddock* is a small, open-air boarding pen for horses, typically non-grazable, often with a shelter for the horse. A *turnout* is an open-air corral for the horse; its use is temporary and typically horses boarded in stalls are released into the turnout a few hours per day for exercise.

Operators should remove animal waste from all stalls, paddocks, and turnouts daily and take it to the facility's designated stockpile or collection bin (see section titled "Bins and Stockpiles", below). Employees should pay close attention to removal in order to avoid spilling any waste where it might contact watercourses. Operators or animal owners should not dispose of waste in watercourses, or on creek banks.

New construction should be placed at least 50 feet from watercourses. This minimum distance is a buffer to protect the water quality of the watercourses. Refer to the section titled "Buffers as Filter Strips", below.

As a BMP, any existing stalls, paddocks, or turnouts should be relocated more than 50 feet from watercourses, or their use should be discontinued, unless it is infeasible to do so. If it is not feasible to relocate or discontinue use, then tenants should take steps to prevent run-off.

Provided the paddocks, and turnouts are cleaned daily, rain water that falls within these animal confinements can follow natural drainage patterns, but only after passing through an effective buffer. If less than the recommended buffer width exists, tenants should avoid using paddocks and turnouts during rainstorms and make sure all manure is removed before the rainstorm.

Pasture and Equestrian Courses

Pastures are areas with year-round, solid, vegetative ground cover, such as sod or grass. Generally pastures are several acres or more in size where grazing occurs. Equestrian courses are established for the purpose of riding and jumping. Open areas of vegetation that surround an equestrian course are considered pastures although the areas may not be grazed.

Pastures do not need to be cleaned of manure. Provided equestrian courses are surrounded by permanent ground covering vegetation, they do not need to be cleaned of manure. Natural processes will break manure down, and vegetation and soil will filter the nutrients.

Pastures should not be over-stocked. The University of California Cooperative Extension, in its publication *Management of Small Pastures*, recommends a guideline of 1 ½ Animal Units maximum per acre to maintain irrigated pasture in good condition. This recommendation assumes the animals graze the pasture for their food source. The recommended stocking rate may be less than 1 ½ Animal Units per acre for dry, non-irrigated pastures on which animals are given supplemental feed.

Because heavily used feeding areas lack vegetation and manure is likely to accumulate, tenants should not feed animals within 50 feet of a watercourse. If it is not feasible to relocate or discontinue use of such feeding areas, tenants should take precautions to avoid run-off into watercourses and remove manure from these sites daily.

Bins and Stockpiles

Bins and stockpiles are containers and piles used to collect animal waste. Bins may include but not be limited to a covered box, a concrete shed, and trash containers. Stockpiles include but are not limited to piles of animal waste, compost, wood shavings, sand, and soil.

Bins and stockpiles should be located as far as possible and feasible from watercourses, but not less than 150 feet. Distances may vary site by site due to topography, vegetated buffers, physical barriers, and diversions that may exist. Bins and stockpiles should not be located in areas subject to frequent flooding regardless of distance from watercourses.

All drains and surface run-on should be diverted around or away from uncovered bins and stockpiles greater than three cubic yards site regardless of distance. This can be achieved using ditches, berms or drainpipes. Covered bins or stockpiles smaller than three cubic yards can be managed by maintaining the minimum distance with an appropriately vegetated buffer. Refer to the section titled, "Buffers as Filter Strips," below.

Sites of uncovered bins and stockpiles larger than three cubic yards should be designed so that all rain that falls on the collection site is confined within the area or is dispersed in a vegetated filter strip and allowed to infiltrate into the soil. Containment can be achieved by a variety of means, such as visqueen wrapped straw bales, visqueen wrapped straw filter rolls, a berm constructed of compacted soil or other impermeable material, or a lipped concrete enclosure.

Uncovered bin and stockpile sites greater than three cubic yards should have an impermeable surface. California regulations list several types of impermeable surfaces. Soils that contain at least 10% clay and not more than 10% gravel and

artificial materials of equivalent permeability are on the list. Concrete slabs are acceptable, and under some circumstances plastic surfaces may also be acceptable.

If the site is less than the recommended distance from watercourses, it should be covered with a plastic tarp during rainstorms or have a roof (UCD Animal Agriculture Research Center, *Technologies and Management Practices for More Efficient Manure Handling*, pages 39-42; and *California Code of Regulations, Section 2562(f)*). In some locations a walled structure may be appropriate.

If the site is less than the recommended distance from watercourses, it may be necessary to create a water storage structure, such as a retention pond or sump. The structure should be sized to contain the 25-year, 24-hour storm frequency (5 to 6 inches per 24-hours according to US Department of Commerce National Oceanic and Atmospheric Administration) and be protected from 100-year flood events. The structure should be lined with impermeable clay, plastic, or concrete. For safety, public access to this structure must be prohibited; a barred covering is suggested as well.

Provided that there is no run-off from the disposal field and percolation of the discharged water to ground water is minimized, applying impacted water to cropped fields or pastures can prevent overflow of water storage structures. Do not apply impacted water within 150 feet of watercourses. Application can be accomplished using a sump pump and pipeline to the discharge field or by pumping the water into a tank truck and spraying it on the discharge field. (UCD Animal Agriculture Research Center, *Technologies and Management Practices for More Efficient Manure Handling*, pages 39-42.)

Off-site Manure Disposal

Removal of animal waste from the property is in most cases the best disposal option. Stockpiles and bins should be removed or emptied before the containment capacity is exceeded or before offensive, obnoxious, or unsanitary conditions develop. Manure collected for removal in the Towns of Portola Valley and Woodside must be removed at least weekly.

Land Application of Manure and Compost

Animal manure and compost can be applied on pastures, reused as a crop nutrient or soil amendment, and reused as a base for trails, courses, and arenas except within 50 feet of watercourses. In all cases the applied materials should not move into watercourses and water should not run off the applied areas into watercourses. Vegetated buffer strips between the applied area and the watercourse is the most reliable method to assure water quality is protected. The section titled "Buffers as Filter Strips", below, discusses buffers in greater detail.

All applications of manure to agricultural fields must be at rates reasonable for the crop, soil, climate, any special local situations, management system, and type of manure. If the manure is wet or liquefied, discharges to disposal fields

should not result in any surface run-off.

All land application rates to crop fields should be based on soil sample test results and crop needs. Compost application rates should not exceed 50 dry tons per acre per year (Northeast Regional Agricultural Engineering Service, *On-Farm Composting Handbook*).

Tenants spreading manure or compost on crop fields should incorporate it into the soil immediately to avoid impacts on rain and/or irrigation water that may run off the applied fields. Under no circumstances should manure or compost be spread where the area is subject to frequent flooding regardless of distance from watercourses.

Unpaved Roads Adjacent to Creek

Loose soil from unpaved roads, including driveways, is a potential source of sediment that can wash into watercourses during rainstorms.

Dirt roads should maintain a minimum of an 8- to 10-foot buffer from the top of the creek bank. The buffer should be appropriately vegetated, or run-off should not be allowed to flow directly into the creek. Where the buffer is insufficient and the road slopes towards the creek, run-off should be diverted into a settling basin, such as a pond, a flat-bottomed roadside ditch, or a vegetated filter strip, or the road should be graded away from the creek.

When grading roads, the new road grade should allow for sheet flow, preventing concentration of run-off toward the creek. After grading, the road's surface should be re-compacted with a drum roller or similar device.

Roads with improved surfaces (such as aggregate base) and with minimal loose soil should maintain, at a minimum, a 3- to 4-foot buffer from the top of the creek bank. The buffer should be vegetated, or run-off should be barred from flowing directly into the watercourse.

Periodic inspections of the roads after rainstorms should be made for evidence of erosion and sediment generation. Where erosion gullies are present, eroded areas should be filled in with approved fill material or the gully lined with an erosion blanket and appropriately vegetated.

New roads should be located at a minimum of 50 feet away from any watercourse.

Other Sediment-Producing Activities Adjacent to Creek

Avoid all activities that might produce sediment that may flow into watercourses:

- Operations, such as potting plants or operating heavy farm equipment, should not be conducted within 50 feet of the creek if no berm or vegetation buffer is present.
- Drains and culverts that discharge into creeks should be maintained and cleaned of sediment regularly.

- When watering plants or livestock, avoid over watering and thus generating man-made run-off that could carry sediment into creeks.
- All operations should be performed in compliance with Santa Clara Valley Water District and other local ordinances and under proper guidance from the Stanford Management Company.

Buffers as Filter Strips

One of the best ways to protect water quality of creeks and intermittent streams is to provide distance between the waterway and the activity that may impinge upon water quality. The area created by the distance is commonly called a buffer.

This report recommends certain buffers for particular activities. The width of an appropriate buffer will depend on the purpose and degree of protection needed. The buffer distances are to be measured from the edge of the waterway, which in most situations is well defined by a sharp drop in elevation into the water channel. Tenants wishing to vary from the recommended buffer widths should consult with the Regional Water Quality Control Board (RWQCB) and/or the Santa Clara Valley Water District for specifics.

To obtain greatest benefit from the buffer, it should be vegetated with grass, trees, shrubs or permanent ground cover. The vegetated buffer acts as a filter and a site for removing sediment, organic matter, and other pollutants from run-off and wastewater by deposition, filtration, absorption, adsorption, decomposition, and volatilization.

Appropriate plant species are listed in Table 2. The use of plant materials not on the list requires prior approval of the Stanford Management Company.

Any water that comes in contact with animal waste, compost, or stockpiled materials should be handled according to the recommendations of this report and pass through the vegetated buffer strip before entering any waterways.

Existing riding trails that cross waterways may cross the buffer and waterways if it is safe to do so. Access of horses to the buffer for other purposes should be limited to avoid trampling of vegetation, heavy grazing and damage to waterway banks.

Conclusion

The recommendations of this report are practical measures to protect the water quality of creeks and intermittent streams. Each leasehold is different; each tenant should develop a plan that includes measures appropriate to his or her leasehold. The county Natural Resource Conservation Service gives free technical support for such plans, as well as specific instructions on implementation. The Regional Water Quality Board is also a source of information and advice.

Because many of the leaseholds contain archaeological resources or may contain habitat for threatened or endangered species, tenants should contact Stanford Management Company prior to the activities specifically noted above to insure that these resources are protected and preserved.

TABLES

- Table 1: Recommended Best Management Practices
- Table 2: Approved List of Plants for Vegetated Buffers

TABLE 1
RECOMMENDED BEST MANAGEMENT PRACTICES

	Animal Washing	Arenas & Riding Rings	Stalls, Paddocks, & Turnouts	Pasture & Equestrian Courses	Bins & Stockpiles	Off-site Manure Disposal	Land Application of Manure and Compost	Unpaved Roads Adjacent to Creek	Other Sediment Producing Activities
1. Sanitation/Maintenance Practices (see note #1, below)	Do not comingle with rain run-off or drain directly into watercourses. Preferably drain washwater into septic field or dry well; if lacking septic or dry well, maintain extra buffer, see below.	Manure does not have to be removed, but should be incorporated into the soil as needed.	Clean daily.	Do not overstock or overgraze; Maintain permanent vegetation (see note #2, below); If feeding within 50 feet of watercourse clean manure from feeding site daily and prevent run-off.	Divert drains and run-on away from sites of uncovered bins or stockpiles larger than 3 cubic yards; these sites also should have impermeable base and prevent run-off with raised edges, e. g. berms or barriers or disperse to vegetated buffer. If less than 150 buffer, retention pond or sump may be required.	Remove before pile exceeds capacity of containment area or unsanitary conditions develop.Removeal at least every week in Towns of Portola Valley and Woodside.	Acceptable on cropped fields, pastures, areans, equestrian courses, and riding trails (see note #3, below)	Where erosion gullies are present, place erosion blanket and vegetate, or grade road away from watercourse in areas of erosion. When grading roads, grade to allow sheet flow and re-compact road surface. For dirt roads with loose soil that grade toward watercourse and have insufficient vegetation buffer, divert run-off away from watercourse into settling basins (i.e. roadside ditch, pond, etc), or filter strips; or grade away from watercourse.	Operations, such as potting and vehicular use, should not be conducted in the vicinity of the creek if no berm or vegetation buffer is present. Maintain drains and culverts (e.g. clean out sediment) that discharge into creeks Do not over water when irrigating or watering animals.
2. Buffer from Watercourses (creeks, intermittent streams, or drains whether man-made or natural--see nore #4 and #5, below)	50 feet (or 100 feet if no septic field) and appropriately vegetated (see note #6, below)	50 feet and appropriately vegetated (see note #6, below).	50 feet and appropriately vegetated (see note #6, below).	Do not spread manure within 50 feet; Do not feed within 50 feet.	150 feet and appropriately vegetated (see note #6, below).		Do not spread within 50 feet.	For roads with improved surfaces (e.g. aggregate base) and minimal loose soil, 3 to 4 feet from top of creek bank and appropriately vegetated, or create barrier. For dirt roads with potentially loose soil, 8 to 10 feet from top of creek bank and appropriately vegetated, or create barrier. Locate new roads at least 50 feet away from creeks.	Comply with Santa Clara Valley Water District and other local ordinances.
3. Rainstorm Precautions	If no septic field or dry well, avoid use in rainstorm.	If uncovered and less than 50-foot buffer, avoid use of in rainstorms, clean up unincorporated manure	If possible avoid use of paddocks and turnouts in rainstorms if less than 50-foot buffer.		Cover with roof or tarp during rainstorms, if lacking appropriate buffer.		Surface run-off from application sites must not flow into watercourses	Periodic inspection after rain events for evidence of erosion and sediment generation.	

Notes:
#1: Contact Stanford Management Company for biological and archaeological review prior to earth moving, depositing fill material, relocation of structures, relocation of piles, or relocation of drains.
#2: Pastures by definition have permanent, ground covering vegetation.
#3: Application must not exceed 50 dry tons per acre per year and must be incorporated into soil before rain or irrigation on cropped fields and arenas.
#4: Topography and site conditions may allow variation in the buffers and practices.
#5: A permit is required in Santa Clara County to (1) construct structures or perform grading within 50 feet of the banks of a watercourse or (2) to excavate or deposit materials on banks.
#6: Appropriately vegetated densely populated grasses/sedges that filter contaminants. See Table 2 for approved list of plants.

Table 2:
Approved List of Plants for Vegetated Buffers

- Phragmites sp. (Common reed)
- Malacothamnus arcuarus (Northern malacothamnus)
- Chenopodium californicum (California goosefoot)
- Conyza canadensis (Horseweed)
- Apocynum cannabinum (Indian hemp)
- Chlorogalum pomeridianum (Soaproot)
- Calochortus sp. (Mariposa lily)
- Fritillaria lanceolata (Checker lily)
- Trillium chloropetalum (Giant wake robin)
- Eschscholzia califonica (California poppy)

*The use of plant materials not on this list requires the prior approval of the Stanford Management Company.

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