MONITORING PLAN

WADDLE RANCH/NORTHSTAR WATERSHED IMPROVEMENT PROGRAM

ADMINISTRATIVE CIVIL LIABILITY ORDER NO. R6T-2009-0012

Prepared for:

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GENERAL OVERVIEW

This project has been developed as part of the settlement associated with the water quality violations incurred by contractors working for NMP at Northstar during the 2006 construction season. This project is funded by NMP as a result of those violations and is being implemented in an effort to offset environmental impacts related to some of those violations. The SEP project is designed and managed such that overall water and environmental quality will be improved in the same watershed as Northstar, which is the Martis Creek Watershed. The locations of these improvements are the Waddle Ranch, which is owned by the Truckee Tahoe Airport District (TTAD), and on Northstar property in the Middle Fork Martis Creek Drainage.

The Waddle Ranch property has been impacted by recent and historic uses including road and trail construction, logging, and grazing. These impacts have contributed to increased erosion and sedimentation and negatively impacted many of the beneficial uses in the Middle Truckee River Watershed. The sediment source control treatments developed and implemented under this project will generate quantifiable reductions in erosion, which will contribute to achieving the goals and objectives of the recently established Total Maximum Daily Load (TMDL) for sediment.

Long-term fire suppression on the Northstar property has led to an overabundance of live and dead fuels and an increased risk of catastrophic wildfire. Additionally, fire suppression has facilitated conifer encroachment (mostly white fire) into riparian areas, suppressing species such as Quaking aspen, thereby reducing the value to wildlife. Vegetation treatments under this project are designed to reduce the risk of wildfire and improve habitat.

This project is designed to enhance and improve watershed conditions within the Waddle Ranch property and the Martis Creek watershed as a whole, located in and near the Martis Valley, eastern Placer County, California. Further, this project is intended to serve as a model for other watershed restoration and monitoring activities in the region. The planned improvements will be demonstrated through qualitative and quantitative measurement in three key areas: 1) road and upland restoration, 2) stream restoration, and 3) forest fuels removal.

Restoration treatments will be implemented in critical sediment source areas at Waddle Ranch that are being identified through an erosion-focused watershed assessment. Most treatments will be focused on eroding unpaved roads that intersect or drain to East Martis Creek and pose a direct and immediate threat to water quality. Several levels of treatment will be tested, ranging from onsite infiltration of road runoff to full road removal and restoration.

Fuels reduction treatments will be implemented at Northstar to reduce stand density, reduce wildfire risk and improve habitat in high priority areas. Fuels treatments will include lop and scatter, chipping, pile burning and mastication.

Three types of baseline and performance monitoring will be employed on this project:

1. Simulated rainfall and runoff monitoring – simulators are used to induce either rainfall or runoff (overland flow) depending on site conditions and management questions. By simulating hydrologic events, we can directly measure runoff and infiltration rates and sediment yields (i.e. erodibilities) from treatment and reference areas.
2. Soil and vegetation monitoring – this package of monitoring measurements includes upland erosion parameters such as surface cover, vegetation species composition, soil moisture, soil density, soil physical characterization, soil nutrient content, and photo monitoring. These soil and vegetation measurements are a critical complement to the rainfall and runoff simulations described above, as they provide valuable information about the ecological sustainability of plant-soil systems, their ability to resist erosive forces and their resilience following disturbance.
3. In-stream water quality and stream flow monitoring – water quality monitoring stations are established along segments of East and West Martis Creek below the respective project locations at Waddle Ranch and Northstar. In-stream water quality and flow monitoring measurements will include near continuous stream flow, near continuous turbidity (Northstar only) and targeted grab sampling for total suspended sediment (TSS), nutrients (N and P) and particle size distribution (Waddle Ranch only). The purposes of in-stream monitoring are to: 1) determine whether or not the impacts of treatments and management activities in upland areas can be detected through in-stream measurements and 2) to develop a sediment discharge curve to estimate sediment loading in East Martis Creek.

SAMPLING DESIGN

For detailed information regarding sampling design, please refer to the QAPP, Element 10 (Sampling Process Design).

Upland Monitoring – Waddle Ranch

A range of sediment source control treatments will be implemented at disturbed sites to improve soil function and reduce erosion. Upland sampling includes soil and vegetation parameters (soil density, soil moisture, soil and vegetation cover) and erosion parameters (infiltration rate and sediment yield) directly measured with rainfall and runoff simulation. Upland monitoring also includes a rapid site erosion assessment and photo monitoring. Upland monitoring will be conducted before and after implementation of sediment source control treatments to quantify changes in sediment yield and other soil and vegetation parameters at at least five (5) locations (Table 1) at Waddle Ranch.

Upland Monitoring – Northstar

Mechanical mastication treatments will be implemented to reduce fuel loading. Upland sampling includes soil and vegetation parameters (soil density, soil moisture, soil and vegetation cover) and erosion parameters (infiltration rate and sediment yield) directly measured with rainfall and runoff simulation. Upland monitoring also includes a rapid site erosion assessment and photo monitoring. Upland monitoring will be conducted before and after implementation of fuels treatments to quantify changes in sediment yield and other soil and vegetation parameters at at least five (5) locations (Table 1) at Northstar.

SOPs for each monitoring method are included in Appendix D of the QAPP. Timing of sampling activities is summarized in Table 3.

IERS monitoring personnel will conduct all monitoring during the summer season (May – October). Based on field conditions, sampling activities may be modified by the project team during the sampling process to provide for field safety and ensure that all collected data is accurate and thorough. Any deviations from this Monitoring Plan will be documented on field data forms at the time of data collection and added to this Monitoring Plan as Appendices. Changes to this Monitoring Plan will also be communicated to and discussed with Sierra Business Council's represntative (who is responsible for third party oversight) in a timely manner.

In-Stream Monitoring – Waddle Ranch

One (1) water quality and stream flow monitoring station has been established in East Martis Creek below all project locations near the lower end of the Waddle Ranch property (see Monitoring Map in Appendix B of the QAPP). This station is equipped with a pressure transducer (stream flow sensor) to monitor near-continuous stream flow/water discharge. Grab samples will be also be collected at this station and analyzed for TSS, particle size, nitrate plus nitrite, TKN, and phosphorous. Regular TSS samples will be collected approximately once every six (6) weeks for up to five (5) years (approximately 45 samples total). Grab sampling frequency will increase during snowmelt periods when stream flows and sediment loading are anticipated to be higher. Approximately twenty-five (25) TSS samples will be collected during snowmelt periods and up to three (3) samples during storm events each season (approximately 140 samples total). Nitrate plus Nitrite, TKN, phosphorous, and particle size will be sampled approximately six (6) times per season, primarily during snowmelt periods and during up to three (3) storm events per season (approximately 30 samples total). Several of the grab samples collected during low flow periods will be analyzed for the latter parameters as well in order to characterize base flow conditions for these parameters. The water quality and stream flow data collected at Waddle Ranch will provide information that will be used to assess whether targeted sediment source control treatments led to a measurable change in sediment and nutrient loading in East Martis Creek and to refine estimates of current sediment and nutrient loading in East Martis Creek. Actual number of storm season samples will depend on the number of storms and the timing of the storms. Sampling parameters, timing, and frequency are also summarized in Table 2. Actual dates of sampling may need to change to accommodate logistical, climatological, or scientific needs.

This monitoring station is expected to be operated year-round. If snow conditions make access to the monitoring station unsafe there will be periods of missing record. Water discharge for these periods will be estimated based on nearby sites. The suspended sediment data for these periods will be estimated from sediment discharge curves developed from the discrete grab samples taken during the accessible periods.

The stations will be operated and samples collected by trained IERS Monitoring Technicians using generally accepted ISO protocols and methods. Specific sampling methods, protocols, and quality assurance procedures are described in the QAPP (Section B, Elements 10 – 14).

Table 1. Waddle Ranch and Northstar - upland monitoring locations.

Note: This is a partial list and includes only upland monitoring sites selected for the 2009 field season. Additional upland monitoring sites will be selected each season as part of the ongoing watershed assessment at Waddle Ranch and based on the locations of fuels treatments completed in subsequent years at Northstar.

LOCATION	SITE	SITE ID	GPS COORDINATES	SOIL AND VEGETATION	RAINFALL AND RUNOFF SIMULATION
Waddle Ranch	Unit 3 Road	U3R	39° 19.6', 120° 5.57'	X	X
Waddle Ranch	Unit 3 Landing	U3L	39° 19.2', 120° 6.31'	X	
Waddle Ranch	Unit 4 Native	U4N	39° 18.39', 120° 6.25'	X	X
Northstar	Highlands View Road Plot 22	HVR 22	39° 16.17', 120° 6.53'	X	
Northstar	Highlands View Road Plot 25	HVR 25	39° 16.15', 120° 6.54'	X	

Table 2. Waddle Ranch - In-stream monitoring locations, objectives, parameters, annual number of samples, operational periods, and instrumentation.

SAMPLING LOCATION	LOCATION ID NUMBER	GPS COORDINATES (LAT, LON)	MANAGEMENT OBJECTIVE	TSS			NITRATE + NITRITE, TKN, P, PARTICLE SIZE		CONTINUOUS DISCHARGE	OPERATIONAL PERIOD	INSTRUMENT -ATION
				Monthly Grab	Snow Melt	Storm	Snow Melt	Storm			Stage
East Martis Creek, above Martis Lake	EM50	39° 04.55', 120° 10.24'	Water quality and discharge	• 9	• 25	• 3	• 3	• 3	X	Year round	Global Water submersible pressure transducer

In-Stream Monitoring – Northstar

Several water quality and stream flow monitoring sites have been established along West Martis Creek. Two stations exist along West Martis Creek downstream of the project area (Sites 4 and 7) and no monitoring sites exist upstream of the project area. Site 7 is directly downstream of the project area, between the confluence with West Fork West Martis Creek and a culvert under Northstar Drive (as shown on the Project Area Map in Appendix A). Site 4 is further downstream at the Northstar Golf Course. These monitoring sites were originally established by JBR in November 2006 to monitor conditions downstream of the Highlands Development and other long-term development activity in the area. Please refer to the NMP water quality monitoring program QAPP (Appendix F, Table 2) for a summary of monitoring parameters and frequency for each monitoring site. The water quality and stream flow data collected at Site 7 will provide information that will be used to assess whether fuels reduction treatments led to a measurable change in sediment and nutrient loading in West Martis Creek.

SAMPLING SCHEDULE

The timing of sampling and other selected project activities is summarized in Table 3. Actual dates of sampling may change to accommodate logistical, climatological, or scientific needs.

Table 3. Schedule of sampling and selected project activities

Activity	*Date (MM/DD/YY)*		*Deliverable*	*Deliverable Due Date*
	Anticipated Date of Initiation	*Anticipated Date of Completion*		
Start Project	*6/01/09*	*01/31/14*	*None*	*N/A*
Progress Reporting	*07/31/09*	*01/31/14*	*Quarterly Progress Reports*	*07/31/09 and quarterly thereafter*
Pre-Implementation Upland Monitoring (Waddle Ranch)	*06/01/09 (same date annually)*	*09/01/09 (same date annually)*	*Annual Monitoring Reports*	*04/30/10; 04/30/11; 04/30/12; 04/30/13*
Post-Implementation Upland Monitoring (Waddle Ranch)	*07/01/09 (same date annually)*	*11/01/09 (same date annually)*	*Annual Monitoring Reports*	*04/30/13; 04/30/14*
Pre-Implementation Upland Monitoring (Northstar)	*07/01/09 (same date annually)*	*11/01/09 (same date annually)*	*Summary of Activities in Quarterly Report*	*10/31/09; 10/31/10; 10/31/11; 10/31/12; 10/31/13*
Post-Implementation Upland Monitoring (Northstar)	*07/01/09 (same date annually)*	*11/01/09 (same date annually)*	*Annual Monitoring Report*	*04/30/10; 04/30/11; 04/30/12; 04/30/13; 04/30/14*
Implement Water Quality Improvement Projects (Waddle Ranch)	*06/01/09 (same date annually)*	*11/01/09 (same date annually)*	*As-Built Reports*	*01/31/10; 01/31/11; 01/31/12; 01/31/13; 01/31/14*
Implement Fuels Treatment Projects (Northstar)	*06/01/09 (same date annually)*	*10/01/09 (same date annually)*	*Fuels Treatment Implementation Monitoring Reports*	*10/31/09; 10/31/10; 10/31/11; 10/31/12; 10/31/13*
In-Stream Monitoring (Waddle Ranch)	*06/01/09*	*07/01/13*	*Annual Monitoring Reports*	*04/31/10; 04/31/11; 04/31/12; 04/31/13; 04/31/14*
In-Stream Monitoring (Northstar)	*ongoing*	*ongoing*	*Annual Monitoring Reports*	*01/31/10; 01/31/11; 01/31/12; 01/31/13; 01/31/14*

Data Management and Analysis	*06/01/09*	*04/01/14*	*Completed Data Set; Submit Database to SWAMP*	*04/30/14*
Final Project Report	*03/01/14*	*04/01/14*	*Final Project Report*	*04/30/14*

SAMPLE HANDLING AND CUSTODY

Sample handling and custody will follow the procedures described in Element 12 of the QAPP.

ANALYTICAL METHODS

The analysis of all sampling constituents will follow the procedures described in Element 13 of the QAPP, Tables 11 and 12.

QUALITY CONTROL

Quality control will be maintained throughout the life of the project as described in Element 14 of the QAPP, Table 14.