7. A composite sample is defined as a combination of no fewer than eight individual samples obtained over the specified sampling period at equal intervals. The volume of each individual sample shall be proportional to the discharge flow rate at the time of sampling. The sampling period shall equal the discharge period, or 24 hours, whichever period is shorter.

8. The Executive Officer approves the use of manual methods utilized by High Sierra Water Laboratory (HSWL) for nitrate-nitrogen (EPA 353.1), ammonium-nitrogen (EPA 350.1), and Total Kjeldahl Nitrogen (EPA 351.2) in place of the automated methods identified in the above methods. The method modification is trivial, since the chemistry is identical, and HSWL has been able to meet or exceed performance standards for these methods.

B. OPERATIONAL REQUIREMENTS

1. Sample Results

Pursuant to California Water Code Section 13267(b), the Discharger shall maintain all sampling and analytical results including: date, exact place, and time of sampling; date analyses were performed; sample collector's name; analyst's name; analytical techniques used; and results of all analyses. Such records shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the Water Board.

2. Operational Log

An operation and maintenance log shall be maintained at the facility. All monitoring and reporting data shall be recorded in a permanent log book.

3. Quality Assurance Project Plan (QAPP)

A QAPP for sampling and analyses that follows the latest USEPA guidance (see internet website http://www.epa.gov/owow/monitoring/volunteer/qappcovr.htm) must be submitted by **July 31, 2006**.

C REPORTING

1. For every item where the requirements are not met, the Discharger shall submit a statement of the actions undertaken or proposed to attain full compliance with requirements at the earliest time, and shall submit a timetable for correction.

2. Pursuant to California Water Code Section 13267(b), all sampling and analytical results shall be made available to the Water Board upon request. Results shall be retained for a minimum of three years. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge, or when requested by the Water Board.

3. The Discharger shall provide a brief summary of any operational problems and maintenance activities to the Water Board with each monitoring report. Any modifications or additions to, or any major maintenance conducted on, or any major problems occurring to the water conveyance systems, treatment facilities, or disposal facilities shall be included in this summary.

4. Monitoring reports shall be signed by:

   a. In the case of a corporation, by a principal executive officer at least of the level of vice-president or his duly authorized representative, if such representative is responsible for the overall operation of the project from which the discharge originates;

   b. In the case of a partnership, by a general partner;

   c. In the case of a sole proprietorship, by the proprietor; or

   d. In the case of a municipal, state or other public project, by either a principal executive officer, ranking elected official, or other duly authorized employee.

5. Certified Cover Letter

   The Discharger shall use Attachment 1 as a certified cover letter, or a cover letter containing the same information, for all reports provided to the Water Board.

6. Modifications

   This Monitoring and Reporting Program may be modified at the discretion of the Water Board Executive Officer.

D. NONCOMPLIANCE

Under Section 13268 of the Water Code, any person failing or refusing to furnish technical or monitoring reports, or falsifying any information provided therein, is guilty of a misdemeanor and may be liable civilly in an amount of up to one thousand dollars ($1,000) for each day of violation under Section 13267 of the Water Code.

II. MONITORING LOCATIONS

The Discharger shall establish the following monitoring locations to demonstrate compliance with the limitations, discharge specifications, and other requirements in this Order:

Monitoring Location (Location 1 and 2 not used)	Monitoring Location Description	Approximate Monitoring Location Latitude	Approximate Monitoring Point Longitude
3	Martis Cr., Schaffer Creek	39.27145	-120.17024

Monitoring Location (locations 1 and 2 not used)	Monitoring Location Description	Approximate Monitoring Location Latitude	Approximate Monitoring Point Longitude
(biomonitoring and near-continuous) 635MAR003	Tributary, Above Siller Property		
4 (biomonitoring and near-continuous) 635MAR004	West Martis Cr Before confluences of Martis Cr and Middle Martis Cr	39.29882	-120.11965
5 (biomonitoring and near-continuous) 635MAR005	East Martis Cr (Undisturbed Background Site)	39.30912	-120.10682
6 (biomonitoring and near-continuous)	Middle Martis Cr after confluence with Martis Cr	To be determined	To be determined
7 (biomonitoring and near-continuous)	West Martis Cr. Below Highlands Drive Project	To be determined	To be determined
8 grab samples	West Martis Cr. above Highlands Drive Project	To be determined	To be determined

III. RECEIVING WATER MONITORING REQUIREMENTS – SURFACE WATER

A. Monitoring Locations: 3, 4, 5, 6, and 7

The Discharger shall sample the above locations as follows for physical habitat characterization and biological monitoring (or use an equivalent method agreed to in advance, in writing, by the Water Board's Executive Officer), and provide a Statement of Qualifications for persons conducting this sampling and evaluating macroinvertebrates:

Parameter	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
See Master	Bioassessment (Targeted Riffle	Once/year in Summer Index	See Attachment 3, BMSP, also USEPA's

Parameter	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Taxonomic List in Attachment 2	Composite Method and Multi-Habitat Method)	Period (August 15 – September 30, when creeks are flowing)	Environmental Monitoring and Assessment (EMAP) bioassessment protocols(1)
Feet and % Fines	Physical Habitat and Riparian Condition Assessment	1x/year	USEPA's EMAP physical characterization protocols(1)

(1) USEPA EMAP bioassessment protocols
http://www.epa.gov/emap/html/pubs/docs/groupdocs/surfwatr/field/fomws.html

B. Monitoring Locations: 3, 4, 5, 6, and 7

The Discharger shall monitor the above locations as follows:

Parameter	Required RLs(1) and Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Turbidity	NTU(1)	Near-Continuous	4x/hour	By *in situ* probe; EPA 180.1
Conductivity	Siemens per meter (S/m)(1)	Near-Continuous	4x/hour	By *in situ* probe; EPA 120.1/SM 2540C
TDS	10 mg/l lab	grab	1x/hour sampling is initiated and 1x/month thereafter	TDS-Total Filterable Residue
pH	0.1 PH units	Near-Continuous	1x/hour	By *in situ* probe; EPA 150.1
Temperature	0.5 °C	Near-Continuous	1x/hour	By *in situ* probe
Total Suspended Solids	1000 µg/l	Grab	1x/day for the first 14 days after near-continuous sampling is	EPA 160.2

Parameter	Required RLs[1] and Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
			initiated and 1x/month thereafter	
Chloride	0.08 mg/l	Grab	Quarterly	EPA 300.0
Sulfate	0.4 mg/l	Grab	Quarterly	EPA 300.0
Total Phosphorus	8 µg/l	Grab	1/week	EPA 365.3
Total Nitrogen	90 µg/l	Grab	1/week	Calculated
Nitrate-Nitrogen (NO3-N)	10 µg/l	Grab	1/week	EPA 353.1; EPA 300.0
Ammonium-Nitrogen (NH4-N)	10 µg/l	Grab	1/week	EPA 350.1; EPA 350.3
Total Kjeldahl N (TKN)	80 µg/l	Grab	1/week	EPA 351.2
Particulate Organic N (PON)	100 µg/l	Grab	1/week	Calculated
Total Petroleum Hydrocarbons	50 µg/l	Grab	4x/year	EPA 8250/8015Mod
Applied Pesticides (MC1 and MC2 Only)	µg/l[1]	Grab	4x/year	Organochlorine pesticides EPA 8081A[1]; Organophosphorous pesticides EPA 8141A[1]; Chlorinated Herbicides EPA 8151A
Sediment Toxicity	Survival rate of test specimen	Grab	3x/year	EPA 600/R-99-064[2]
Flow and Precipitation	Hydrograph and inches per day (storm event based)	Instantaneous or gauged	Near-Continuous	USGS Water Supply Paper 2175[3]; Precipitation data from Truckee Ranger Station

(1) Reporting Limits (RLs) for chemical constituents, or contaminants not listed in the Tables shall be at least as sensitive as the more restrictive of those required for analysis of pollutants under CFR, Title 40, Part 136, or analysis of drinking water under CCR, Title 22, Division 4, Chapter 15, or CFR, Title 40, Part 141.

(2) USEPA Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates http://www.epa.gov/waterscience/cs/freshmanual.pdf

(3) USGS Water Supply Paper 2175 http://pubs.usgs.gov/wsp/wsp2175/

IV. REPORTING REQUIREMENTS

A. Self Monitoring Reports (SMRs)

1. At any time during the term of this permit, the State Water Board or Lahontan Water Board may notify the Discharger to electronically submit self-monitoring reports. Until such notification is given, the Discharger shall submit self-monitoring reports in accordance with the requirements described below.

2. The Discharger shall submit **quarterly and annual** Self Monitoring Reports including the results of all required monitoring using USEPA-approved test methods or other test methods specified above. **Quarterly reports shall be due on May 1, August 1, November 1, and February 1 following each calendar quarter. Annual reports shall be due on February 1 following each calendar year.**

3. All Self Monitoring Reports shall contain information in an electronic tabular format, and interpretations of data by means of statistical analyses and graphical representation. Bioassessment data shall be reported using the Excel spreadsheet, Master Taxa List (see Attachment 2).

4. Monitoring periods and reporting for all required monitoring shall be completed according to the following schedule:

Sampling Frequency	Monitoring Period Begins On...	Monitoring Period	SMR Due Date
4x / hour	August 15, 2006	January 1 through March 31 April 1 through June 30 July 1 through September 30 October 1 through December 31	May 1 August 1 November 1 February 1
1x / hour	August 15, 2006	January 1 through March 31 April 1 through June 30 July 1 through September 30 October 1 through December 31	May 1 August 1 November 1 February 1
1 / week	July 1, 2006	January 1 through March	May 1

Sampling Frequency	Monitoring Period Begins On	Monitoring Period	SMR Due Date
		31 April 1 through June 30 July 1 through September 30 October 1 through December 31	August 1 November 1 February 1
6x / year	July 1, 2006	January 1 through March 31 April 1 through June 30 July 1 through September 30 October 1 through December 31	May 1 August 1 November 1 February 1
4x / year	July 1, 2006	January 1 through March 31 April 1 through June 30 July 1 through September 30 October 1 through December 31	May 1 August 1 November 1 February 1
1x / year	August 15, 2006	August 15 through September 30	September 15, 2007

4. The Discharger shall report with each sample result the applicable Minimum Level (ML) and the current Method Detection Limit (MDL).

5. The Discharger shall arrange all reported data in a tabular format. The data shall be summarized to clearly illustrate whether the project is operating in compliance with requirements.

6. SMRs must be provided to the Water Board, signed and certified as required by Section I, above, to the address listed below:

CRWQCB, Lahontan Region
2501 Lake Tahoe Blvd.
South Lake Tahoe, CA 96150

B. Other Reports

By **July 31, 2006**, the Discharger shall provide, for acceptance by the Water Board Executive Officer, a Site Selection Report verifying the final latitude and longitude of all monitoring stations and the basis for selection.

Harold J. Singer

Harold J. Singer
EXECUTIVE OFFICER

Date: June 8, 2006

ATTACHMENTS

1. Reporting Template Cover Page
2. Master Taxonomic List
3. Benthic Macroinvertebrate Sampling Procedure (BMSP)

ENCLOSURE C – WATER BOARD CEQA FINDINGS

Placer County, acting as California Environmental Quality Act (CEQA, Public Resources Code Section 21000, et seq.) Lead Agency, certified a final Environmental Impact Report (EIR) for the Northstar Highlands Development Project (Project) in February 2004.

The Final EIR provides a detailed record concerning project effects. The Final EIR includes alternatives analyzed, legal, economic and technical considerations, operational descriptions, and other information crucial to understanding the Project proposal, and sets forth the basis for including or excluding mitigation measures for various identified impacts.

When an EIR has been prepared for a project, a Responsible Agency shall not approve the project as proposed, pursuant to California Code of Regulations, title 14, section 15096 (g)(2), subdivision (g)(2), if the agency finds any reasonable alternative or feasible mitigation measures within its powers that would substantially lessen or avoid any significant effect the project would have on the environment. The Water Board, acting as a CEQA Responsible Agency in compliance with California Code of Regulations, title 14, section 15096, subdivision (g)(2), has evaluated the significant and potentially significant impacts to water quality identified in the Final EIR. The Water Board evaluated potential mitigation measures proposed by the Project proponent (Northstar Mountain Properties) in order to reduce significant water quality impacts to insignificant levels by implementing feasible impact avoidance, minimization, and mitigation measures. As a result of this evaluation, the Water Board finds that the proposed mitigation measures evaluated by the Lead Agency to avoid or substantially lessen the significant environmental effect(s) as identified in the Final EIR are adequate.

The EIR for the Project identifies other potentially significant impacts, significant impacts, and cumulative significant impacts that are not related to water quality. The Water Board is not responsible for requiring the implementation of the mitigation measures identified in the EIR or additional mitigation measures other parties have deemed necessary for impacts unrelated to water quality.

The findings concerning the significant and potentially significant impacts to water quality is reproduced below from the Final EIR, which provides "Impacts and Mitigation Measures" required by the Lead Agency. The Final EIR describes required mitigation measures where impacts were identified. In each case, the Final EIR text is quoted, followed by Findings of the Water Board concerning the adequacy of mitigation measures, and the level of residual impact after considering proposed changes in the Project description and mitigation measures. (Note that the Final EIR uses the acronym "RWQCB" to refer to the Water Board.)

"4.7 HYDROLOGY AND WATER QUALITY

Increased Amount of Impervious Surfaces and Runoff

Impact 4.7.2 Development of the proposed project would increase the amount of impervious surface and increase the amount of runoff from the proposed project site. This impact is considered potentially significant. The proposed project would result in new land use developments, including buildings, parking lots, roadways, and trail improvements. The project as proposed would be inconsistent with Placer County General Plan Policy 4.E.9, which requires developments to consider drainage courses and provide for good soil conservation practices. New developments would also occur elsewhere in the Northstar-at-Tahoe community. As such, additional impervious surfaces would be created within and surrounding the proposed project site. Currently, most runoff on the project site is in the form of sheet flow, some of which is collected via the existing roadside ditches and roadways and into culverts that discharge to natural and improved downstream systems. The grading and drainage designs for future developments on the project site would maintain existing drainage patterns by preserving watershed areas and by releasing flows downstream in a manner consistent with existing conditions. Peak flow rates for future phases would be mitigated by the use of infiltration ponds, detention ponds, water quality trenches, or a combination of these facilities along with the option of adding soil amendments to increase infiltration rates. Each future phase would include design of appropriate facilities specific to its requirements to mitigate peak flows. The post-development drainage design is also expected to include the collection of runoff generated by impervious surfaces on roadways into culverts that discharge to natural and improved downstream systems. In most places, runoff will not be captured in a roadside ditch but will instead be collected in drainage drop-inlets and conveyed to cross-drainage or outlet structures via underground storm drains. Local watersheds draining to the proposed alignment of Highlands Drive are depicted on Figure 4.7-3. A comparison of pre-development and post development peak rates of runoff generated by these local watersheds during a 2-, 10-, and 100-year storm are depicted on Table 4.7-3.

Table 4.7-3
INCREASE IN RUNOFF DUE TO DEVELOPMENT

Drainage Area[1]	Pre Development			Post Development			Percent Increase		
	Q2 (cfs)	Q10 (cfs)	Q100 (cfs)	Q2 (cfs)	Q10 (cfs)	Q100 (cfs)	Q2 (cfs)	Q10 (cfs)	Q100 (cfs)
1	2.4	5.3	10.5	2.5	5.4	10.7	5.8%	1.9%	1.5%
2	4.8	9.7	19.2	4.9	9.8	19.4	2.6%	1.0%	1.0%
3	8.0	15.3	34.0	8.2	15.5	34.2	2.3%	1.2%	0.6%
4	3.4	6.5	14.1	3.5	6.7	14.3	3.6%	1.9%	1.3%
5	4.8	9.7	19.0	4.9	9.8	19.1	2.7%	1.3%	0.3%
6	1.9	3.5	7.3	2.0	3.6	7.4	5.8%	3.1%	1.5%
7	3.0	5.4	11.4	3.1	5.5	11.5	3.0%	1.7%	0.8%
8	3.2	6.9	13.7	3.3	7.0	13.8	3.8%	1.8%	0.8%
9	9.4	18.4	37.8	9.5	18.5	38.0	2.0%	1.0%	0.5%
10	4.7	10.8	21.4	4.8	10.9	21.5	2.8%	0.7%	0.5%
11	1.9	3.3	7.1	1.9	3.4	7.1	3.0%	3.9%	0.0%
12	12.6	26.6	56.6	12.8	26.8	56.8	1.7%	0.8%	0.3%
13	4.7	10.6	20.3	5.0	10.8	20.6	5.4%	2.4%	1.2%
14	2.8	5.1	10.6	2.9	5.2	10.7	3.7%	2.0%	1.0%
15	12.0	22.5	48.7	12.2	22.7	48.9	1.6%	0.9%	0.4%
16	26.7	74.4	146.2	27.0	74.7	146.5	1.0%	0.4%	0.2%
17	9.7	20.5	43.6	10.1	21.0	44.0	4.8%	2.4%	0.9%
18	6.7	14.2	30.2	7.7	15.2	31.2	14.5%	7.0%	3.3%
19	1.3	2.7	5.3	1.4	2.7	5.4	4.8%	0.2%	2.8%

Source: Auerbach, 2004
[1]See Figure 4.7-4

Some of the proposed development areas would be located in areas that could receive potentially significant storm runoff from upstream off-site subbasins. Without redirection, this storm runoff could pose a flooding threat to the proposed buildings, particularly those designed to have finished floors set below ground elevations along their upslope edges. Conveyance facilities on the project site would be designed for the 10-year storm event and evaluated for the 100-year storm event, in compliance with the County Stormwater Management Manual (SWMM) and the County Land Development Manual, as well as Lahontan Water Board requirements. The preliminary programmatic drainage study for the proposed Highlands project predicted the peak flows for the existing and future

(post-development) conditions at two prominent downstream locations. The peak flows are shown in Table 4.7-4. Because future conditions include other future development and ski-related improvements outside the Highland project site that also drain to Northstar Drive and State Route 267 (SR 267), the proposed project's contribution to the increase in peak flow would be less than the total amount shown in the table.

TABLE 4.7-4
EXISTING AND FUTURE WITH PROJECT PEAK FLOW (CFS)

Location	Area (sq mi)	10-Year Existing	10-year Future	10-year Increase (percent)	100-Year Existing	100-Year Future	100-year Increase (percent)
Northstar Drive at West Martis Creek	4.0	549	578	29 (5.3)	1,076	1,113	37 (3.4)
SR 267 at Martis Creek	25.1	2,126	2,159	33 (1.6)	4,218	4,263	45 (1.1)

cfs = cubic feet per second
Source: Auerbach Engineering Group 2002a

The future, post-development increase from existing peak runoff rates will be less than 5.3 percent on Northstar Drive and less than 1.6 percent on SR 267. While the subbasins involved are small in size and the changes expected in the overall watershed are relatively small, the proposed project would result in alterations to existing pervious surfaces and would result in increased runoff, resulting in a potentially significant impact. While this impact has been identified as potentially significant, the project applicant has proposed measures described in Appendix 3.0 and Section 4.7 of the PEA (EDAW, 2003) that would assist in mitigating this impact and the requirement to design and construct the proposed project in accordance with the aforementioned County and Lahontan RWQCB criteria would also reduce impacts. These project applicant measures are provided below as an EIR mitigation measure that is included in the mitigation monitoring and reporting program (see Section 8.0) to ensure it is applied to the project.

Mitigation Measures

MM 4.7.2a As part of the submittal of Improvement Plans for the project, the project applicant shall submit and obtain approval of a final drainage report in conformance with the requirements of Section 5 of the Land Development Manual and the Placer County Storm Water Management Manual that are in effect at the time of submittal. The report shall be prepared by a Registered Civil Engineer and shall, at a minimum, include the following:

- A written text addressing existing conditions, the effects of project improvements, all appropriate calculations, a watershed map, increases in downstream flows, proposed on- and off-site improvements and detention

facilities, features to protect downstream uses and property and drainage easements to accommodate downstream flows from this project.

- Storm water runoff shall be reduced to pre-project conditions through the installation of retention/detention facilities. Retention/detention facilities shall be designed in accordance with the requirements of the Placer County Storm Water Management Manual that are in effect at the time of submittal, and to the satisfaction of the Placer County Department of Public Works. The Placer County Department of Public Works may, after review of the project drainage report, delete this requirement if it is determined that drainage conditions do not warrant installation of this type of facility. No retention/detention facility construction shall be permitted within any identified wetlands area, floodplain, or right -of-way, except as authorized by project approvals.
- The report shall map the limits of the 100-year floodplain for West Martis Creek and the West Fork of West Martis Creek through the project area as well as building setbacks. The report shall also show residential and nonresidential building yard lot elevations 2 feet above the 100-year floodplain (or finished floor 3 feet above).
- All drainage facilities shall be designed with the assumption that upstream watersheds are fully developed. Future development shall not exceed the capacity of the facilities that are provided. In addition, facilities shall be designed with the assumption that all surfaces are impervious, as a result of winter snowpack, during peak flow conditions, per Placer County and Placer County Flood Control and Water Conservation District requirements.
- Snow storage areas shall be located outside of areas that drain directly into drainages and will include water quality control features, such as water treatment wetlands and detention basins.
- All related underground and surface drainage systems must be addressed in order to ensure full integration of areas that will generate runoff. These areas will include rooftops, sidewalks, cut/fill slopes, patio areas, streets, parking lots, up gradient off-site source areas, and impervious landscaping areas. Seepage from underground sources must also be addressed.
- Grading and drainage designs for future developments shall maintain existing drainage patterns by preserving watershed areas and by releasing flows downstream in a manner consistent with existing conditions.

Timing/Implementation: Prior to approval of improvement plans and included in the development notebook for Phase 1 and each subsequent phase of Highlands.
Enforcement/Monitoring: Placer County Department of Public Works, Placer County Flood Control and Water Conservation District and Lahontan Regional Water Quality Control Board.

MM 4.7.2b Rock lined ditches shall be installed on the cut slope side of the road and out of the right-of-way to capture off site drainage and allow it to pass under

the proposed Highlands Drive without being treated for water quality as approved by the DPW.

Timing/Implementation: Prior to approval of improvement plans for Phase 1 and each subsequent phase of Highlands.
Enforcement/Monitoring: Placer County Department of Public Works.

MM 4.7.2c Runoff from the downhill road edge will be allowed to sheet flow onto the road shoulder and across vegetated slopes, vegetated swales or filter strips. Sheet runoff shall be allowed to continue across landscape areas and open space where possible. Vegetated swales and slopes shall be designed per the CASQA BMP recommendations found in the New Development and Redevelopment Handbook on fact sheets TC 30 and TC 31. In addition, principles and practices outlined in Section 3.2.4 Landscape and Open Space of the aforementioned handbook including mulches, lower soil compaction and adding amendments to the soil to increase the soils stability and permeability will be incorporated into the design. Where overland flow must remain concentrated, swales will be designed with a combination of rock and vegetation to promote reduction in flow velocity and increased infiltration opportunities.

Timing/Implementation: Prior to approval of improvement plans for Phase 1 and each subsequent phase of Highlands.
Enforcement/Monitoring: Placer County Department of Public Works.

MM 4.7.2d Prior to environmental determination for new development within the Program Area, a project level, site-specific analysis of the drainage impacts associated with the new proposed development shall be provided to the DPW. The project level analysis shall update the program level analysis, if necessary, and include a site-specific analysis based on the specific improvements proposed to the satisfaction of the Placer County Department of Public Works. Additional mitigation measures shall be included in the analysis as required based on the project level specific impacts. The project level, site-specific drainage report shall be consistent with the Program analysis and the Phase 1 mitigation measures.

Timing/Implementation: Prior to determination of environmental documentation for subsequent phases of development.
Enforcement/Monitoring: Placer County Department of Public Works.

MM 4.7.2e Drainage facilities, for purposes of collecting runoff on individual lots, shall be designed in accordance with the requirements of the Placer County Storm Water Management Manual that are in effect at the time of submittal, and to the satisfaction of the Placer County Department of Public Works. These facilities shall be constructed with subdivision improvements and easements provided as required by the Placer County Department of Public Works.

Maintenance of these facilities shall be provided by the homeowners' association or other entity approved by DPW.

Timing/Implementation: Prior to approval of improvement plans for Phase 1 and each subsequent phase of Highlands.
Enforcement/Monitoring: Placer County Department of Public Works.

MM 4.7.2f The following off-site drainage facilities shall be evaluated in the drainage report for condition and capacity and shall be upgraded, replaced, or mitigated as specified by the Placer County Department of Public Works: A) Northstar Drive at West Martis Creek, B) SR 267 at Martis Creek.

Timing/Implementation: Prior to approval of improvement plans for Phase 1 and each subsequent phase of Highlands.
Enforcement/Monitoring: Placer County Department of Public Works.

Implementation of mitigation measures 4.7.2a through 4.7.2f would make the proposed project consistent with Placer County General Plan Policy 4.E.9 and reduce the impact to less than significant."

Water Board Analysis, Findings, and Mitigation Measures for Section 4.7.2

The Water Board concurs with the impact assessment above, and finds that proposed mitigation measures within 4.7.2 are adequate to reduce impacts to less than significant if they are implemented accordingly.

Water Board staff will perform periodic Project site inspections of the Project and take enforcement actions where necessary to ensure that the above actions are performed adequately. These actions and procedures shall reduce this potentially significant impact to a less than significant impact.

<u>Mitigation Measure</u>

RBMM–1: Pursuant to Section D.1.a. of State Water Resources Control Board Order No. 99-08-DWQ, Northstar Mountain Properties is required to demonstrate compliance with the above-cited Mitigation Measures MM 4.7.2a through MM 4.7.2f prior to construction of any facilities that will generate storm water runoff. Northstar Mountain Properties is required to submit the Storm Water Pollution Prevention Plan to the Water Board for review and acceptance at least 30 days prior to beginning construction of any facility that will generate storm water runoff.

"4.7 HYDROLOGY AND WATER QUALITY

Potential Short-Term Accelerated Soil Erosion and Sedimentation and/or Release of Pollutants to Adjacent Water Bodies/Wetlands

Impact 4.7.3 Slope and soil disturbance associated with proposed project construction activities could cause short-term accelerated soil erosion and sedimentation and/or the release of other pollutants to adjacent waterways and wetlands. This impact is considered potentially significant.

Construction activities for the proposed project are currently proposed to commence in spring 2005 and continue through 2022. Phase 1 construction would commence in spring 2005 and continue through 2010 (Phase 1 impacts are discussed below) with future subsequent project construction occurring as future proposed project applications are submitted, CEQA and other environmental processes are completed, and projects are approved. It should be noted that construction would not occur continuously for 18 years, but would occur periodically, during the spring, summer, and fall months, as each future development project is approved for construction. Offsite improvements would also be necessary for roadway construction and realignments and utility construction. The project site would be subject to new construction and grading, including new buildings, parking lots, utility relocations, and roadway construction. Within the construction site, areas would be protected from disturbance to preserve specimen trees and native vegetation. Excavations and embankments would be necessary to construct building pads, transportation improvements, and utilities associated with project development. Retaining walls may be required along Highlands Drive and some minor roadways as deemed appropriate by the DPW to reduce site impacts, dependent upon grades. The maximum depth of any excavation would be approximately 45 feet, and embankments would generally be lower than 35 feet. Most excavated soil that is uncontaminated and free of debris would be used onsite as fill for embankments and in other areas where necessary. However, excavation for subsurface structures and/or roadway improvements would result in excess material that may be exported from the project site. Materials that may be imported to the proposed project site include, but are not limited to, aggregate base rock for roadway and parking area subgrade, sand bedding and backfill for utility lines, and crushed rock for building and foundations. Construction staging areas would be established during the construction phases of each of the subsequent phases on the Highlands project site. These would be used for storage of vehicles, equipment, materials, fuels, lubricants, and solvent. Excavated material may be graded and smoothed to establish staging areas, for temporary employee and construction parking, and these staging areas would be fenced. Construction staging plans for each subsequent phase of development would be developed as part of the project application and analyzed during future environmental review.

As a condition of approval of the project, and upon approval of the SWPPP by the Lahontan Regional Water Quality Control Board, the BMPs identified below (or their equivalent) would be implemented during construction and post-construction activities, including the following:

- While construction activities for the future phases would not be determined until the future developments have been defined, project buildout would require excavation, grading, and other construction activities that may result in increased sedimentation and soil erosion. Erosion protection and bank stabilization measures such as rock slope protection and revegetation in cooperation with BMP's will be required. Surplus or waste materials shall not be permanently placed in drainage ways or within the 100-year flood plain or surface waters.
- All loose piles of soil, silt, clay, sand, debris, or earthen materials shall be protected in a reasonable manner to prevent discharge of pollutants.
- Dewatering shall be done in a manner so as to prevent the discharge of pollutants, including earthen materials, from the site without treatment.
- All disturbed areas shall be stabilized by appropriate erosion and/or sediment control measures by October 15 of each year.
- All work performed between October 15th and May 1st of each year shall be conducted in such a manner that the project can be winterized within 48 hours.
- After completion of a construction project, all surplus or waste earthen material shall be removed from the site and deposited at a legal point of disposal.
- All sensitive areas near construction sites shall be protected by fencing or other means to prevent unnecessary encroachment outside the active construction zone.
- Construct a stabilized construction entrance per the Placer County LDM Plate Standard.
- During construction, temporary erosion control facilities shall be used as necessary to prevent discharge of earthen materials from the site during periods of precipitation runoff. Temporary erosion control facilities will include:
  - Filter fabric erosion control fencing shall be installed downstream of construction activity at specific locations to be determined in the field, to ensure that sediment laden runoff does not leave the site. – Gravel bag sediment barriers shall be installed around existing and new drainage inlets during construction to provide a temporary means of preventing sediment from entering the storm drainage system.
  - Gravel bag check dams shall be installed in unimproved temporary or unstabilized drainage ditches and swales to reduce flow velocity and prevent sediment transport. Gravel bag check dams will be installed in ditches at a minimum spacing of 200 feet, unless the plans require closer spacing.

- o Diversion dikes shall be required to divert sheet flow from newly disturbed areas until revegetation can be completed and ground stabilized. Diversion dikes shall also be used to help promote sheet flow from concentrated sources where appropriate.
- o Settling pond with gravel cone outlet may be used to provide a location to help filter runoff. Where used for this purpose, a gravel cone outlet shall be installed to provide settling time and filtering before runoff is discharged.
- o Dust control shall be implemented to minimize the potential for erosion and the transport of pollutants offsite.

- Control of run-on water from off-site areas shall be managed to prevent such water from degrading before it discharges from the site.
- Drainage swales disturbed by construction activities shall be stabilized by appropriate soil stabilization measures to prevent erosion.
- Revegetated areas shall be continually maintained in order to assure adequate growth and root development. Erosion control facilities shall be installed with a routine maintenance and inspection program to provide continued integrity or erosion control facilities.
- Infiltration trenches/pits shall be incorporated at the outlet of all new culverts draining proposed impervious road surfaces. These infiltration pits shall be sized based on the Lahontan 20-year, 1-hour design storm. The infiltration pits shall provide settling time and filtering as the water is absorbed into the ground. Infiltration trenches and pits shall be inspected once yearly to ensure they are functioning properly and to ensure debris is removed from the flow path.
- Rock energy dissipaters shall be placed at pipe outlets to reduce the velocity and energy of concentrated storm water flows. Outlet protection shall help to prevent scour and to minimize the potential for downstream erosion. Rock riprap shall be placed at the outlet of pipes, drains, culverts, conduits, or channels at the bottom of mild to steep slopes
- Modified drain inlets shall be required for the pretreatment of most roadway runoff. The modified inlets shall include sediment sumps with drains and oil-separation baffles at the outlets. These inlets may also be fitted with oil-absorbent pillows if necessary. Drain inlets shall be inspected once per year to determine the need for replacement of oil-absorbent pillows and the need for sediment removal.
- Sand oil separators shall be required for pretreatment of runoff from larger areas subject to vehicular traffic and parking. Larger sand-oil separation vaults shall generally be used where the placement of multiple smaller modified drain inlets is impractical, or where the flow rate from any one source of runoff from vehicular areas is too large for the smaller inlets to handle.
- Vegetated/rock lined swales have been designed with a combination of rock and vegetation swales, where overland flow must remain concentrated, to promote reduction in flow velocity and to increase infiltration opportunities.

The vegetated/rock swale shall collect and detain storm water runoff to provide ample settling time before the water is absorbed into the ground water.

- Waterbreaks shall be installed to control surface flows from some portions of the site in order to reduce downstream erosion potential. Waterbreaks shall meet all the requirements of Sections 934.6(a) and 934.6(b) of the Forest Practices Act. Waterbreaks shall be installed along proposed skid trails at approximate 50-foot to 150-foot spacing (dependent on gradient) in order to prevent transport of eroded earthen materials and other wastes. Waterbreaks shall be constructed upon conclusion of use of tractor roads, logging roads, and landings that do not have permanent and adequate drainage facilities or drainage structure. Waterbreaks shall consist of either the rolling dip-type of waterbar or alternatively, straw or pine needle wattles can be used. Waterbreaks shall be built on a 2-4 degree angle off of horizontal and shall end in a water spreading structure such as rock weir, wattle berm, vegetative cover, duff, slash, rocks or less erodible material whenever possible.
- Revegetation shall be implemented for all finished excavation and cut slopes and all areas disturbed by construction to establish a vegetative cover. Typical revegetation of roadway disturbance involves hydroseed, fertilizer, and mulch. Other disturbed areas may receive similar treatment depending on the slope, aspect, soil constituents and size of the disturbed area. Some portions of the developed area will also be landscaped with various types of shrubs, trees and grasses. The application rates, seed mixes, fertilizer content and other specifics of the revegetation process are developed on a case by case basis, and shall be submitted with the construction drawings along with landscape construction plans.
- All required approvals associated with construction-related storm water permit requirements of current federal Clean Water Act National Pollutant Discharge Elimination System (NPDES) program and other associated permit approvals from the Lahontan Regional Water Quality Control Board or EPA. While this impact has been identified as potentially significant, the project applicant has proposed measures 4.7-A, 4.7-H, 4.7-J, and 4.7-K described in **Appendix 3.0** [hereby incorporated by reference], which would assist in mitigating this impact. However, the project as proposed would be inconsistent with Placer County General Plan Policy 4.E.9, which requires developments to consider drainage courses and provide for good soil conservation practices. Project applicant measures are incorporated into the EIR mitigation measures below that are included in the mitigation monitoring and reporting program (see Section 8.0) to ensure they are applied to the project. Mitigation Measures

MM 4.7.3a In compliance with the requirements of the State General Construction Activity Storm Water Permit as well as the Water Quality Control Plan for the Lahontan Region (Basin Plan), the project applicant shall prepare a

Stormwater Pollution Prevention Plan (SWPPP), which describes the site, erosion and sediment controls, means of waste disposal, implementation of approved local plans, control of post-construction sediment and erosion control measures and maintenance responsibilities, and non-storm water management controls (such as those water quality control features identified in the Storm Water Pollution Prevention Plan for Northstar Village Phase I - PSOMAS, 2003). The SWPPP shall be submitted to the Lahontan Regional Water Quality Control Board for review. The applicant shall require all construction contractors to retain a copy of the approved SWPPP on the construction site. Best Management Practices identified in the SWPPP shall be utilized in all subsequent site development activities. Water quality controls shall be consistent with the Placer County Grading Ordinance and the Lahontan Regional Water Quality Control Board's Lahontan Regional Project Guidelines for Erosion Control and will demonstrate that the water quality controls will ensure in compliance with all current requirements of the County and Lahontan Regional Water Quality Control Board. Water quality controls shall ensure that run-off meets the water quality control plan for the Lahontan Region (Basin Plan) water quality objectives for Martis Creek, as well as comply with the Basin Plan's narrative water quality objectives, state antidegradation policy, and maintain beneficial uses of Martis Creek and Martis Creek Reservoir as defined by the Basin Plan. Storm water quality sampling and reporting associated with the SWPPP shall be the responsibility of the project applicant.

Timing/Implementation: Prior to improvement plan approval and included in CCRs for Phase 1 and each subsequent phase.
Enforcement/Monitoring: Lahontan Regional Water Quality Control Board.

MM 4.7.3b Grading activities shall be prohibited during the winter months, unless approved by the County and the Lahontan Regional Water Quality Control Board. Exposed graded areas shall be protected during the winter months using appropriate methods.

Timing/Implementation: During construction activities.
Enforcement/Monitoring: Placer County Public Works Department and Lahontan Regional Water Quality Control Board.

MM 4.7.3c Prior to environmental determination for new development within the Program Area, a project level analysis of the water quality impacts associated with the new proposed development shall be provided to the DPW. The project level analysis shall include additional site-specific mitigations based on the proposed specific improvements to the satisfaction of the Placer County Department of Public Works and, if necessary, update the program analysis mitigation measures. The analysis shall also include a plan identifying the location of proposed water quality mitigations and a preliminary design.

Timing/Implementation: Prior to environmental determination of subsequent phases of development.
Enforcement/Monitoring: *Department of Public Works.*

MM 4.7.3d Prior to improvement plan approvals; the project applicant shall develop a Temporary and Permanent BMP Plan (including maintenance) and identify who will be responsible for ensuring its implementation and making the necessary updates/modifications. The BMPs (as described under Impact 4.7.3 and in Table 3-4 of the Draft EIR) shall be designed according to the California Stormwater Quality Association Stormwater Best Management Practice Handbooks for Construction and for New Development/Redevelopment (or other similar source as approved by the Placer County Department of Public Works).

Timing/Implementation: Prior to improvement plan approval and included in development notebook for Phase 1 and each subsequent phase.
Enforcement/Monitoring: Placer County Public Works Department and RWQCB.

Implementation of mitigation measures MM 4.3.2a, MM 4.3.2c, and MM 4.7.3a through MM 4.7.3c would require construction and operational features of each phase of the project to provide sufficient water quality control measures to protect existing water quality conditions in the West Fork of West Martis Creek and West Martis Creek as a performance standard and would make the proposed project consistent with Placer County General Plan Policy 4.E.9 and reduce the potential impact to **less than significant.**"

Water Board Analysis, Findings and Mitigation Measures for Section 4.7.3

The Water Board concurs with the impact assessment above, and finds that proposed mitigations including Best Management Practices (BMPs) and Environmental Protection Measures as adopted and incorporated into the proposed Project are adequate to reduce impacts to less than significant if they are included within the Stormwater Pollution Prevention Plan and implemented and maintained (Note – the EIR referenced MM 4.3.2a and MM 4.3.2c which relate to health effects. The Water Board believes that this reference should have been to MM 4.7.2a and MM 4.7.2c as these mitigation measures would be expected to reduce the potential impact as described in Section 4.7.3.).

Water Board staff will perform periodic Project site inspections of the Project and take enforcement actions where necessary to ensure that the above actions are performed adequately. These actions and procedures will reduce this potentially significant impact to a less than significant impact.

Mitigation Measure

RBMM–2: Pursuant to Section D.1.a. of State Water Resources Control Board Order No. 99-08-DWQ, Northstar Mountain Properties is required to demonstrate compliance with the above-cited Mitigation Measures MM 4.7.2a, MM 4.7.2c, and MM 4.7.3a through MM 4.7.3d prior to construction of any facilities that will generate storm water runoff. Northstar Mountain Properties is required to submit the Storm Water Pollution Prevention Plan to the Water Board for review and acceptance at least 30 days prior to beginning construction of any facility that will generate storm water runoff.

"Possible Increased Urban Contaminants in Surface Runoff

Impact 4.7.4 Project operation at buildout would result in an increase in urban contaminants in surface runoff, which could adversely affect Martis Creek and its tributaries. This impact is considered potentially significant. Operation of the proposed project under buildout would create additional residential units, commercial uses, and recreational uses, as well as increased impervious surfaces throughout the project site. The change in current conditions would potentially result in indirect impacts on the water quality in the Truckee River and West Martis Creek, as well as the groundwater associated with these water bodies. The proposed development would increase the amount of runoff. Runoff from developed uses would typically contain contaminants such as oils, grease, fuel, antifreeze, byproducts of combustion (such as lead, cadmium, nickel, and other metals), nutrients, sediment, and other pollutants. Additionally, sizable quantities of animal waste from pets (e.g., dogs and cats) could lead to fecal contamination of water sources. The proposed land uses may involve the following activities that may contribute to water quality degradation:

- Residential: Maintenance of common landscape areas associated with the use of fertilizers, herbicides, and pesticides; motor vehicle operation and maintenance; and animal waste.
- Hotel and Ski-Related Commercial: Maintenance of landscape area associated with the use of fertilizers, herbicides, and pesticides, and motor vehicle operation and maintenance.
- Recreation: Hiking, mountain biking, off-road vehicle use on unpaved roads, and trails and ski terrain maintenance resulting in sedimentation in waterways.

Precipitation during the early portion of the wet season (November to April) displaces these pollutants into the stormwater runoff, resulting in high pollutant concentrations in the initial wet weather runoff. This initial runoff, containing peak pollutant levels, is referred to as the "first flush" of storm events. It is estimated that during the rainy season, the first flush of heavy metals and hydrocarbons would occur during the first 5 inches of seasonal rainfall. In compliance with the

requirements of the RWQCB, the proposed project would require all individual developments on the project site to use BMPs for water quality treatment for the onsite impervious areas. The stormwater volume to be provided for in meeting the County and RWQCB requirements would both attenuate peak runoff rates and provide stormwater treatment. In addition drainage inlets would be fitted with oil-water separators and sediment sumps. Runoff from future building rooftops would be either treated at the dripline with infiltration facilities or collected and conveyed to other treatment facilities. Given that the existing Highlands project site currently lacks water quality control measures, implementation of the proposed project features is expected to improve stormwater quality from the Highlands site. Furthermore, the Cumulative Water Quality Analysis Report for Lahontan Development (1996-2002) (Huffman & Carpenter, Inc. 2003) demonstrates that the implementation of appropriate water quality control measures and monitoring for development projects in the Martis Valley area can maintain existing water quality conditions.

Additionally, the increase in impervious surfaces would require snow removal services above current levels. The use of de-icers, such as sand and/or magnesium chlorides, would also increase. Alternative de-icing systems, such as the hydronic system in use at Beaver Creek, Colorado, are being considered for feasibility at the Northstar-at-Tahoe resort community that would remove large quantities of snow and eliminate the need for unnecessary de-icer products. Filtering devices would be necessary in areas storing snow that may contain water quality contaminants such as de-icers and automobile exhaust components. The final design of filtering devices is not yet complete but may include using storage areas in places that already include filtering devices in their design. Northstar has stated that all methods would comply with Lahontan RWQCB standards. Lahontan RWQCB permits bioswales (using grasses for filtration) and hard systems (filtration tanks) for filtering runoff. Northstar will most likely use a hard system to clean out sand and oil from snowmelt so as to prevent water quality impacts on West Martis Creek and to meet local, state, and federal water quality standards.

The increase in population within the project site, as a result of additional housing, and new commercial uses would contribute to an increase in raw sewage that would be treated at TTSA's wastewater treatment facility located next to the Truckee River. T-TSA discharges treated effluent into the Truckee River. The increase in sewage from this proposed project could contribute to the overall pollutant levels entering the Truckee River. However, it should be noted that T-TSA has evaluated such impacts on water quality in its EIR for the expansion of the T-TSA treatment facility.

Mitigation Measures

MM 4.7.4a The drainage report and subsequent site development submittals shall address storm drainage management during construction and thereafter

and shall include provisions for the application of "Best Management Practice" (BMP) measures and water quality control features (such as those identified in Draft EIR Table 3-4 and in the Storm Water Pollution Prevention Plan prepared for Northstar Village Phase 1 - PSOMAS, 2003) to reduce erosion, water quality degradation, etc from all project improvements. Permanent water quality control features described in the report shall demonstrate (such as through routine water quality monitoring) that the water quality controls are adequate to meet the Water Quality Control Plan for the Lahontan Region (Basin Plan) water quality objectives for Martis Creek, as well as comply with the Basin Plan's narrative water quality state antidegradation policy and maintain beneficial uses of Martis Creek and Martis Creek reservoir as designed by the Basin Plan. The project will also participate in the Martis Valley Community Plan Comprehensive Water Quality Monitoring Program and subsequent requirement of Martis Valley Community Plan Natural Resources Implementation Program 18. Storm water discharges and discharge of earth and materials into the 100-year floodplain (i.e., bridge crossing structures) shall be in compliance with all current requirements of the Lahontan Regional Water Quality Control Board (e.g., Lahontan Region Project Guidelines for Erosion Control).

Timing/Implementation: Prior to approval of improvement plans for Phase 1and each subsequent phase of Highlands.
Enforcement/Monitoring: Lahontan RWQCB, Placer County Planning Department

MM 4.7.4b Storm drainage from project impervious surfaces (including roads) shall be collected and routed through specially designed catchbasins, vaults, filters, etc. for entrapment of sediment debris and oils/greases (such as those water quality control features identified in Draft EIR Table 3-7 and in the Storm Water Pollution Prevention Plan prepared for Northstar Village Phase I - PSOMAS, 2003). Maintenance of facilities shall be provided by the project applicant until the community is under the control of a Home Owners Association or similar entity, then it is the association's obligation to provide facility maintenance. This situation will prevail unless, and until, a County Service Area is created and said facilities are accepted by the County for maintenance. Easements shall be created and offered for dedication to the County for maintenance and access to these facilities in anticipation of possible County maintenance.

Timing/Implementation: Prior to approval of improvement plans for Phase 1 and each subsequent phase of Highlands.
Enforcement/Monitoring: Placer County Department of Public Works

Implementation of the above mitigation measures and MM 4.7.2a, MM 4.7.2c, and MM 4.7.3a through 4.7.3c would reduce this impact to less than significant."

Water Board Analysis, Findings and Mitigation Measures for Section 4.7.4

The proposed Project meets necessary conditions to receive an exemption to discharge prohibitions applicable to 100-year floodplain areas.

The Water Board concurs with the impact assessment above, and finds that proposed mitigations as specified in mitigation measure 4.7.4 including the implementation of Best Management Practices and implementation of a cumulative effects water quality monitoring and reporting plan as prescribed in this Order are adequate to reduce significant impacts to less than significant if they are implemented accordingly.

Water Board staff will perform periodic site inspections of the Project and review water quality monitoring reports and take enforcement actions where necessary to ensure that the above actions are performed adequately. These actions and procedures will reduce this significant impact to a less than significant impact.

Mitigation Measures

RBMM-3: Pursuant to Section D.1.a. of State Water Resources Control Board Order No. 99-08-DWQ, Northstar Mountain Properties is required to demonstrate compliance with the above-cited Mitigation Measures MM 4.7.4a and MM 4.7.4b prior to construction of any facilities that will generate storm water runoff. Northstar Mountain Properties is required to submit the Storm Water Pollution Prevention Plan to the Water Board for review and acceptance at least 30 days prior to beginning construction of any facility that will generate storm water runoff.

RBMM-4: Mitigation Measure MM 4.7.4a relies on a "Martis Valley Community Plan Comprehensive Water Quality Monitoring Program" which has yet to be developed. In lieu of this program the Water Board is specifying a water quality monitoring program as part of this Order. Northstar Mountain Properties shall comply with this Water Board required monitoring program.

"Alteration of Floodplain Conditions

Impact 4.7.5 Development of Highlands Drive would encroach into the channels and 100-year floodplains of the West Fork of West Martis Creek and West Martis Creek. The roadway will also traverse across numerous minor drainage paths and sheet flow zones that accommodate storm runoff generated within local subbasins in the area. Construction of the roadway without adequate drainage crossings and provisions to accommodate channel flows and surface runoff could alter floodplain conditions and expose nearby areas to flooding hazards. This impact is considered **significant**.

Placer County General Plan Policy 4.F.4 and Martis Valley Community Plan Policy 6.F.4 require the evaluation of potential flood hazards prior to approval of development projects. The project as proposed would be inconsistent with these policies.

There are two natural channels on the project site. The proposed construction of Highlands Drive would involve spanning the West Fork of West Martis Creek and West Martis Creek with a roadway. There are also numerous minor drainage paths and sheet flow areas that Highlands Drive will traverse across. Though there are no official FEMA floodplains that cross the alignment of Highlands Drive, West Martis Creek, the West Fork of West Martis Creek, the minor drainage paths, and sheet flow areas produce areas of inundation during a 100-year storm that are of a sufficient magnitude that it must be considered in the design and construction of the roadway.

See **Figure 4.7-1** for the location of the 100-year floodplain and wetlands on the Highlands site. If cross-drainage bridges and culverts installed underneath Highlands Drive are of insufficient size or number to accommodate runoff from these flooding sources, there will be alterations and diversions to drainage flow that may expose local upstream and downstream areas to increased flood hazard. In addition, placement of bridge structures in the 100-year floodplain would be subject to the provisions of Chapter 4 of the Water Quality Control Plan for the Lahontan Region (Basin Plan) associated with prohibitions of discharge of earthen materials into the 100-year floodplain of the Truckee River Hydrologic Unit and/or state waters and would be require the granting of an exemption. The project would appear to qualify for an exemption for transportation facilities. There are two areas where Highlands Drive would cross the 100-year floodplain: northeast of the Big Springs Day Lodge and where it crosses the West Fork of West Martis Creek. At the crossing by Big Springs Day Lodge, a bridge is proposed that would span the floodplain and wetland to avoid impacts. However, at the West Fork of West Martis Creek Crossing, the Highlands Drive alignment would impact approximately 5,085 square feet of the floodplain. As such, the impact is considered significant.

Mitigation Measures

MM 4.7.5a As part of the submittal of the final drainage report for each phase of the project, the report shall include the following:

- Any exposed utility crossings on roadway bridges or box culverts that span West Martis Creek and the West Fork of West Martis Creek shall be placed on the downstream side of the culvert/bridge, shall not restrict the flow capacity of the culvert and shall be placed in protective sleeves. Any sewer line crossings shall be placed in protective sleeves. Any sewer line crossings shall be placed in steel casings to preclude the possibility of damage to the sewer line or spill into the creek if there is a leak.

- For drainage structures serving the West Fork of West Martis Creek and West Martis Creek and other drainage courses where there may be potential for erosion from high velocity floodwaters, erosion protection and bank stabilization measures such as rock slope protection shall be implemented to maintain the integrity of the structures.
- All potential surface waters of the State, and all waters of the U.S. including wetlands shall be avoided in the project design, to the maximum extent practicable. All proposed project features that would include impacts to surface waters of the State shall meet Lahontan RWQCB requirements of the grant of an exemption for the placement of fill in surface waters of the state as set forth in the Basin Plan.

Timing/Implementation: Prior to approval of improvement plans for Phase 1 and each subsequent phase of Highlands.
Enforcement/Monitoring: County Department of Public Works, Placer County Flood Control and Water Conservation District and Lahontan RWQCB.

MM 4.7.5b The project applicant shall provide final roadway and drainage crossing design for Highlands Drive to the County for approval. The plans shall reflect the design elements contained in the approved final drainage report.

Timing/Implementation: Prior to approval of improvement plans for Phase I.
Enforcement/Monitoring: County Department of Public Works, Placer County Flood Control and Water Conservation District and Lahontan RWQCB.

Implementation of these mitigation measures would provide for project consistency with the Placer County General Plan and Martis Valley Community plan policies and reduce the potential flooding impact to **less than significant** by ensuring that the culverts and drainage provisions associated with Highlands Drive do not expose local properties to increased flooding hazards."

Water Board Analysis, Findings and Mitigation Measures for Section 4.7.5

The Water Board concurs with the impact assessment above, and finds that proposed mitigations including erosion protection and bank stabilization measures are adequate to reduce significant impacts to less than significant if they are implemented accordingly. Furthermore, impacts within the 100-year floodplain are now 1765 square feet, not 5085 square feet as described in the EIR.

The Water Board finds that prohibition exemption criteria are met for granting a prohibition exemption to allow excavation and fill within the floodplain areas. Water Board staff will perform periodic site inspections of the Project and take enforcement actions where necessary to ensure that the above actions are

performed adequately. These actions and procedures shall reduce this significant impact to a less than significant impact.

RBMM–5: Pursuant to Section D.1.a. of State Water Resources Control Board Order No. 99-08-DWQ, Northstar Mountain Properties is required to demonstrate compliance with the above-cited Mitigation Measures MM 4.7.5a and MM 4.7.5b prior to construction of any facilities that will generate storm water runoff. Northstar Mountain Properties is required to submit the Storm Water Pollution Prevention Plan to the Water Board for review and acceptance at least 30 days prior to beginning construction of any facility that will generate storm water runoff.

"Potential Short-Term Accelerated Soil Erosion and Sedimentation and/or Release of Pollutants to Nearby Waterbodies

Impact 4.7.9 Slope and soil disturbance associated with construction activities for Phase 1 developments could cause accelerated soil erosion and sedimentation or the release of other pollutants to adjacent waterways and wetlands. This impact is considered **potentially significant.**

Proposed Phase 1 construction activities would increase erosion on the Phase 1 project sites, and excavated materials may be transported by wind or water flow to West Martis Creek, resulting in potential temporary impacts on surface water quality in West Martis Creek caused by the increase in sediments, the release of other pollutants, and/or increased soil erosion. The project as proposed would be inconsistent with Placer County General Plan Policy 4.E.9, which requires developments to consider drainage courses and provide for good soil conservation practices. If Highlands Drive is constructed with a 35 mph design speed, it would require a 650 foot radius curve, opposed to a 250 foot radius curve for the proposed 25 mph design speed. An additional four acres of disturbed area and 35,000 cubic yards of fill would be required to accommodate the higher design speed. Refer to Impact 4.7.3 for further discussion of the potential impacts to nearby waterbodies associated with construction. This is a potentially significant impact.

While this impact has been identified as potentially significant, the project applicant has proposed measures 4.7-A, 4.7-H, 4.7-J, and 4.7-K described in Section 3.0, Project Description, that would assist in mitigating this impact. Project applicant measures are identified in this section and incorporated into the EIR mitigation measures below that are included in the mitigation monitoring and reporting program (see Section 8.0) to ensure they are applied to the project.

Mitigation Measures
Implementation of mitigation measures MM 4.7.3a through 4.7.3d would require construction and operational features of each phase of the project to provide sufficient water quality control measures to ensure no adverse impacts to water

quality in the West Fork of West Martis Creek and West Martis Creek as a performance standard and would make the proposed project consistent with Placer County General Plan Policy 4.E.9 and reduce the impact to **less than significant.**"

Water Board Analysis, Findings and Mitigation Measures for Section 4.7.9

The Water Board concurs with the impact assessment above, and finds that proposed mitigations are adequate to reduce potentially significant impacts to less than significant if they are implemented accordingly.

Water Board staff will perform periodic site inspection of the Project and take enforcement actions where necessary to ensure that the above actions are performed adequately.

RBMM-6: Pursuant to Section D.1.a. of State Water Resources Control Board Order No. 99-08-DWQ, Northstar Mountain Properties is required to demonstrate compliance with Mitigation Measures MM 4.7.3a through 4.7.3d prior to construction of any facilities that will generate storm water runoff. Northstar Mountain Properties is required to submit the Storm Water Pollution Prevention Plan to the Water Board for review and acceptance at least 30 days prior to beginning construction of any facility that will generate storm water runoff.

"Alteration of Floodplain Conditions

Impact 4.7.11 Development of Highlands Drive as proposed in Phase 1 would encroach into the channels and 100-year floodplains of the West Fork of West Martis Creek and West Martis Creek. The roadway will also traverse across numerous minor drainage paths and sheet flow zones that accommodate storm runoff generated within local subbasins in the area. Construction of the roadway without adequate drainage crossings and provisions to accommodate channel flows and surface runoff could alter floodplain conditions and expose nearby areas to flooding hazards. This impact is considered **significant.**

As discussed in the Program Level analysis, implementation of Phase 1 would include the development of a new roadway that would cross the West Fork of West Martis Creek, West Martis Creek, and numerous minor drainage paths. Though there are no official FEMA floodplains that cross the alignment of Highlands Drive, West Martis Creek, the West Fork of West Martis Creek, the minor drainage paths, and sheet flow areas produce areas of inundation during a 100-year storm that are of a sufficient magnitude that it must be considered in the design and construction of the roadway. The project as proposed would be inconsistent with Placer County General Plan Policy 4.F.4 and Martis Valley Community Plan Policy 6.F.4, which requires evaluation of potential flood hazards and Placer County General Plan Policy 4.F.1 and Martis Valley

Community Plan Policy 6.F.1, which requires protection from, at minimum, a 100-storm event. If cross-drainage bridges and culverts installed underneath Highlands Drive are of insufficient size or number to accommodate runoff from these flooding sources, there will be alterations and diversions to drainage flow that may expose local upstream and downstream areas to increased flood hazard. In addition, placement of bridge structures in the 100-year floodplain would be subject to the provisions of Chapter 4 of the Water Quality Control Plan for the Lahontan Region (Basin Plan) associated with prohibitions of discharge of earthen materials into the 100-year floodplain of the Truckee River Hydrologic Unit and would be require the granting of an exemption. The project would appear to qualify for an exemption for transportation facilities. As such, the impact is considered **significant.**

Mitigation Measures
Implementation of mitigation measures MM 4.7.5a and MM 4.7.5b would make the proposed project consistent with Placer County General Plan and Martis Valley community Plan policies and reduce the potential flooding impact to **less than significant** by ensuring that the culverts and drainage provisions associated with Highlands Drive in Phase 1 do not expose local properties to increased flooding hazards.

Water Board Analysis, Findings and Mitigation Measures for Section 4.7.11

The Water Board concurs with the impact assessment above, and finds that proposed mitigations are adequate to reduce significant impacts to less than significant if they are implemented accordingly.

Water Board staff will perform periodic site inspection of the Project and take enforcement actions where necessary to ensure that the above actions are performed adequately. These actions and procedures will reduce this cumulative significant impact to a less than significant impact.

RBMM–7: Pursuant to Section D.1.a. of State Water Resources Control Board Order No. 99-08-DWQ, Northstar Mountain Properties is required to demonstrate compliance with Mitigation Measures MM 4.7.5a and 4.7.5b prior to construction of any facilities that will generate storm water runoff. Northstar Mountain Properties is required to submit the Storm Water Pollution Prevention Plan to the Water Board for review and acceptance at least 30 days prior to beginning construction of any facility that will generate storm water runoff.

"Cumulative Water Quality Impacts

Impact 4.7.15 Construction and operational activities associated with Northstar Highlands and the off-site intersection improvements would contribute to

cumulative surface water quality impacts to area waterways. This would be a **cumulative significant** impact.

As previously described, the Truckee River is currently a Section 303(d) listed impaired waterway for sediment. Construction and operation of Northstar Highlands and the off-site intersection improvements could result in the increase in sediment and other pollutants into West Martis Creek and eventually the Truckee River. Cumulative development in Martis Valley and the Truckee River Watershed could add to surface water quality impacts to the Truckee River.

Mitigation Measures
Implementation of mitigation measures MM 4.7.2a, MM 4.7.2c and MM 4.7.3a through 4.7.3c would require that the project protect existing water quality conditions. Implementation of these mitigation measures would mitigate the project's and off-site intersection improvement's contribution to cumulative water quality impacts to **less than significant.**

Water Board Analysis, Findings and Mitigation Measures for Section 4.7.15

The Project proponent has developed a SWPPP with an inspection and monitoring program to prevent adverse effects to water quality. If effectively implemented, these plans will prevent cumulative adverse water quality impacts to surface waters in the Project area (West Martis Creek and West Fort of West Martis Creek/Martis Valley/Truckee River Watershed) and reduce cumulative significant impacts to less than significant.

Developing and implementing the above programs should prevent potentially significant cumulative adverse water quality impacts to surface and ground water resources. However, a means to verify that these plans are effective in preventing potentially significant or significant cumulative impacts has not been established. Furthermore, the means to verify the effectiveness of the plans is required as a mitigation monitoring measure in the Highlands Development Project EIR, which requires participation in a "comprehensive monitoring program" as proposed in Placer County's Martis Valley Community Plan (MVCP). The Highlands Development Project EIR states, "... The project will also participate in the Martis Valley Community Plan Comprehensive Water Quality Monitoring Program and any subsequent requirement of Martis Valley Community Plan Natural Resources Implementation Program 18." Results of water quality sampling shall be provided in a report submitted to the Lahontan Regional Water Quality Control Board (RWQCB) to verify compliance with this measure. The timing and implementation of the above mitigation measure is to be prior to approval of Improvement Plans, by Placer County.

The MVCP Natural Resources Implementation Program 18 states, "The County shall work with the Lahontan WQCB [Water Quality Control Board], the ACOE

[Army Corps of Engineers], TTSA [Tahoe-Truckee Sanitation District], and private landowners to initiate a comprehensive water quality monitoring program to address the cumulative impacts on water quality in Martis Lake and the creeks which drain into it. The program shall strive to coordinate existing water quality monitoring efforts underway presently and modify those as necessary to create a comprehensive program." The time frame stated in the MVCP for this to occur is "2004 and on-going." As of May 2006, no such monitoring program has been developed or implemented. Without a monitoring program there is no basis to conclude that cumulative impacts will be mitigated to a less-than-significant level.

A lawsuit challenging the adequacy of the MVCP has been filed against the Placer County Board of Supervisors that has not been finally adjudged in a legal proceeding. California Code of Regulations, title 14, section 15233 states that if a lawsuit is filed challenging an EIR for noncompliance with CEQA, Responsible Agencies shall act as if the EIR complies with CEQA. California Code of Regulations, title 14, section 15231 states that a final EIR prepared by a Lead Agency shall be conclusively presumed to comply with CEQA for purposes of use by Responsible Agencies unless the EIR is finally adjudged in a legal proceeding not to comply with the requirements of CEQA.

Pursuant to Section 15097 of CEQA Guidelines, "[i]n order to ensure that the mitigation measures and project revisions identified in the EIR or negative declaration are implemented, the public agency shall adopt a program for monitoring or reporting on the revisions which it has required in the project and the measures it has imposed to mitigate or avoid significant environmental effects. A public agency may delegate reporting or monitoring responsibilities to another public agency or to a private entity which accepts the delegation; however, until mitigation measures have been completed the lead agency remains responsible for ensuring that implementation of the mitigation measures occurs in accordance with the program." Insofar as Placer County has delegated responsibility for developing the program for cumulative effects monitoring and reporting, the Water Board accepts this delegation on a limited-term basis until a Placer County-coordinated program, as described in the MVCP, is developed and implemented by Placer County. Therefore, to address the lack of a County-coordinated cumulative effects mitigation-monitoring program (from which to conclude cumulative-impact mitigation and monitoring measures are effective), this Order imposes a condition that requires the Project proponent to implement a comprehensive cumulative impacts mitigation-monitoring and reporting program. Such a program has been developed and is included in the Monitoring and Reporting Program (MRP) made a part of this Order. The MRP incorporates information to establish baseline water quality conditions and establishes a monitoring program that will confirm that cumulative significant impacts do not occur, in accordance with the Highlands Development Project EIR, or to detect cumulative impacts should they occur so that additional mitigation measures

described in the Highlands Development Project EIR and MVCP EIR will be implemented.

The cumulative effects monitoring Plan for the Project will be implemented through the MRP, and includes sampling at five sites for compliance and adaptive monitoring purposes. Sites include three previously designated biomonitoring sites and two additional sites to be determined prior to July 1, 2006 through a coordinated effort between the Water Board and the Project proponent. The sites are located within the Truckee River Hydrologic Unit on Martis Creek, West Martis Creek, and East Martis Creek. Monitoring will include chemical, biological (EPT Index), physical habitat, and flow parameters. The site-specific and cumulative effects monitoring is compiled in the MRP and is required as a condition in this Section 401 Water Quality Certification Order. The Water Board has the authority to require such monitoring and corrective actions through the Clean Water Act, Porter-Cologne Water Quality Control Act, and the various regulatory programs authorized through these two laws.

The existing and additional monitoring is intended to assist Northstar Mountain Properties in detecting any actual or potential adverse water quality impacts that may occur, so that these parties may respond to the situation and implement the appropriate corrective actions. The results generated by implementing the monitoring will also be useful in evaluating any cumulative impacts that may occur in the Martis Creek Watershed as a result of other developments.

Successfully implementing the various design, implementation, monitoring, evaluation, and corrective elements of the Project's SWPPP in combination with the Project design, will reduce the cumulative significant impact to less than significant.

RBMM–8: Pursuant to Section D.1.a. of State Water Resources Control Board Order No. 99-08-DWQ, Northstar Mountain Properties is required to demonstrate compliance with Mitigation Measures MM 4.7.2a, MM 4.7.2c and MM 4.7.3a through 4.7.3c prior to construction of any facilities that will generate storm water runoff. Northstar Mountain Properties is required to submit the Storm Water Pollution Prevention Plan to the Water Board for review and acceptance at least 30 days prior to beginning construction of any facility that will generate storm water runoff.

RBMM-9: Mitigation Measure MM 4.7.4a relies on a "Martis Valley Community Plan Comprehensive Water Quality Monitoring Program" which has yet to be developed. In lieu of this program the Water Board is specifying a water quality monitoring program as part of this Order. Northstar Mountain Properties shall comply with this Water Board required monitoring program.

"4.9 BIOLOGICAL AND NATURAL RESOURCES

Potential Loss or Disturbance of Sensitive Habitats

Impact 4.9.2 Development of the project could result in the loss or disturbance of small amounts (less than 1 acre) of riparian habitat (mountain alder, willow alder, and aspen alliances) and loss (fill) of jurisdictional Waters of the U.S., including wetlands (less than 1 acre) and other Waters of the State. These habitats are under the jurisdiction of USACE, CDFG, and RWQCB, under Section 404 of the CWA, Section 1602 of the Fish and Game Code, and Section 401 of the CWA and Porter Cologne Act, respectively. This impact is considered **significant.**

Both the Placer County General Plan and Martis Valley Community Plan have numerous policies concerning the protection of riparian habitat and wetlands. Policies 1.I.2, 6.A.3, 6.A.4, 6.A.7, 6.B.1, 6.B.2, 6.B.3, 6.B.5, 6.C.1, 6.C.9, 6.D.14 of the Placer County General Plan and 1.G.3, 1.G.6, 9.D.3, 9.D.4, 9.D.7, 9.D.8, 9.E.10, 9.F.3, 9.F.4, 9.F.7, 9.G.10 of the Martis Valley Community Plan regulate these areas. The project as proposed would be inconsistent with these policies. For this impact evaluation the mountain alder, willow alder, and aspen alliance plant communities are collectively referred to as riparian habitat. The proposed Highland Drive crosses through or near areas supporting riparian vegetation associated with West Martis Creek and the West Fork of West Martis Creek (**Figure 4.9-1**). Construction of this roadway could result in the disturbance or removal of small amounts of riparian habitat (approximately 5,085 square feet) in these areas. The proposed Phase 1 water main also passes very near, and potentially through riparian habitats within and north of Parcel 2. Disturbance of small amounts of riparian habitat may occur during construction of the water main. The area proposed for the widening of the Village Run trail contains small amounts (less than 1 acre) of riparian habitat, which is assumed to be converted to annual grassland or similar vegetation suitable for winter skiing use.

The overall maximum disturbance removal of riparian habitat associated with Phase 1 development would total less than 1 acre. However, riparian communities are considered sensitive by CDFG and the County. CDFG has jurisdiction over riparian habitat under Section1602 of the Fish and Game Code. While the County does consider riparian habitat a sensitive community and has established sensitive habitat buffer requirements of 50 feet for riparian zones in General Plan Policy 6.A.1, this policy has exceptions to the buffer requirement including an exception when the location is necessary for the construction of new roads, bridges, trails, or similar infrastructure where the County determines there is no feasible alternative and the project has minimized environmental impacts through project design and infrastructure placement.

Development of the Phase 1 parcels could result in the loss (fill) or temporary disturbance of small amounts (less than 1 acre) of jurisdictional Waters of the

U.S., including wetlands. The proposed Highland Drive crosses through areas supporting wetlands and other Waters of the U.S. associated with West Martis Creek and the West Fork of West Martis Creek (**Figure 4.9-1**).

Construction of this roadway could result in the disturbance or removal of small amounts (less than 1 acre) of these resources. The proposed Phase 1 water main also passes very near (and potentially through) jurisdictional waters within and north of Parcel 2. Fill of small amounts of wetlands or other Waters of the U.S. could occur during construction of the water main. The area proposed for widening of the Village Run Trail contains similar small amounts of wetlands that could be disturbed during grading activities. Waters of the U.S., including wetlands are considered sensitive by the USACE, CDFG, RWQCB, and the County. USACE has jurisdiction of Waters of the U. S under Section 404 of the CWA. CDFG has jurisdiction over many Waters of the U.S under Section 1602 of the Fish and Game Code. RWQCB has jurisdiction over Waters of the U.S and Waters of the State under the Section 401 of the CWA and the Porter-Cologne Act. In addition, the Lahontan RWQCB has issued a general prohibition against allowing any new direct impact on wetlands or other Waters of the United States in the entire Truckee River watershed (which includes the project study area) unless exemption criteria can be met. Therefore, adverse affects to these sensitive habitats is considered **potentially significant**.

Mitigation Measures

MM 4.9.2a Prior to approval of improvement plans, the project applicant shall have the existing wetland delineations verified by the USACE to confirm the exact boundaries of jurisdictional features within the project study area. The project applicant shall redesign/refine the project to avoid and/or minimize all impacts on riparian vegetation and jurisdictional Waters of the United States, including wetlands, and Waters of the State to the maximum extent practicable. If, based on the verified delineation, it is determined that fill of Waters of the U.S., including wetlands, would result from project implementation, authorization for such fill shall be secured from USACE via the Section 404 permitting process prior to project implementation.

As part of the Section 404 permitting process, a conceptual wetlands mitigation plan shall be developed by a qualified wetland biologist. The acreage of Waters of the U.S., including wetlands and riparian habitat that would be removed shall be replaced or restored/enhanced on a "no-net-loss" of function and value in accordance with USACE and CDFG regulations and Placer County General Plan provisions. The mitigation plan shall quantify the total jurisdictional acreage lost or indirectly affected, describe creation/replacement ratios for acres filled, annual success criteria, potential mitigation sites, and monitoring and maintenance requirements. The applicant shall ensure that no less than 1.2 acre of wetlands shall be created for each acre loss and no less than 1.2 acres of other Waters of the U.S. will be restored for each acre lost of degraded. The applicant shall also

ensure that for each created and or restored waters, the waters will be achieve no less than 80% functional success for at least three consecutive years during the monitoring period for the mitigation to be considered complete. The plan shall be prepared by a qualified wetland biologist pursuant to, and through consultation with, USACE. Implementation of the plan would create or restore/enhance jurisdictional Waters of the U.S., including wetlands to compensate for the loss of jurisdictional Waters of the U.S., including wetlands and riparian habitat. If a Section 404 permit is required from the USACE, a Section 401 permit would be required from the Lahontan RWQCB. If it is determined by a qualified wetland biologist and through consultation with Lahontan RWQCB that features that qualify as Waters of the State will be affected, the applicant would be required to obtain authorization from Lahontan RWQCB to fill/disturb these features prior to project implementation.

Timing/Implementation: Prior to approval of improvement plans for Phase 1 and each subsequent phase.
Enforcement/Monitoring: Placer County Planning Department, Placer County Department of Public Works, USACE, CDFG, and Lahontan RWQCB.

MM 4.9.2b A 1602 Streambed Alteration agreement for removal of or disturbance to riparian habitat and Waters of the U.S (i.e., stream, lake, or river) shall be required from CDFG prior to approval of improvement plans.

Timing/Implementation: Prior to approval of improvement plans for Phase 1 and each subsequent phase.
Enforcement/Monitoring: Placer County Planning Department, Placer County Department of Public Works, and CDFG.

MM 4.9.2c In addition to the requirements of the mitigation plan referenced under MM4.9.2a, the applicant shall prepare and implement a riparian vegetation mitigation and monitoring plan for disturbed riparian vegetation that does not fall within the USACE jurisdiction. The plan shall include: (a) onsite and/or offsite location(s) for replacement shrubs and trees, based on a replacement ratio of 1.2-inch stem/trunk diameter replacement for every inch diameter of stem/trunk affected; (b) protection measures for replacement shrubs and trees that shall ensure that 80 percent of replacement plantings are alive and vigorous 3 years following site revegetation; (c) monitoring measures including construction monitoring to ensure disturbance is minimized and replacement monitoring for a minimum of 3 years by a qualified restoration ecologist, arborist or biologist; and (d) replacement plantings for any lost shrubs or trees below an 80% survival rate during the monitoring period, and an additional monitoring period of 3 years by a qualified restoration ecologist, arborist or biologist following this subsequent replanting. The plan shall be submitted as an element of the 1602 Streambed Alteration Agreement for removal of or disturbance to riparian habitat and Waters of the U.S (i.e., stream, lake, or river) as required from CDFG prior to project

implementation. The long-term effect of this mitigation shall ensure a no net loss of riparian habitat due to the project.

Timing/Implementation: Prior to approval of improvement plans for Phase 1 and each subsequent phase.
Enforcement/Monitoring: Placer County Planning Department, Placer County Department of Public Works, and CDFG.

Implementation of the above mitigation measures and mitigation measures identified in Section 4.7, Hydrology and Water Quality would provide project consistency with Placer County General Plan and Martis Valley Community Plan policies and reduce impacts on wetlands and Waters of the United States and Waters of the State to a **less than significant** level by minimizing disturbance, replacing jurisdictional features, and restoring habitat."

Water Board Analysis, Findings and Mitigation Measures for Section 4.9.2

The Project proponent has developed a Mitigation and Monitoring Plan that includes details for restoration of impacted riparian habitat where avoidance is not achievable. Proposed mitigations including restoration of riparian wetland, will occur at 1.5:1 for a total of 0.327 acres. The plan identifies an on-site location for replacement vegetation to achieve riparian habitat value at a minimum of no net loss; protection measures for replacement vegetation that will ensure that 50% of replacement plantings be alive and vigorous five years following site revegetation with 25% total cover; and monitoring measures to ensure disturbance is minimized and replacement monitoring for a minimum of 5 years by a qualified professional. Implementation of this plan is a condition of this Order. Periodic site inspections of the Project by the Water Board staff will ensure that the above actions are performed adequately and will reduce the significant impact to less than significant.

RBMM-10: Northstar Mountain Properties shall implement the wetlands mitigation and monitoring contained in the Mitigation and Monitoring Plan dated October 5, 2005.

"Possible Water Quality Degradation Potentially Affecting Lahontan Cutthroat Trout

Impact 4.9.4 Development of the proposed project could result in releases of sediment and contaminants that could reach downstream habitat occupied by the Lahontan cutthroat trout. The Lahontan cutthroat trout is federally listed as threatened. Degradation of water quality resulting from project activities could adversely affect this species. This impact is considered **potentially significant.**

The Lahontan cutthroat trout can be found in the Truckee River and could potentially spawn in associated Martis Creek tributaries and drainages in the project study area (although the probability is very low). This species is federally listed as threatened and is afforded additional protection under County Policies 6.C.6 and 6.C.8. Placer County General Plan Policies 1.I.2 and 6.D.14 and Martis Valley Community Plan Policies 1.G.03, 9.E.10 and 9.G.10 require biological studies and mitigation of impacts to special-status species. The project as proposed is inconsistent with these policies. Field reviews have not identified this species as present in the project study area, and it is not expected to occur given the ephemeral nature of the stream reaches in the project study area and the presence of potential fish barriers (e.g., fallen logs, downcuts) between the project site and downstream areas. Additionally, the Lahontan cutthroat trout is subject to competition with other trout species and interbreeding, both of which decrease the species' survival potential in the project region. Development of the proposed project and its associated components would result in the construction/improvement of road crossings in West Martis Creek and West Fork of West Martis Creek, creating the potential for releases of sediment and contaminants that could adversely affect water quality. Declines in water quality could also result from increases in stormwater runoff associated with the proposed project. Water quality impacts near the project site could adversely affect Lahontan cutthroat trout in downstream areas if substantial amounts of sediment and/or contaminants are carried offsite via West Martis Creek and the west fork of West Martis Creek. This would be considered a **potentially significant** impact.

Mitigation Measures
Mitigation measures identified in Section 4.7, Hydrology and Water Quality, and MM 4.9.2a through 4.9.2c would ensure that stormwater discharges and project construction would not result in increased sediment or pollutant loads in nearby waterways that would adversely impact fisheries downstream. Several features incorporated into the proposed project such as infiltration facilities and sand/oil separators would also assist in protecting water quality. With implementation of these mitigation measures and project components incorporated into the proposed project, this potentially significant impact would provide project consistency with General Plan and Community Plan policies and the impacts would be reduced to a **less than significant** level."

Water Board Analysis, Findings and Mitigation Measures for Section 4.9.4

The Water Board concurs with the impact assessment above, and finds that proposed mitigations are adequate to reduce potentially significant impacts to less than significant if they are implemented accordingly.

Water Board staff will perform periodic site inspection of the Project and take enforcement actions where necessary to ensure that the above actions are

performed adequately. These actions and procedures will reduce this potentially significant impact to a less than significant impact.

RBMM–11: Pursuant to Section D.1.a. of State Water Resources Control Board Order No. 99-08-DWQ, Northstar Mountain Properties is required to demonstrate compliance with Mitigation Measures MM 4.7.2a through MM 4.7.2f, MM 4.7.3a through MM 4.7.3d, MM 4.7.4a and 4.7.4b, MM 4.7.5a and MM 4.7.5b, and MM 4.9.2a through 4.9.2c prior to construction of any facilities that will generate storm water runoff. Northstar Mountain Properties is required to submit the Storm Water Pollution Prevention Plan to the Water Board for review and acceptance at least 30 days prior to beginning construction of any facility that will generate storm water runoff.

"Potential Loss or Disturbance of Sensitive Habitats

Impact 4.9.11 Development of the project could result in the loss or disturbance of small amounts (less than 1 acre) of riparian habitat (mountain alder, willow alder, and aspen alliances) and loss (fill) of jurisdictional Waters of the U.S., including wetlands (less than 1 acre) and Waters of the State. These habitats are under the jurisdiction of USACE, CDFG, and RWQCB, under Section 404 of the CWA, Section 1602 of the Fish and Game Code, and Section 401 of the CWA and Porter Cologne Act, respectively. This impact is considered **significant.**

Both the Placer County General Plan and Martis Valley Community Plan have numerous policies concerning the protection of riparian habitat and wetlands. Policies 1.I.2, 6.A.3, 6.A.4, 6.A.7, 6.B.1, 6.B.2, 6.B.3, 6.B.5, 6.C.1, 6.C.9, 6.D.14 of the Placer County General Plan and 1.G.3, 1.G.6, 9.D.3, 9.D.4, 9.D.7, 9.D.8, 9.E.10, 9.F.3, 9.F.4, 9.F.7, 9.G.10 of the Martis Valley Community Plan regulate these areas. The project as proposed would be inconsistent with these policies. For this impact evaluation the mountain alder, willow alder, and aspen alliance plant communities are collectively referred to as riparian habitat. The proposed Highland Drive crosses through or near areas supporting riparian vegetation associated with West Martis Creek and the West Fork of West Martis Creek (**Figure 4.9-1**). Construction of this roadway could result in the disturbance or removal of small amounts of riparian habitat in these areas. The proposed Phase 1 water main also passes very near, and potentially through riparian habitats within and north of Parcel 2. Disturbance of small amounts of riparian habitat may occur during construction of the water main. The area proposed for the widening of the Village Run trail contains small amounts (less than 1 acre) of riparian habitat, which is assumed to be converted to annual grassland or similar vegetation suitable for winter skiing use. The overall maximum disturbance removal of riparian habitat associated with Phase 1 development would total less than 1 acre. However, riparian communities are considered sensitive by CDFG and the County.

CDFG has jurisdiction over riparian habitat under Section 1602 of the Fish and Game Code. While the County does consider riparian habitat a sensitive community and has established sensitive habitat buffer requirements of 50 feet for riparian zones in General Plan Policy 6.A.1, this policy exceptions to the buffer requirement including an exception when the location is necessary for the construction of new roads, bridges, trails, or similar infrastructure where the County determines there is no feasible alternative and the project has minimized environmental impacts through project design and infrastructure placement. Development of the Phase 1 parcels could result in the loss (fill) or temporary disturbance of small amounts (less than 1 acre) of jurisdictional Waters of the U.S., including wetlands. The proposed Highland Drive crosses through or near areas supporting wetlands and Waters of the U.S. associated with West Martis Creek and the West Fork of West Martis Creek (**Figure 4.9-1**). Construction of this roadway could result in the disturbance or removal of small amounts (less than 1 acre) of these resources. The proposed Phase 1 water main also passes very near (and potentially through) jurisdictional habitats within and north of Parcel 2. Fill of small amounts of wetlands or other waters of the U.S. could occur during construction of the water main. The area proposed for widening of the Village Run Trail contains similar small amounts of wetlands that could be disturbed during grading activities. Waters of the U.S., including wetlands are considered sensitive by the USACE, CDFG, RWQCB, and the County. USACE has jurisdiction of Waters of the U. S under Section 404 of the CWA. CDFG has jurisdiction over many Waters of the U.S under Section 1602 of the Fish and Game Code. RWQCB has jurisdiction over Waters of the U.S and Waters of the State under the Section 401 of the CWA and the Porter-Cologne Act. In addition, the Lahontan RWQCB has issued a general prohibition against allowing any new direct impact on wetlands or Waters of the U.S. in the entire Truckee River watershed (which includes the project study area) unless exemption criteria can be met. Therefore, adverse affects to these sensitive habitats is considered **potentially significant.**

Mitigation Measures

Mitigation Measure MM 4.9.2, identified under the Program Level analysis, would also apply to Phase 1. With implementation of this mitigation measure, would provide project consistency with Placer County General Plan and Martis Valley Community Plan policies and this impact would be reduced to a **less than significant** level."

Water Board Analysis and Findings for Section 4.9.11

The Water Board concurs with the impact assessment above, and finds that proposed mitigations are adequate to reduce potentially significant impacts to less than significant if they are implemented accordingly.

Water Board staff will perform periodic site inspection of the Project and take enforcement actions where necessary to ensure that the above actions are performed adequately. These actions and procedures will reduce this potentially significant impact to a less than significant impact.

RBMM-12: Northstar Mountain Properties shall implement the wetlands mitigation and monitoring contained in the Mitigation and Monitoring Plan dated October 5, 2005.

"Possible Water Quality Degradation Potentially Affecting Lahontan Cutthroat Trout

Impact 4.9.13 Development of the Phase 1 parcels could result in releases of sediment and contaminants that could reach downstream habitat occupied by the Lahontan cutthroat trout. This impact is considered **potentially significant.** The Lahontan cutthroat trout is federally listed as threatened. Degradation of water quality resulting from project activities could adversely affect this species. Refer to Impact 4.9.5 for further discussion of this impact.

Mitigation Measures
Mitigation measures identified in Section 4.7, Hydrology and Water Quality under Program Level, would apply to this impact. See the discussion of mitigation measures under Impact 4.9.5. With implementation of these mitigation measures, this impact would be reduced to a **less than significant** level."

Water Board Analysis, Findings and Mitigation Measures for Section 4.9.13

The Water Board concurs with the impact assessment above, and finds that proposed mitigations are adequate to reduce potentially significant impacts to less than significant if they are implemented accordingly.

Water Board staff will perform periodic site inspection of the Project and take enforcement actions where necessary to ensure that the above actions are performed adequately. These actions and procedures will reduce this potentially significant impact to a less than significant impact.

RBMM-14:

"Cumulative Biological Resource Impacts

Impact 4.9.19 Development of the Northstar Highlands site would contribute to impacts to wildlife habitat, riparian habitat, jurisdictional wetlands and other water of the United States, and special-status species. This would be a **cumulative significant** impact. In addition to the Northstar Highlands project, several other developments in eastern Placer County are currently approved, proposed, under

construction or in the preliminary planning stages. These projects include are identified in **Table 4.0-1** and have the potential to adversely affect the biological resources in the region. Future developments would require on- and offsite improvements to provide water, wastewater, storm drainage, solid waste disposal, and other such services at the required level of service. Such improvements could contribute to the loss of potential habitat within the region.

As described under program and project impacts, implementation of the Northstar Highlands project would result in significant impacts to wildlife habitat, riparian habitat, wetland resources, special-status plant populations, Lahontan cutthroat trout, and special-status bird and raptor species prior to implementation of mitigation. This would contribute to a significant loss of these biological resources in the region. Placer County General Plan Policies 1.I.2 and 6.D.14 and Martis Valley Community Plan Policies 1.G.03, 9.E.10 and 9.G.10 require biological studies and mitigation of impacts to special-status species. The project as proposed is inconsistent with these policies. This would be a cumulative significant impact.

Mitigation Measures
Implementation of mitigation measures MM 4.7.3a through d and MM 4.7.4a and b identified in Section 4.7, Hydrology and Water Quality, and mitigation measures MM 4.9.2a through c, MM 4.9.3, and MM 4.9.5, as described in this section, would provide project consistency with Placer County General Plan and Martis Valley Community Plan policies and reduce the cumulative impacts of the project to a **less than significant** level."

Water Board Analysis, Findings and Mitigation Measures for Section 4.9.19

The Project proponent has developed a Mitigation and Monitoring Plan that includes details for restoration of impacted riparian habitat where avoidance is not achievable. Proposed mitigations including restoration of riparian wetland will occur at 1.5:1 for total of 0.327 acres. The plan identifies an on-site location for replacement vegetation to achieve riparian habitat value at a minimum of not net loss; protection measures for replacement vegetation that will ensure that 50% of replacement plantings be alive and vigorous five years following site revegetation with 25% total cover; and monitoring measures to ensure disturbance is minimized and replacement monitoring for a minimum of five years by a qualified professional. If the goals of mitigation are not met after this five-year period, an alternate parcel with ephemeral drainage and riparian habitat (under ownership of the Project proponent) shall be identified for mitigation compensation to satisfy mitigation requirements.

The Water Board will require the Project proponent to include physical, chemical (including turbidity), biological, and continuous monitoring to verify that no cumulative effects occur to water quality. Annually, specific assessments of

stream macroinvertebrates and habitat conditions shall occur. Implementation of this monitoring in cooperation with periodic site inspections of the Project by Water Board staff to ensure that the above actions are performed adequately will reduce the cumulative significant impact to less than significant.

Water Board staff will perform periodic site inspection of the Project and take enforcement actions where necessary to ensure that the above actions are performed adequately. If impacts are identified, the Water Board will require corrective actions. These actions and procedures will reduce this cumulative *significant impact to a less than significant impact.*

RBMM-14: Pursuant to Section D.1.a. of State Water Resources Control Board Order No. 99-08-DWQ, Northstar Mountain Properties is required to demonstrate compliance with Mitigation Measures MM 4.7.2a, through MM 4.7.2f, MM 4.7.3a through MM 4.7.3d, MM 4.7.4a and 4.7.4b, and MM 4.7.5a and MM 4.7.5b, prior to construction of any facilities that will generate storm water runoff. Northstar Mountain Properties is required to submit the Storm Water Pollution Prevention Plan to the Water Board for review and acceptance at least 30 days prior to beginning construction of any facility that will generate storm water runoff.

ATTACHMENT 1

Date _____

California Regional Water Quality Control Board
Lahontan Region
2501 Lake Tahoe Boulevard
South Lake Tahoe, CA 96150

Facility Name: _____

Address: _____

Contact Person: _____

Job Title: _____

Phone: _____

Email: _____

WDR/NPDES Order Number: _____

WDID Number: _____

Type of Report (circle one): **Monthly** **Quarterly** **Semi-Annual** **Annual** **Other**

Month(s) (circle applicable month(s)*: **JAN** **FEB** **MAR** **APR** **MAY** **JUN** **JUL** **AUG** **SEP** **OCT** **NOV** **DEC**

*annual Reports (circle the first month of the reporting period)

Year: _____

Violation(s)? (Please check one): _____ **NO** _____ **YES***

***If YES is marked complete a-g (Attach Additional information as necessary)**

a) Brief Description of Violation: _____

b) Section(s) of WDRs/NPDES Permit Violated: _____

c) Reported Value(s) or Volume: _____

d) WDRs/NPDES Limit/Condition: _____

e) Date(s) and Duration of Violation(s): _____

f) Explanation of Cause(s): _____

g) Corrective Action(s)
(Specify actions taken and a schedule for actions to be taken)

_____

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision following a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my knowledge of the person(s) who manage the system, or those directly responsible for data gathering, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

If you have any questions or require additional information, please contact _____ at the number provided above.

Sincerely,

Signature: _____

Name: _____

Title: _____

ATTACHMENT 2

Master Taxonomic List
for
Northstar Highlands Development Project Monitoring and Reporting Program

Master Taxa List

Stream	Martis Cr	Martis Cr,	Martis Cr,	Martis Cr, East Fork
Site	above cont	below golf	above Sille	forest margin
Sitetag	635MAR0(	635MAR0(	635MAR0(	635MAR005
Date	7/26/2004	7/28/2004	7/27/2004	7/28/2004
Year	2004	2004	2004	2004
Replicate #	TR	TR	TR	TR
# field kicks	8	8	8	8
# sample splits	4	5	4	5
Split Fraction	0.0625	0.03125	0.0625	0.03125

Phylum or Class	Class or Order	Family-Subfamily	Genus (and species)	TV	FFG				
INSECTA	[illegible]	Baetidae	Acentrella sp.	4	cg				
INSECTA	[illegible]	Ephemerellidae	Attenella delantala	2	cg			2	
INSECTA	[illegible]	Baetidae	Baetis sp.	5	cg	53	1	41	15
INSECTA	[illegible]	Ephemerellidae	Caudatella hystrix	1	cg				
INSECTA	[illegible]	Heptagenidae	Cinygma sp.	2	sc				
INSECTA	[illegible]	Heptagenidae	Cinygmula sp.	4	sc	4		56	4
INSECTA	[illegible]	Baetidae	Diphetor hageni	5	cg	17			5
INSECTA	[illegible]	Ephemerellidae	Drunella doddsi	0	cg			22	
INSECTA	[illegible]	Ephemerellidae	Drunella flavilinea-coloradensis	0	cg			8	
INSECTA	[illegible]	Ephemerellidae	Drunella spinifera	0	p		1	29	
INSECTA	[illegible]	Heptagenidae	Epeorus sp.	0	sc	1		1	
INSECTA	Ephemeroptera	Heptagenidae	Ironodes sp.	3	sc				5
INSECTA	Ephemeroptera	Heptagenidae	Leucrocuta-Nixe sp.	3	sc				
INSECTA	Ephemeroptera	Leptophlebiidae	Paraleptophlebia bicornuta	4	cg				
INSECTA	Ephemeroptera	Leptophlebiidae	Paraleptophlebia sp.	4	cg	4	4	3	22
INSECTA	Ephemeroptera	Heptagenidae	Rhithrogena sp.	0	sc			14	
INSECTA	Ephemeroptera	Ephemerellidae	Serratella sp.	2	cg	7	13	7	
INSECTA	Ephemeroptera	Ephemerellidae	Timpanoga hecuba	7	cg				
INSECTA	Ephemeroptera	Leptohyphidae	Tricorythodes sp.	4	cg				
INSECTA	Megaloptera	Sialidae	Sialis sp.	4	p				1
INSECTA	Plecoptera	Perlidae	Calineuria californica	2	p				
INSECTA	Plecoptera	Perlodidae	Cultus sp.	2	p			6	1
INSECTA	Plecoptera	Leuctridae	Despaxia augusta	0	sh			1	
INSECTA	Plecoptera	Perlidae	Doroneuria baumanni	1	p			8	2
INSECTA	Plecoptera	Perlodidae	Frisonia picticeps	2	p			2	
INSECTA	Plecoptera	Chloroperlidae	Hapiloperla/Plumiperla sp.	1	p	7		5	
INSECTA	Plecoptera	Perlodidae	Isoperla sp.	2	p			3	
INSECTA	Plecoptera	Nemouridae	Malenka sp.	2	sh		5	3	9
INSECTA	Plecoptera	Leuctridae	Moselia infuscata	0	sh			2	
INSECTA	Plecoptera	Pteronarcyidae	Pteronarcella sp.	0	om				
INSECTA	Plecoptera	Pteronarcyidae	Pteronarcys sp.	0	om			1	1
INSECTA	Plecoptera	Perlodidae	Skwala sp.	2	p	6	1		3
INSECTA	Plecoptera	Chloroperlidae	Suwallia sp.	1	p	1		2	
INSECTA	Plecoptera	Chloroperlidae	Swelisa sp.	1	p	2		12	4
INSECTA	Plecoptera	Capniidae	undetermined Capniidae sp.	1	sh				
INSECTA	Plecoptera	Peltoperlidae	Yoraperla sp.	1	sh	1		25	3
INSECTA	Plecoptera	Nemouridae	Zapada sp.	2	sh	53	64	56	62
INSECTA	Trichoptera	Glossosomatidae	Agapetus sp.	0	sc	1			1
INSECTA	Trichoptera	Apatanidae	Apatania sp.	1	sc			39	
INSECTA	Trichoptera	Brachycentridae	Brachycentrus americanus	1	om			1	
INSECTA	Trichoptera	Hydropsychidae	Ceratopsyche sp.	4	cf	10	8	4	47
INSECTA	Trichoptera	Limnephilidae	Desmona sp.	1	sh		1		
INSECTA	Trichoptera	Limnephilidae	Ecclisomyia sp.	2	om			2	
INSECTA	Trichoptera	Glossosomatidae	Glossosoma sp.	1	sc	1		16	
INSECTA	Trichoptera	Hydroptilidae	Hydroptila sp.	6	ph				2
INSECTA	Trichoptera	Lepidostomatidae	Lepidostoma sp.	1	sh				3
INSECTA	Trichoptera	Brachycentridae	Micrasema sp.	1	mh			1	20
INSECTA	Trichoptera	Uenoidae	Neophylax sp.	3	g			1	
INSECTA	Trichoptera	Hydroptilidae	Ochrotrichia sp.	4	ph				2
INSECTA	Trichoptera	Limnephilidae	Psychoglypha sp.	2	sh				
INSECTA	Trichoptera	Rhyacophilidae	Rhyacophila acropedes/brunnea grp.	1	p			1	1
INSECTA	Trichoptera	Rhyacophilidae	Rhyacophila betteni grp.	1	p	1		4	1
INSECTA	Trichoptera	Rhyacophilidae	Rhyacophila sibirica grp.	0	p				

Phylum or Class	Class or Order	Family-Subfamily	Genus (and species)	TV	FFG	Split Fraction	0.0625	0.03125	0.0625	0.03125
INSECTA	Trichoptera	Rhyacophilidae	Rhyacophila vofixa grp.	0	p			3		
INSECTA	Trichoptera	Philopotamidae	Wormaldia sp.	3	cf					1
INSECTA	Coleoptera	Dytiscidae	Agabus sp.	8	p			1		
INSECTA	Coleoptera	Haliplidae	Brychius cf. homii	5	mh					
INSECTA	Coleoptera	Elmidae	Cleptelmis addenda	4	cg			86		41
INSECTA	Coleoptera	Psephenidae	Eubrianax edwardsi	4	sc					25
INSECTA	Coleoptera	Elmidae	Heterlimnius corpulentus	4	cg				29	
INSECTA	Coleoptera	Hydraenidae	Hydraena sp.	5	p			2		
INSECTA	Coleoptera	Elmidae	Lara avara	4	sh				2	1
INSECTA	Coleoptera	Elmidae	Narpus concolor	4	cg				2	
INSECTA	Coleoptera	Hydraenidae	Ochthebius sp.	5	p			1		
INSECTA	Coleoptera	Elmidae	Optioservus quadrimaculatus	4	sc		184	44		8
INSECTA	Coleoptera	Elmidae	Zaitzevia parvula	4	sc		35	26		18
INSECTA	Diptera	Tipulidae	Antocha monticola	3	cg		3		1	22
INSECTA	Diptera	Ceratopogonidae	Bezzia-Palpomyia sp.	6	p			14		1
INSECTA	Diptera	Ceratopogonidae	Ceratopogon sp.	6	p					
INSECTA	Diptera	Empididae	Chelifera sp.	6	p					
INSECTA	Diptera	Tipulidae	Cryptolabis sp.	3	sh					
INSECTA	Diptera	Tipulidae	Dicranota sp.	3	p		2	5		3
INSECTA	Diptera	Pelecorynchidae	Glutops sp.	3	p				8	
INSECTA	Diptera	Tipulidae	Hexatoma sp.	2	p				1	
INSECTA	Diptera	Psychodidae	Pericoma sp.	4	cg		12	2	9	
INSECTA	Diptera	Ptychopteridae	Ptychoptera sp.	7	cg					
INSECTA	Diptera	Simuliidae	Simulium sp.	6	cf		12	9	4	46
INSECTA	Diptera	Tipulidae	Tipula sp.	4	om			1		
INSECTA	Diptera	Muscidae	undetermined Muscidae	6	p					
TURBELLARIA	Tricladida	Planariidae	Dugesia tigrina	4	p		1	9	23	4
OLIGOCHAETA	undetermined	undetermined	undetermined Oligochaeta spp.	5	cg		9	347	15	13
GASTROPODA	Pulmonata	Physidae	Physa sp.	8	sc			6		
GASTROPODA	Pulmonata	Planorbidae	Gyraulus sp.	8	sc					1
CRUSTACEA-Malacostr	Amphipoda	Hyalellidae	Hyalella azteca	8	cg					
CRUSTACEA-Malacostr	Decapoda	Astacidae	Pacifastacus leniusculus	6	om		1	1		
CRUSTACEA	Ostracoda	undetermined	undetermined Ostracoda spp.	8	cg				12	
BIVALVIA	Pelecypoda	Sphaeriidae	Pisidium sp.	8	cf		4	3	10	29
ANNELIDA-Hirudinea	Rhyncobdellida	Glossiphoniidae	Helobdella stagnalis	6	p			11		
INSECTA	Diptera	Chironomidae-Chironominae	Apedilum sp.	6	cg					
INSECTA	Diptera	Chironomidae-Tanypodinae	Apsectrotanypus sp.	7	p			2		
INSECTA	Diptera	Chironomidae-Orthocladiinae	Brillia sp.	5	sh			1	1	
INSECTA	Diptera	Chironomidae-Orthocladiinae	Chaetocladius dentiforceps grp.	6	cg			1		
INSECTA	Diptera	Chironomidae-Chironominae-Tanytar	Cladotanytarsus vanderwulpi grp.	7	cg		1			
INSECTA	Diptera	Chironomidae-Orthocladiinae	Corynoneura sp.	7	cg		1	3	4	1
INSECTA	Diptera	Chironomidae-Orthocladiinae	Cricotopus (Nostococladius) sp.	7	cg		25		2	84
INSECTA	Diptera	Chironomidae-Orthocladiinae	Cricotopus (Orthocladius) sp.	7	cg		9	11	9	116
INSECTA	Diptera	Chironomidae-Diamesinae-Diamesini	Diamesa sp.	6	cg					1
INSECTA	Diptera	Chironomidae-Orthocladiinae	Euklefferiella brehmi grp.	8	om		16		4	43
INSECTA	Diptera	Chironomidae-Orthocladiinae	Euklefferiella claripennis grp.	8	om		2	1	2	11
INSECTA	Diptera	Chironomidae-Orthocladiinae	Euklefferiella devonica grp.	8	om			1		18
INSECTA	Diptera	Chironomidae-Orthocladiinae	Euklefferiella pseudomontana grp.	8	om				4	
INSECTA	Diptera	Chironomidae-Orthocladiinae	Heleniella sp.	6	cg				3	
INSECTA	Diptera	Chironomidae-Orthocladiinae	Heterotrissocladius marcidus grp.	0	cg					
INSECTA	Diptera	Chironomidae-Tanypodinae-Pentane	Larsia sp.	6	p					
INSECTA	Diptera	Chironomidae-Orthocladiinae	Limnophyes sp.	8	cg					
INSECTA	Diptera	Chironomidae-Macropelopiini	Macropelopia sp.	6	p					
INSECTA	Diptera	Chironomidae-Chironominae-Tanytar	Micropsectra sp.	7	cg		23	49	25	148
INSECTA	Diptera	Chironomidae-Chironominae-Chiron	Microtendipes pedellus grp.	6	cf					
INSECTA	Diptera	Chironomidae-Tanypodinae-Pentane	Nilotanypus sp.	6	p					
INSECTA	Diptera	Chironomidae-Prodiamesinae	Odontomesa sp.	6	cf					
INSECTA	Diptera	Chironomidae-Diamesinae-Diamesini	Pagastia sp.	1	cg		10	13	3	11
INSECTA	Diptera	Chironomidae-Orthocladiinae	Parakiefferiella sp.	4	cg		2		1	1
INSECTA	Diptera	Chironomidae-Tanypodinae-Pentane	Peramerina sp.	6	p					
INSECTA	Diptera	Chironomidae-Orthocladiinae	Parametriocnemus sp.	5	cg			6		4

Phylum or Class	Class or Order	Family-Subfamily	Genus (and species)	TV	FFG	Split Fraction	0.0625	0.03125	0.0625	0.03125
INSECTA	Diptera	Chironomidae-Orthocladiinae	Paraphaenocladius sp.	4	cg					
INSECTA	Diptera	Chironomidae-Chironominae-Chiront	Paratendipes sp.	8	cg				16	
INSECTA	Diptera	Chironomidae-Chironominae-Chiront	Polypedilum aviceps	6	om		1			
INSECTA	Diptera	Chironomidae-Chironominae-Chiront	Polypedilum scalaenum	6	om					
INSECTA	Diptera	Chironomidae-Diamesinae-Diamesini	Potthastia gaedii grp.	2	cg					7
INSECTA	Diptera	Chironomidae-Diamesinae-Diamesini	Potthastia longimana grp.	2	cg					
INSECTA	Diptera	Chironomidae-Orthocladiinae	Psectrocladius psilopterus grp.	8	cg		1			
INSECTA	Diptera	Chironomidae-Orthocladiinae	Psectrocladius sordidellus grp.	8	cg					
INSECTA	Diptera	Chironomidae-Chironominae-Psuedo	Pseudochironomus sp.	5	cg		1	1		
INSECTA	Diptera	Chironomidae-Diamesinae-Diamesini	Pseudodiamesa sp.	6	cg					
INSECTA	Diptera	Chironomidae-Orthocladiinae	Rheocricotopus sp.	6	om			3	8	4
INSECTA	Diptera	Chironomidae-Chironominae-Tanytar	Rheotanytarsus sp.	6	cf			5		1
INSECTA	Diptera	Chironomidae-Chironominae-Tanytar	Stempellina sp.	2	cg				1	
INSECTA	Diptera	Chironomidae-Chironominae-Tanytar	Stempellinella sp.	4	cg		4	2	19	
INSECTA	Diptera	Chironomidae-Orthocladiinae	Symposiocladius sp.	6	pa					1
INSECTA	Diptera	Chironomidae-Orthocladiinae	Synorthocladius sp.	2	cg					1
INSECTA	Diptera	Chironomidae-Chironominae-Tanytar	Tanytarsus sp.	6	cf		8	3		
INSECTA	Diptera	Chironomidae-Orthocladiinae	Thienemanniella cf. xena	6	cg			2		
INSECTA	Diptera	Chironomidae-Tanypodinae-Pentene	Thienemannimyia grp.	6	p			5	1	
INSECTA	Diptera	Chironomidae-Tanypodinae	Trissopelopia sp.	6	p					
INSECTA	Diptera	Chironomidae-Orthocladiinae	Tvatenia bavarica grp.	5	cg		21	19	19	37
INSECTA	Diptera	Chironomidae-Chironominae-Tanytar	Virgatanytarsus sp.	6	f					
HYDRACARINA	Arachnoidea		Atractides sp.	8	p		4			6
HYDRACARINA	Arachnoidea		Aturus sp.	5	p			3		
HYDRACARINA	Arachnoidea	Thyadinae	Cyclothyas	5	p				4	
HYDRACARINA	Arachnoidea		Estelloxus sp.	8	p				2	
HYDRACARINA	Arachnoidea		Feltria sp.	5	p					
HYDRACARINA	Arachnoidea		Frontipodopsis	5	p					
HYDRACARINA	Arachnoidea		Hygrobates sp.	8	p					
HYDRACARINA	Arachnoidea		Lebertia sp.	8	p		2	11	6	2
HYDRACARINA	Arachnoidea		Ljania sp.	5	p					
HYDRACARINA	Arachnoidea		Mucronothrus sp.	5	p					
HYDRACARINA	Arachnoidea		Nudomideopsis sp.	5	p					
HYDRACARINA	Arachnoidea		Paramideopsis sp.	5	p				2	
HYDRACARINA	Arachnoidea		Protzia sp.	8	p		3	7	7	3
HYDRACARINA	Arachnoidea		Sperchon sp.	8	p		3	14	2	5
HYDRACARINA	Arachnoidea		Sperchonopsis sp.	8	p				4	
HYDRACARINA	Arachnoidea		Testudacarus sp.	5	p		1	6	2	5
HYDRACARINA	Arachnoidea		Torrenticola sp.	5	p				2	
HYDRACARINA	Arachnoidea		Wandesia sp.	5	p					
			Organisms in IDd subsample							
			Other				432	669	494	427
			Midge				125	128	122	499
			Mite				13	41	31	21
			Total				570	838	647	947
			Richness				46	50	70	58
			%Chiro Taxa				0.33	0.36	0.24	0.29
			EPT richness				16	10	32	22
			Richness intolerant (0-2)				12	8	30	16
			%Tolerant (7-10)				0.165	0.130	0.168	0.504
			Biotic Index				4.44	4.76	3.50	5.48

This current draft protocol for benthic macroinvertabrate sampling procedures are defined by Dr. David B. Herbst, Associate Research Biologist of the University of California, Sierra Nevada Aquatic Research Laboratory, who is under contract to the Lahontan Water Board and California Department of Fish and Game[1]. Sampling at SWAMP sites include both a Targeted Riffle and Multi-Habitat sample method.

Benthic Macroinvertebrate Sampling Procedure

Field crews and laboratory personnel must have proper training and experience at the methods, or be under the direct supervision of person(s) who have proper training and experience. In addition, a Quality Assurance Project Plan developed following USEPA guidance must be prepared and followed.

Select sample locations according to the applicable protocol. Always sample from down-to upstream, and take care not to disturb the stream substrate prior to sample collection.

For each "kick" sample from relatively fast-moving water (i.e. non-pool habitat), place the net in the water so that the mouth of the net is perpendicular to and facing into the flow of the water. Sample an area approximately 30 square centimeters directly upstream of the net (a square area with sides equal to net width). Work from the upstream edge of the sampling plot backward and carefully pick up and rub stones directly in front of the net to remove attached animals. Dig your fingers into the substrate to a depth of about 10 cm and run your fingers through the disturbed material. Let the water run clear of any organisms or organic material before carefully lifting the net. After collecting each sample, remove large rocks or wood debris after washing them within the net using the current. If compositing multiple samples, this sample may remain in the net as subsequent samples are collected, but only in relatively fast-moving water such that organisms cannot escape. Damage and escape of organisms can be avoided by transferring the sample to a bucket periodically as described below.

If sampling in pools, take only a single collection within the tail zone of the pool (i.e. downstream third of pool zone) by sweeping or brushing the sample area into the mouth of the net; this flushing by hand will facilitate collection of the invertebrates. The net may also be used to scoop through sample area after the sweep. More than a single area sampled will usually produce too much sample volume to process and preserve.

Following sample collection, quickly dip the net into the stream to consolidate the material to the bottom of the D-net. Pick out any large rocks, wood, or debris, washing them within the net utilizing the current and making sure to remove any attached insects. Invert the net into a bucket 1/4 to 1/3 full of stream water. Shake out the net to collect all the debris and insects (do not dip in bucket water since insects will adhere). Dip net into the stream again to consolidate remaining contents and flick inverted net into the bucket.

[1] http://www.waterboards.ca.gov/lahontan/QAPPP/QAPP_Index.html Appendix 2. California Department of Fish and Game, December 2003. California Stream Bioassessment Procedure.

Generally a sample will include an excessive amount of organic matter. This can be separated and cleaned by serial rinses it in a series of buckets and/or pans (generally three or four) filled with water. Following rinsing, inspect this material in a shallow white pan, either removing organic matter free of organisms, piece-by-piece, or by removing the organisms and placing them into the sample container. Once sufficient organic matter is removed, elutriate (i.e. pour off lighter material) the remaining sample with a swirling motion into another bucket, or aquarium net. Repeat, adding additional water each time, until all visible organic matter has been poured off, typically about five times. If elutriating into a bucket, use only a small volume of water in each elutriation so the receiving bucket does not overflow. Only rocks and sand should be left in the original bucket. Pour a portion of the remaining rocks and sand into a shallow white pan. Search all the remnant sample for any remaining organisms (most often denser, cased organisms such as caddisflies, midges, snails, and clams) and add to sample if found until the entire sample has been searched.

Strain collected material through a fine mesh aquarium net supported on one bucket (this may also serve as elutriation since some sand usually remains). Gently squeeze (i.e. so as not to damage organisms) excess water from the net-bound sample, and then transfer it into a sample container. Use BioQuip forceps to scrape any remaining debris into vial. Fill container with ethanol to preserve the bugs. Fill to a level such that the sample debris is no more than one-half to two-thirds of the volume (otherwise use a larger volume container, or two containers for the sample). Add a small volume of rose bengal stain, and gently stir with forceps to release air trapped in the sample.

Label each sample container using labeling tape as shown below:

Stream	Sample Type or
Site name	Replicate Number
Date	(# Kicks)

In the "sample type or replicate number" space record the protocol used (i.e. targeted riffle or multi-habitat), the habitat type sampled (i.e. riffle or pool), and/or the replicate number (i.e. #1), as appropriate. If two containers are used, label as above for each but call one 1 of 2 and the other 2 of 2.

<u>Equipment</u>:

- Waders or appropriate water shoes
- D-net (250 or 500 μm mesh, 30-cm wide, tapered, 40 to 60 cm long)
- 2 Buckets
- Aquarium net
- BioQuip forceps
- 2 white exam trays

- 100% ethanol
- Rose Bengal stain
- Field data record sheet

Sample containers are typically Fisher brand polypropylene jars in volumes of 125, 250, or 500 ml, selected depending on the sample protocol used and quantity of organic matter in the sample. These containers sometimes leak alcohol when shaken or not stored upright. If these conditions are likely to occur during transport (i.e. from long hikes or bumpy roads), seal the container lid using electrical tape. This tape can remain until the container is opened for processing and invertebrate identification in the laboratory. Upon arrival at the laboratory, drain and replace the alcohol for samples with a high proportion of organic matter to ensure proper preservation.

Standard Sampling Methods

Targeted Riffle Method (500 µm D-net)

See Figure 1 for a schematic description of this method.

Field sampling: Select four riffle units within the 150 meter reach using a random number table. If fewer riffle series are available, assign additional sample locations by proportion to the size of each riffle. Working from down- to upstream, use a 500 µm D-net to collect two kick samples from each riffle, determining their specific locations using a random number table (i.e. generate two random digits for each sample location; multiply each by ten to get the percent upstream along the riffle unit's length and the percent of the total width from the left bank, respectively). If this location cannot be sampled because it is too deep or it is occupied by a large boulder, select a new pair of random numbers to determine a new location. Composite and process all eight kick samples together. For each sample location, record the dominant substrate size-class, and the presence of wood, algae, or aquatic vegetation within the sample quadrat on an invertebrate field sampling record sheet. As each sample is collected, it should be placed into the composite bucket before taking the next sample. This method is flexible with respect to number of riffles sampled (2 each from the 4 longest riffles, and up to 1 each from 8 randomly-selected riffles), and the flow – fast-water habitat may also be included where riffles are not clearly defined or are rare.

Laboratory processing: Use a rotating drum splitter to obtain a sub-sample of about 500 estimated organisms after serial splits (1 split = ½ fraction; 2 = ¼, 3 = 1/8, 4 = 1/16, 5 = 1/32, and 6 = 1/64. In practice the split taken for a target riffle composite is often in the range of 4 to 6. All organisms in the split are identified and counted, with at least 550 needed. If below this number, then another split fraction is processed, identified and counted. Taxonomy is generally performed to the lowest practical taxon, based on the availability of taxonomic keys. Midges and mites represent significant diversity and are identified to the genus level, and species-group for midges in some cases. Follow the template (Martis 2004 Invert data – template) for taxonomic resolution to ensure consistency with previous studies. A grid-tray sub-sampling procedure may also be acceptable, with prior approval from water board staff.

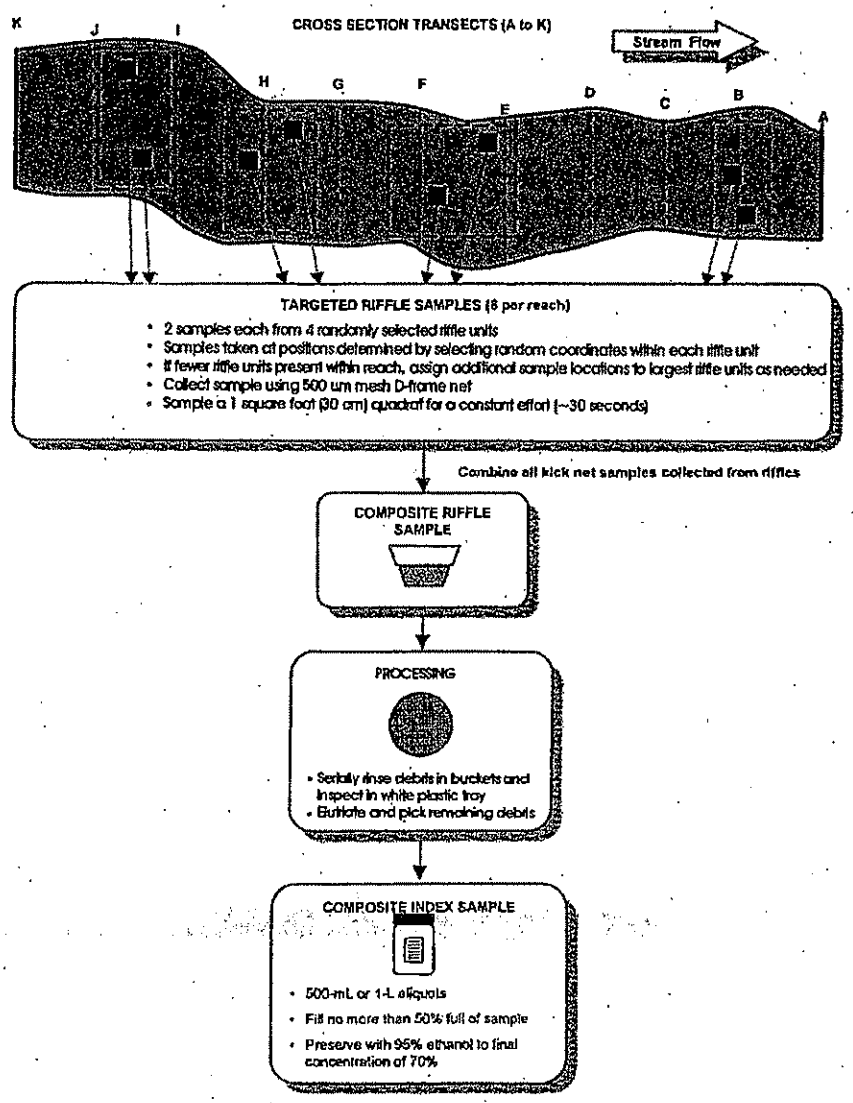
Data analysis and submittal: Submit results in electronic format, using the template provided (Martis 2004 Invert data – template).

De-contamination Procedures

Where applicable, follow all procedures recommended by the California Department of Fish and Game to prevent the spread of New Zealand Mud Snails. See:

http://www.dfg.ca.gov/fishing/html/administration/mudsnail/mudsnail_0.htm

Figure 1: Schematic diagram of the Targeted Riffle Protocol.



APPENDIX F

Bioassessment of Aquatic Ecosystems

BIOASSESSMENT OF AQUATIC ECOSYSTEMS

This appendix provides an overview of the bioassessment of aquatic ecosystems, in particular those of the Sierra Nevada, and in Attachment F-1, provides the protocol and field data forms for the California Stream Bioassessment Procedure.

AQUATIC ECOSYSTEMS AND BIOASSESSMENT

Aquatic invertebrates serve as valuable indicators of stream habitat integrity. Each aquatic invertebrate species has a different tolerance level to stress from habitat degradation. Some species have narrow and specific habitat requirements and are, therefore, restricted to certain habitat conditions, while others can survive in a wide variety of habitat conditions (Erman 1996). Therefore, it is possible to use different invertebrate species and assemblages as indicators of water quality and habitat conditions (Herbst 2001).

Aquatic invertebrates have been shown to be sensitive and informative indicators of stream ecosystem integrity and of water quality and have been used for many decades to monitor and assess impacts on aquatic and terrestrial habitats (i.e., bioassessment). The principal behind bioassessment is to determine the biological integrity of an affected site by comparing its biotic community to that of a known undegraded or reference site. Aquatic invertebrates are becoming a critical component of bioassessment because they are more diverse, ubiquitous, and abundant than fish and because these organisms are in contact with both the water and bottom substrate in streams. Aquatic invertebrate studies have contributed to an understanding and assessment of stream ecosystem integrity as related to land use activities. A survey of aquatic invertebrates in the study area watershed has been conducted; however, these data are not currently available for analysis. Once available, these data could be analyzed using biological metrics that are commonly used in bioassessment procedures. Biological metrics used in bioassessment procedures include taxa richness measures, species composition measures, tolerance/intolerance measures, and functional feeding groups (Table F-1).

Table F-1
Biological Metric Used in Bioassessment Procedures

Biological Metrics	Description	Response to Impairment
Richness Measures		
Taxa Richness	Total number of individual taxa	decrease
EPT Taxa	Number of taxa in the Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly) insect orders	decrease
Ephemeroptera Taxa	Number of mayfly taxa (genus or species)	decrease
Plecoptera Taxa	Number of stonefly taxa (genus or species)	decrease
Trichoptera Taxa	Number of caddisfly taxa (genus or species)	decrease
Composition Measures		
EPT Index	Percent composition of mayfly, stonefly and caddisfly larvae	decrease
Sensitive EPT Index	Percent composition of mayfly, stonefly and caddisfly larvae with Tolerance Values of 0 through 3	decrease
Shannon Diversity Index	General measure of sample diversity that incorporates richness and evenness (Shannon and Weaver 1963)	decrease
Tolerance/Intolerance Measures		
Tolerance Value	Value between 0 and 10 weighted for abundance of individuals designated as pollution tolerant (higher values) and intolerant (lower values)	increase

Table F-1 Biological Metric Used in Bioassessment Procedures		
Percent Intolerant Organisms	Percent of organisms in sample that are highly intolerant to impairment as indicated by a tolerance value of 0, 1 or 2	decrease
Percent Tolerant Organisms	Percent of organisms in sample that are highly tolerant to impairment as indicated by a tolerance value of 8, 9 or 10	increase
Percent Hydrosychidae	Percent of organisms in the caddisfly family Hydropsychidae	increase
Percent Baetidae	Percent of organisms in the mayfly family Baetidae	increase
Percent Dominant Taxa	Percent composition of the single most abundant taxon	increase
Functional Feeding Groups		
Percent Collectors	Percent of macrobenthos that collect or gather fine particulate matter	increase
Percent Filterers	Percent of macrobenthos that filter fine particulate matter	increase
Percent Scrapers	Percent of macrobenthos that graze upon periphyton	variable
Percent Predators	Percent of macrobenthos that feed on other organisms	variable
Percent Shredders	Percent of macrobenthos that shreds coarse particulate matter	decrease
Source: California Stream Bioassessment Procedure (Harrington 2002, Aquatic Bioassessment Laboratory, in prep.)		

AQUATIC BIOASSESSMENT IN THE SIERRA NEVADA

There are several practitioners currently using different bioassessment protocols in the Sierra Nevada. In 1995, DFG developed and distributed a standardized protocol for invertebrate bioassessment known as the CSBP (as discussed above). The CSBP is a regional adaptation of the U.S. Environmental Protection Agency (EPA) Rapid Bioassessment Protocols (Barbour et al. 1999) and is recognized by the EPA as California's standardized bioassessment procedure (Davis et al. 1996). The CSBP is the most commonly used bioassessment method throughout California (LTIMP 2002).

Researchers at the University of California's Sierra Nevada Aquatic Research Lab (UC-SNARL) have developed a different method that is more intensive than CSBP. UC-SNARL has been working under contract with Lahontan RWQCB to develop reference conditions for streams throughout the eastern Sierra Nevada and Tahoe Basin (LTIMP 2002, Herbst 2001).

The Forest Service is using a method that was developed with scientists at Utah State University for use by the Forest Service. The method is currently being used throughout the western United States, including the Sierra Nevada (LTIMP 2002).

There are additional practitioners in California who are using other bioassessment methods/procedures for special studies or particular needs. The use of several different bioassessment methods in the region may prove problematic when attempting to compare data from different reference and restored sites throughout the Sierra Nevada.

In an attempt to address the comparability issue, the Methods and Data Comparability Board (MDCB) of the National Water Quality Monitoring Council has been an advocate for the promotion of a performance based methods system (PBMS) as one of its top priorities in providing a mechanism that will allow data comparability among various monitoring programs and data bases including bioassessment (Strong 1998). MDCB originally defined PBMS as a process that permits the use of any appropriate method that demonstrates the ability to meet established criteria and complies with specified data quality needs. In the 6 October 1997 Federal Register, the Environmental Protection Agency (EPA 1997) defines PBMS as "a set of processes wherein the data quality

needs, mandates or limitations of a program or project are specified, and serve as criteria for selecting appropriate methods to meet those needs in a cost effective manner."

Recommendations have been made through the Lake Tahoe Interagency Monitoring Program (LTIMP) that all bioassessment practitioners implement the EPA's PBMS so that the bioassessment data collected by all practitioners can be comparable to the greatest extent possible (LTIMP 2002). Aquatic bioassessment at the resort would be conducted using the CSBP multi-habitat and targeted riffle protocols to ensure consistency (for comparison purposes) with existing data and future efforts (Herbst 2001, Harrington pers. com., 2005). Data collected during the aquatic bioassessment surveys would be used with an index of biological integrity to measure the condition of the aquatic resources on the resort over time.

ATTACHMENT F-1

California Stream Bioassessment Procedure

CALIFORNIA STREAM BIOASSESSMENT PROCEDURE

(Protocol Brief for Biological and Physical/Habitat Assessment in Wadeable Streams)

The California Stream Bioassessment Procedure (CSBP) is a standardized protocol for assessing biological and physical/habitat conditions of wadeable streams in California. The CSBP is a regional adaptation of the national Rapid Bioassessment Protocols outlined by the U.S. Environmental Protection Agency in "Rapid Bioassessment Protocols for use in Streams and Rivers" (EPA 841-D-97-002). The CSBP is a cost-effective tool which utilizes measures of the stream=s benthic macroinvertebrate (BMI) community and its physical/habitat characteristics to determine the stream=s biological and physical integrity. BMIs can have a diverse community structure with individual species residing within the stream for a period of months to several years. They are also sensitive, in varying degrees, to temperature, dissolved oxygen, sedimentation, scouring, nutrient enrichment and chemical and organic pollution. Biological and physical assessment measures integrate the effects of water quality over time, are sensitive to multiple aspects of water and habitat quality and can provide the public with a familiar expression of ecological health.

The purpose of this Protocol Brief is to introduce the techniques of bioassessment to aquatic resource professionals and, hopefully, to encourage them to incorporate measures of biological and physical/habitat into their water quality programs. The use of this procedure will ensure that the data they generate can be used by state regulatory agencies and will be compatible with a statewide bioassessment effort. The Protocol Brief is only a summary and does not contain all the information that may be required to implement a bioassessment program. Additional information and updates on bioassessment can be obtained by visiting the **California Aquatic Bioassessment Web Site at www.dfg.ca.gov/cabw/cabwhome.html**.

CALIFORNIA DEPARTMENT OF FISH AND GAME SCIENTIFIC COLLECTING PERMIT

Anyone who collects fish, amphibians, or invertebrates from the waters of the state must have in their possession a DFG Scientific Collecting Permit. The permit can be obtained from the DFG License and Revenue Branch in Sacramento (916 227-2225). Those people conducting bioassessment in California should specify on the permit application, that they will take freshwater invertebrates (authorization 5) and incidental fish (authorization 6) and amphibians (authorization 8). It is also advisable to contact the local Game Warden and District Fisheries Biologist at the closest Regional Office prior to collecting. Starting in summer 1999, everyone indicating that they will be conducting bioassessment in California will receive the most recent version of the CSBP Protocol Brief and an Access[7] database program to store, process and return a copy of the collected data.

FIELD PROCEDURES FOR COLLECTING BMI SAMPLES AND ASSESSING PHYSICAL/ HABITAT QUALITY

The CSBP can be used to detect aquatic impacts from point and non-point sources of pollution and for assessing ambient biological condition. The sampling unit is an individual riffle or riffles within a reach of stream depending on the type of sampling design used. Riffles are used for collecting biological samples because they are the richest habitat for BMIs in wadeable streams. **The BMI sampling procedures described in this Protocol Brief are intended for sampling wadeable, running water streams with available riffle habitats.** There are approved modifications of this procedure for narrow (< 1m) streams, wadeable streams with sand or mud bottoms and channelized streams. There are also procedures for lentic or still water environments. Contact DFG or visit the California Aquatic Bioassessment Web Site for more information.

Point Source Sampling Design

There will be discernable perturbations, impacting structures or discharges into the stream with point sources of pollution. The sampling units will be individual riffles within the affected section of stream and an upstream unaffected section. At least one riffle in the unaffected section should be sampled and one or more riffles in the affected section depending on the amount of detail that is required on downstream recovery. The riffles used for sampling BMIs should have relatively similar gradient, substrate and physical/habitat characteristics and quality. **One sample will be collected from 3 randomly chosen transects in each riffle**.

Use the following step-by-step procedures for collecting BMIs using the point source sampling design:

FIELD EQUIPMENT AND SUPPLIES

- Measuring tape
- D-shaped kick net (0.5mm mesh)
- Standard Size 35 sieve (0.5mm mesh)
- Wide-mouth 500 ml plastic jars
- White sorting pan and forceps
- 95% ethanol
- California Bioassessment Worksheet (CBW)
- Physical/ Habitat Quality form
- Chain of Custody form
- Random number table
- pH, temperature, DO and conductivity meter
- Stadia rod and hand level/ clinometer
- Densiometer/ Solar Pathfinder
- GPS unit or watershed topographic map

Step 1. Place the measuring tape along the bank of the entire riffle while being careful not to walk in the stream. Each meter or 3 foot mark represents a possible transect location. Select 3 transects from all possible meter marks along the measuring tape using a random number table. Walk to the lowest transect before proceeding to Step 2.

Step 2. Inspect the transect before collecting BMIs by imagining a line going from one bank to the other, perpendicular to the flow. Choose 3 locations along that line where you will place your net to collect BMIs. If the substrate is fairly similar and there is no structure along the transect, the 3 locations will be on the side margins and the center of the stream. If there is substrate and structure complexity along the transect, then as much as possible, select the 3 collections to reflect it.

Step 3. After mentally locating the 3 areas, collect BMIs by placing the D-shaped kick-net on the substrate and disturbing a 1x2 foot portion of substrate upstream of the kick-net to approximately 4-6 inches in depth. Pick-up and scrub large rocks by hand under water in front of the net. Maintain a consistent sampling effort (approximately 1-3 minutes) at each site. Combine the 3 collections within the kick-net to make one Acomposite@ sample.

Step 4. Place the contents of the kick-net in a standard size 35 sieve (0.5 mm mesh) or white enameled tray. Remove the larger twigs, leaves and rocks by hand after carefully inspecting for clinging organisms. If the pan is used, place the material through the sieve to remove the water before placing the material in the jar. Place the sampled material and label (see box) in a jar and completely fill with 95% ethanol. Never fill a jar more than 2/3 full with sampled material and gently agitate jars that contain primarily mud or sand.

Step 5. Proceeding upstream, repeat Steps 2 through 4 for the next two randomly chosen transects within the riffle.

Non-point Source Sampling Design

There will be no obvious perturbations or discharges into the stream with non-point sources of pollution. This sampling design is appropriate for assessing an entire stream or large section of stream. The sampling units will be riffles within a reach of stream. The stream reach must contain at least 5 riffles within the same stream order and relative gradient. **One sample will be collected from the upstream third of 3 randomly chosen riffles.**

Bioassessment Sample Label

Riffle/ Reach Number:_____
Transect Number: _____
Stream Name: _____
Date/ Time: _____
Sample by: _____

Use the following step-by-step procedures for collecting BMIs using the non-point source sampling design:

Step 1. Randomly choose 3 of the 5 riffles within the stream reach using the random number table.

Step 2. Starting with the downstream riffle, place the measuring tape along the bank of the entire riffle while being careful not to walk in the stream. Select 1 transect from all possible meter marks along the top third of the riffle using a random number table.

Step 3. (See Point Source Sampling Design Step 2)

Step 4. (See Point Source Sampling Design Step 3)

Step 5. (See Point Source Sampling Design Step 4)

Step 6. Proceeding upstream, Repeat Steps 2 through 5 for the next two riffles within the stream reach.

Sampling Design for Assessing Ambient Biological Conditions

Assessment of ambient biological condition utilizes both the point and non-point source sampling designs to cover an entire watershed or larger regional area. Ambient bioassessment programs are used to evaluate the biological and physical integrity of targeted inland surface waters. Stream reaches should be established in the upper, middle and lower portions of each watershed and above and below areas of particular interest. Quite often bioassessment is incorporated into an existing chemical or toxicological sampling design. In most cases, the water quality information is being collected at a particular point on the stream. Although there will be the tendency to use the point source design, try to convert to a non-point reach design for biological sampling.

Measuring Physical/Habitat Quality

The physical/habitat scoring criteria is an EPA nationally standardized method. It is used to measure the physical integrity of a stream and can be a stand-alone evaluation or used in conjunction with a bioassessment sampling event. DFG recommends that this procedure be conducted on every reach of stream sampled as part of a bioassessment program. Fill out the Physical/Habitat Quality Form for the entire reach where the BMI samples were collected as part of a non-point source sampling design. Some of the parameters do not apply to a single riffle, so this procedure is usually not performed as part of the point source sampling design. **This procedure is an effective measure of a stream=s physical/habitat quality, but requires field training prior to using it and implementation of quality assurance measures throughout the field season.** A detailed description of the scoring criteria is available through the California Aquatic Bioassessment Web Site.

Measuring Chemical and Physical/Habitat Characteristics

Measurements of the chemical and physical/habitat characteristics are used to describe the riffle environment and help the water resource specialist interpret the BMI data. The information can be used to classify stream reaches and to explain anomalies that might occur in the data. **They are not necessarily a good substitute for a quantitative fisheries habitat survey**.

Use the following step-by-step procedures to measure chemical and physical/habitat characteristics:
Step 1. Water temperature, specific conductance, pH and dissolved oxygen should be measured at the sampling site using approved standardized procedures and instruments.

Step 2. Record the riffle length determine for the procedure to choose the transect locations. Estimate the average riffle width by averaging several measurements along its length. Measure the riffle depth by placing the stadia rod at several places within the riffle and averaging the measurements.

Step 3. Estimate or measure the entire length of the reach where the three riffles are chosen as part of the non-point source sampling design.

Step 4. Measure the riffle velocity using a flow meter placed in front of the three locations along the transect(s) where the BMI samples were collected. Average the readings.

Step 5. Estimate the percent of the riffle surface that is covered by shade from streamside vegetation (canopy cover) using a densiometer at several places along the riffle and averaging the readings.

Step 6. Determine substrate complexity and embeddedness by applying Parameters 1 and 2, respectively from the Physical/Habitat Quality Form to the riffle where the BMI sample was collected. Use the entire riffle to assess these parameters and make note if the area along the transect(s) is considerably different from the rest of the riffle.

Step 7. Visually estimate the percent of riffle in each of the following substrate categories: fines (<0.1"), gravel (0.1-2"), cobble (2-10"), boulder (>10") and bedrock (solid). Use the entire riffle to assess this parameter and make note if the area along the transect(s) is considerable different from the rest of the riffle.

Step 8. Estimate substrate consolidation by kicking the substrate with the heel of your wader boots to note whether it is loosely, moderately or tightly cemented. The estimate should also take into consideration the hands-on experience obtained from collecting the BMI sample.

Step 9. Measure the gradient or slope of the riffle using a stadia rod and hand level or a clinometer.

Using the California Bioassessment Worksheet

A California Bioassessment Worksheet (CBW) should be filled out for each individual riffle when following the Point Source Sampling Design and for the entire reach when using the Non-point Sampling Design. Use the following step-by-step procedures for filling out the CBW:

Step 1. Enter the watershed and stream name, date and time of sample collection, name of the company or agency collecting the samples, sample identification number(s), and a short site description on the CBW.

Step 2. Enter the names of each crew member in the Crew Member Box.

Step 3. Determine the longitude and latitude coordinates and elevation from a GPS unit or watershed topographic map. Determine which California ecoregion or sub-ecoregion the site is located in by using the U.S. Forest Service map obtained by visiting the California Aquatic Bioassessment Web Site. Record this information and any other comments on the sampling site in the Site Location Box.

Step 4. Record the water temperature, specific conductance, pH and dissolved oxygen measurements in the Chemical Characteristics Box.

Step 5. Record the physical/habitat characteristics in the Riffle/Reach Characteristics Box. For the Point Source Sampling Design, record the riffle length, the 3 transect locations along the riffle and the physical/habitat characteristics information (starting with Ave. Riffle Width) on the lines below the Ariffle 1" column. For the Non-point Source Sampling Design, record the reach length, the total score from the Physical/Habitat Quality Form and all physical/habitat characteristics information on the lines below the Ariffle 1" through Ariffle 3" columns.

Step 6. Record the name and address of the Bioassessment Laboratory that received the samples along with the laboratory sample numbers if they are different than the field sample identification numbers.

Using the Chain of Custody (COC) Form

The Chain of Custody (COC) form is a necessary part of collecting BMI samples. It is an official document for tracking the samples from the field to the laboratory and then to their final storage area. The COC will also provide important information if samples are lost or misplaced. Use the following step-by-step procedures for using the COC:

Step 1. At the end of the field day, record the following information on the COC for each group of BMI samples: program name; watershed name; field ID numbers; sampling dates; and name, address, telephone number and signature of one of the crew members collecting the sample.

Step 2. Field samples and COCs must remain in a locked sample depository until a decision has been made to send them to a bioassessment laboratory for processing.

Step 3. When transporting to a bioassessment laboratory, each group of samples must be accompanied by a COC. Upon delivery, a Bioassessment Laboratory Number will be assigned to each sample. Record this number on the COC and each individual CBW along with the name and address of the bioassessment laboratory. When all samples listed on the COC are accounted for, then the individual delivering the samples will sign the "Released By" portion and the laboratory personnel will sign the "Received By" portion of the COC. The original COC will remain at the laboratory and a copy will be retained by the project supervisor.

PROFESSIONAL (LEVEL 3) LABORATORY PROCEDURES

The CSBP has three levels of BMI identification. Level 3 is the professional level equivalent and requires identification of BMIs to a standard level of taxonomy, usually to genus and/or species level. **All professional Bioassessment Laboratories should belong to the California Bioassessment Laboratories Network (CAMLnet).** This organization was conceived to provide technical assistance to laboratories and ensure that laboratory efforts are consistent throughout California. Contact DFG or visit the California Aquatic Bioassessment Web Site for information on CAMLnet.

LABORATORY EQUIPMENT

- Dissecting microscopes
- Standard Size 35 sieve (0.5 mm)
- Gridded picking tray
- Wide-mouth glass jars
- Glass petri dishes
- Vials
- Taxonomic Keys
- 70% EtOH/ 5% glycerol
- Fine dissection forceps
- Standardized taxonomic list
- Waterproof paper/ pencils
- Laboratory benchsheets
- Random number generator
- Chain of Custody form

Subsampling

Step 1. Retrieve the sample from the sample depository and cross-check the sample number with the bioassessment laboratory number on the COC.

Step 2. Empty the contents of the sample jar into the # 35 sieve (0.5 mm mesh) and thoroughly rinse with water.

Step 3. Once the sample is rinsed, clean and remove debris larger than 2 inch. Remove and discard green leaves, twigs and rocks. Do not remove filamentous algae and skeletonized leaves.

Step 4. After cleaning, place the material into a plastic tray marked with equally sized, numbered grids (approximately 2x2 inches). Do not allow any excess water into the tray. Spread the moist, cleaned debris on the bottom of the tray using as many grids necessary to obtain an approximate thickness of 2 inch. Make an effort to distribute the material as evenly as possible.

Step 5. Remove and count macroinvertebrates from randomly chosen grids until 300 BMIs are removed. Place the BMIs in a clean petri dish containing 70% ethanol/5% glycerin. Completely count the remaining organisms in the last grid but do not include them with the 300 used for identification. The final count should be recorded on the benchsheet for eventual abundance calculations.

Step 6. The debris from processed grids should be put in a clean Aremnant@ jar and the remaining contents of the tray should be placed back into the original sample jar. Both jars should be filled with fresh 70% ethanol, labeled (bioassessment laboratory number and either Aoriginal@ or Aremnant@) and returned to the sample depository.

Identification of BMIs

Step 7. Identify the 300 BMIs from each sample to the standardized level recommended by CAMLnet using appropriate taxonomic keys.

Step 8. Place identified BMIs in individual glass vials for each taxon. Each vial should contain a label with taxonomic name, bioassessment laboratory number, stream, county, collection date and collector's name. This voucher collection should be labeled and returned to the Sample Depository.

Step 9. Record taxonomic information on a Macroinvertebrate Laboratory Bench Sheet. The bench sheet should include the following information: watershed or project name; sampling date; sample ID number; bioassessment laboratory number; date of subsampling; name of subsampler; remnant jar number; taxonomy completion date; name of taxonomist; taxonomic list of organism and enumeration; total number of organisms; total number of taxa; list of unknowns, problem groups and comments.

Step 10. Maintain a reference collection of representative specimens of all accurately identified BMI taxa.

QUALITY ASSURANCE (QA) PROCEDURES FOR THE FIELD AND LABORATORY

QA for Collecting BMIs

The CSBP is designed to produce consistent, random samples of BMIs. It is important to prevent bias in riffle choice and transect placement. The following procedures will help field crews collect unbiased and consistent BMI samples:

1. In using the CSBP, most sampling reaches should contain riffles that are at least 10 meters long, one meter wide and have a homogenous gravel/cobble substrate with swift water velocity. **There are approved modifications of the CSBP when these conditions do not exist. Contact DFG or visit the California Aquatic Bioassessment Web Site for methods to sample narrow streams, wadeable streams with muddy bottoms and channelized streams.**

2. A DFG biologists or project supervisor should train field crews in the use of the BMI sampling procedures described in the CSBP. Field personnel should review the CSBPs before each field season.

3. During the training, crew members should practice collecting BMI samples as described in the CSBP. The 2 ft^2 area upstream of the sampling device should be delineated using the measuring tape or a metal grid and the collection effort should be timed. Practice repeatedly until each crew member has demonstrated sampling consistency. Throughout the sampling season, assure that effort and sampling area remain consistent by timing sampling effort and measuring sampled area for approximately 20% of the sampling events. The results should be discussed immediately and need not be reported.

QA for Measuring Physical/Habitat Quality

Physical/habitat parameters are assessed using a ranking system ranging from optimal to poor condition. This rapid ranking system relies on visual evaluation and is inherently subjective. The following procedures will help to standardize individual observations to reduce differences in scores:

1. A DFG biologist or a project supervisor should train field crews in the use of the EPA physical/habitat assessment procedures. Contact DFG or visit the California Aquatic Bioassessment Web Site for a detailed description of the procedures. Field personnel should review these procedures before each field season.

2. At the beginning of each field season, all crew members should conduct a physical/habitat assessment of two practice stream reaches. Assess the first stream reach as a team and discuss in detail each of the 10 physical/habitat parameters described in the EPA procedure. Assess the second stream reach individually and when members are finished, discuss the 10 parameters and resolve discrepancies.

3.Crews or individuals assessing physical/habitat quality should frequently mix personnel or alternate assessment responsibilities. At the end of each field day, crew members should discuss habitat assessment results and resolve discrepancies.

4.The Project Supervisor should randomly pre-select 10 - 20% of the stream reaches where each crew member will be asked to assess the physical/habitat parameters separately. The discrepancies in individual crew member scores should be discussed and resolved with the Project Supervisor.

QA for the Laboratory

Laboratory analysis of macroinvertebrate samples can be a significant cost for bioassessment programs. The CSBP specifies identification of BMIs to a standard level of taxonomy, usually to genus and/or species level. The CSBP also requires subsampling procedures using a fixed count of 300 organisms. Employing these procedures with confidence requires an effective quality assurance program. Complete quality assurance compliance will require a

minimal 10% cost overhead. However, it will allow for testing whether subsampling, organism enumeration and taxonomic identification are consistent and accurate. Use the following procedures in the bioassessment laboratory to ensuring that quality data is produced:

The California Macroinvertebrate Laboratory Network (CAMLnet) - All individuals, private consulting firms and agency personnel using the CSBP laboratory procedures should contact the WPCL for information on CAMLnet. This group consists of personnel from bioassessment laboratories throughout California. The group provides a forum where laboratory procedures are discussed and the BMI taxonomic levels are determined. It also provides taxonomic workshops and assistance with interlaboratory taxonomic verification.

Standard Operation Procedures (SOP) - Each bioassessment laboratory should produce an SOP manual following the procedures outlined in the CSBP, but with detailed instructions specific to each laboratory. The SOP manual should be maintained for all laboratory operations and updated regularly. The assigned personnel and the duties of a Laboratory Supervisor and QA Taxonomist should be specified in the SOP manual. Customized benchsheets should be developed for each phase of subsampling and identification.

Sample Handling and Custody - When samples arrive, laboratory staff should inspect the samples for a sufficient volume of ethanol and labels for pertinent information including water-body name, sample date and time, location, transect number and sampler name. The steps discussed in the AUsing the Chain of Custody (COC)@ section in this protocol should be followed. The sample description information should be recorded in the Laboratory Sample Inventory Log and each sample given a unique identification number. A written and electronic record should be maintained to trace the samples from entry into the laboratory through final analysis. Samples should be stored in the a Sample Repository until processing and returned after processing.

Subsampling - Subsampling involves removing 300 organisms from each sample, or all organisms if the entire sample contains fewer than 300. The procedure to estimate abundance usually requires removing more than 300 organisms from each sample; however, only 300 are retained for identification. The Subsampling Technician systematically transfers organisms from the sample to a collection vial then transfers the processed sample debris (remnant) into a Remnant jar. At least 10% of the Remnant samples should be examined by the QA Taxonomist for organisms that may have been overlooked during subsampling. For subsamples containing 300 or more organisms, the Remnant sample should contain fewer than 10% of the total organisms subsampled. The Remnant for samples containing fewer than 300 organisms should contain fewer than 30 organisms.

Taxonomic Identification and Enumeration - The CSBP requires that all organisms are identified to a standardized taxonomic level using established taxonomic keys and references. The QA Taxonomist should check at least 10% of the samples for taxonomic accuracy and enumeration of individuals within each taxon. The same sample numbers that were selected randomly for the subsampling quality control should be used for this procedure. Misidentifications and/or taxonomic discrepancies as well as enumeration errors should be noted on the laboratory benchsheets. The Laboratory Supervisor determines if the errors warrant corrective action.

Organism Recovery - During the sorting and identification process organisms may be lost, miscounted or discarded. Taxonomists will record the number of organisms discarded and a justification for discarding on the laboratory benchsheets. Organisms may be discarded for several reasons including: 1) subsampler mistakes (e.g. inclusion of terrestrial or semi-aquatic organisms or exuviae), 2) small size (< 0.5 mm), 3) poor condition or 4) fragments of organisms. The number of organisms recovered at the end of sample processing will also be recorded and a percent recovery determined for all samples. Concern is warranted when organism recoveries fall below 90%. Samples with recoveries below 90% should be checked for counting errors and laboratory benchsheets should be checked to determine the number of discarded organisms. If the number of discarded organisms is high, then the technician that performed the subsampling should be informed and re-trained if necessary.

Corrective Action - Any quality control parameter that is considered out of range should be followed by a standard corrective action that includes two levels. Level I corrective action includes an investigation for the source of error or discrepancy derived from the quality control parameter. Level II corrective action includes checking all samples for the error derived from the quality control parameter but is initiated only after the results of the Level 1 process justify it. The decision to initiate Level II corrective action and reanalyze samples or conduct quality control on additional samples should be made by the Laboratory Supervisor.

Interlaboratory Taxonomic Validation - An external laboratory or taxonomic specialist should be consulted on a regular basis to verify taxonomic accuracy. External validation can be performed on selected taxa to help the laboratory taxonomists with problem groups of BMIs and to verify representative specimens of all taxa assembled in a reference collection.

Bioassessment Validation - The CSBP recommends at least 10% bioassessment validation where whole samples of 300 identified BMIs are randomly selected from all samples either for a particular project or for all samples processed within a set time period such as each 6 months or a year. The labels should be removed from the vials and replaced with a coded label that does not show the taxonomic name of the BMIs. The validation laboratory or specialist should be instructed to identify and enumerate all specimens in each vial and produce a taxonomic list. There will inevitably be some disagreements between the bioassessment and the external laboratory on taxonomic identification. These taxa should be re-examined by both parties and a resolution reached before a final QA report is written. **DFG is working on this QA technique to determine the acceptable level of misidentification and appropriate corrective actions.**

DATA DEVELOPMENT AND ANALYSIS

The CSBP analysis procedures are based on the EPA:s multi-metric approach to bioassessment data analysis. The EPA is developing procedures for multi-variate analysis of bioassessment data, but that method is not presented here. However, the sampling protocols presented in this document were designed to facilitate the use of multi-variate analysis and more information will be presented when standardizes techniques for California become available.

A taxonomic list of the BMIs identified for each sample should be generated for each project along with a table of sample values and means for the biological metrics listed on the last page of this document. Variability of the sample values should be expressed as the coefficient of variability (CV). Significance testing can be use for point source sampling programs and ranking procedures can be used to compare sites sampled using the non-point sampling design (contact DFG for information on ranking formulas). Ultimately, there will be a regional Index of Biological Integrity (IBI) to compare sample site mean values.

Starting in summer 1999, an Access[7] database program to store, process and return a copy of the collected data will be available. Contact DFG or visit the California Aquatic Bioassessment Web Site to learn more about the availability of regional IBIs and the database program.

BIOLOGICAL METRICS USED TO DESCRIBE BENTHIC MACROINVERTEBRATE (BMI) SAMPLES COLLECTED FOLLOWING THE CALIFORNIA STREAM BIOASSESSMENT PROCEDURE (CSBP)

Biological Metrics	Description	Response to Impairment
Richness Measures		
Taxa Richness	Total number of individual taxa	decrease
EPT Taxa	Number of taxa in the Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly) insect orders	decrease
Ephemeroptera Taxa	Number of mayfly taxa (genus or species)	decrease
Plecoptera Taxa	Number of stonefly taxa (genus or species)	decrease
Trichoptera Taxa	Number of caddisfly taxa (genus or species)	decrease
Composition Measures		
EPT Index	Percent composition of mayfly, stonefly and caddisfly larvae	decrease
Sensitive EPT Index	Percent composition of mayfly, stonefly and caddisfly larvae with Tolerance Values of 0 through 3	decrease
Shannon Diversity Index	General measure of sample diversity that incorporates richness and evenness (Shannon and Weaver 1963)	decrease
Tolerance/Intolerance Measures		
Tolerance Value	Value between 0 and 10 weighted for abundance of individuals designated as pollution tolerant (higher values) and intolerant (lower values)	increase
Percent Intolerant Organisms	Percent of organisms in sample that are highly intolerant to impairment as indicated by a tolerance value of 0, 1 or 2	decrease
Percent Tolerant Organisms	Percent of organisms in sample that are highly tolerant to impairment as indicated by a tolerance value of 8, 9 or 10	increase
Percent Hydropsychidae	Percent of organisms in the caddisfly family Hydropsychidae	increase
Percent Baetidae	Percent of organisms in the mayfly family Baetidae	increase
Percent Dominant Taxa	Percent composition of the single most abundant taxon	increase
Functional Feeding Groups		
Percent Collectors	Percent of macrobenthos that collect or gather fine particulate matter	increase
Percent Filterers	Percent of macrobenthos that filter fine particulate matter	increase
Percent Scrapers (Grazers)	Percent of macrobenthos that graze upon periphyton	variable
Percent Predators	Percent of macrobenthos that feed on other organisms	variable
Percent Shredders	Percent of macrobenthos that shreds coarse particulate matter	decrease

PHYSICAL HABITAT QUALITY
(California Stream Bioassessment Procedure)

WATERSHED/ STREAM: _____ DATE/ TIME: _____

COMPANY/ AGENCY: _____ SAMPLE ID NUMBER: _____

SITE DESCRIPTION: _____

Circle the appropriate score for all 20 habitat parameters. Record the total score on the front page of the CBW.

Parameters to be evaluated within the sampling reach

HABITAT PARAMETER	CONDITION CATEGORY			
	OPTIMAL	**SUBOPTIMAL**	**MARGINAL**	**POOR**
1. Epifaunal Substrate/ Available Cover	Greater than 70% (50% for low gradient streams) of substrate favorable for epifaunal colonization and fish cover; most favorable is a mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% (30-50% for low gradient streams) mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% (10-30% for low gradient streams) mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% (10% for low gradient streams) stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/ Depth Regimes *(deep<0.5 m, slow<0.3 m/s)*	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low-gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low-gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameters to be evaluated in an area longer than the sampling reach

HABITAT PARAMETER	CONDITION CATEGORY			
	OPTIMAL	**SUBOPTIMAL**	**MARGINAL**	**POOR**
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left of right side by facing downstream	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) Note: determine left or right side by facing downstream.	More than 90% of the streambank surfaces and immediate riparian zones covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities haveimpacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0

CALIFORNIA BIOASSESSMENT WORKSHEET

WATERSHED/ STREAM: _____ DATE/ TIME: _____

COMPANY/ AGENCY: _____ SAMPLE ID #: _____

SITE DESCRIPTION: _____

SAMPLING CREW

_____

_____

_____

SITE INFORMATION

GPS Coordinates

Latitude: _____

Longitude: _____

Elevation: _____

Ecoregion: _____

COMMENTS:

_____

_____

_____

_____

_____

CHEMICAL CHARACTERISTICS

Water Temperature: _____

Specific Conductance: _____

pH: _____

Dissolved Oxygen: _____

Bioassessment Laboratory Information:

_____

_____

_____

_____

_____

SEND A COPY OF THIS FORM TO:
DFG/ WPCL
2005 Nimbus Road
Rancho Cordova, CA 95670
(916) 358-2858
website: www.dfg.ca.gov/cabw/cabwhome.html

RIFFLE/ REACH CHARACTERISTICS

Point Source Sampling Design

Riffle Length: _____

Transect 1: _____

Transect 2: _____

Transect 3: _____

(record Physical/ Habitat Characteristcs in Riffle 1 column)

Non-Point Source Sampling Design

Reach Length: _____

Physical Habitat Quality Score: _____

Physical/ Habitat Characteristics

	Riffle 1	Riffle 2	Riffle 3
Riffle Length:	_____	_____	_____
Transect Location:	_____	_____	_____
Avg. Riffle Width:	_____	_____	_____
Avg. Riffle Depth:	_____	_____	_____
Riffle Velocity:	_____	_____	_____
% Canopy Cover:	_____	_____	_____
Substrate Complexity:	_____	_____	_____
Embeddedness:	_____	_____	_____
Substrate Composition:			
Fines (<0.1”):	_____	_____	_____
Gravel (0.1-2”):	_____	_____	_____
Cobble (2-10”):	_____	_____	_____
Boulder (>10”):	_____	_____	_____
Bedrock (solid):	_____	_____	_____
Substrate Consolidation:	_____	_____	_____
Percent Gradient:	_____	_____	_____

CALIFORNIA STREAM BIOASSESSMENT PROCEDURE
CHAIN OF CUSTODY (COC) RECORD

Project Name: _____ Date/ Time: _____

Watershed Name:_____ Boiassessment Lab: _____

Sample Number	Lab Number	Sample Date	Sample Description

Sampled by: (sign and date)	Relinquished by: (sign and date)	Received by: (sign and date)
Received by: (sign and date)	Received by: (sign and date)	Received by: (sign and date)

Address of Sampler:

_____

_____

_____

_____

Address of Project Advisor:

_____

_____

_____

_____

91728	44078	96998	25780	58455	99398	16299	30849	56199	45791
56489	18412	62384	48356	75118	51724	7962	62571	13801	10633
26008	30424	44745	71156	73603	52920	32012	56567	28693	22644
49864	5438	98149	44583	87573	37067	80217	52738	22178	48264
39666	4377	80040	38685	96850	54884	5688	88314	54190	6957
83576	92168	37324	72652	78431	59142	55787	17989	81991	95926
23670	80579	84178	799	71974	99821	43125	50789	90272	35574
87975	76200	53759	19222	76617	25341	85869	89617	14629	31322
26124	80985	95411	51349	9322	52887	66059	93470	20527	91142
89224	48066	62669	15806	9590	64712	2723	42518	14275	12582
16945	56219	70292	83056	84787	39471	8409	60760	16240	38967
68995	89831	64408	65234	45348	53418	23153	7967	3207	90746
83774	11014	22528	147	17261	99443	35455	92555	13866	64339
42548	51674	42715	27867	39232	7665	54904	58891	1231	29431
64710	20643	66849	39263	77285	57101	96155	28881	945	98860
63165	93728	94343	89748	33536	5512	35890	81693	89378	94102
40560	45532	29546	76068	75350	8114	78700	97206	12674	59472
40497	85910	64852	78287	41305	65074	86565	36817	90469	33320
78253	65886	91014	5189	27810	8425	50837	90848	15566	55301
6726	60284	15637	76386	26291	82058	93008	31185	27787	27832
75398	44114	94338	94110	84544	24230	39688	30293	10743	80838
76322	63173	16930	97452	15667	38601	92162	19744	35484	46763
66649	15644	69687	45869	1547	33766	22164	16953	87813	48022
37893	12167	98162	96011	91455	9461	14744	29528	12735	8861
2140	94216	48465	39993	72352	35922	13664	23909	75847	77078
61458	48058	32617	89494	9373	81388	98574	55392	9903	20920
62625	61463	6986	43373	71397	44207	77525	65801	94388	61531
75058	34685	37439	96897	1716	96907	97725	4668	58993	79548
52831	73191	64944	86567	78534	36705	35228	94795	57045	29891
34633	63695	99933	8600	46315	75279	82753	80519	22842	91397
32432	87083	55613	38712	77856	21022	91372	62566	65890	41602
44172	13651	34399	25967	52017	93718	30391	81218	70272	42931
92844	78189	15041	43163	57278	16716	51717	94447	63929	32066
43231	19607	27777	38990	94169	81895	68611	65469	3589	77865
82916	26280	2108	97253	89662	9628	10004	86829	79043	83724
49574	12138	99224	60236	1127	88024	4866	86393	93601	13793
72409	56938	92585	42321	47203	97135	26727	49075	49157	121
77156	14992	87483	53367	56545	34281	63976	56392	43359	57029
34228	59830	28700	56993	50813	66532	58929	84038	99788	77246
98423	49581	30802	87072	90228	63318	80658	92848	37173	88826

18570	29895	7607	89572	52690	70464	20532	50443	64823
2448	67832	89598	62241	8618	57946	20735	91040	44269
99987	97585	40238	5032	99367	24618	99400	42672	64405
19350	20110	40749	42085	32769	66135	87928	50806	64671
62954	20328	99145	25362	57235	21427	61430	91451	31827
25836	69393	13558	631	57294	68296	26794	88383	72800
5704	42530	45130	58296	767	30820	90684	91403	10505
62636	75475	75436	73633	16104	46156	38379	51443	75871
41374	32300	43184	13209	49485	65678	13028	99745	3989
9893	60624	78947	40480	46413	19390	16444	49445	99840
52721	2834	37041	47563	80565	61660	48533	81939	13101
83253	23619	84503	72779	15167	58008	85127	56060	52025
14066	97892	2900	42295	28319	37390	73110	81942	65509
8636	49709	42290	53164	95177	62109	39033	60637	75271
75508	62576	62870	63572	55039	96969	43323	97335	66539
89666	71232	46334	75514	90964	95384	77535	96106	8001
79232	3529	47061	60679	89791	57068	1857	10567	60706
26900	6028	22247	21495	37898	25824	50810	9045	62681
33249	38154	71746	43830	30152	28796	32991	24347	64861
97355	64451	41273	50353	71747	39207	44071	71818	158
64143	21112	59108	53389	12792	54159	35051	47583	8138
89287	55276	10858	47845	69191	3803	16748	47367	50568
26002	83088	53066	87662	23548	83322	42079	91795	20860
51560	56871	81329	1819	50614	56453	30235	19327	50809
20539	28795	1253	98196	76344	24413	87415	68523	53665
62821	77929	69327	82278	45165	94453	23030	45423	96938
27414	66399	10635	6220	6352	87505	6859	77638	64724
78594	7897	16036	6669	83452	15921	12177	83870	5922
83312	64623	31661	52888	11672	9061	3522	26574	15936
32818	28634	4868	49362	51474	18688	42195	10806	88513
20594	4938	77394	96024	8082	86273	37304	35314	26903
18556	6618	27256	28236	14398	28143	79891	25227	45087
77237	24983	15875	82995	90914	94509	99814	29822	66623
95016	65072	72685	47373	82479	21491	84350	73390	42078
18355	78424	41804	11162	73271	28251	40180	89616	91159
14186	45382	75616	47801	29002	57439	39816	85482	6533
52433	31802	66033	3487	22033	86061	31103	20172	68028
38782	19888	12117	38651	27799	98799	77047	67341	12936
14052	30597	29937	27004	14969	11078	22217	30415	41066
8146	80866	770	99774	53536	43431	33634	47960	39999