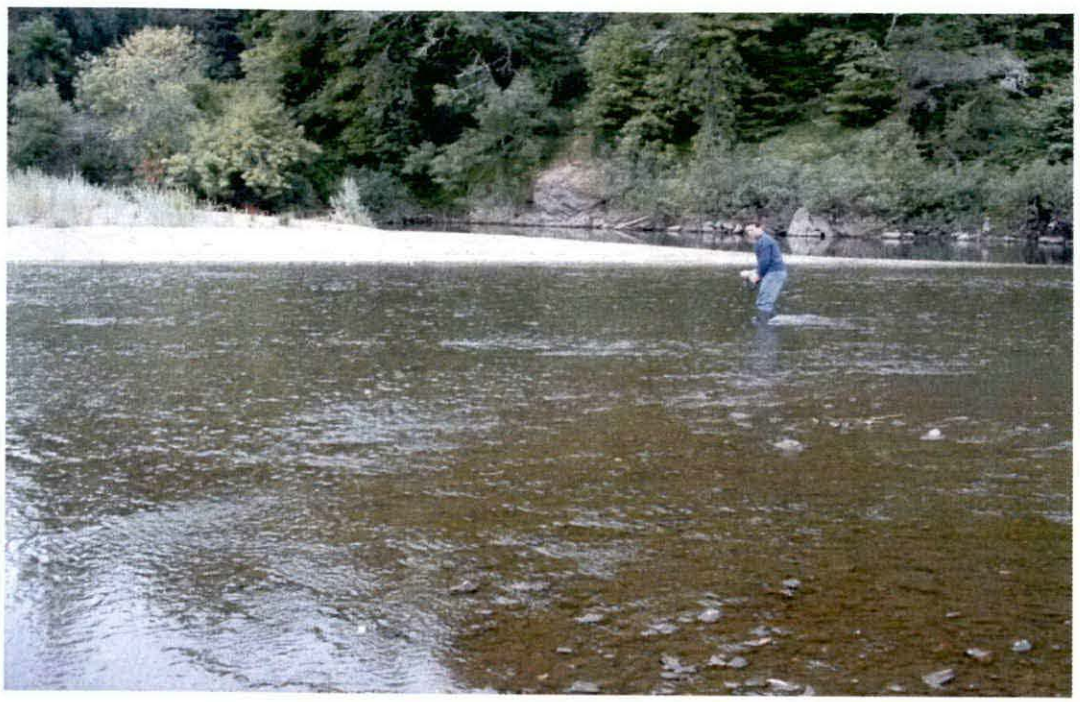
Russian River Water Quality Monitoring Plan
for the
Sonoma County Water Agency
2010 Temporary Urgency Change (TUC)



Prepared by

Sonoma County Water Agency
404 Aviation Boulevard
Santa Rosa, CA 95403-9019

June 2010

TABLE OF CONTENTS

1.0 INTRODUCTION

The Sonoma County Water Agency (SCWA) petitioned the State Water Resources Control Board (State Board) to reduce minimum in-stream flows in the Russian River as required by the National Marine Fisheries Service's (NMFS) *Biological Opinion for Water Supply, Flood Control Operations, and Channel Maintenance conducted by the U.S. Army Corps of Engineers, the Sonoma County Water Agency, and the Mendocino County Russian River Flood Control and Water Conservation District in the Russian River Watershed* (Russian River Biological Opinion, NMFS 2008). NMFS' Russian River Biological Opinion concluded that summer minimum in-stream flows required by the State Board's Decision 1610 in the upper Russian River and Dry Creek are too high for optimal juvenile steelhead habitat. NMFS also determined that the conversion of the tidally-influenced Russian River estuary into a closed freshwater lagoon during the summer months would provide improved habitat for rearing juvenile steelhead. Prior to the State Board approving the petition to permanently change minimum in-stream flows, the SCWA must undertake an environmental review, in accordance with the California Environmental Quality Act (CEQA), to assess potential impacts that could occur as a result of changed flows. As such, this monitoring plan will focus on water quality sampling and monitoring that would provide the data necessary to analyze potential impacts under CEQA.

2.0 BACKGROUND

Under the federal Endangered Species Act (ESA), steelhead, coho salmon and Chinook salmon in the Russian River watershed are listed as threatened or endangered species. Coho salmon is also listed as endangered under the California Endangered Species Act (CESA). In September 2008, NMFS issued the Russian River Biological Opinion (Biological Opinion), a culmination of more than a decade of consultation under Section 7 of the ESA among SCWA, U.S. Army Corps of Engineers (Corps), and NMFS regarding the impacts of SCWA's and Corps' water supply and flood control operations in the Russian River watershed on the survival of these listed fish species. The California Department of Fish and Game (CDFG) issued a consistency determination on November 9, 2009, finding that the Biological Opinion was consistent with the requirements of the CESA and adopting the measures identified in the Biological Opinion.

Studies conducted during the consultation period that ultimately led to the Biological Opinion indicate that summer flows required by Decision 1610 in the upper Russian River and Dry Creek are too high for optimal juvenile salmonid habitat. NMFS also concluded in the Biological Opinion that the historical practice of breaching the sandbar that builds up and frequently closes the mouth of the Russian River during the summer and fall may adversely affect the listed species. NMFS concluded in the Biological Opinion that it might be better for

juvenile steelhead and salmon if the sandbar is kept closed during these times, to allow for the formation of a seasonal freshwater lagoon in the Russian River estuary. Minimum in-stream flows required by Decision 1610 result in flows into the estuary that make it difficult to maintain a freshwater lagoon while preventing flooding of adjacent properties.

Without the requested modifications to the in-stream flow requirements, the high summer time flows required by Decision 1610 will continue to jeopardize the recovery of coho salmon and steelhead in the Russian River and its tributaries.

Changing minimum in-stream flows will assure the maintenance of a natural resource, i.e., the in-stream resources of the Russian River, by increasing available salmonid rearing habitat in the upper Russian River and Dry Creek, and providing a lower, closer to natural inflow to the estuary between late spring and early fall, thereby enhancing the potential for maintaining a seasonal freshwater lagoon that could support increased production of juvenile steelhead.

3.0 OBJECTIVES

Objective of this sampling and analysis plan: Supplement existing data to provide a more complete basis for analyzing spatial and temporal water quality trends due to Biological Opinion-stipulated changes in river flow and estuary management.

4.0 PURPOSE AND NEED

One of the conditions in the order for the TUC petition states that SCWA prepare this Water Quality Monitoring Plan (Monitoring Plan) for the Russian River in consultation with: (1) the North Coast Regional Water Quality Control Board (NCRWQCB); (2) the United States Geological Survey (USGS); (3) NMFS; and (4) the Division of Water Rights (DWR). The purpose of the Monitoring Plan is to provide information to evaluate potential changes to water quality and availability of habitat for aquatic resources resulting from the proposed permanent changes to Decision 1610 minimum in-stream flows that are mandated by the Biological Opinion. Furthermore, the Monitoring Plan will build upon previous water quality studies that have been conducted in the Russian River and the estuary, and provide information to support the development of future CEQA documents required for permanent changes to Decision 1610 and changes in estuary management.

CEQA requires a Lead Agency to disclose to decision makers and the public the potential direct and indirect significant effects on the environment that may result from a proposed project and to identify ways to avoid or minimize

potentially significant effects. A significant effect on the environment "means a substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance" (CEQA Guidelines Section 15382) that is "based to the extent possible on scientific and factual data" (CEQA Guidelines Section 15064). The "threshold of significance" or criteria that may be used to determine whether an effect is significant can be "a quantitative or qualitative standard, or set of criteria, pursuant to which the significance of a given environmental effect may be determined."[1]

The effort described in this monitoring plan is intended to support the SCWA's future CEQA compliance documents to disclose the potentially significant environmental effects of proposed changes to minimum instream flows and estuary management by utilizing available existing water quality data and building upon these data. Depending upon the environmental setting, the existing health or ecologic standards established for particular constituents, and the available data, evaluations of significance may be quantitative or qualitative.

Monitoring will be conducted to track potential changes to water quality associated with reduced flows in the mainstem Russian River and extended closure of the estuary during the dry season to form a summer lagoon at the mouth of the river. Mainstem and estuary monitoring will include continuous hourly monitoring of temperature, dissolved oxygen, pH, and specific conductance at several stations stretching from Ukiah to Jenner. In addition, the estuary will be monitored hourly to observe salinity concentration and stratification in the water column; as well as up and downstream migration of the salt water layer associated with tidal exchange, periods of lower instream flows, and extended sandbar closures. Water samples will also be collected and analyzed for several constituents by USGS and SCWA staff.

Regarding water quality monitoring to support the SCWA's CEQA compliance efforts, the following preliminary questions help explain the objective of the monitoring plan:

- What are the background levels of nutrients and pathogens under the current minimum in-stream flow levels? How do these background levels respond to changes in in-stream flow, considering other contributing factors?
- Does water temperature and dissolved oxygen respond to changes in minimum in-stream flows?

[1] Governor's Office of Planning and Research, Thresholds of Significance: Criteria for Defining Environmental Significance, CEQA Technical Advice Series, September 1994.

- Are there secondary biological effects related to changes in water quality related to in-stream flow changes (e.g. stress to fish, plants, invertebrates) and if so, what are they? Effects to public health/recreation?
- What are the background levels of nutrients and pathogens in the Estuary? How do the levels respond to managing the estuary as a closed summer lagoon, considering other contributing factors?
- Do water temperature, dissolved oxygen, and salinity respond to managing the estuary as a closed summer lagoon?
- Are there secondary biological effects related to changes in water quality as a result of managing the estuary as a closed summer lagoon (e.g. stress to fish, plants, invertebrates) and if so, what are they? Effects to public health/recreation?

5.0 SAMPLING AND ANALYSIS PLAN

5.1 Mainstem Russian River Study (USGS)

USGS will conduct the mainstem Russian River sampling effort. The effort will be conducted in two phases during 2010. Phase 1 will include one sampling event in late spring (week of June 14). Phase 2 will include two sampling events; summer and early fall (tentatively August and October). Table 1 contains a complete list of the eleven surface-water sites and four groundwater sites to be sampled during 2010. The surface water and groundwater sample locations are shown in Figures 1 and 2, respectively. To provide a consistent database, water samples will be collected from previously-sampled sites located along the Russian River between the city of Ukiah and the vicinity of the estuary near the town of Duncans Mills. These sites include reaches of the Russian River that have extensive recreational use.

The Russian River surface-water sites, in downstream order, include: Russian River near Hopland (site 2, USGS 11462500), located downstream from Lake Mendocino; Russian River near Cloverdale (site 3, USGS 11463000), located within the agricultural area of the Alexander Valley; Russian River at Digger Bend near Healdsburg (site 4, USGS 11463980), located within the city of Healdsburg and upstream from any hydrologic influence from Healdsburg Veterans Memorial beach; Russian River at Riverfront Park (site 6, USGS 383132122514901), located downstream from the confluence with Dry Creek and four to five miles from the city of Healdsburg's wastewater treatment plant; Russian River at Wohler Bridge (site 7, USGS 11465400), located within the SCWA's water supply facility; Russian River at Steelhead Beach (site 8, USGS 3829591225356010) located near the SCWA's water supply facility and downstream from the confluence with Mark West Creek; Russian River near

Guerneville (site 9, USGS 11467000), located just downstream of the Hacienda Bridge; Russian River at Johnsons Beach (site 11, USGS 11467002), within the resort area of Guerneville; Russian River at Monte Rio (site 13, USGS 382757123003801, which is located downstream from the Dutch Bill Creek confluence; and Russian River at Casini Ranch (site 14, USGS 382754123030501), a private campground with private beach access located near the town of Duncans Mills and below the Austin Creek confluence. The Russian River at Casini Ranch site is the furthest downstream site in order to minimize any tidal influences from the estuary. Refer to Figure 1 for a map of surface-water site locations.

The other surface-water site will be Mark West Creek (site 22, USGS 11466800), a small creek which originates in the Mayacama Mountains to the east of the Santa Rosa Plain and empties into the Russian River at Mirabel Heights between the SCWA's riverbank filtration facility and Steelhead Beach (Figure 2). Mark West Creek drains the Laguna de Santa Rosa, which receives seasonal discharge from Santa Rosa's Regional Wastewater Treatment Plant.

The previously-sampled groundwater sites were selected on the basis of their close proximity to the Russian River (Figure 2). The groundwater sites include: MW-93-14 (site 26, USGS 383002122530601) and TW-1 (site 30, USGS 383045122525701), located within the area of the SCWA's water supply facility; SB-OW-1a (site 27, USGS 383003122540401), located at Steelhead Beach; and HA-OW-4 (site 33, USGS 383132122514501) located within Riverfront Park.

All samples will be analyzed for nutrients, major ions, trace metals, total and dissolved organic carbon, a broad suite of organic wastewater compounds (polyaromatic hydrocarbons, disinfection-by-products, selected pesticides and herbicides, and personal care and household products such as fragrances and detergents), by laboratories operated by the USGS. In addition, water samples collected at surface-water sites located at Russian River near Hopland, Russian River at Digger Bend near Healdsburg, Russian River near Guerneville and at Russian River at Casini Ranch will be analyzed for human-use pharmaceuticals; these analyses will also be conducted by laboratories operated by the USGS. For a list of constituents to be sampled please refer to Tables 2-4 .

Surface-water samples will be collected and shipped to state-certified Alpha Analytical Laboratories, Incorporated (Ukiah, CA) where they will be analyzed for standard bacterial indicators (total and fecal coliform and enterococci). Ceramic tiles, as a substrate for the collection of algae samples, will be placed at 3 real-time water-quality data stations along the Russian River (Russian River near Hopland, Russian River at Digger Bend near Healdsburg and Russian River near Guerneville). These real-time water-quality data stations provide a continuous

record of dissolved oxygen, pH, specific conductance, water temperature and turbidity at these Russian River sites. Data for these sites are available online through http://waterdata.usgs.gov/nwis. The tiles would be installed during the first sampling event in the late spring. The tiles placed at the three Russian River sites will be removed, chlorophyll-*a* and ash-free-dry mass per unit area of tile will be measured, and the tiles will be replaced back into the river. These measurements will be used to determine the production of algae in the Russian River at the three locations. Water samples may also be collected from production wells, if made available, and analyzed for some or all of the constituents listed above. USGS personnel will coordinate with SCWA to identify potential production wells that may be sampled. Groundwater samples will not be analyzed for standard bacterial indicators.

Quality-control (QC) samples will be collected to assess the validity of the water-quality data collected during the study. QC sample types used in this study will include the collection of field blanks and sequential replicate samples. All field blanks will be collected at the sampling site using dionized water and will be subjected to the same sampling equipment, field processing, preservation, storage and transportation, and laboratory analysis for the collection of environmental samples. The sequential replicate samples will be collected to evaluate any bias and (or) variability introduced by sampling procedures. Sampling methodology including: chain-of-custody procedures, sample labeling, storage and transport protocols, sample containers and sample collection methods, and decontamination will follow USGS Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, chapters A1-A9 (available online at http://pubs.water.usgs.gov/twri9A), in conjunction with protocols established by Alpha Labs and Sonoma County Water Agency. Discharge measurements and surface-water samples from the Russian River will also be collected using depth- and width-integrated sampling methods as outlined in the USGS Field Manual.

Furthermore, the USGS NWQL uses the laboratory reporting level (LRL) as a threshold for reporting analytical results. The LRL is set to minimize the reporting of false negatives (not detecting a compound when it actually is present in a sample) to less than one percent. The LRL usually is set at two times the long-term method detection level (LT-MDL). The LT-MDL is derived from the standard deviation of at least 24 MDL determinations made over an extended period of time. LT-MDLs continually are monitored and updated. The method detection limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99-percent confidence that the concentration is greater than zero (at the MDL there is less than one percent chance of a false positive). Detections between the LRL and the LT-MDL will be reported as "estimated" concentrations.

The water-quality baseline established by the continuation of this study will provide additional information to evaluate potential changes to water quality resulting from the proposed permanent changes to minimum in-stream flows and estuary management during the summer months. This information will build on the results from previous water-quality studies that have been conducted within the Russian River Basin during summer flow to assess potential impacts on water-quality that could occur as a result of permanent changes to in-stream flow requirements.

5.1.1 Reporting (USGS)

A USGS Data Report describing the water quality of the Russian River Basin during summer flows will be prepared at the completion of the one-year monitoring program. The information from this report and previous datasets will be evaluated to support the SCWA's future CEQA compliance documents as described in section four. As the results become available SCWA staff will provide the data via its website as has been the process in previous years.

5.2 Russian River Estuary Study (SCWA)

5.2.1 Datasonde Deployment

Water quality monitoring will occur at nine stations in the lower, middle, and upper reaches of the Russian River estuary, including areas upstream from the estuary that become inundated during closed lagoon conditions. Seven stations will be located in the mainstem between the mouth of the river at Jenner and Monte Rio and two stations will be located at the confluences of Willow and Austin creeks, in areas that are subject to tidal and/or closed lagoon inundation. Refer to Figure 3 for a map of estuary water quality station locations.

SCWA staff will use several Yellow Springs Incorporated (YSI) 6600 series multi-parameter datasondes (sondes) equipped with a YSI 6560 combination conductivity/temperature sensor, a YSI 6561 pH sensor, and a YSI 6562 dissolved oxygen sensor to collect water quality parameters at all sites. Sondes will be programmed to record hourly measurements of water temperature (Celsius), dissolved oxygen (milligrams per liter, mg/L), specific conductance (microsiemens), salinity (parts per thousand, ppt), and hydrogen ion (pH). Sondes may also be equipped with a YSI 6136 turbidity sensor during the monitoring season to monitor turbidity at differing depths of the water column. Monitoring sites will be accessed by boat or by foot.

All sondes will be recalibrated following the manufacturer's 6-Series User Manual and data downloaded every two weeks by SCWA staff. The YSI temperature sensor utilizes a thermistor that does not require calibration or

maintenance. However, thermistor accuracy will be checked against a National Institute of Standards and Technology (NIST) thermometer during initial deployment to ensure the sensor is functioning properly. The YSI 6560 conductivity sensor will be calibrated using a 10,000 microsiemen (µS/cm) standard. The YSI 6561 pH sensor will be calibrated to two points using buffer solutions of pH 7 and 10. The YSI 6562 dissolved oxygen sensor will be calibrated using the dissolved-oxygen-calibration chamber-in-air method where the calibration chamber is set-up with water and allowed to reach 100-percent saturation prior to calibration. The YSI 6136 turbidity sensor will be calibrated to two-points using standards of 0 and 1,000 NTU. The calibrated sensor will then be checked with a 500-NTU standard to confirm sensor accuracy in the range of values expected in the stream.

Field calibration and data collection will be conducted using the YSI 650 Multiparameter Display System (MDS) datalogger designed to work with the 6-Series datasondes. Data will be downloaded onto the YSI 650 MDS and then transferred to a PC, where data will undergo analysis by SCWA staff.

Estuary sites (Figure 3) include:

- Russian River @ Mouth at Goat Rock State Beach (2 YSI 6600 Datasondes)
- Russian River @ Patty's Rock upstream from Penny Island (2 YSI 6600 Datasondes)
- Russian River @ Bridgehaven downstream from the Highway 1 bridge (2 YSI 6600 Datasondes)
- Russian River @ Sheephouse Creek downstream of Sheephouse Creek (2 YSI 6600 Datasondes)
- Russian River @ Heron Rookery halfway between Sheephouse and Freezeout creeks (2 YSI 6600 Datasondes)
- Russian River @ Freezeout Creek downstream of Freezeout Creek (2 YSI 6600 Datasondes)
- Russian River @ Monte Rio downstream of Dutch Bill Creek (1 YSI 6600 Datasonde)
- Willow Creek (1 YSI 6600 Datasonde)
- Austin Creek (1 YSI 6600 Datasonde)

The six mainstem stations located in the lower, middle, and upper estuary between the Mouth and Freezeout Creek will have a vertical array of two datasondes. Monitoring stations will be comprised of a concrete anchor attached to a steel cable suspended from the surface by a large buoy with sondes attached at varying depths along the cable. The rationale for choosing these sites was to locate the deepest pools at various points throughout the Estuary to obtain the

fullest vertical profiles possible and to monitor anoxic events and temperature or salinity stratification. The four stations in the lower and middle estuary that are predominantly saline will have sondes placed at the surface (approximately 1-meter depth) and mid-depth portions of the water column. The two stations in the upper estuary, where water is predominantly fresh, will be located at the mid-depth and bottom of the water column.

One additional mainstem station will be established upstream from the estuary in freshwater habitat that becomes inundated during sandbar closure events. This station at Monte Rio has not previously been observed to become saline and will have one sonde placed in the thalweg, or deepest part of the water column. The two tributary stations in Willow and Austin creeks will each have one sonde that will be placed in their respective thalwegs near the confluences with the Russian River.

Sondes will be located in this manner to track changes to water quality in the water column, vertically and longitudinally, within the estuary during reduced in-stream flows, tidal fluctuation and closure events. The placement of sondes in this manner will also allow SCWA staff to track changes to water quality that may be associated with the migration and stratification of the salt water layer within the estuary.

5.2.2 Nutrient/Bacterial/Algal Sampling

Water samples will be collected from five surface-water sites in the Russian River estuary (Figure 3). All samples will be analyzed for nutrients, chlorophyll *a*, standard bacterial indicators (total and fecal coliform, and enterococci), total and dissolved organic carbon, and turbidity (See Table 5). Sampling methodology including: chain-of-custody procedures, sample labeling, storage and transport protocols, sample containers and sample collection methods, and decontamination will follow USGS Field Manual for the Collection of Water-Quality Data: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 9, chapters A1-A9 (available online at http://pubs.water.usgs.gov/twri9A), in conjunction with protocols established by Alpha Labs and SCWA. As identified in Table 5, Alpha Labs will be reporting the results at the MDL, however the data will be subject to their reporting protocols which will require that they flag the results as "Detected but below Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ)".

Grab Samples will be collected every two weeks when flows are above D1610 normal year levels (125 cfs - measured at USGS gauging station 11467000, near Hacienda), and will be collected weekly when flows drop below D1610 normal year levels (125 cfs). See Figure 2 for a map of surface-water sampling locations.

Measurements of water temperature, pH, specific conductance, dissolved oxygen, and barometric pressure will be collected using a YSI 6600 datasonde and YSI 650MDS datalogger during water sample collection.

Russian River sites (Figure 3) include:

- Russian River @ Jenner Boat Ramp
- Russian River @ Bridgehaven below Willow Creek
- Russian River @ Duncans Mills above Freezeout Creek
- Russian River @ Casini Ranch below Austin Creek
- Russian River @ Monte Rio below Dutch Bill Creek

Additional focused sampling will also occur under certain conditions and following specific river management and operational events at the sites listed above.

- Removal of Vacation Beach Dam - 3 samples within 10 days after dam removal
- Sandbar Breach - 3 samples within 10 days after breach
- Lagoon Outlet Channel implementation - 3 samples within 10 days after implementation.

At the conclusion of any focused sampling event, regular sampling will resume following the schedule based on flows, as described above.

These analyses will continue the SCWA effort to establish a water-quality baseline for the Russian River estuary (including the area of inundation during closure) from Monte Rio to the river mouth at Jenner. The baseline established with these analyses will enable SCWA to assess the influence of reduced flows in the lower mainstem, a closed lagoon in the Russian River estuary, and the operation of a lagoon outlet channel across the river mouth sandbar, during summer flow.

5.2.3 Reporting (SCWA)

A report describing the results of the SCWA 2010 Russian River estuary water quality monitoring and sampling effort will be prepared as described in the Biological Opinion. The report will provide summaries of data observations recorded for each constituent sampled or monitored. The report may also provide recommendations for changes to monitoring and sampling efforts to be conducted in subsequent years. The information from this report will be used in a synthesis report being prepared by SCWA for the Biological Opinion that incorporates other estuary studies and discusses trends and observations relating to the proposed permanent changes to minimum in-stream flows and estuary management during the summer months.

5.3 Additional Monitoring

5.3.1 Permanent Datasondes

In coordination with the USGS SCWA maintains five multi-parameter water quality sondes on the Russian River located at Russian River near Hopland, Russian River at Digger Bend near Healdsburg and Russian River near Guerneville (aka Hacienda Bridge), SCWA's water supply facility at Mirabel, and Johnson's Beach. These five sondes are referred to as "permanent" because SCWA maintains them as part of its early warning detection system. The sondes take real time readings of water pH, temperature, dissolved oxygen content (DO), specific conductivity, turbidity, and depth, every 15 minutes and transmit the raw data via telemetry to the Agencies operations center. As previously noted, Russian River near Hopland, Russian River at Digger Bend and Russian River near Guerneville data is provided in cooperation with the USGS on its "Real-time Data for California" website. For those interested in the complete set of water quality data, SCWA offers an "email subscription" available to the public via SCWA's website.

In addition to the permanent sondes, in 2009 SCWA, in cooperation with the USGS, installed seasonal sondes with real-time telemetry at the USGS river gage station at Russian River near Cloverdale (north of Cloverdale at Commisky Station Road) and at the new gage station at the Russian River at Jimtown (Alexander Valley Road Bridge). These two additional sondes are included by the USGS on its "Real-time Data for California" website.

The data collected by the sondes described above and historical sonde data will be evaluated to support the SCWA's future CEQA compliance documents as described in section four.

5.3.2 Seasonal Bacterial Sampling (Beach Sampling)

The NCRWQCB in cooperation with the Sonoma County Environmental Health Department (DEH) conducts seasonal bacteriological sampling at Russian River beaches which experience the greatest body contact recreation.

The NCRWQCB seasonal sampling locations consist of: Camp Rose Beach; Healdsburg Veterans Memorial Beach; Steelhead Beach; Forestville Access Beach; Johnson's Beach; and Monte Rio Beach. Bacteriological samples are collected weekly beginning in June and continuing through September. The NCRWQCB expects to begin more specific and targeted sampling for pathogens upon completion of an in-house laboratory later this summer. The samples will be analyzed using the Colilert-18 quantitray MPN method for total coliform and *E. coli* and the Enterolert quantitray method for Enterococcus. Results from the

sampling program are reported by the NCRWQCB and the DEH at their respective websites and on the DEH Beach Sampling Hotline.

The analyses resulting from the 2010 beach sampling program and any specific targeted sampling conducted by the NCRWQCB will be evaluated to support the SCWA's future CEQA compliance documents as described in section four.

Table 1. List of all the surface-water and groundwater sites to be sampled in the Russian River Basin, Mendocino and Sonoma Counties, California, 2010.

Map Site No.	Station No.	Station name	Site Type[1]
2	11462500	Russian River near Hopland CA	SW
3	11463000	Russian River near Cloverdale CA	SW
4	11463980	Russian River at Digger Bend near Healdsburg CA	SW
6	383132122514901	Russian River at Riverfront Park	SW
7	11465400	Russian River at Wohler Bridge	SW
8	382959122535601	Russian River at Steelhead Beach	SW
9	11467000	Russian River near Guerneville (Hacienda)	SW
11	11467002	Russian River at Johnsons Beach	SW
13	382757123003801	Russian River at Monte Rio	SW
14	382754123030501	Russian River at Casini Ranch	SW
22	11466800	Mark West Creek near Mirabel Heights	SW
26	383002122530601	8N/9W-32C1, MW-93-14	GW
28	383003122540403	8N/9W-31C5, SB-OW-1a	GW
30	383045122525701	8N/9W-29F1, TW-1	GW
33	383132122514501	8N/9W-21F1, HA-MW-4	GW

[1]SW – Surface-water, GW - Groundwater

Table 2. List of major-ions, selected trace elements, and nutrients to be analyzed in water samples collected from the Russian River Basin, Mendocino and Sonoma Counties, California, 2010.

Compound	USGS Parameter Code	CAS Number	Laboratory Reporting Level	Units
Major-ions and selected trace elements				
Acid neutralizing capacity (ANC), laboratory	90410	471-34-1	8	mg/L
Aluminum	01106	7429-90-5	4	µg/L
Antimony	01095	7440-36-0	0.04	µg/L
Arsenic	01000	7440-38-2	0.06	µg/L
Barium	01005	7440-39-3	0.4	µg/L
Beryllium	01010	7440-41-7	0.02	µg/L
Boron	01020	7440-42-8	4	µg/L
Bromide	71870	24959-67-9	0.02	mg/L
Cadmium	01025	7440-43-9	0.02	mg/L
Calcium	00915	7440-70-2	0.02	µg/L
Chloride	00940	16887-00-6	0.12	mg/L
Chromium	01030	7440-47-3	0.12	µg/L
Cobalt	01035	7440-48-4	0.02	µg/L
Copper	01040	7440-50-8	1	µg/L
Fluoride	00950	16984-48-8	0.08	mg/L
Iron	01046	7439-89-6	4	µg/L
Lead	01049	7439-92-1	0.06	µg/L
Lithium	01130	7439-93-2	1	µg/L
Magnesium	00925	7439-95-4	0.012	mg/L
Manganese	01056	7439-96-5	0.2	µg/L
Mercury	71890	7439-97-6	0.01	µg/L
Molybdenum	01060	7439-98-7	0.02	µg/L
Nickel	01065	7440-02-0	0.12	µg/L
Potassium	00935	7440-09-7	0.06	mg/L
Residue, 180°C (Total Dissolved Solids)	70300	---	10	mg/L
Selenium	01145	7782-49-2	0.06	µg/L
Silica	00955	7631-86-9	0.02	mg/L
Silver	01075	7440-22-4	0.008	µg/L
Sodium	00930	7440-23-5	0.12	mg/L
Strontium	01080	7440-24-6	0.8	µg/L
Sulfate	00945	14808-79-8	0.18	mg/L
Thallium	01057	7440-28-0	0.04	µg/L

Uranium, natural	22703	7440-61-1	0.006	µg/L
Vanadium	01085	7440-62-2	0.16	µg/L
Zinc	01090	7440-66-6	2	µg/L
Nutrients				
Nitrogen, ammonia as N	00608	7664-41-7	0.02	mg/L
Nitrogen, ammonia + organic nitrogen, total	00625	17778-88-0	0.1	mg/L
Nitrogen, ammonia + organic nitrogen	00623	17778-88-0	0.1	mg/L
Nitrogen, nitrite	00613	14797-65-0	0.002	mg/L
Nitrogen, nitrite + nitrate	00631	---	0.04	mg/L
Organic carbon, dissolved	00681	---	0.4	mg/L
Organic carbon, total	00680	---	0.6	mg/L
Phosphorus	00666	7723-14-0	0.006	mg/L
phosphorus, orthophosphate	00671	14265-44-2	0.008	mg/L
Phosphorus, total	00665	7723-14-0	0.008	mg/L

Table 3. List and primary uses of organic wastewater compounds to be analyzed in water samples collected from the Russian River Basin, Mendocino and Sonoma Counties, California, 2010.

Compound	USGS parameter code	CAS number	Laboratory reporting level	Uses
1,4-Dichlorobenzene	34572	106-46-7	0.04	Deodorizer
1-Methylnaphthalene	62054	90-12-0	0.04	Fuels
2,6-Dimethylnaphthalene	62055	581-42-0	0.12	Fuels
2-Methylnaphthalene	62056	91-57-6	0.04	Fuels
3-*beta*-Coprostanol	62057	360-68-9	2	Fecal sterol
3-Methyl-1H-indole (skatol)	62058	83-34-1	0.04	Fragrance
3-*tert*-Butyl-4-hydroxyanisole	62059	25013-16-5	0.6	Antioxidant
4-Cumylphenol	62060	599-64-4	0.1	Detergent metabolite
4-*n*-Octylphenol	62061	1806-26-4	0.16	Detergent metabolite
4-Nonylphenol	62085	84852-15-3	2	Detergent metabolite
4-Nonylphenol diethoxylates	62083	---	5	Detergent metabolite
4-*tert*-Octylphenol diethoxylates	61705	---	1	Detergent metabolite
4-*tert*-Octylphenol monoethoxylates	61706	---	1	Detergent metabolite
4-*tert*-Octylphenol	62062	140-66-9	1.4	Detergent metabolite
5-Methyl-1H-benzotriazole	62063	136-85-6	2	Anticorrosive
Acetophenone	62064	98-86-2	0.4	Fragrance
Acetyl hexamethyl tetrahydronaphthalene (AHTN)	62065	21145-77-7	0.5	Fragrance
Anthracene	34221	120-12-7	0.04	Combustion product
Anthraquinone	62066	84-65-1	0.16	Manufacturing
Benzo[*a*]pyrene	34248	50-32-8	0.08	Combustion product
Benzophenone	62067	119-61-9	0.12	Fixative
beta-Sitosterol	62068	83-46-5	4	Plant sterol
beta-Stigmastanol	62086	19466-47-8	2	Plant sterol
Bromacil	4029	314-40-9	1	Herbicide
Caffeine	50305	58-08-2	0.1	Stimulant
Camphor	62070	76-22-2	0.06	Flavorant
Carbaryl	82680	63-25-2	1	Insecticide
Carbazole	62071	86-74-8	0.04	Insecticide
Chlorpyrifos	38933	2921-88-2	0.12	Insecticide
Cholesterol	62072	57-88-5	2	Plant/animal sterol
Cotinine	62005	486-56-6	0.4	Nicotine metabolite

Diazinon	39572	333-41-5	0.08	Insecticide
d-Limonene	62073	5989-27-5	0.14	Fungicide
Fluoranthene	34377	206-44-0	0.04	Combustion product
Hexahydrohexamethyl cyclopentabenzopyran (HHCB)	62075	1222-05-5	0.5	Fragrance
Indole	62076	120-72-9	0.08	Pesticide inert
Isoborneol	62077	124-76-5	0.18	Fragrance
Isophorone	34409	78-59-1	0.08	Solvent
Isopropylbenzene (cumene)	62078	98-82-8	0.2	Fuels
Isoquinoline	62079	119-65-3	0.4	Flavorant
Menthol	62080	89-78-1	0.4	Fragrance
Metalaxyl	50359	57837-19-1	0.12	Fungicide
Methyl salicylate	62081	119-36-8	0.1	Liniment
Metolachlor	39415	51218-45-2	0.08	Herbicide
N-N-diethyl-*meta*-toluamide (DEET)	62082	134-62-3	0.14	Insect repellant
Naphthalene	34443	91-20-3	0.04	Combustion product
para-Cresol	62084	106-44-5	0.18	Wood preservative
Phenanthrene	34462	85-01-8	0.04	Combustion product
Prometon	4037	1610-18-0	0.2	Herbicide
Pyrene	34470	129-00-0	0.04	Combustion product
Tetrachloroethene	34476	127-18-4	0.12	Solvent, degreaser
Tribromomethane	34288	75-25-2	0.1	Chemical intermediate and solvent
Tributyl phosphate	62089	126-73-8	0.2	Flame retardant
Triclosan	62090	3380-34-5	0.2	Antimicrobial disinfectant
Triethyl citrate	62091	77-93-0	0.4	Cosmetics
Triphenyl phosphate	62092	115-86-6	0.12	Plasticizer
Tris(2-butoxyethyl) phosphate	62093	78-51-3	0.8	Plasticizer
Tris(2-chloroethyl) phosphate	62087	115-96-8	0.1	Flame retardant
Tris(dichloroisopropyl) phosphate	62088	13674-87-8	0.12	Flame retardant

[USGS parameter code is a 5-digit number assigned for identification and data storage purposes which is used in the U.S. Geological Survey National Water Information System (NWIS), to uniquely identify a specific constituent or property; CAS, Chemical Abstract Services number assigned by the American Chemical Society for identification and computer search purposes; –, CAS number not assigned; Laboratory reporting levels (LRL) is in micrograms per liter (mg/L). Lower values may be reported as estimated concentrations, indicated with an 'E', if compound is present.]

Table 4. List and primary uses of human-use pharmaceuticals to be analyzed for select water samples collected from the Russian River Basin, Mendocino and Sonoma Counties, California, 2010.

Compound	USGS parameter code	CAS number	Laboratory reporting level	Uses
1,7-Dimethylxanthine	62030	611-59-6	0.12	Precursor is a stimulant
Albuterol	62020	18559-94-9	0.06	Bronchodilator
Acetaminophen	62000	103-90-2	0.08	Analgesic
Carbamazepine	62793	298-46-4	0.04	Antiepileptic
Codeine	62003	76-57-3	0.04	opiate agonist
Dehydronifedipine	62004	67035-22-7	0.08	Precursor is a antianginal
Diltiazem	62008	42399-41-7	0.08	Antihypertensive
Diphenhydramine	62796	147-24-0	0.04	Antipruritic
Sulfamethoxazole	62021	723-46-6	0.16	Antibiotic
Thiabendazole	62801	148-79-8	0.06	Anthelmintic, fungicide
Trimethoprim	62023	738-70-5	0.02	Antibiotic
Warfarin	62024	81-81-2	0.1	Anticoagulant, rodenticide

[USGS parameter code is a 5-digit number assigned for identification and data storage purposes which is used in the U.S. Geological Survey National Water Information System (NWIS), to uniquely identify a specific constituent or property; CAS, Chemical Abstract Services number assigned by the American Chemical Society for identification and computer search purposes; —, CAS number not assigned; Laboratory reporting levels (LRL) is in micrograms per liter (mg/L). Lower values may be reported as estimated concentrations, indicated with an 'E', if compound is present.]

Table 5. List of bacterial indicators and nutrients to be analyzed in water samples collected from the Russian River Estuary, Sonoma County, California, 2010.

Compound	Test Method	Method Detection Limit (MDL)	Laboratory Reporting Limit (LRL/PQL[1])	Units
Nitrogen, ammonia as N	SM4500NH3C	0.1	0.2	mg/L
Ammonia Unionized	EPA600	0.0001	0.0005	mg/L
Nitrogen, ammonia + organic nitrogen, total	SM4500-N_{org} B	0.1	0.2	mg/L
Nitrogen, nitrate as N	EPA300.0	0.03	0.2	mg/L
Nitrogen, nitrite as N	EPA300.0	0.02	0.2	mg/L
Organic carbon, dissolved	SM5310C	0.04	0.3	mg/L
Organic carbon, total	SM5310C	0.04	0.3	mg/L
Phosphorus, orthophosphate	SM4500-P E	0.02	0.02	mg/L
Phosphorus, total	SM4500-P E	0.02	0.1	mg/L
Chlorophyll (a)	SM1020OH	0.00005	0.01	mg/L
Coliform, total	SM9221 (MTF)[2]	>2	>2	MPN[3]
Coliform, fecal	SM9221 (MTF)	>2	>2	MPN
Enterococci	SM9230 (MTF)	>2	>2	MPN
Turbidity	EPA180.1	0.02	0.1	NTU

Alpha Labs will be reporting the results at the MDL, however the data will be subject to their reporting protocols which will require that they flag the results as "Detected but below Reporting Limit; therefore, result is an estimated concentration, detected but not quantified (DNQ)".

[1] PQL – Practical Quantitation Limit

[2] MTF – multiple tube fermentation

[3] MPN – most probable number

Figure 1: Location of Surface-Water Sites in the Russian River Basin, Mendocino and Sonoma Counties, California

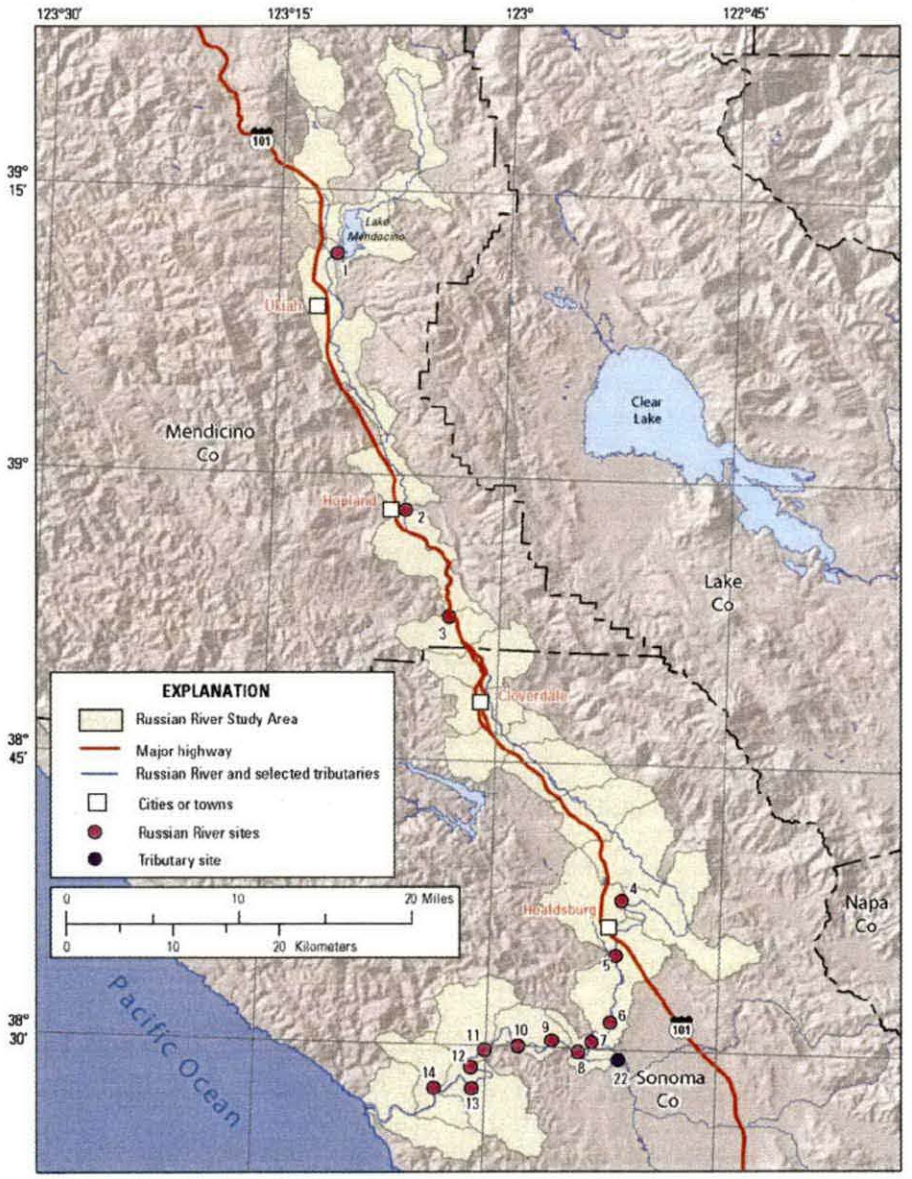


Figure 1. Location of surface-water sites in the Russian River Basin, Mendocino and Sonoma Counties, California.

RRIFR
Russian River Instream Flow and Restoration

Figure 2: Location of Groundwater Sites in the Lower Russian River Basin, Mendocino and Sonoma Counties, California

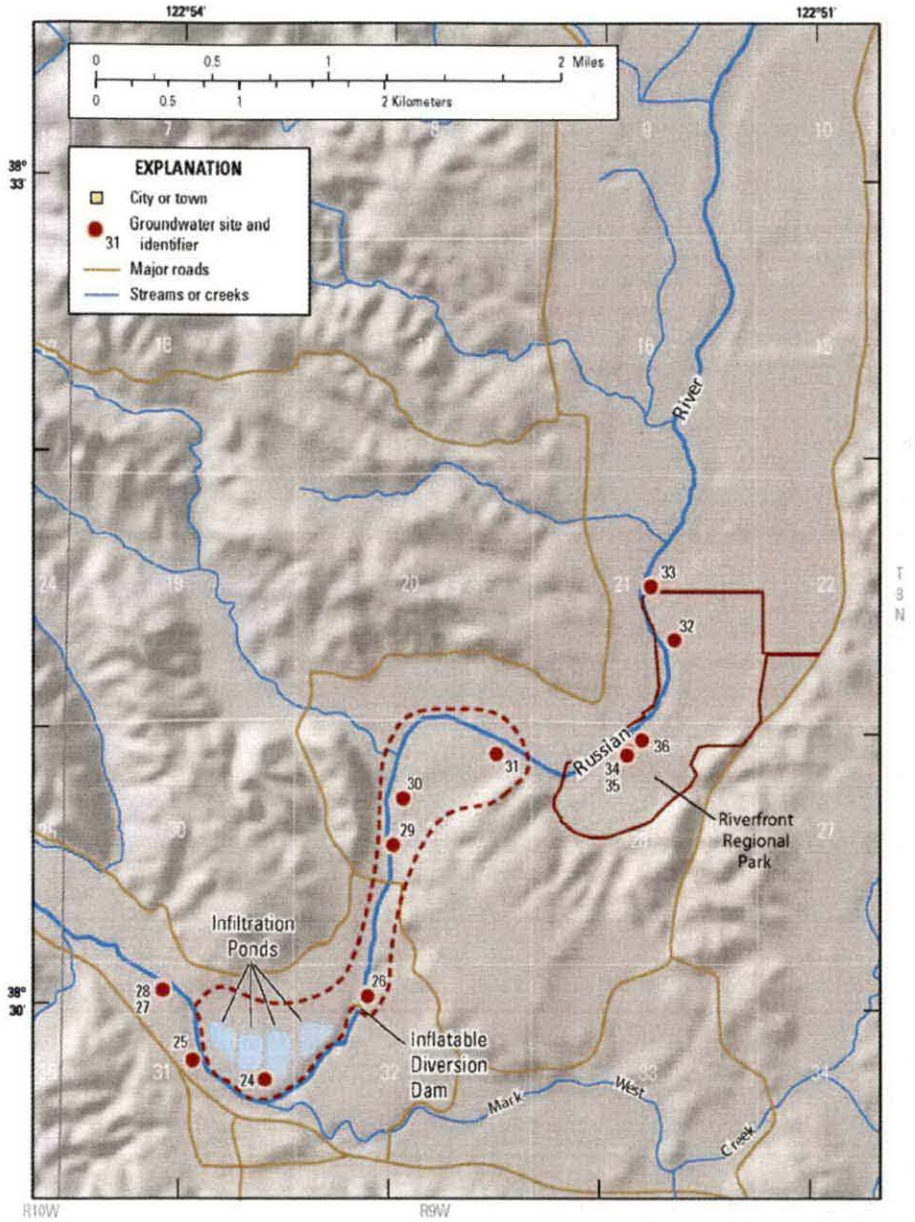


Figure 2. Location of groundwater sites in the Lower Russian River Basin, Sonoma County, California.

RRIFR
Russian River Instream Flow and Restoration

Figure 3: 2010 Russian River Estuary Monitoring Program