

State of California  
Regional Water Quality Control Board  
North Coast Region

Peter Otis  
August 14, 1997

EXECUTIVE OFFICER'S SUMMARY REPORT  
8:30 a.m., August 28, 1997  
Regional Water Quality Control Board  
Hearing Room  
5550 Skylane Boulevard, Suite A  
Santa Rosa, California

ITEM: 1

SUBJECT: Update on the Waste Reduction Strategy for the Laguna de Santa Rosa

## DISCUSSION

### Background

The Laguna de Santa Rosa was placed on the Clean Water Act, Section 303(d) list of impaired waterbodies in 1992 and 1994 because of occurrences of high unionized ammonia and low dissolved oxygen. High unionized ammonia levels are the result of inputs of nitrogen in various forms. Low dissolved oxygen levels arise from inputs of organic matter, and algal growth using more oxygen than is produced in the system. Pursuant to the provisions of the Clean Water Act, the Regional Water Board prepared a Waste Reduction Strategy for the Laguna de Santa Rosa, dated March 1, 1995, which set forth estimates for the pollutant sources of concern, as well as pollutant reduction goals. The 1995 Waste Reduction Strategy (WRS) identified and provided estimates of the nitrogen sources to the Laguna de Santa Rosa, and recognizing that it may not be feasible to immediately attain the desired levels of water quality in the Laguna de Santa Rosa, established numeric interim and final goals for nitrogen compounds as well as for unionized ammonia concentrations. For dissolved oxygen, the WRS set forth a final but not an interim goal. The U.S. Environmental Protection Agency approved the WRS as consistent with Section 303(d) of the Clean Water Act on May 4, 1995.

The dynamics of the hydrology of the Laguna de Santa Rosa are complex, and the WRS acknowledged the uncertainty of the estimates with respect to pollutant sources and loads. In order to gather field data to validate the assumptions, the WRS contains a monitoring program for the Laguna de Santa Rosa. The monitoring was intended to provide information regarding attainment of the goals, as well as the basis for reevaluating the goals at a future date if necessary. In October 1995, Regional Water Board staff prepared an Interim Water Quality Monitoring Report for the Laguna de Santa Rosa, which described the results of monitoring from January through June 1995. This report provides an update to the October 1995 report.

As described in the WRS, a reduction of inputs of nutrients and organic matter into the Laguna de Santa Rosa should reduce algal productivity as well as the intensity of the nighttime and early morning dissolved oxygen sags that adversely affect aquatic life. The WRS set forth a target for dissolved oxygen of a minimum of 7.0 mg/l, which is consistent with the minimum objective for dissolved oxygen set forth in the Basin Plan.

### **Regional Water Board WRS Monitoring Program**

The monitoring plan included in the WRS set forth the following objectives:

- 1) to provide information regarding the level of attainment to the USEPA criterion for unionized ammonia and to the Basin Plan objective for dissolved oxygen at the four attainment sites on the Laguna de Santa Rosa.
- 2) to provide information to identify areas within the watershed for further reductions in nitrogen and/or organic matter.
- 3) to investigate the extent to which sediments and aquatic vegetation contribute to nutrient and dissolved oxygen flux.

The WRS established four attainment points on the Laguna de Santa Rosa: Trenton-Healdsburg Road (LTH), Guerneville Road (LGR), Occidental Road, (LOR), and Stony Point Road (LSP). An additional point, located at the Willowside Road crossing of Santa Rosa Creek (SRCWS), though not an attainment site, was later included because under some conditions, it was observed that complete mixing of Santa Rosa Creek and Laguna de Santa Rosa was not occurring at LGR. Regional Water Board staff initiated twice-monthly monitoring of these locations in January 1995. To minimize variability factors, attainment points were visited at approximately the same time of day at each sampling event (usually between 9:00 a.m. and noon). In addition, the monitoring was designed so that an equal proportion of storm and non-storm samples were obtained during both winter seasons of 1995-1996 and 1996-1997. Attachment 2 is a map of the Laguna de Santa Rosa, depicting the four attainment points and sampling locations.

Field sampling parameters included pH, specific conductance, dissolved oxygen, water temperature, and stream flow. Chemical analyses were conducted on grab samples collected at the same time that field measurements were taken. Samples collected at every field sampling were analyzed for ammonia, nitrate, and biochemical oxygen demand, while those collected at every other field sampling were analyzed for the above, plus nitrite and total Kjeldahl nitrogen. Unionized ammonia was calculated using pH, temperature, and total ammonia-nitrogen data. In addition, dissolved oxygen saturation percentage was calculated from the field and instrument calibration data.

In addition, Regional Water Board staff installed continuous recording data recorders at three attainment points in the Laguna de Santa Rosa, (LSP, LOR, and LTH), during the months of June, July and August in order to determine the diurnal fluctuations of dissolved oxygen, pH, temperature, and specific conductivity.

Attachment 3 summarizes the results of the laboratory analyses for the nitrogen compounds at the four attainment points, and field observations for dissolved oxygen, from January 19, 1995 through May 28, 1997. Utilizing the nitrogen concentrations summarized in Attachment 3 and

Laguna de Santa Rosa from wastewater. From the Self-Monitoring Reports and the measured flows at LTH, Regional Water Board staff calculated wastewater loading estimates at LTH. Following is a comparison of the WRS and Self-Monitoring nitrogen loading estimates for LTH.

Estimates of Nitrogen Loading from Wastewater, in pounds per year, at Trenton-Healdsburg Road

| Season | WRS     | Self-Monitoring Reports |           |
|--------|---------|-------------------------|-----------|
|        |         | 1995-1996               | 1996-1997 |
| Winter | 244,932 | 443,045                 | 375,094   |
| Spring | 22,059  | 32,297                  | 5,588     |
| Summer | 0       | 0                       | 0         |
| Fall   | 18,148  | 0                       | 6,128     |
| Total  | 285,139 | 475,342                 | 386,810   |

The estimates set forth in the WRS strategy are lower than the estimates calculated from the Self-Monitoring Reports. Staff tends to place more reliance in the results provided by the Self-Monitoring Reports, and proposes to use those values as a basis for comparison in the future. A reduction in nitrogen loading from wastewater can be expected to occur in the near future as a result of the Upgrade Project at the Subregional Wastewater Treatment Plant. The Upgrade Project includes the addition of two aeration basins with anoxic zones and a fifth secondary clarifier, designed to provide an increased level of ammonia nitrogen removal. This additional level of treatment is expected to go on line prior to the next discharge season.

Dairy Agriculture: Several Clean Water Act Section 319(h) grants for nonpoint source control have been implemented by the City of Santa Rosa and the Goldridge and Sotoyome-Santa Rosa Resource Conservation Districts in efforts to reduce inputs of waste to the Laguna de Santa Rosa from confined animal operations, primarily dairies. The results of these efforts, although not specifically quantified at this time, without a question contribute to the improvement of water quality in the Laguna de Santa Rosa over the long term.

Urban Runoff: Efforts have increased to control pollutants contained in urban runoff through the recent implementation of federally-mandated storm water regulations. In compliance with those regulations, the Regional Water Board adopted Resolution No. 97-3, an NPDES Permit and Waste Discharge Requirements for the City of Santa Rosa, the Sonoma County Water Agency and the County of Sonoma (Co-Permittees), in March 1997. Resolution No. 97-3 established a municipal storm water permit for the urban area surrounding the City of Santa Rosa, based on a storm water management program, which included steps to fulfill the waste reduction goal set forth in the WRS. Resolution No. 97-3 calls for the Co-Permittees to provide, on July 1, 1998 and each year thereafter, a summary of analytical results, and an evaluation of the effectiveness of their storm water control efforts in meeting the goals.

In addition, the Regional Water Board has issued approximately 250 industrial and 100 construction storm water permits throughout the Region. Each permitted site is required to

Attachment 1. Summary of the long-term net load goals for each pollutant source at four attainment points within the Laguna de Santa Rosa, by season.

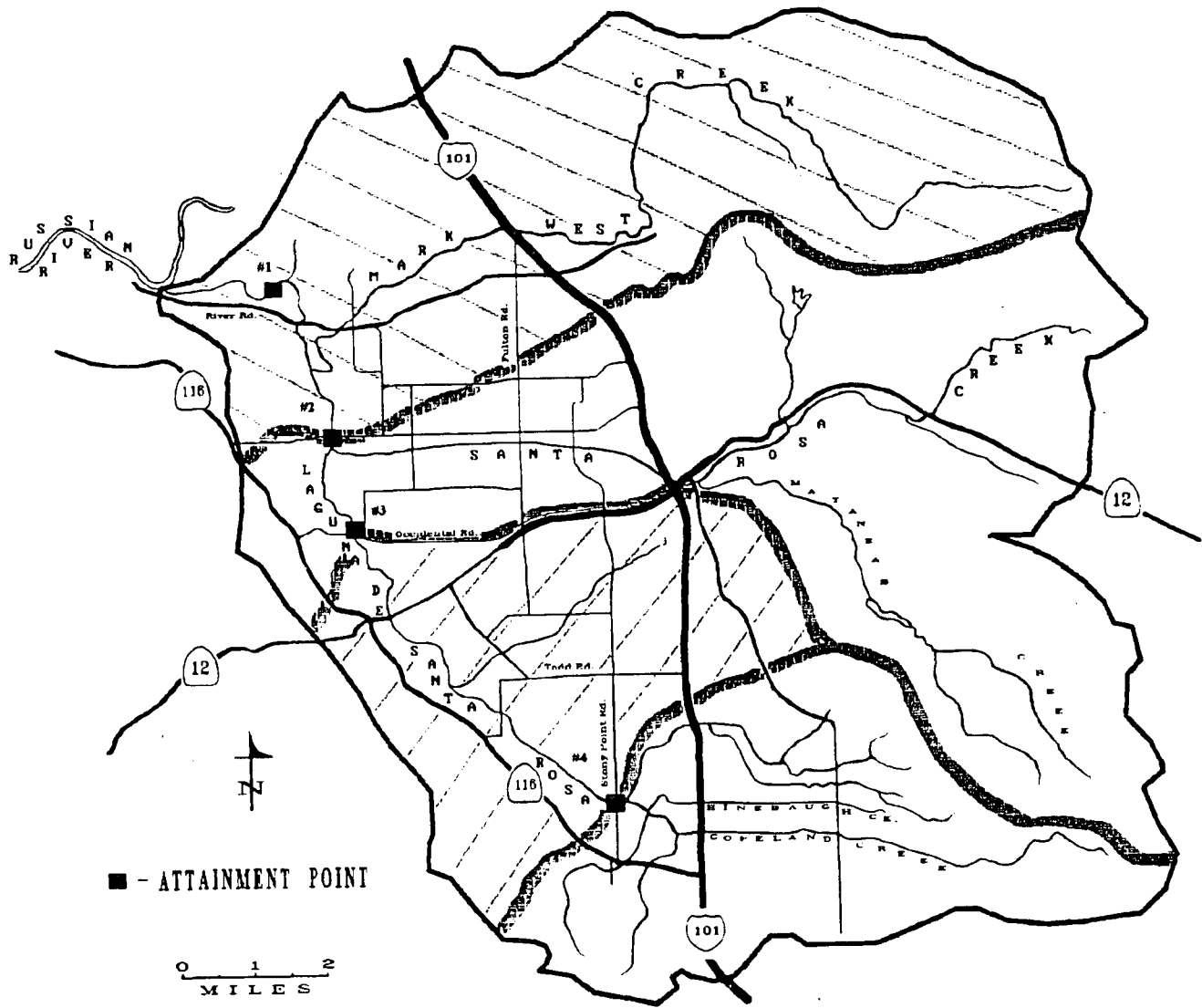
TOTAL NITROGEN (pounds/season)

| SOURCE                  | ATTAINMENT POINT 1<br>TRENTON-HEALDSBURG |        |        |        | ATTAINMENT POINT 2<br>GUERNEVILLE |        |        |        | ATTAINMENT POINT 3<br>OCCIDENTAL |        |        |        | ATTAINMENT POINT 4<br>STONY POINT |        |        |       |
|-------------------------|--|--------|--------|--------|-----------------------------------|--------|--------|--------|----------------------------------|--------|--------|--------|-----------------------------------|--------|--------|-------|
|                         | WINTER                                   | SPRING | SUMMER | FALL   | WINTER                            | SPRING | SUMMER | FALL   | WINTER                           | SPRING | SUMMER | FALL   | WINTER                            | SPRING | SUMMER | FALL  |
| URBAN WASTEWATER        | 52,393                                   | 6,468  | 0      | 5,175  | 87,935                            | 4,160  | 0      | 2,029  | 24,971                           | 0      | 0      | 0      | 17,054                            | 1,161  | 0      | 514   |
| NON-IRRIGATED DAIRY AG. | 0  | 0      | 0      | 0      | 112,466                           | 12,857 | 0      | 9,761  | 112,466                          | 9,202  | 0      | 8,387  | 0                                 | 0      | 0      | 0     |
| DAIRY POND              | 28,425                                   | 3,509  | 351    | 2,807  | 20,325                            | 2,509  | 251    | 2,007  | 16,119                           | 1,990  | 199    | 1,592  | 15,100                            | 1,864  | 186    | 1,491 |
| SEPTIC                  | 47,300                                   | 5,840  | 0      | 4,672  | 15,094                            | 0      | 0      | 0      | 77,940                           | 0      | 0      | 0      | 51,335                            | 3,496  | 0      | 1,546 |
| OPEN SPACE              | 0  | 0      | 0      | 0      | 0                                 | 0      | 0      | 0      | 0                                | 0      | 0      | 0      | 0                                 | 0      | 0      | 0     |
| TOTAL                   | 8,479                                    | 4,163  | 9,632  | 4,151  | 7,314                             | 3,592  | 8,577  | 3,581  | 6,913                            | 3,395  | 8,827  | 3,384  | 5,993                             | 2,943  | 6,134  | 2,934 |
|                         | 17,643                                   | 2,178  | 218    | 1,742  | 10,239                            | 1,264  | 126    | 1,011  | 439                              | 54     | 5      | 43     | 3,310                             | 409    | 41     | 327   |
|                         | 154,240                                  | 22,158 | 10,201 | 18,547 | 253,373                           | 24,382 | 8,954  | 18,389 | 238,848                          | 14,641 | 9,031  | 13,406 | 92,792                            | 9,873  | 6,361  | 6,812 |

TOTAL AMMONIA (pounds/season)

| SOURCE                  | ATTAINMENT POINT 1<br>TRENTON-HEALDSBURG |        |        |       | ATTAINMENT POINT 2<br>GUERNEVILLE |        |        |       | ATTAINMENT POINT 3<br>OCCIDENTAL |        |        |       | ATTAINMENT POINT 4<br>STONY POINT |        |        |       |
|-------------------------|--|--------|--------|-------|-----------------------------------|--------|--------|-------|----------------------------------|--------|--------|-------|-----------------------------------|--------|--------|-------|
|                         | WINTER                                   | SPRING | SUMMER | FALL  | WINTER                            | SPRING | SUMMER | FALL  | WINTER                           | SPRING | SUMMER | FALL  | WINTER                            | SPRING | SUMMER | FALL  |
| URBAN WASTEWATER        | 4,581                                    | 566    | 0      | 399   | 8,004                             | 326    | 0      | 130   | 2,271                            | 0      | 0      | 0     | 1,318                             | 50     | 0      | 10    |
| NON-IRRIGATED DAIRY AG. | 0  | 0      | 0      | 0     | 15,002                            | 1,523  | 0      | 1,040 | 15,002                           | 695    | 0      | 366   | 0                                 | 0      | 0      | 0     |
| DAIRY POND              | 1,469                                    | 181    | 18     | 145   | 1,051                             | 130    | 13     | 104   | 833                              | 103    | 10     | 82    | 781                               | 96     | 10     | 77    |
| SEPTIC                  | 7,883                                    | 1,143  | 0      | 705   | 2,515                             | 0      | 0      | 0     | 12,990                           | 0      | 0      | 0     | 8,556                             | 325    | 0      | 68    |
| OPEN SPACE              | 0  | 0      | 0      | 0     | 0                                 | 0      | 0      | 0     | 0                                | 0      | 0      | 0     | 0                                 | 0      | 0      | 0     |
| TOTAL                   | 2,829                                    | 1,389  | 3,215  | 1,385 | 2,438                             | 1,197  | 2,860  | 1,194 | 2,304                            | 1,131  | 2,941  | 1,128 | 1,997                             | 981    | 2,044  | 0     |
|                         | 509                                      | 63     | 6      | 50    | 296                               | 37     | 4      | 29    | 13                               | 2      | 0      | 1     | 96                                | 1      | 1      | 1     |
|                         | 17,271                                   | 3,342  | 3,239  | 2,684 | 29,306                            | 3,213  | 2,877  | 2,497 | 33,413                           | 1,931  | 2,951  | 1,577 | 12,748                            | 1,464  | 2,055  | 1,112 |

Attachment 2. The Laguna de Santa Rosa watershed



Attachment 3. Summary of nitrogen compounds at four attainment points in the Laguna de Santa Rosa, January 19, 1995 to May 28, 1997,

**Total nitrogen (the sum of organic, nitrate, nitrite, and ammonia nitrogen) in mg N/L in the Laguna de Santa Rosa.**

| Attainment Point | Number of Measurements | Mean | Range        |
|------------------|------------------------|------|--------------|
| LSP              | 27                     | 1.83 | 0.71 - 5.22  |
| LOR              | 27                     | 3.13 | 0.64 - 10.95 |
| LGR              | 18                     | 1.59 | 0.425 - 5.99 |
| LTH              | 27                     | 1.83 | 0.485 - 5.3  |

**Total ammonia in mg N/L in the Laguna de Santa Rosa.**

| Attainment Point | Number of Measurements | Mean  | Range         |
|------------------|------------------------|-------|---------------|
| LSP              | 55                     | 0.119 | 0.025 - 0.769 |
| LOR              | 55                     | 0.207 | 0.025 - 1.04  |
| LGR              | 38                     | 0.101 | 0.025 - 0.513 |
| LTH              | 55                     | 0.127 | 0.025 - 0.653 |

**Unionized ammonia in mg N/L in the Laguna de Santa Rosa.** Attainment goals are: a) 60% of measurements below 0.025 mg N/L by July 1996; b) 70% of measurements below 0.025 mg N/L, by July 1998, and; c) 80% of measurements below 0.025 mg N/L by July 2000.

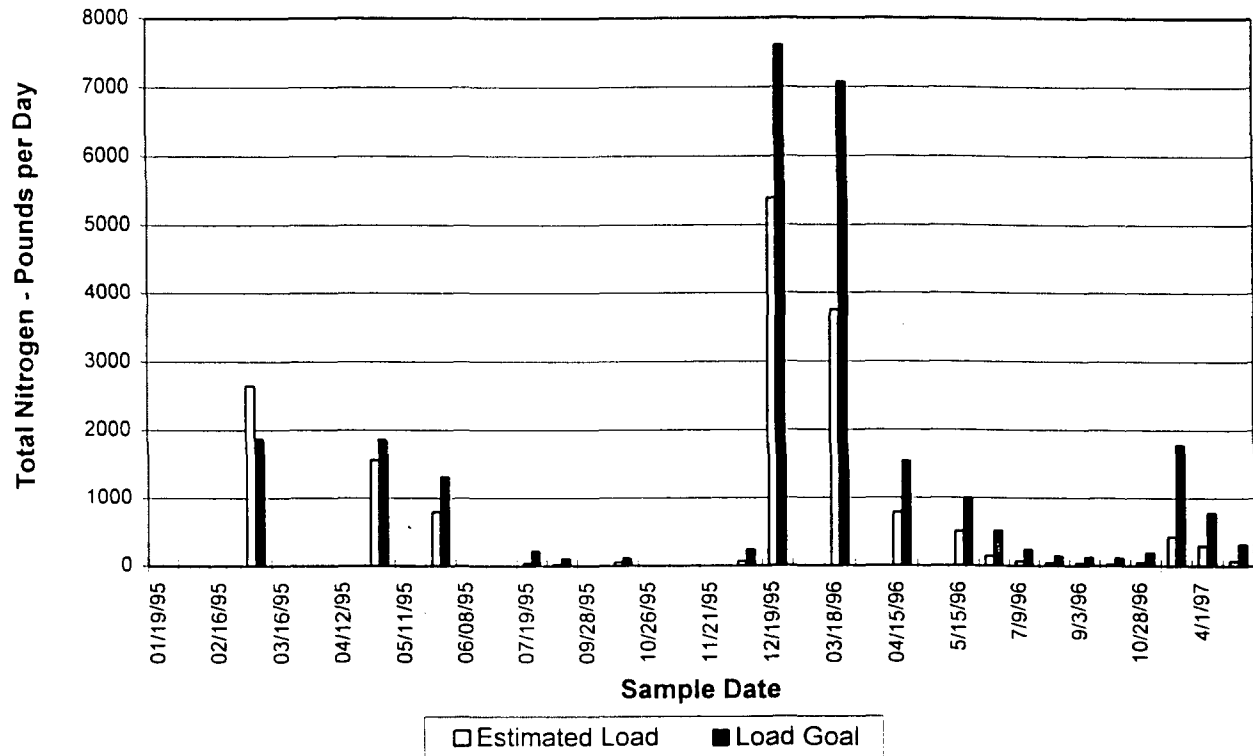
| Attainment Point | Number of Measurements | Mean    | Range              | Percent of Measurements Achieving Final Goal |
|------------------|------------------------|---------|--------------------|--|
| LSP              | 55                     | 0.00203 | 0.00013 - 0.0116   | 100  |
| LOR              | 55                     | 0.0058  | 0.00029 - 0.0379   | 94.5   |
| LGR              | 38                     | 0.00282 | 0.00027 - 0.0106   | 100  |
| LTH              | 55                     | 0.00186 | 0.000095 - 0.00688 | 100  |

**Dissolved Oxygen in mg/l in the Laguna de Santa Rosa.** Goal = 100 % of measurements above 7.0 mg N/L

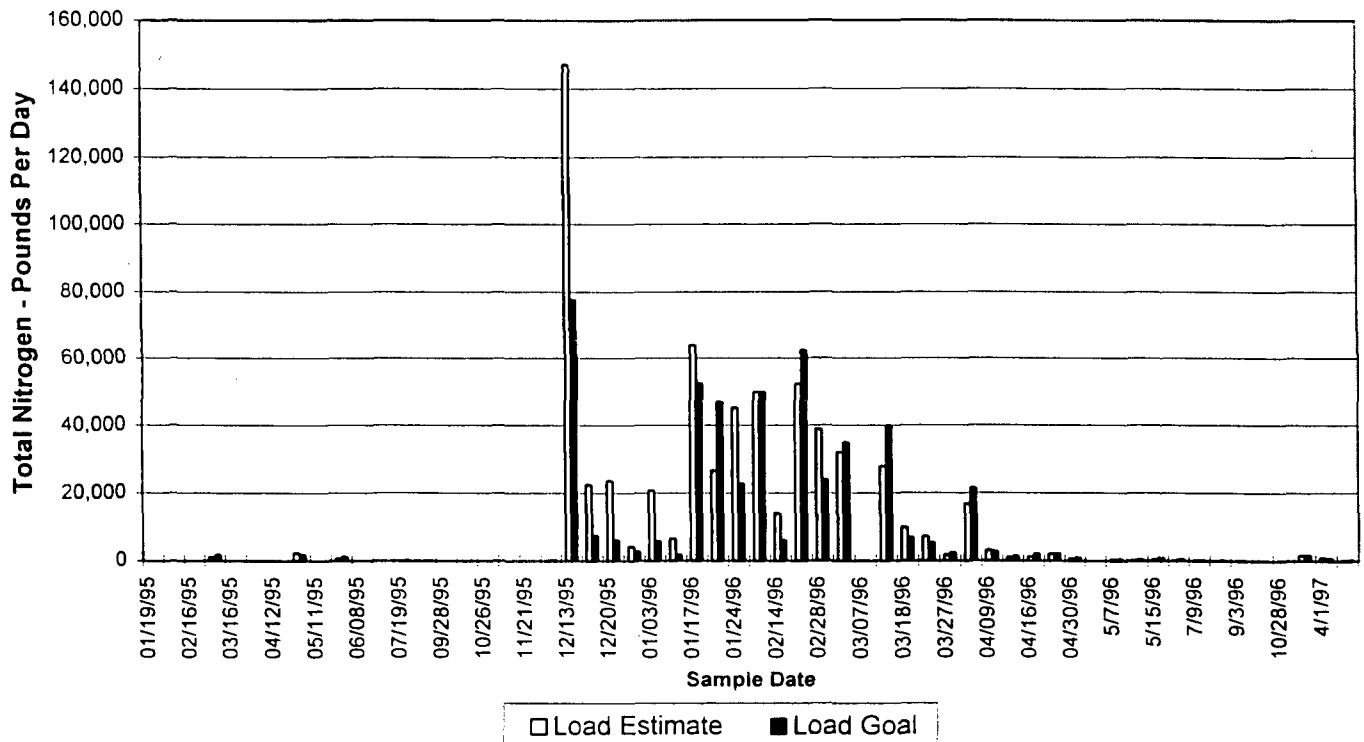
| Attainment Point | Number of Measurements | Mean | Range      | Percent of Measurements Achieving Goal |
|------------------|------------------------|------|------------|--|
| LSP              | 56                     | 6.19 | 2.2 - 9.4  | 39.3                                   |
| LOR              | 56                     | 8.16 | 3.0 - 20.0 | 60.7                                   |
| LGR              | 39                     | 6.09 | 2.5 - 9.9  | 30.8                                   |
| LTH              | 56                     | 7.28 | 4.2 - 10.6 | 57.1                                   |

Attachment 4. Load estimates for total nitrogen in pounds per day at four attainment points in the Laguna de Santa Rosa.

**Laguna de Santa Rosa at Stony Point Road (LSP)**  
**Load Estimates for Total Nitrogen**

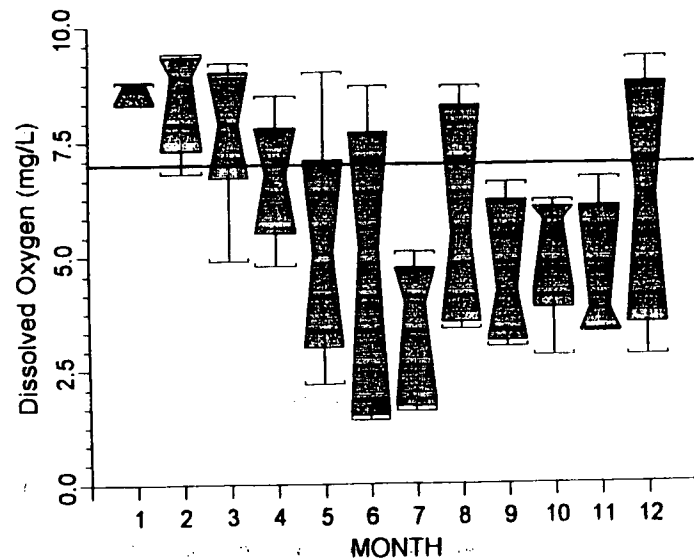


**Laguna de Santa Rosa at Occidental Road (LOR)**  
**Load Estimates for Total Nitrogen**

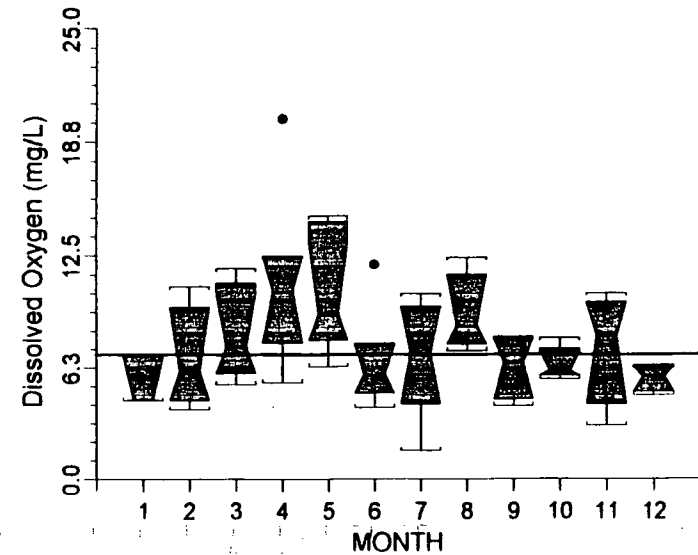


Attachment 5. Dissolved oxygen in mg/l at four attainment points in the Laguna de Santa Rosa, January 1995 through July 1997. Reference line = 7.0 mg/l

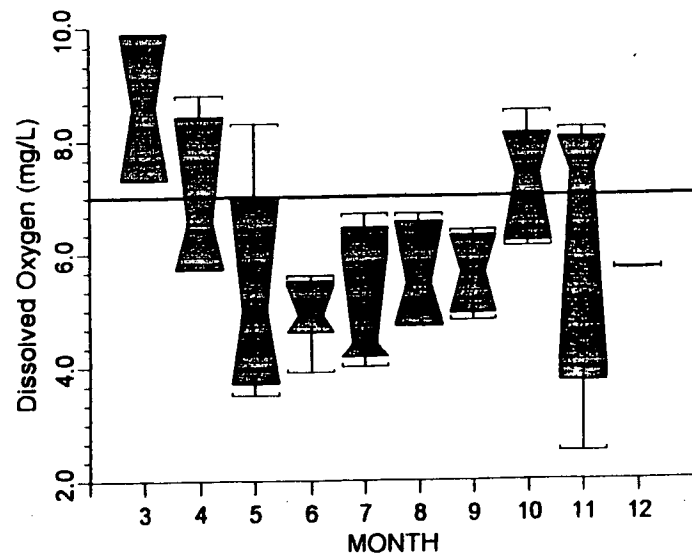
Laguna at Stony Point Road (LSP)



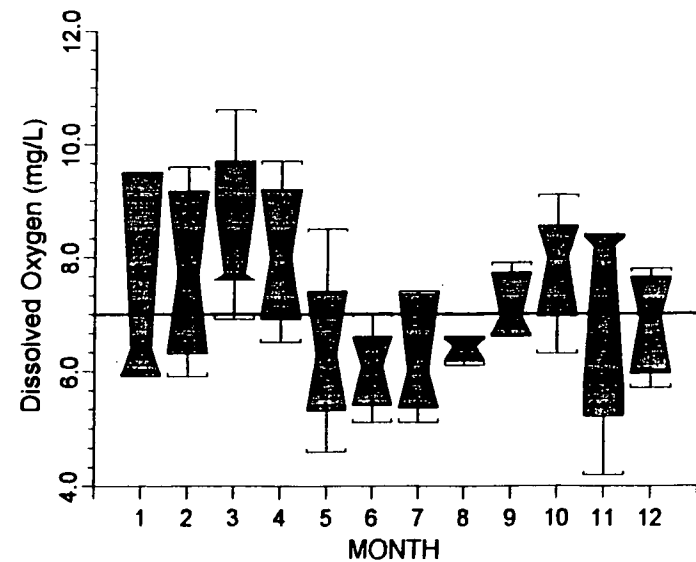
Laguna at Occidental Road (LOR)



Laguna at Guerneville Road (LGR)

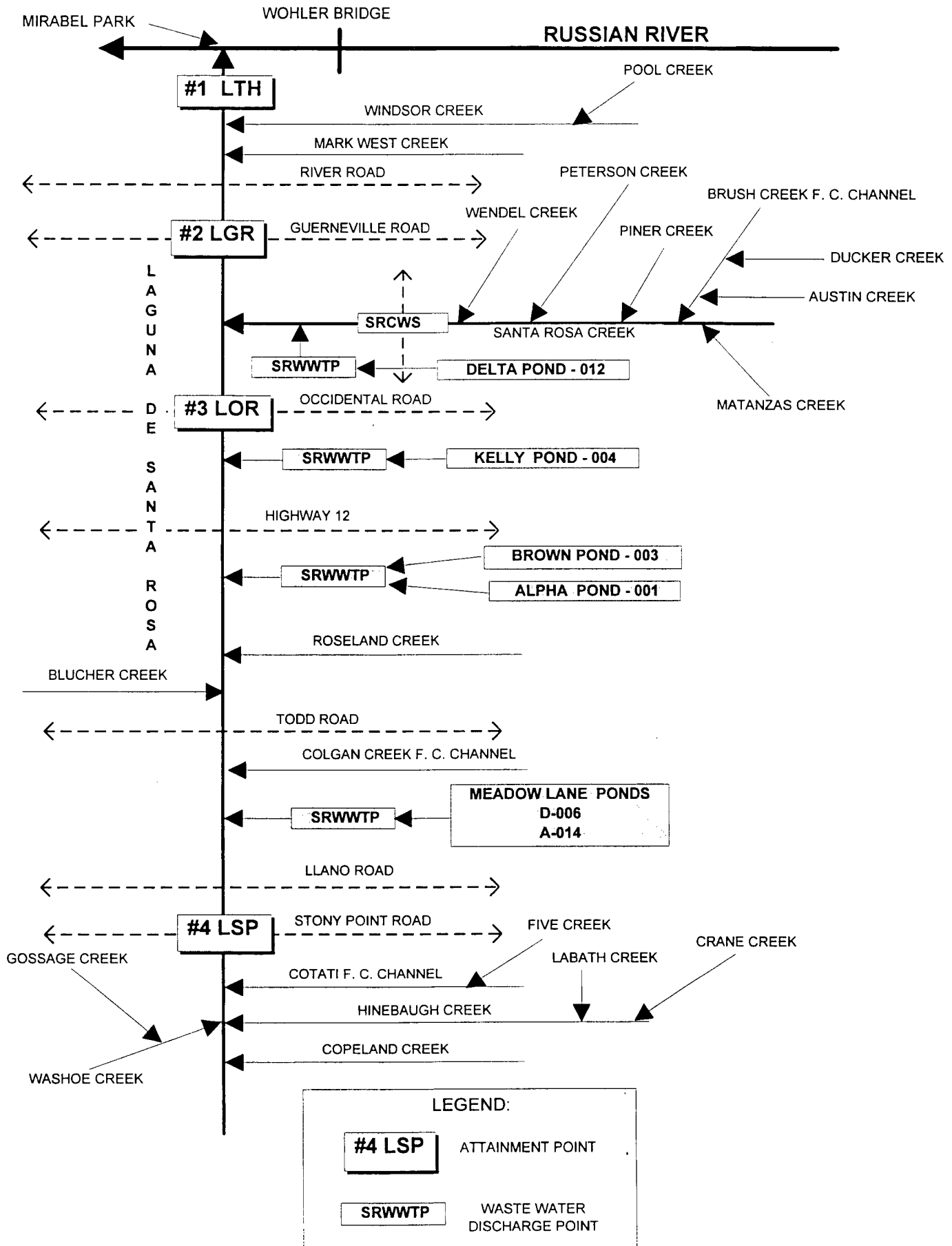


Laguna at Trenton-Healdsburg Road (LTH)





Attachment 7. The Laguna de Santa Rosa system including sources of wastewater inputs and the four attainment points.



Attachment 6. Continuous dissolved oxygen at three attainment points in the Laguna de Santa Rosa, July 9, 1997 through July 17, 1997.

