MERRITT SMITH
CONSULTING
ENVIRONMENTAL SCIENCE AND COMMUNICATION

MEMORANDUM

TO: Lynn Small, Deputy Director Environmental Compliance

FROM: Mike Deas, P.E., Ph.D.
Dave Smith, Ph.D.

DATE: 3 January 2009

SUBJECT: Model Verification Approach for Receiving Water Quality Limit Compliance Assurance and Monitoring Plan

INTRODUCTION

The compliance workbook (spreadsheet) has been established as a tool to determine the quantity to be discharged in compliance with receiving water limits consistent with the City's Receiving Water Quality Limit Compliance Assurance and Monitoring Plan. The compliance spreadsheet is based on a modeled representation of the edge of the zone of initial dilution (ZID) over a range of receiving water and recycled water flows. RWQCB staff have requested field validation of the modeled location of the ZID edge. Outlined herein is a monitoring plan to verify modeled ZID edge location. Observations will be made during discharge to assess receiving water conditions above and below the outfall with known conditions at the identified monitoring locations (Laguna de Santa Rosa near Sebastopol, Santa Rosa Creek near Willowside, and Delta Pond). Parameters to be monitored, locations, and methodology are outlined below

WATER QUALITY CONSTITUENTS AND SAMPLING METHODS

Six water quality constituents will be measured in the receiving water: temperature, pH, dissolved oxygen, conductivity, and turbidity. With the exception of conductivity, all parameters are incorporated into the current compliance calculator. Conductivity is a useful conservative constituent for assessing mixing zones. Nitrate will also be collected via grab samples to support the requested Basin Plan amendment for mixing zones. In addition, spot measurements of velocity will be measured. The physical parameters (temperature, pH, dissolved oxygen, conductivity, and turbidity) will be sampled with a water quality probe at mid-water column depth, and vertical variability will also be described. Velocity will be measured at 0.4 times the total depth from the bottom of the channel. This depth represents the depth-averaged velocity based on the theoretical logarithmic vertical velocity profile for turbulent streams, and is the standard single depth measurement approach for velocities associated with discharge measurements.

LOCATIONS AND FREQUENCY

Temperature, pH, dissolved oxygen, conductivity, and turbidity will be collected along approximately linear cross sections, normal to the longitudinal axis of the stream, as shown in Figure 1. Starting approximately 400 feet above the outfall, three cross sections spaced at approximately 100 foot intervals will be sampled. At approximately 100 feet above the outfall to Guerneville Road, cross sections will be located approximately 50 feet apart. Between the outfall and the confluence of Santa Rosa Creek and the Laguna, additional cross sections will be sampled (i.e., separated by less than 50 feet) to ensure representative zones of influence are captured consistent with the receiving water flow and the discharge. Three cross sections approximately 100 feet apart will be collected in the Laguna above the confluence with Santa Rosa Creek.

Each cross section will be sampled at a minimum of five locations representing left bank, right bank, mid-channel, and intermediate points between the mid-channel and the banks. In the vicinity of the outfall and downstream, additional measurements may be required to effectively define the zone of initial dilution, and the locations and level of detail will be refined in the field. All parameters will also be collected coincidentally at the Laguna de Santa Rosa near Sebastopol, Santa Rosa Creek near Willowside, and Delta Pond.

Cross section locations and sampling densities should be viewed as a target sampling strategy, and field conditions may warrant deviation from this plan.

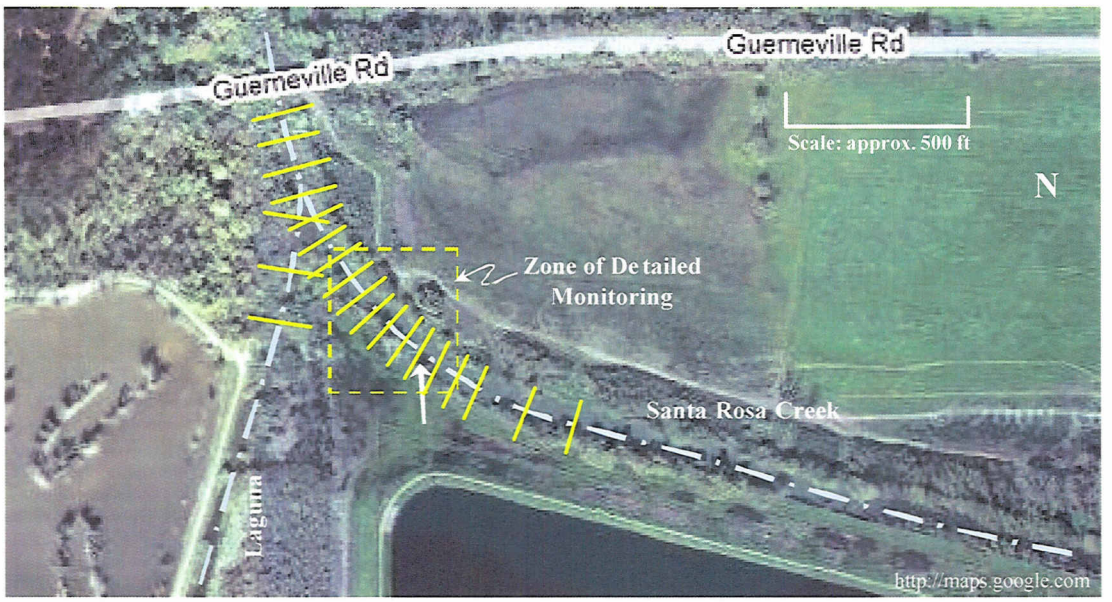

Figure 1. Study area and approximate location of proposed monitoring cross sections

METHODOLOGY

Equipment

As noted above, sampling for physical parameters will be carried out with a datasonde or similar probe. Approximately ten nitrate will be collected in HDPE bottles and placed on ice for processing at the laboratory. Velocity measurements will be made with a velocity meter.

The instrument used to collect physical parameters will be a handheld unit, capable of profiling or sampling in different depths of water. Grab samples will be collected in a van Dorn or Kemmerer bottle, or if waters are shallow and well mixed, by dipping into the current. Datasondes will be deployed at Laguna de Santa Rosa near Sebastopol, Santa Rosa Creek near Willowside, and Delta Pond, and grab samples of nitrate will be collected after the detailed observations near the outfall.

Flow Rate and Range of Discharge

The field data collection should be conducted when the following conditions exist:

- Discharge of recycled water is occurring and flexibility to vary discharge rate exists. Collection of data when discharge rate is between approximately 10 and 50 mgd is desirable; and

- Receiving water flow rate is less than approximately 100 to 150 cfs (65 to 97 mgd) is desirable for safety. These reaches of Santa Rosa Creek and the Laguna are heavily vegetated with woody riparian vegetation and boating in such conditions can be extremely hazardous.

Field crews should assess the potential for study approaches at higher flow rates while completing this work (e.g., dye studies).

Model Validation

Data collected in the vicinity of the outfall will largely act as conservative constituents because of the short transit time between the outfall and immediate downstream reaches. A sufficient number of constituent measurements will allow isopleths of common concentration to be plotted and these will be compared with simulation results. Also, local velocity measurements will be compared with simulation conditions.

Equipment:

- Boat and crew (need to maintain boat while someone conducts measurement) – I think for safety we need 3 people (a driver, a velocity sampler, and a WQ sampler)
- Three deployed datasondes and one handheld (with turbidity probe)
- Sampling equipment for nitrate
- Velocity meter (e.g., Marsh McBirney)
- GPS
- General field supplies