

## Introduction

This water quality monitoring fact sheet was prepared by the Irrigated Agriculture Program of the Central Coast Regional Water Quality Control Board (Water Board) and made available on November 30, 2008. The data were delivered by Central Coast Water Quality Preservation, Inc. (CCWQP) to the Water Board as part of the monitoring and reporting requirements for all dischargers enrolled under *Conditional Waiver of Waste Discharge Requirements for Discharge from Irrigated Lands, Order No. R3-2004-0117*. Monitoring stations were selected to represent water quality in predominantly agricultural areas, but in some cases reflect mixed land uses upstream of the sites.

## 309ALG Salinas Reclamation Canal at La Guardia

The Cooperative Monitoring Program sampled Salinas Reclamation Canal at La Guardia 38 times (one sample per month) between January 2005 and December 2007, with an additional sample in February 2005.

## Summary of Water Quality Data

### Notable Measured Analytes for Water Quality Monitoring

Analyte/Parameter	Average	Range	Water Quality Criteria (WQC) or Guideline <sup>1</sup>	Percent Outside WQC or Guideline
Ammonia as N, Unionized	0.138 mg/L	0.002–1.561 mg/L	<0.025 mg/L <sup>+</sup>	64%
Nitrate/Nitrite as N	17.0 mg/L	0.15–41 mg/L	<10.0 mg/L*	73%
Orthophosphate as P	0.92 mg/L	0.00–5.46 mg/L	<0.12 mg/L*	92%
Turbidity (NTU)	340 NTU	14 –2524 NTU	<25 NTU*	86%
Conductivity	1.03 mmho/cm	0.39–1.82 mmho/cm	Ranges: * <0.75 No Problem 0.75–3.0 Increasing >3.0 Severe	% in Range: 22% 78% 0%
pH	8.3	7.3–9.3	7.0–8.3 <sup>+</sup>	49%
Annual Median Dissolved Oxygen (% Saturation)	2005: 85% 2006: 77% 2007: 115%	21–194%	>85% annual median <sup>+</sup>	Std met Std not met Std met
Dissolved Oxygen	8.6 mg/L	1.8–15.9 mg/L	>5.0 mg/L (GEN/WARM) <sup>+</sup> >7.0 mg/L (COLD/SPWN)*	8% 27%
Chlorophyll a	8.4 µg/L	0.0–140 µg/L	<40 µg/L*	3%
Water Temperature	20.0°C	11.2–28.2°C	Water Basin Specific	--

+ Indicates standard defined in the Water Quality Control Plan, Central Coast Basin (Basin Plan)

\* Indicates guideline not described in the Basin Plan or not specifically stated as applicable to the beneficial uses of the site. Origin of the guideline is described in the individual discussion of the analyte/parameter.

The present and potential beneficial uses for **Salinas Reclamation Canal** as defined in the Basin Plan include Water Contact Recreation (REC-1), Non-Contact Water Recreation (REC-2), Wildlife Habitat (WILD), Warm Fresh Water Habitat (WARM), and Commercial and Sport Fishing (COMM).

<sup>1</sup> Water Quality Criteria (WQC) are defined in the Water Quality Control Plan, Central Coast Basin (also referred to as the “Basin Plan”) to protect beneficial uses such as drinking water, fish habitat, irrigation water, etc. WQC include general water quality standards for some analytes as well as specific criteria based on the defined beneficial uses. Other water quality guidelines were compiled to provide a standard in order to compare sites. Bold indicates beneficial uses that apply to this watershed.

## Unionized Ammonia (as N)

Unionized ammonia (as N) is a calculated value based on water temperature, pH, and total ammonium concentration. Ammonia can be toxic in water. With high water temperature and/or high pH, ammonia becomes unionized and is toxic at much lower levels. The Basin Plan general water quality objectives state that unionized ammonia shall not exceed 0.025 mg/L. Over time, ammonia should reduce to nitrate, so long-lasting levels of ammonia may indicate continuous discharges of waste. **Twenty-three of 36 samples (64%) exceeded the standard, reaching over 60 times the standard (July 2007 – 1.561 mg/L). Four of the five highest samples occurred between May and July. The average unionized ammonia concentration was 0.138 mg/L. However, the standard deviation was 0.283 mg/L, indicating extreme (high and low) samples.**

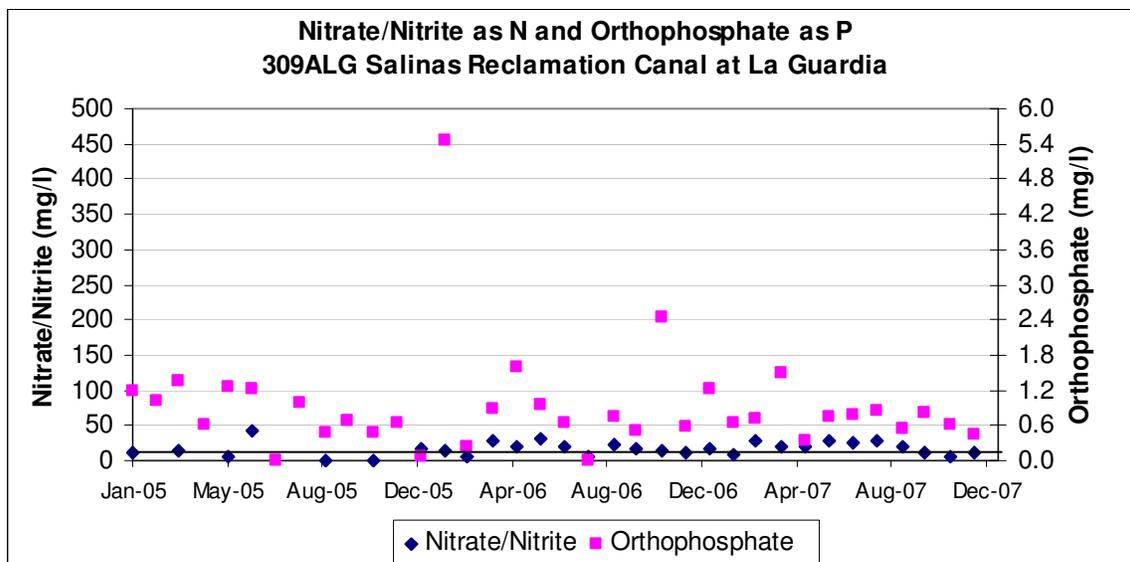
## Nitrate/Nitrite as N

The Municipal and Domestic Supply (MUN) objective states in Table 3-2 of the Basin Plan that nitrate as NO<sub>3</sub> shall not exceed 45 mg/L. This value is equivalent to 10 mg/L of nitrate as N. Nitrite accounts for a small percent of total nitrate/nitrite, and therefore, nitrate as N criterion was used as a guideline for nitrate/nitrite. **Twenty-two of 30 nitrate/nitrite samples (73%) exceeded the guideline; one by more than four times (June 2005 – 41 mg/L). The average concentration was 17.0 mg/L. The four highest concentrations occurred between June and August.**

## Orthophosphate as P

The Basin Plan does not contain orthophosphate standards. The Central Coast Ambient Monitoring program (CCAMP) non-regulatory guideline for general water quality objectives states that orthophosphate concentrations shall not exceed 0.12 mg/L. **Orthophosphate concentrations exceeded the guideline in 33 of 36 samples (92%); by more than 10 times in eight samples, and by 45 times in one sample (February 2006 – 5.46 mg/L). There is no apparent seasonal cycle. The average concentration was 0.92 mg/L.**

The chart below shows the nitrate/nitrite and orthophosphate concentrations throughout the sampling period. The guidelines for nitrate/nitrite as N and orthophosphate as P state that their concentrations shall not exceed 10 mg/L and 0.12 mg/L, respectively, shown by the black horizontal line on the graph.



## Turbidity

The Basin Plan states: “Water shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses.” Sigler et al.<sup>2</sup> shows that turbidity levels of 25 NTU or greater caused reduction in juvenile salmonid growth due to interference with their ability to find food. Turbidity is often affected by suspended material in runoff. **Thirty-two of 37 turbidity readings (86%) exceeded the guideline. Turbidity levels in the Salinas Reclamation Canal at La Guardia**

<sup>2</sup> Sigler, J.W., T.C. Bjornn, & F.H. Everst. (1984). *Effects of chronic turbidity on density and growth of steelhead and coho salmon*. Transactions of the American Fisheries Society. 113:142-150.

averaged 340 NTU, ranging from 14 to 2524 NTU. The standard deviation was almost 500 NTU, indicating extreme (high and low) readings.

## Conductivity

Conductivity is measured from a water sample. Based on Table 3-3 of the Basin Plan showing Guidelines for Interpretation of Quality of Water for Irrigation, conductivity below 0.75 mmho/cm causes no problems to irrigation, between 0.75 and 3 mmho/cm causes increasing problems, and conductivity above 3 mmho/cm causes severe problems. The conductivity level can be greatly affected by geologic and biological influences and is not necessarily related to agricultural activities. **Eight of 37 conductivity samples (22%) indicated no problems to irrigation water; 29 samples (78%) indicated increasing problems; no samples indicated severe problems. Conductivity appears to be greater each year between May and October than November and April.**

## pH

Multiple beneficial uses have objectives for pH. The Basin Plan general water quality objective for pH is between 7.0 and 8.5; MUN, AGR, REC-1, and REC-2 pH objectives are between 6.5 and 8.3. The standard, therefore, is 7.0-8.3 if one or more of MUN, AGR, REC-1, and REC-2 is defined as a beneficial use. pH above 9 can cause skin irritation to humans and makes water inhospitable to many species. **Eighteen of 37 pH samples (49%) exceeded the standard, with four samples with pH levels over 9. pH is often affected by salinity, however, the total conductivity does not appear to be high. pH appears to be on an annual cycle peaking in June of each year, and it may be increasing over the three years.**

## Dissolved Oxygen Concentration and Dissolved Oxygen Saturation

The Basin Plan general water quality objectives state annual median dissolved oxygen shall remain above 85% saturation. General and WARM objectives state that the dissolved oxygen concentration must remain above 5.0 mg/L at all times, and SPWN and COLD objectives state that the dissolved oxygen concentration must remain above 7.0 mg/L at all times. **Three of 37 samples (8%) did not meet the general and WARM concentration standard. Dissolved oxygen did not meet the saturation standard during 2006, with a median annual value of 77% saturation. Median annual values for 2005 (85%) and 2007 (115%) met the standard for dissolved oxygen saturation.**

**Though no standards have been set in the Basin Plan regarding dissolved oxygen supersaturation (>100%), studies have shown that supersaturation of gases may cause gas bubble trauma in fish<sup>3</sup>. Dissolved gas saturation levels were not collected at this site; however, oxygen levels reached 194% saturation, which may indicate dissolved gas supersaturation.**

## Chlorophyll a

Healthy and appropriate Chlorophyll a levels are not defined in the Basin Plan. Chlorophyll a indicates phytoplankton growth, a necessary component of healthy water bodies. Because turbidity causes interference for the Chlorophyll a probe, measurements of Chlorophyll a may not be accurate when turbidity is above 1000NTU. Chlorophyll a levels over 40µg/L are considered problematic by North Carolina Administrative Code (NCAC). **One of 36 Chlorophyll a readings (3%) exceeded the guideline (July 2005 – 140 µg/L). Excluding the value from July 2005, the average would be 4.60 µg/L.**

## Temperature

Sullivan et al.<sup>4</sup> state that the maximum weekly average temperatures for protection of steelhead or rainbow trout, and coho salmon is 19.6 and 19.7°C respectively. **The temperature averaged 20.0°C and ranged from 11.2 to 28.2°C. Though weekly averages were not taken, the temperatures taken at this site indicate averages that may exceed the maximum temperatures for fish protection. However, the Basin Plan defines this site as a warm-water body, which may not be suitable for fish habitat or spawning.**

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<sup>3</sup> Mesa, M.G., L.K. Weiland, & A.G. Maule. (2000). *Progression and severity of gas bubble trauma in juvenile salmonids*. Transactions of the American Fisheries Society. 129:174-185.

<sup>4</sup> Sullivan, K., D.J. Martin, R.D. Cardwell, T.E. Toll, & S. Duke. (2000). *An analysis of the effects of temperature on salmonids of the Pacific Northwest with implications for selecting temperature criteria*. Portland, OR: Sustainable Ecosystems Institute.

## Summary of Toxicity Data

### Species with Significant Mortality

	Feb-05	Mar-05	Apr-05	Jul-05	Sep-05	Feb-06	May-06	Aug-06	Sep-07	Feb-07	Mar-07	Apr-07	Oct-07
Invertebrate (Water Column)	Yes <sup>+</sup>	Yes <sup>+</sup>		Yes <sup>+</sup>	Yes <sup>+</sup>	Yes <sup>+</sup>		Yes	Yes	Yes	Yes		Yes
Invertebrate (Sediment)			Yes				Yes					Yes	
Fish (Water Column)	No*	No				Yes		No	No	No	No		No
Algae (Water Column)	No	No				Yes		No	No	No	No		No

<sup>+</sup>Indicates complete mortality within 24 hours of test initiation

\*Indicates significant effect on growth or reproduction (even though mortality did not have a significant effect)

Significant effect is determined by statistically significant rates of mortality, growth, or reproduction compared to a control sample and provides an indication that something is affecting plant or animal life in the stream. Invertebrates show significant sensitivity to organophosphates and pesticides. Significant effect to algae often indicates the presence of herbicides and metals such as copper. Fish are less sensitive to organophosphates but can be impacted by other pollutants such as ammonia and pyrethroid pesticides.

### Photos of Site



February 2006



July 2006

### QAQC

The data in this water quality monitoring fact sheets meet the quality assurance and quality control requirements of the Water Board's Surface Water Ambient Monitoring Program (SWAMP). Additional surface water monitoring data are available at the Water Board's Central Coast Ambient Monitoring Program website <http://www.ccamp.org>. Any questions regarding the data or analysis should be directed to either **Peter Meertens** at [pmeertens@waterboards.ca.gov](mailto:pmeertens@waterboards.ca.gov) (805) 549-3869 or **Amanda Bern** at [abern@waterboards.ca.gov](mailto:abern@waterboards.ca.gov) (805) 594-6197.

### Attachment: Monitoring Data

